Lynch Mining Pty Ltd

EL7/2005 “Luina”

Annual Report for the period 30 June 2011 to 30 June 2012.

By: Bright Phase Pty Ltd

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- Draft Resource Report
- DPEMP Application, NOI, Department of Environment communications
- Mining One latest draft JORC Report

1.0 Introduction

This report details all development work undertaken on Exploration License 7/2005, "Luina" during the Annual Period 30th June 2011 to 30th June 2012.

Exploration License 7/2005, "Luina" covering an area of 18km2 lies in Western Tasmania and is situated to the west of Waratah. Access is via the sealed Waratah-Savage River road and then via a series of sealed and unsealed mine access and forestry roads/tracks.

The terrain is dominated by steep shrub and tree covered slopes, with a significant area of rehabilitated mine workings and former town site. Areas of former forestry clearing are also present. Both the Whyte River and Washington Creek transect the tenement areas.

Development work during the reporting period focused on understanding and defining the project's geology and progression of the project environmental approvals. Specifically, they included:

- Consolidation of all available drilling data, development of mine drill hole spreadsheet database and block model based on geological reinterpretation and assay of splits of the original cores held at the Mineral Resources Tasmania (MRT) Morningside core store, and progress on a Mine Resource Report.
- Submission of an Environment Protection and Biodiversity Conservation Act 1999 (EPBC) Referral document to the Federal Department of the Environment.
- Development of a Notice of Intent for progression of the Cleveland project.
- Development of a JORC-Waiver report for the ASX.

2.0 Tenure

Exploration license 7/2005 (Luina) covering an area of 18km2 was granted to Lynch Mining Pty Ltd on 30th June 2005 for a period of 5 years. The lease is now granted on a year-by-year basis. Lynch Mining has negotiated a contract with Bright Phase Resources Ltd to sell ownership of this lease subject to a number of conditions being met.

3.0 Previous Exploration

The Cleveland deposit was discovered in 1898. Initial production of the surficial ore commenced in 1908, and ceased in 1914 after production of 295.5 tonnes of cassiterite. Tributing continued until 1917, during which time a further 48 tonnes were produced. Aberfoyle commenced mining in 1968, and mining was ceased in early 1986, primarily due to the collapse of the tin price.

At the cessation of the more recent mining activity, approximately 7 million tonnes of ore assaying 0.82% Sn and 0.35% Cu had been processed.

Various reports show that a significant resource remains in the deposit, with Measured and Indicated resources of 5.2 million tonnes @ 0.70% Sn and 0.31% Cu and Inferred resources of 1.3 million tonnes @ 0.72% Sn and 0.22% Cu at a 0.35% Sn cut-off. In addition, a large resource known as the Foley Zone located at the lower levels of the mine had been drilled and is reported to contain 3.8 million tonnes @ 0.28% WO_3 at a 0.2% WO_3 cut-off. Data for these estimates has been sourced to archived reports currently stored at Burnie Labs and available online on the MRT website. The

most important document for confirmation of this data is Aberfoyle's "close-out report". An independent geologist's progress report has been produced by Mining One, including a block model based on geological reinterpretation and assay of splits of the original cores held at the MRT Morningside core store.

4.0 Regional and Local Geology

The Cleveland ore bodies occur in a steeply dipping northeast trending succession of arenaceous, argillaceous, and chemical sediments and mafic volcanic rocks and ultramafic/mafic complexes. The sequence is unfossiliferous but has been correlated by rock type with the Cambrian Crimson Creek Formation of the Zeehan-Rosebery area. The Meredith Granite, a high level, late tectonic Late Devonian to Early Carboniferous granitic pluton believed to be genetically associated with the mineralisation, intrudes the sequence east and south of the mine. The Cleveland ore bodies are located in a dominantly fine grained sedimentary sequence that is thought to lie in an embayment on the margin of a basaltic eruptive centre.

The tin-copper ore bodies occur as a series of sub parallel, near vertical sulphide lenses within the Halls Formation. The mineralisation is composed largely of fine to medium grained quartz, tourmaline, fluorite, chlorite, and pyrrhotite plus chalcopyrite, cassiterite and stannites. Eleven lenses are recognised and are divided into two groups; the footwall and the hanging wall lodes separate by a micaceous greywacke unit and an overlying basic volcanic unit. The footwall lodes are composed of three relatively thick lenses (Henry, Lucks and Khaki) which have a strike length of less than 200 metres. The hanging-wall lodes (or Halls lenses) comprise 5 lenses and have a greater strike length and stratigraphic continuity than the footwall lodes, attaining a maximum thickness of about 30 metres and a maximum strike length of about 600 metres. The sulphide lenses are offset by a series of sub parallel, southeast dipping reverse faults.

5.0 Developmental Activities

Developmental activities during the period have principally involved progressing a Mine Resource Report (not finalised), submission of the EPBC documentation to the Federal Department of the Environment and follow through submission of Notice of Intent documentation.

5.1 Mine Resource Report

Bright Phase engaged Mining One to develop a Mine Resource Report to progress the project's geological basis and resource block model and to prepare for JORC compliant resource reporting.

After reviewing all available drilling information held at Burnie Laboratories, Bright Phase engaged 4 data entry clerks to document into Microsoft Excel all drill hole data. This data is shown in the draft report attached to this Annual Report.

This data was then issued to Mick McKeown from Mining One, who has subsequently generated the attached draft Resource Report. It is Bright Phase's intention, following the next round of capital raising, to complete the Resource Report to JORC Compliance

standards. There are a number of outstanding clarifications from Mining One that requires a review of the drill data and approximately 6 weeks further work. It is envisaged that this will be completed by the 4th Quarter, 2012.

5.2 Environmental Approvals

Bright Phase progressed the environmental approvals process during the year as a priority. It is the company's view that environmental approvals are the critical path activity in the project development schedule. Therefore the company spent a considerable amount of time and effort over the last 12 months progressing the EPBC and NOI processes, including various associated independent studies and water quality monitoring on the site.

As a result of these efforts including a site visit undertaken by the federal minister, the Federal Department of Environment judged the Cleveland Project to be a Controlled Action, but with control delegated to the Tasmanian EPA. Environment Tasmania has undertaken a separate site visit, reviewed the NOI submission and has reverted with Guidelines for preparation of Development Proposal and Environmental Management Plan (DPEMP) documentation. It is envisaged that the DPEMP submission document will be completed by the 4th Quarter, 2012.

The EPBC and NOI documentation is attached, along with correspondence from the Federal Department of Sustainability, Environment, Water, Population and Communities (SEWPC).

5.3 Generation of ASX JORC waiver.

During the 12 months, Bright Phase reviewed capital raising options and the Board of Directors decided to pursue an option of a capital raising and floating of shares on the Australian Securities Exchange. In order to pursue an ASX listing, Bright Phase needed to either have a JORC-compliant resource, or to apply for a waiver under Section 5.6 of the Listing Rules to state the mineral resource in the company's prospectus as "Non-JORC". Attached is the final draft of this JORC Waiver report, also generated by Mining One.

6.0 Expenditure

Expenditure over the license area totalled $433,875 during the reporting period to 30th June 2012and is broken down by expense in the table below:

Geoscientific Costs	220,921
Land Access Costs	99,140
Feasibility Study Costs	61,020
Other Costs	22,198
Administration Costs	30,595
Total	433,875

7.0 Conclusions and Recommendations

EL 7/2005 covers the Cleveland Sn/Cu mine area in western Tasmania, which has been subject to a long period of exploration and mining.

Recommendations for future activities:

- Complete JORC resource report
- Re-drill the tailings and complete more detailed metallurgical testwork on fresh material stored excluding oxygen prior to it reaching the laboratory
- Complete geotechnical assessment and conceptual mining plan for tailings treatment project
- Complete DPEMP documentation and any associated outstanding studies and submit to Environment Tasmania
- Begin feasibility study on tailings reprocessing
- Begin scoping study on re-opening the underground mine
- Apply for Mining Lease

Appendix 1 – Draft Resource Report

CLEVELAND MINE, LUINA, TASMANIA
PROGRESS REPORT ON DEVELOPMENT OF A RESOURCE BLOCK MODEL

for

BRIGHT PHASE RESOURCES LIMITED

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Job No.	1606_M	Mining One Pty Ltd
Doc No.	Document1	Level 9, 50 Market Street
Date:	June 2012~~December 2011~~	Melbourne VIC 3000
Prepared by:	M V McKeown	Ph: 03 9600 3588 Fax: 03 9600 3944

State Grid used in this report

Unless otherwise stated, any reference to a State Grid in this report is the Australian Geodetic Datum 1966 known as AGD66. This is the older datum which was generally in use prior to 31 March 2003. Tasmania now operates on a new State Grid known as GDA94 and coordinates in the two systems are significantly different.

This is not a report of Resources or Ore Reserves in Accordance with the JORC Code

This is not a report of Mineral Resources or Ore Reserves in Accordance with the JORC Code.

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Textual abbreviations used in this report

Aberfoyle	Any of the Aberfoyle and Cominco group of companies including, for example, Aberfoyle Ltd, Cleveland Tin N.L., Aberfoyle Exploration Pty Ltd and Cominco Exploration Pty Ltd.
asl	above sea level
BCA	Bedding to Core Angle: the maximum angle between a trace of bedding and the long axis of core: bedding parallel to the core axis has a BCA of 0^{O}.
Bright Phase Resources	Bright Phase Resources Limited.
DTM	Digital Terrain Model, a Surpac name for a wireframe.
EL	Exploration Licence.
HMS	Heavy Media Separation.
JORC	Joint Ore Reserve Committee (of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geosciences and Minerals Council of Australia).
Mining One	Mining One Pty Ltd
MRT	Mineral Resources Tasmania (a State Government Department).
RL	Reduced Level, a measure of elevation in height
Western Metals	Western Metals Limited.

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Figure 17 Part of working section G: the heights of the development which is shown are about 5 metres; a suggested interpretation by the author is shown as synclinal fold closure pencilled in near the bottom of the figure; this interpretaion would dispense with the requirement for the fault marked W on this section and to be fair this is the interpretation shown on working cross-section I.

Figure 18 Part of working cross-section N; it would be reasonable to connect the two podes of Henry's lode marked 1 to the pod marked 6.

Figure 19 Plan showing the quartz porphyry dyke and accompanying quartz vein halo and Hall's B lens.

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1 INTRODUCTION

The Cleveland Mine is located at Luina about 80km from Burnie (See Figure 1).

Bright Phase Resources Limited ("Bright Phase Resources") is an Australian public unlisted company based in Queensland. Bright Phase Resources is investigating the mineral deposits and tailings at the Cleveland Mine at Luina on the West Coast of Tasmania. The Cleveland Mine is an underground tin and copper mine which closed in 1986 after which the surface area of the mine site was rehabilitated.

The Cleveland mine occurs within Exploration Licence 7/2005 ("EL7/2005") which is held by Lynch Mining Pty Ltd ("Lynch Mining") (See Figure 2).

Exploration by the Tasmania Mines Department and the Australian Bureau of Mineral Resources in the 1950s identified the potential for relatively large cassiterite bearing sulphide ore bodies (Hughes, 1952, 1953a, 1953b, 1954 and Keunecke, O. and Tate, K.H., 1954). Consequently, in 1961, the Aberfoyle Tin Development Partnership acquired the leases at Cleveland and commenced systematic exploration based on geological mapping and using diamond drilling (Mason et al., 1963). Since then, over 2000 diamond drill holes have been drilled into the deposit and its known depth has been demonstrated to about 700 metres below the surface (Barth, 1986).

In the 1960s and early 1970s, the mines of the Aberfoyle group of companies ("Aberfoyle") were Australia's chief producers of tin and tungsten. The group operated Cleveland tin and copper mine, the Storeys Creek and Aberfoyle tin and tungsten mines in North-East Tasmania, and the Ardlethan tin mine in southern New South Wales.

Mining of ore at Cleveland commenced in 1968 using trackless mining for mining and ore haulage to the surface. The Cleveland Mine was among the first in the world to use trackless mining and the mine now extends to a depth of over 500 metres below surface (See Figure 4).

Production from the mine during the Aberfoyle operation was 5,645,000 tonnes at a grade of 0.68% Sn and 0.29% Cu (See Table 1). The mine closed in 1986 following the collapse of the tin price after 1980 (See Figure 3).

There are large remaining resources of tin and tungsten at Cleveland in the form of semi-massive sulphide, quartz stockworks and greisen, and tailings.

Bright Phase has retained Mining One Pty Ltd ("Mining One") to develop a digital database of the existing geological data and to create a resource block model which can be used in future mining studies. This report describes the progress made in these tasks.

In particular, this report records:

- information regarding the grid system and reference planes which were used by Aberfoyle;
- a summary description of the geology;
- comments regarding the current geological interpretation;
- details of the existing data and progress made on creating a digital database;
- modelling of the mineralisation, including a preliminary resource estimate;
- a brief assessment of the exploration potential in the mine.

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Figure 1 Location of the Cleveland Mine

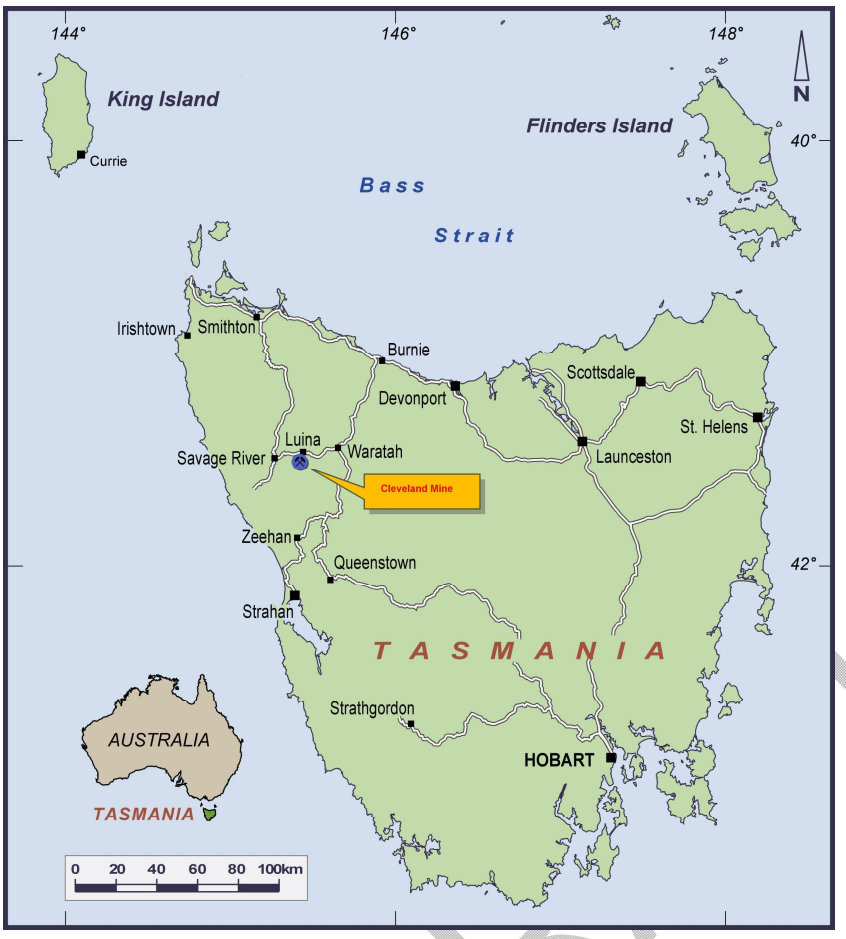

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Figure 2 **Location of Exploration Licence 7/2005 (Coordinates are based on Australian Geodetic Datum 1966).**

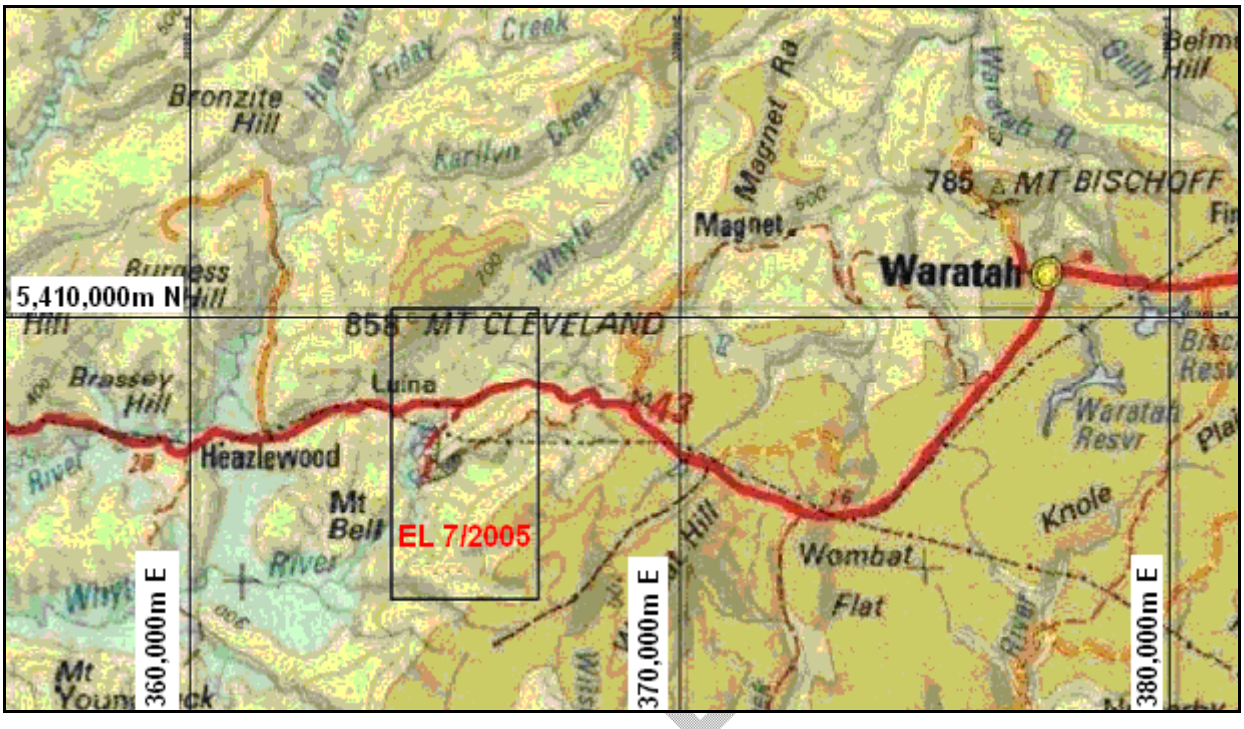

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Table 1 Cleveland Mine – Mine Production During Aberfoyle Operations.
(Compiled from Aberfoyle Ltd and Cleveland Tin N.L. annual reports.)

Year	Ore Treated tonnes	Ore Treated	
		% Sn as cassiterite	% Cu
1968	?	?	?
1969	256,865	0.85	0.40
1970	281,875	0.79	0.37
1971	305,726	0.73	0.42
1972	357,498	0.78	0.40
1973	505,806	0.76	0.32
1974	314,210	0.75	0.25
1975	289,018	0.78	0.32
1976	363,036	0.73	0.27
1977	393,275	0.66	0.22
1978	388,579	0.53	0.18
1979	352,977	0.52	0.24
1980	367,866	0.47	0.21
1981	439,304	0.51	0.22
1982	350,300	0.64	0.28
1983	277,700	0.71	0.25
1984	180,300	0.71	0.26
1985	137,000	0.80	0.25
1986	83,700	0.92	0.41
Total	**5,645,035**	**0.68**	**0.28**

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Figure 3 Tin Price 1960 to 2010 – US$ per Tonne

(Compiled from Minerals Year Books of the Bureau of mines of the United States Geological Survey.)

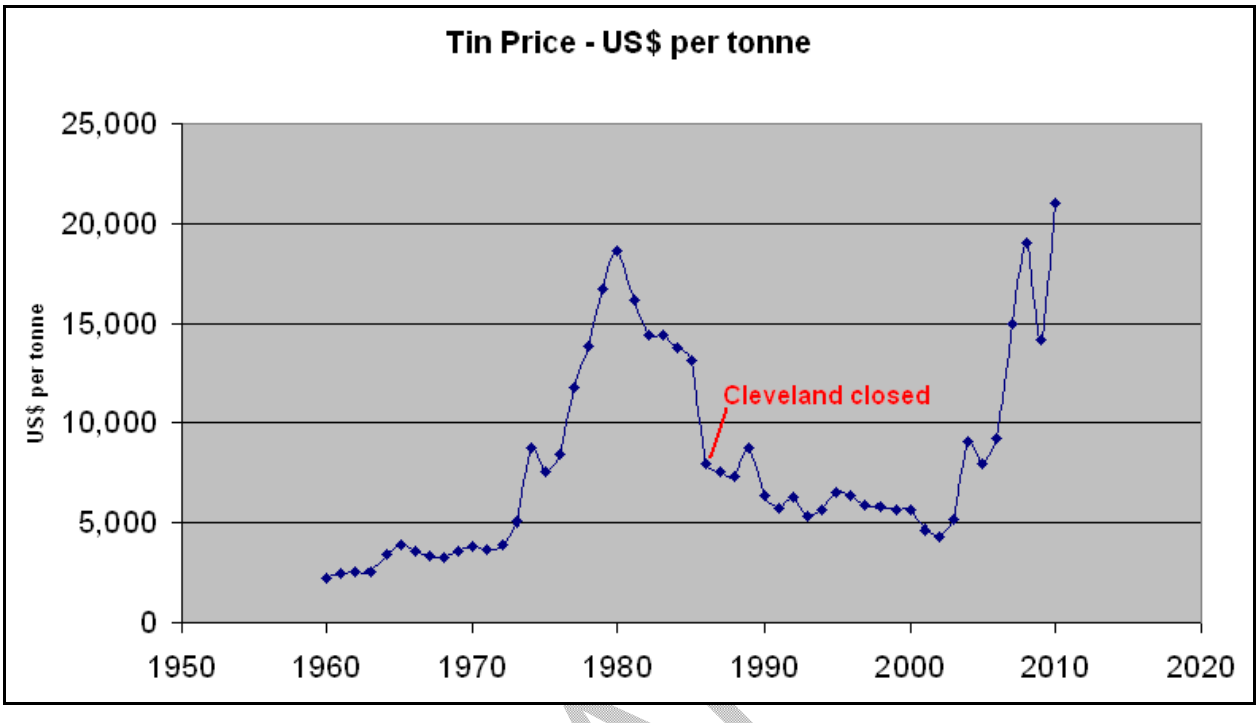

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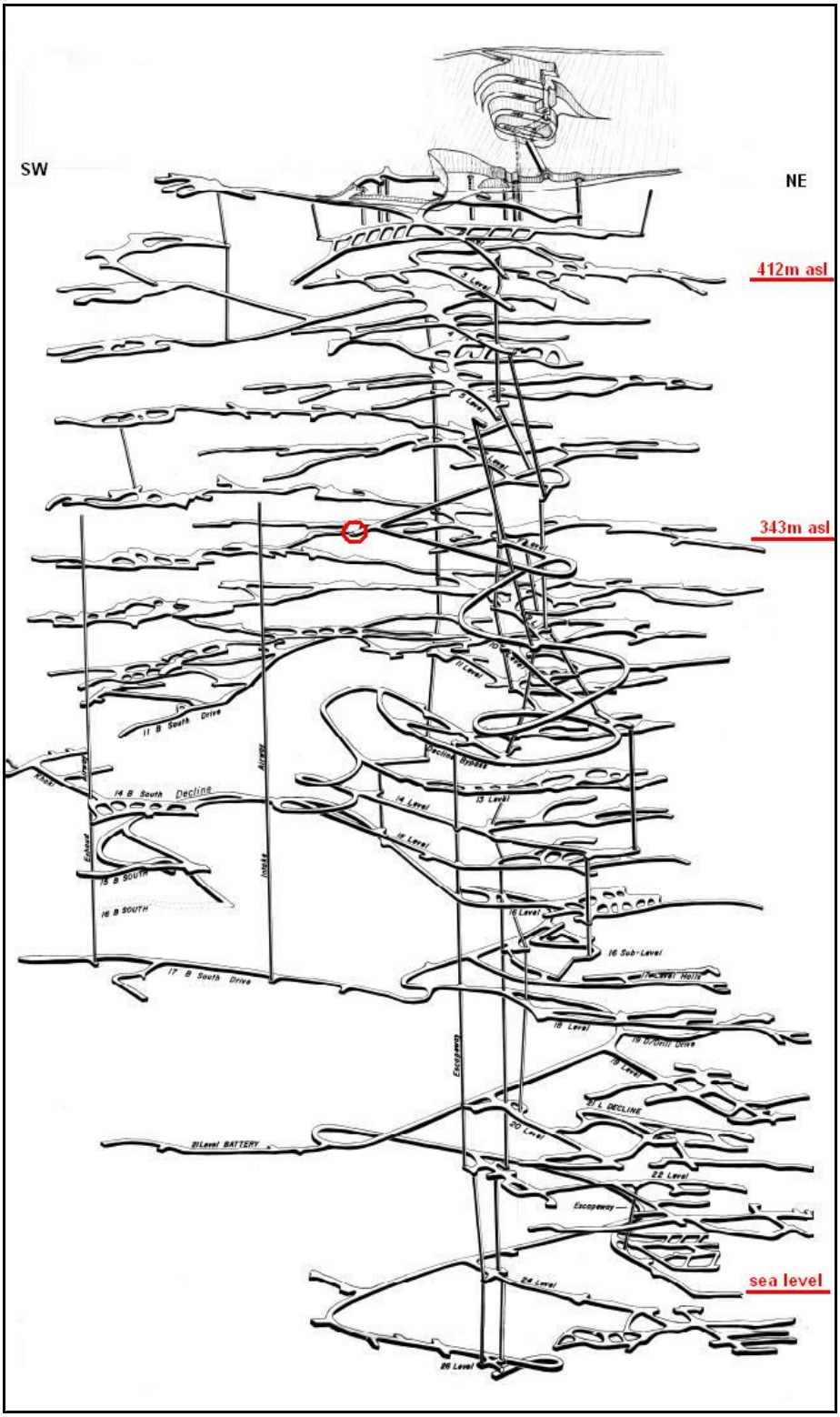
Figure 4 **Cleveland Mine: the entrance to the Cleveland Decline is circled; the mine was over 500m deep: the heights above sea level (asl) are shown on the right.**

(Taken from Aberfoyle records.)



2 GRID CONVENTION AND REFERENCE PLANES IN THE CLEVELAND MINE

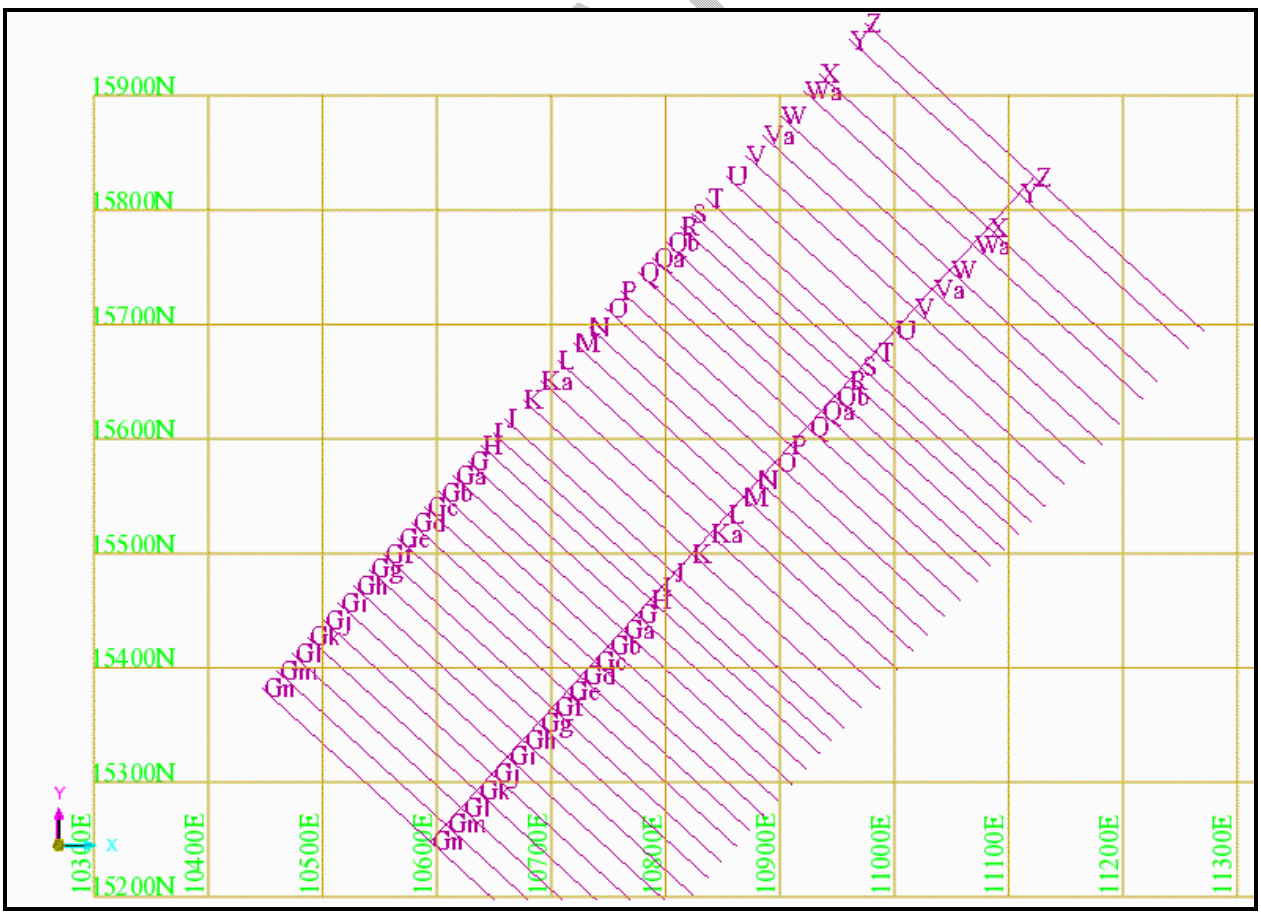
The Cleveland Mine Grid was established in the 1950s during the early geophysical investigations of the field and was used by Aberfoyle during its tenure of the mine. Unfortunately none of the principal compass directions of the Cleveland Mine Grid is parallel to the strike of the mineralisation. Consequently, Aberfoyle established two reference planes which were parallel to the strike of the mineralisation; the principal and most used reference plane was parallel to the strike of the Hall's, Henry's and Khaki lodes (See Figure 7) and was known as Hall's Reference Plane (See Figure 5).

Relative Levels (RL) used in the mine were heights above sea level + 1000m. Note that some older plans and reports refer to the heights above sea level without the addition of the 1000m.

Aberfoyle used a series of cross-sections, perpendicular in strike to Hall's Reference Plane. The locations and ad hoc numbering of these cross-sections date back to the start of exploration drilling on cut grids in the 1960s (See Figure 5).

Further details of the location of the Cleveland Mine Grid, Hall's Reference Plane, mine levels and section locations are attached (See Appendix 1 to Appendix 3).

Figure 5 Hall's Reference Plane and the Cleveland Mine Grid (halls_grid2.str)



3 GEOLOGY

3.1 Ore Minerals in the Cleveland Mine

Worldwide, tin is won from cassiterite, copper from chalcopyrite and tungsten from wolframite or scheelite (See Table 2). Tin and copper grades are usually expressed as % Sn and % Cu respectively; tungsten grades are usually expressed as % WO_3.

Tin, copper and tungsten occur at Cleveland: tin occurs principally as cassiterite and in minor amounts as stannite; copper occurs principally as chalcopyrite and also in minor amounts as stannite; tungsten occurs as wolframite.

Table 2 Tin, copper and tungsten ore minerals

Ore Mineral	Formula	Metal Content	Occurrence at Cleveland
cassiterite	SnO_2	78.6% Sn	Yes
stannite	$Cu_2S.FeS.SnS_2$	27.5%Sn, 29.5%Cu	Yes
wolframite	$(Fe,Mn)WO_4$	76.4% WO_3	Yes
scheelite	$CaWO_4$	80.5% WO_3	No

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Traditional processing of tin bearing ore recovers only cassiterite. Consequently, it is important to know how much of the tin in a deposit occurs as cassiterite. Stannite is soluble in nitric acid whereas cassiterite is not and soluble tin assays are assays of tin occurring in stannite and the determination of the grade of tin as cassiterite is calculated by determining the total tin and the soluble tin grade and then subtracting one from the other:

grade of tin as cassiterite = total tin grade – soluble tin grade

This was the practice by Aberfoyle at Cleveland.

Cassiterite is relatively heavy with a specific gravity of about 7gm per cubic centimeter.

Traditionally, cassiterite bearing ore from hard rock deposits, such as those at Cleveland, is reduced in size by crushing and the crushed material is passed through a Heavy media separation (HMS) process where some less dense, tin poor material is floated off and discarded. The remaining ore then passes to grinding so that the cassiterite grains are mostly liberated from the other minerals present. Then, coarser cassiterite is concentrated by gravity methods using jigs, spirals and shaking tables. Sulphide minerals present are then removed by sulphide flotation and finer cassiterite is concentrated by cassiterite flotation into a cassiterite concentrate usually assaying over 60% Sn. The processing recovery of tin is commonly in the range of 55% to 75%. The cassiterite concentrate is then smelted to recover the tin in a traditional tin smelter.

An alternative method of tin concentration, known as fuming, was first suggested in the 1970s but, to date, this process has not been used anywhere. This process mirrors that just described but a cassiterite concentrate assaying only about 10% Sn is produced. The processing recovery of tin is hoped to be as high as 85% to 90%. The cassiterite concentrate is then smelted to recover the tin in a ~~special~~ tin smelter ~~which employs a smelting process known as fuming~~.

The principal aim of processing at Cleveland was the recovery of tin rather than copper. This was because the tin price was then, as now, significantly greater than the copper price and the tin grade of the ore was greater than the copper grade (See Table 3).

The cassiterite in the semi-massive sulphide mineralisation is fine grained with grains generally being in the range 0.02mm to 0.07mm across. The fine grain size dictates the extent to which the ore must be ground to release the cassiterite from the other minerals present so that it can then be recovered. As the grind size becomes finer, the cassiterite becomes more difficult to recover in a traditional processing plant which uses gravity and flotation methods to recover the cassiterite. During the Aberfoyle operations at Cleveland, tin and copper recovery both averaged about 60% (See Table 3 – the final years reflect the mining of remnant ore in the upper levels).

Table 3 Cleveland Mine – mill performance during Aberfoyle operations.

Year	Ore Treated	Feed Grade		Sn Recovered from Cassiterite		Cu Recovered	
	tonnes	% Sn as cassiterite	% Cu	tonnes	recovery	tonnes	recovery
1969	256,865	0.85	0.40	1,136	52%	378	37%
1970	281,875	0.79	0.37	1,472	66%	717	69%
1971	305,726	0.73	0.42	1,557	69%	823	65%
1972	357,498	0.78	0.40	1,874	67%	969	69%
1973	505,806	0.76	0.32	2,668	69%	1216	76%
1974	314,210	0.75	0.25	1,513	65%	529	69%
1975	289,018	0.78	0.32	1,370	60%	565	61%
1976	363,036	0.73	0.27	1,519	60%	617	62%
1977	393,275	0.66	0.22	1,386	54%	420	49%
1978	388,579	0.53	0.18	1,236	60%	458	65%
1979	352,977	0.52	0.24	1,106	60%	422	49%
1980	367,866	0.47	0.21	1,080	63%	414	53%
1981	439,304	0.51	0.22	1,337	60%	518	55%
1982	350,300	0.64	0.28	1,457	65%	602	60%
1983	277,700	0.71	0.25	1,182	60%	405	59%
1984	180,300	0.71	0.26	668	53%	300	64%
1985	137,000	0.80	0.25	525	48%	198	59%
1986	83,700	0.92	0.41	434	56%	140	41%
Total	**5,645,035**	**0.68**	**0.28**	**23,519**	**61%**	**9,691**	**60%**

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3.2 Local Geology

The Cleveland and Mt Bischoff tin mines both occur to the north of the outcrop of the Meredith granite (See Figure 6).

Two other mines occur in the area: the Magnet silver lead mine between Cleveland and Mt Bischoff and the Godkin Mine to the south of Cleveland (See Figure 6). The more significant of these was the Magnet Mine which operated from 1895 to 1940 and produced 630,000 tonnes of ore containing 38,000 tonnes of lead and 8,000,000 ounces of silver (Cottle, 1953).

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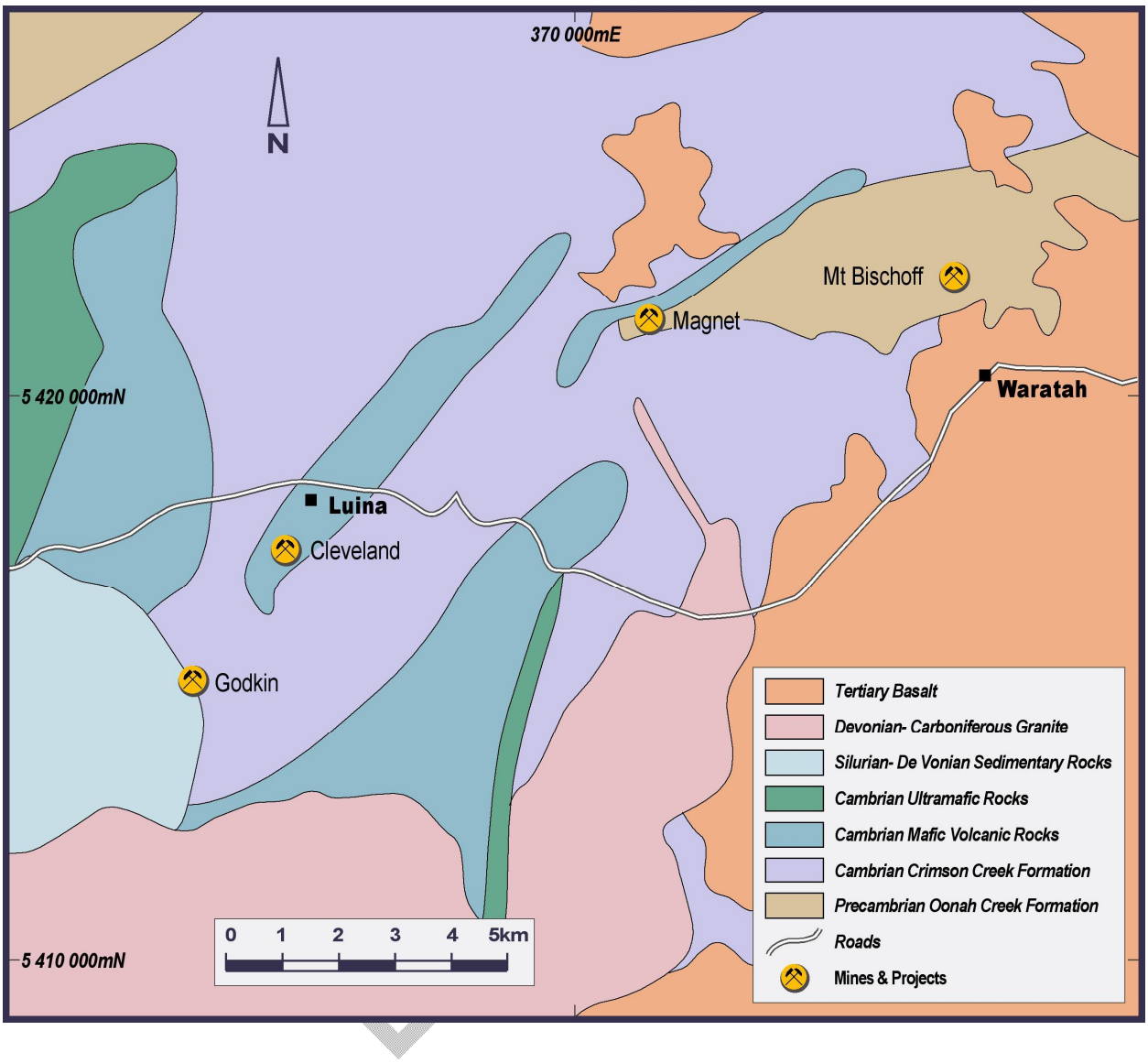
Figure 6 Local geology around Cleveland.



3.3 Mine Geology

At Cleveland, the known tin, copper and tungsten mineralisation occurs within a series of sedimentary rocks belonging to Hall's Formation (See Figure 7~~Figures 7~~ and 8). Hall's Formation is underlain by the sandstone and overlain by volcanics. All these sedimentary rocks are of Cambrian age and, while they were originally deposited horizontally, they have been tilted and are now more or less vertical.

The sedimentary rocks were intruded by the Devonian-Carboniferous Meredith granite. A quartz porphyry dyke occurs in the bottom of the mine below 350m from the surface.

The mineralisation at Cleveland is of three styles:

- Tin and copper bearing semi-massive sulphide consisting of pyrrhotite and pyrite with cassiterite and lesser chalcopyrite and stannite, and quartz, fluorite and carbonates. Sulphide minerals make up 20% to 30% of the mineralisation.
- Tungsten bearing greisen with wolframite in quartz and mica.
- Tungsten bearing quartz stock work with wolframite in quartz.

The semi-massive sulphide has formed by the replacement of limestone and is geologically similar to the tin bearing semi-massive and massive sulphide mineralisation at Renison.

The known tin and copper bearing semi-massive sulphide mineralisation occurs entirely within Hall's Formation, as faulted, more or less vertically dipping, lenticular deposits with strike lengths of up to 550 metres, across strike thicknesses of up to 30 metres and down-dip extents of up to 800 metres (See **Error! Reference source not found.**~~Figure 8~~). The deposits are referred to as lodes, and from east to west, these are:

- Battery, Smithy and Luck's Lodes,
- Khaki Lode
- Hall's Lodes,
- Henry's Lode,

The tungsten bearing greisen formed by the hydrothermal alteration of the quartz porphyry dyke. The dyke dips vertically and has a known strike length of 100m, an across strike thickness of up to 60m and a down-dip extent of 800 metres (Jackson et al., 2000).

The tungsten bearing quartz stock work formed by the intense quartz veining which forms a halo around the quartz porphyry dyke.

The tungsten bearing greisen and quartz stock work is known as Foley's Zone (See Figure 9). Foley's Zone dips vertically and has a known strike length of 300 metres, an across strike width of up to 300 metres and a down-dip extent of over 900 metres (Dronseika, 1983).

The quartz stock work and the semi-massive sulphide mineralisation overlap in part.

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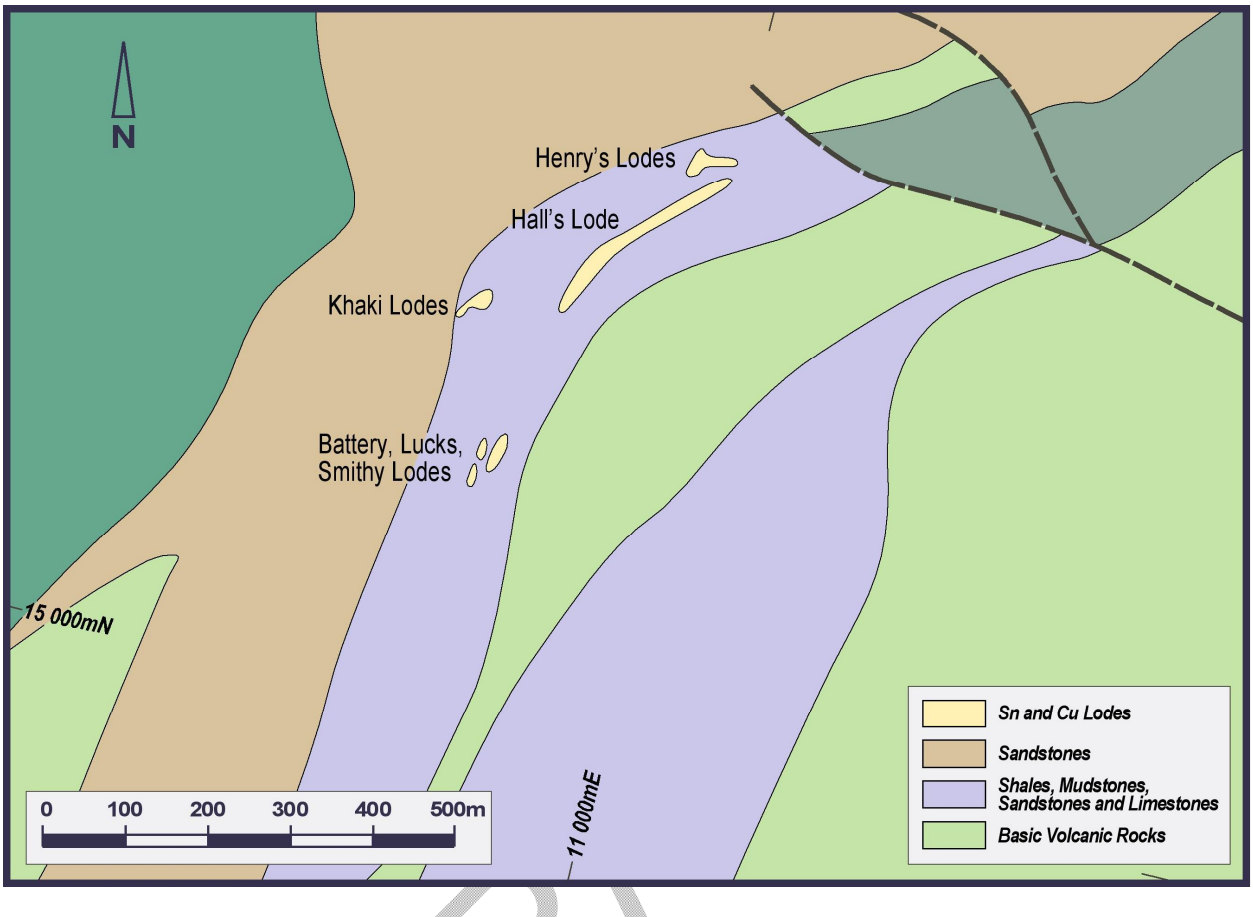
Figure 7 Geology near the Cleveland Mine.



Modelling of the granite, based on geophysical gravity survey, indicates that the top of the granite is nearly 4 kilometres deep at Cleveland (Leaman and Richardson, 1989 and 2003) (See Figure 10). This is important because:

- at Renison, the tin mineralisation continues at least to the granite,
- in Cornwall, tin mineralisation continues into the granite, and
- the granite is deeper than thought by explorers from the 1960s to the 1980s.

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Figure 8 **Tin copper bearing semi-massive sulphide mineralisation on cross-section number "N".**

(Updated after Collins et al., 1989)

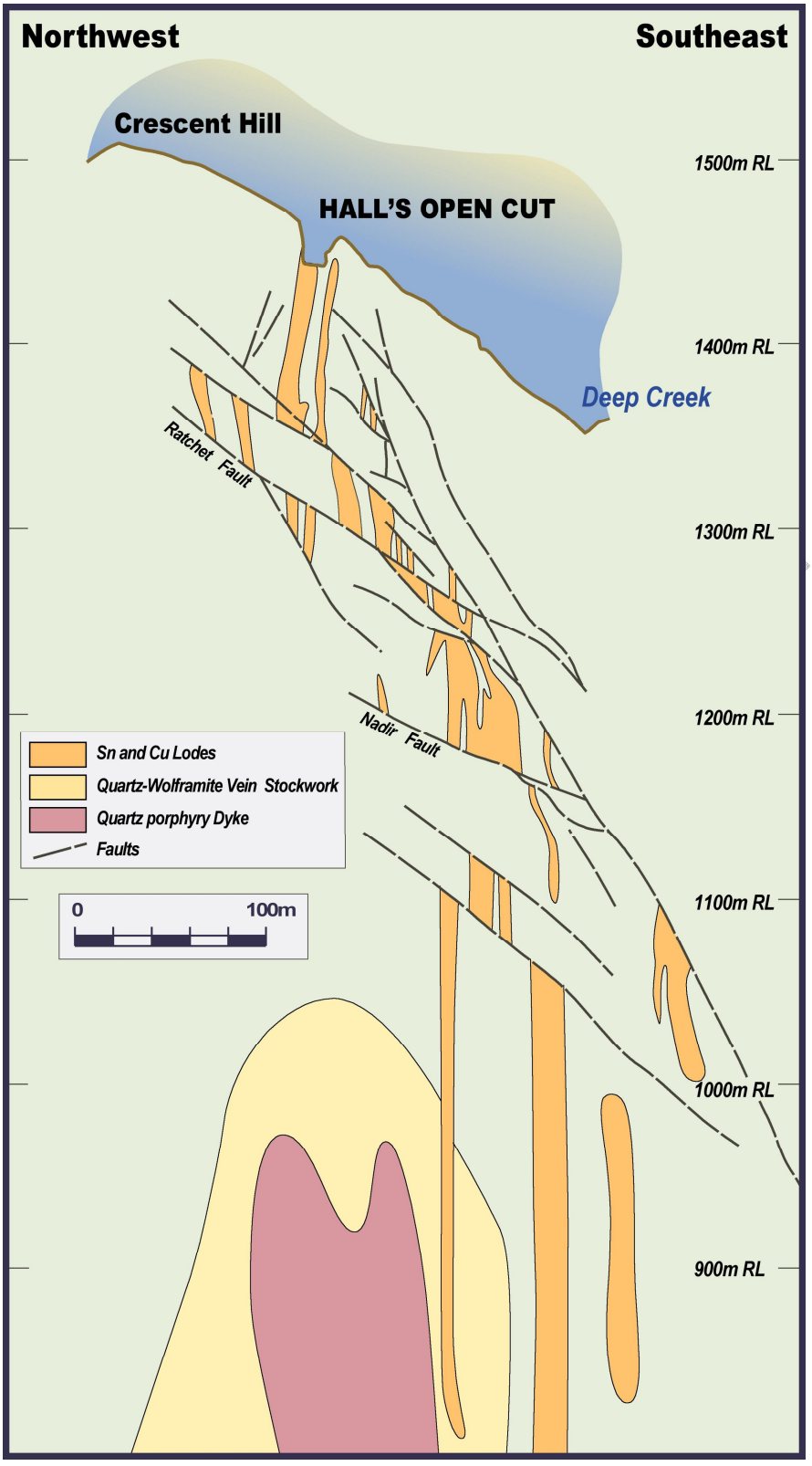


Figure 9 Schematic representation of Foley's Zone – cross section. (After Jackson et al, 2000.)

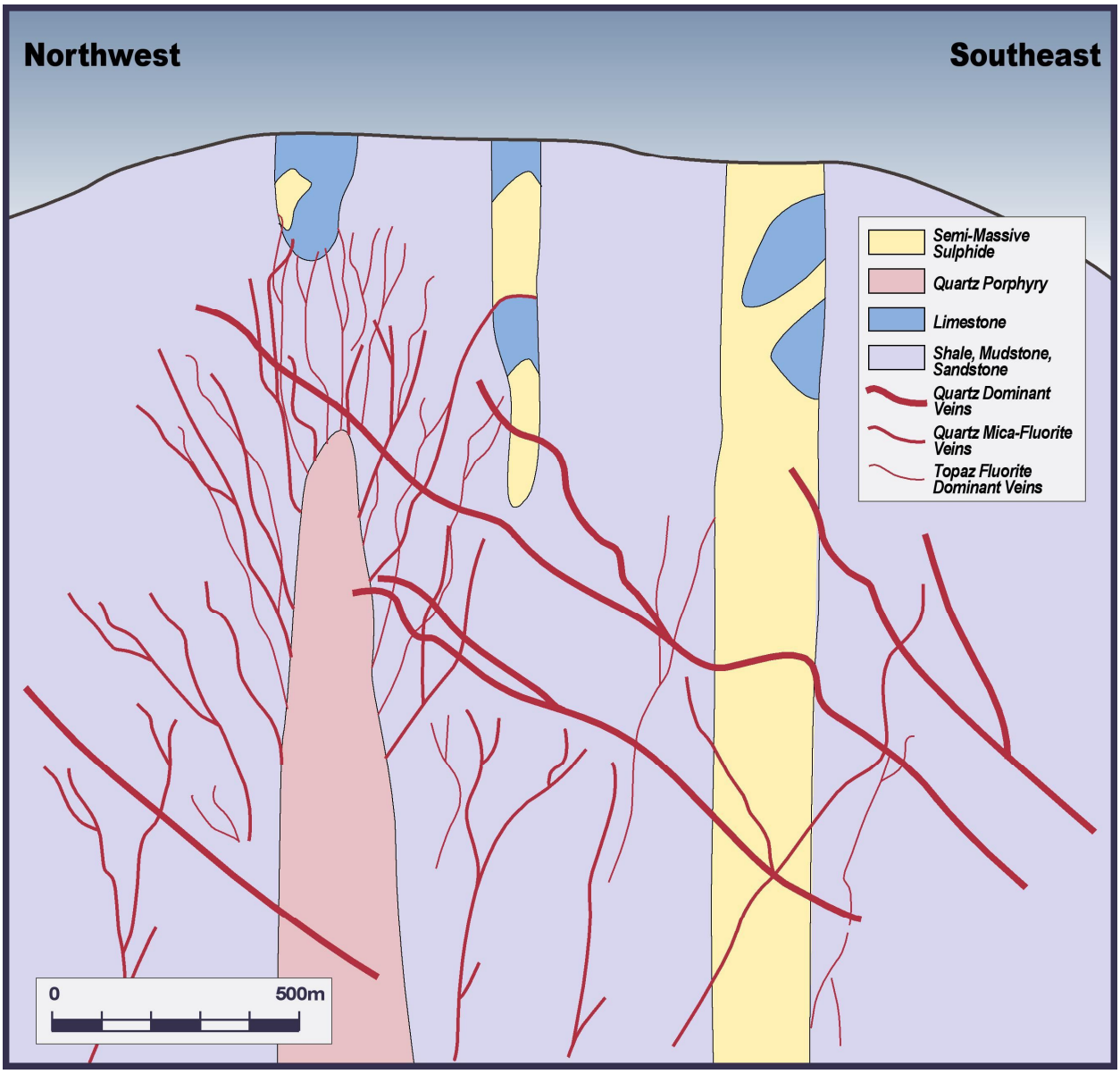
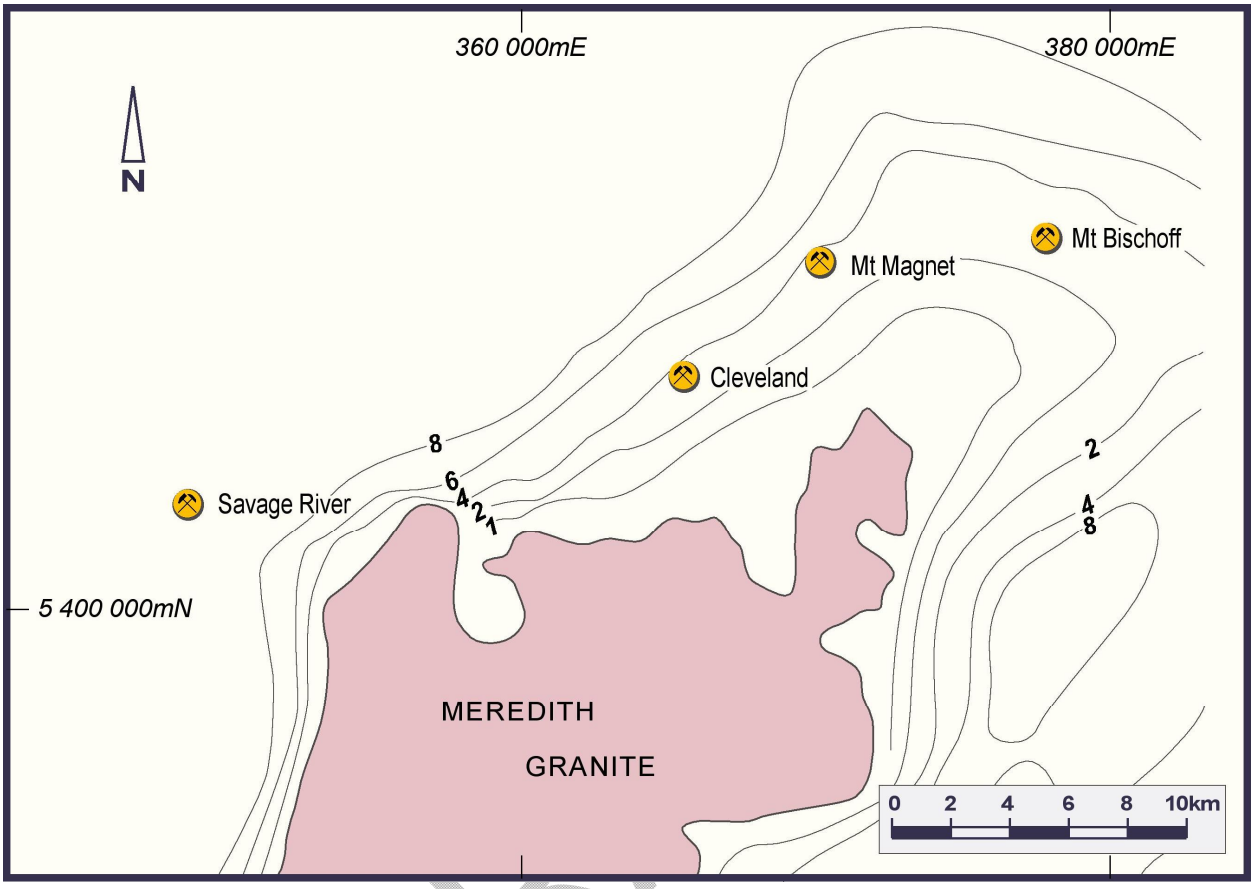


Figure 10 Depth to the Granite
(After Leaman and Richardson, 1989)



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4 INTERPRETATION OF THE MINERALISATION IN THE MINE

The geological interpretation of the mineralisation at Cleveland has changed several times.

The replacement style of the tin and copper bearing massive sulphide mineralisation was first recorded in Reid (1923). The mineralisation appears to have replaced limestone beds within Hall's Formation (See 3.3 Mine Geology). However, the interpretation of the boundaries of the lodes has changed several times depending on whether the structure was thought to be controlled by folds or reverse faults and whether the faults were steep or flat:

- **Folding:** Carey (1945) considered that "the orebodies are replacement deposits, which conform to the folded structures of the sedimentary rocks, not to fractures or fissures… the lodes of Henry's cut, Hall's cut, no. 12 workings, and all of Luck's lodes (No. 8, 10 and 16 workings) are all developed on the troughs and adjacent limbs of synclines."
- **Folding**: Mason (1965) claimed that "complex folding and multiple plications of the mineralized lode bed often cause several parallel repetitions of it interspersed with bands of barren chert thus giving the effect of successive sulphide and chert bands".
- **Steep reverse faults**: Cox and Glasson (1967) suggested that the structure of the mineralisation was controlled by steeply dipping faults which caused multiple repetitions of the lodes in cross-section (See Figure 11).
- **Flat reverse faults**: Ransom and Hunt (1975) postulated that the structure of the mineralisation was controlled by a small number of relatively flat reverse faults cutting across gently undulating lodes (See Figure 12).
- **Flat reverse faults**: Collins (1981) re-interpreted the structure and increased the number of postulated flat reverse faults significantly (See Figure 13).
- **Flat reverse faults**: Barth (1986) perpetuated the interpretation of Collins (1981) (See Figure 14).

The interpretation based on flat faults off-setting the lodes was in use when the mine closed in 1986, for example, see **Error! Reference source not found.**~~Figure 8~~. However, there are several reasons why this interpretation may be in error:

1. The actual appearance of the flat faults has not been described, for example, not in Collins (1981) nor in Collins et al. (1989) nor in Barth (1986).
2. The underground mapping shown on the working cross-sections was not always taken into account when interpreting the positions of the flat reverse faults, for example, on cross-section Ka the traces of two faults defy the observed geology (See Figure 15).
3. Similarly, the interpreted positions of the flat reverse faults do not always take into account the lithologies logged in diamond drill holes, for example, on working cross-section K, the traces of two faults ignore the apparent continuity of a lens of volcanics on the cross-section (See Figure 16).
4. There are many places where lenses which are close to each other could be interpreted as the limbs of synclines, for example, on cross-section G Hall's A and Hall's B lenses could be interpreted in this way (See Figure 17).
5. There are also places where lenses which have been interpreted on either side of a flat reverse fault could be joined together sensibly, for example, see the pods of Henry's lode on working cross-section N (See Figure 18).

The current geological interpretation is based on the working cross-sections. These paper cross-sections are at 1:500 scale and show locations and geological mapping of underground

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development, and traces of diamond drill holes annotated with logged rock types (See Figure 15 to Figure 18). There are no tin assays shown on the cross-sections. Also, note that in the drill logs there are no records of bedding to core angles (BCA), sometimes known as α angles and so these are also not shown on the cross-sections. Despite these short-comings the working cross-sections are an invaluable source of geological information (See 5.1 Existing Data).

There seems to have been an attempt made to interpret the structure taking into account rock types only. This was a relatively puristic geological approach but it ignored all other existing and available data such as:

- mapped exposures of geology in underground development,
- assays of diamond drill core, and
- BCAs.

In addition, there appears to have been a reluctance to interpret dips of lodes which were anything but vertical to sub-vertical.

The interpretation of the boundaries to tin lodes without reference to Sn assays is particularly odd and a record of BCAs would have helped to determine the dip of the lithological units and lodes on cross-section.

Lode boundaries should be re-interpreted taking into account all the available data. This will require the logging of BCAs in selected holes amongst those stored in the Mineral Resources Tasmania ("MRT") Core Store at Mornington, Tasmania.

An inadequate geological interpretation could have an adverse impact on the classification of resources according to the JORC code.

Another important consequence of the current interpretation is that the lode mineralisation has been interpreted as 42 separate lenses or pods (See Table 5) which are disconnected and some of which are quite small. This interpretation has negative implications for mine planning, particularly stope design, and a simpler interpretation, if valid, would help to improve the potential productivity of the mine.

For the record, Barth (1986) noted that the quartz porphyry "dike is surrounded by a vein halo, which in one place, cuts across the near vertical dipping marginal part of lower Hall's B lens" (see Figure 19). This implies that the quartz porphyry dyke is younger than the tin lode mineralisation and probably over-prints the lode mineralisation.

Also, for the record the rock type codes, as assumed by the author, shown on the working cross-sections are listed in Table 4.

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Table 4 Rock type codes as used on working cross-sections, as assumed by the author.

Code	Rock Type
vb	basic volcanic
vf	
dol	dolomite
ch	chert
sh	shale
ss	sandstone
lm	limestone
L	lode
min	mineralised

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Figure 11 Cross-section interpreted by Cox and Glasson (1971); this is cross-section Qa.

(Cox and Glasson, 1971)

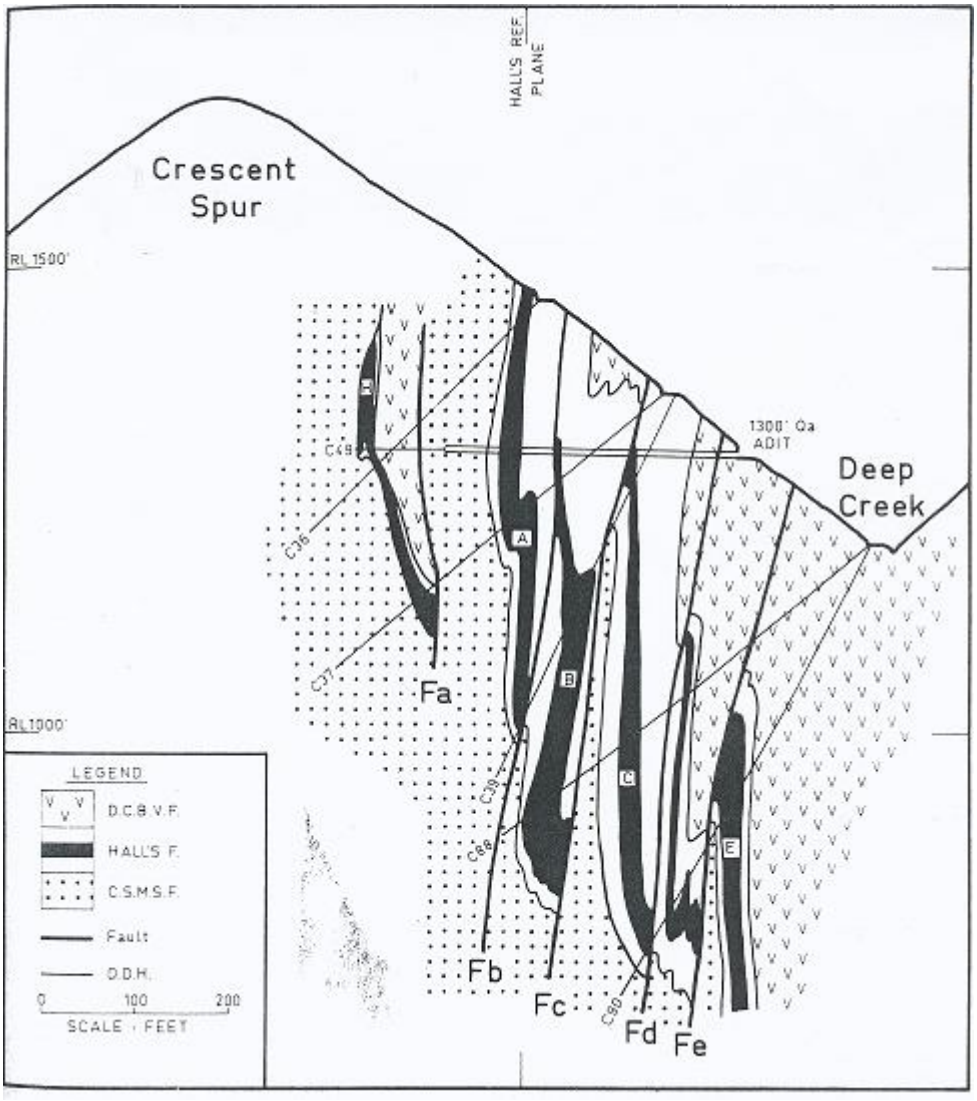


Figure 12 Cross-section interpreted by Ransom and Hunt (1975); this is cross-section Qa, the same cross-section as shown in Figure 11.

(Ransom and Hunt, 1975)

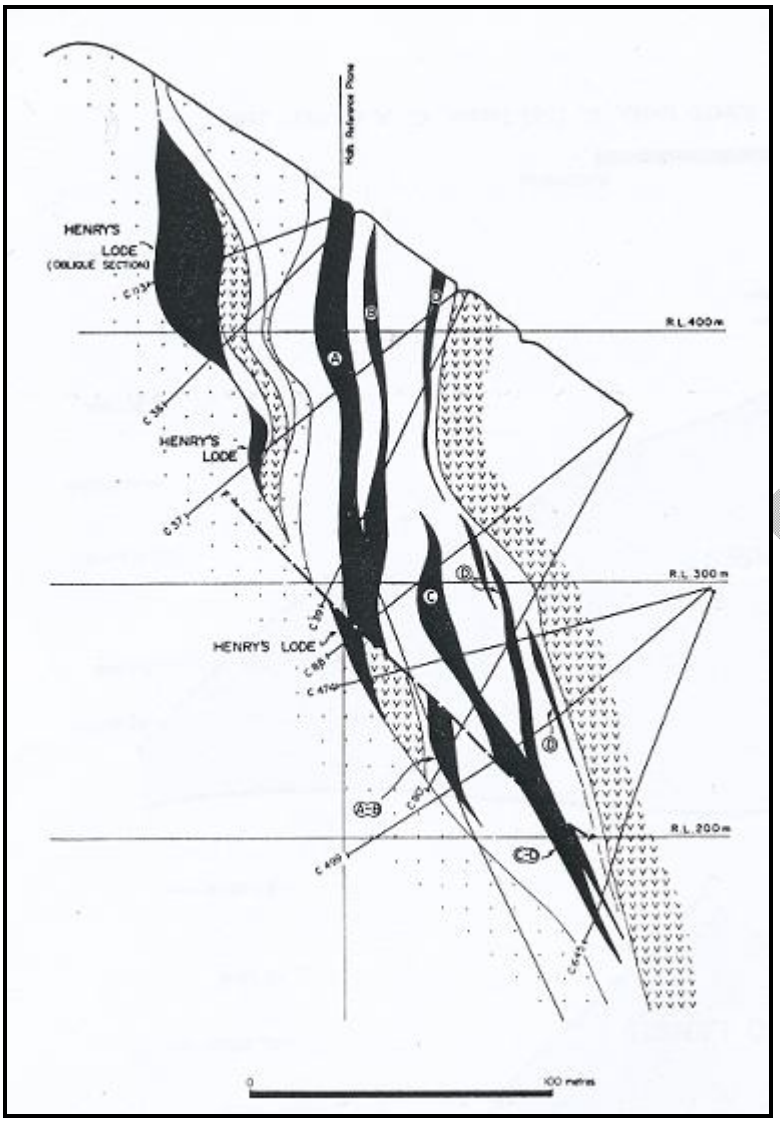


Figure 13 Cross-section interpreted by Collins (1981); this is cross-section Qa, the same cross-section as shown in Figure 11 and Figure 12.

(Collins, 1981)

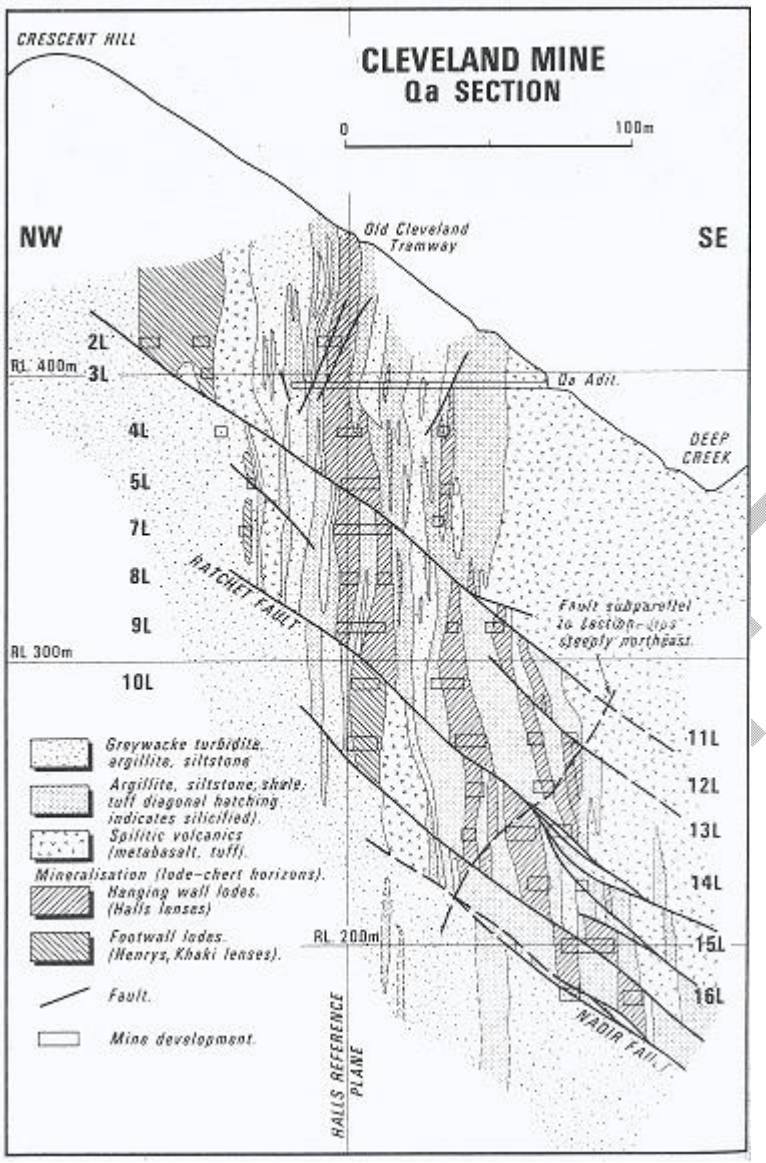


Figure 14 Diagrammatic cross-sections from Barth (1986).

(Barth, 1986)

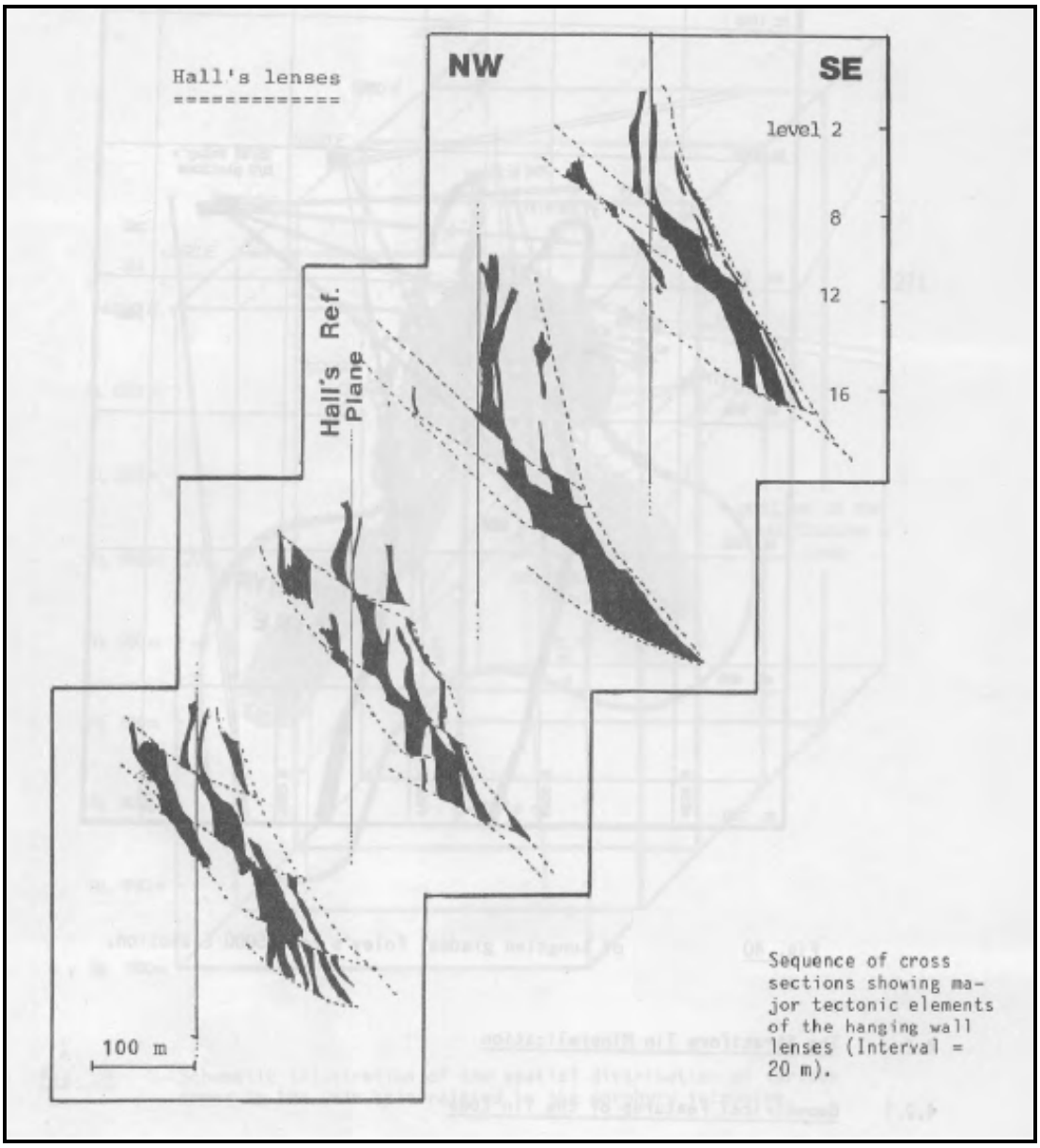


Figure 15 **Part of working section Ka: the heights of the development which is shown are about 5 metres; note that the traces of the faults marked W and J defy the observed geology.**

(Aberfoyle 1:500 working cross-sections)

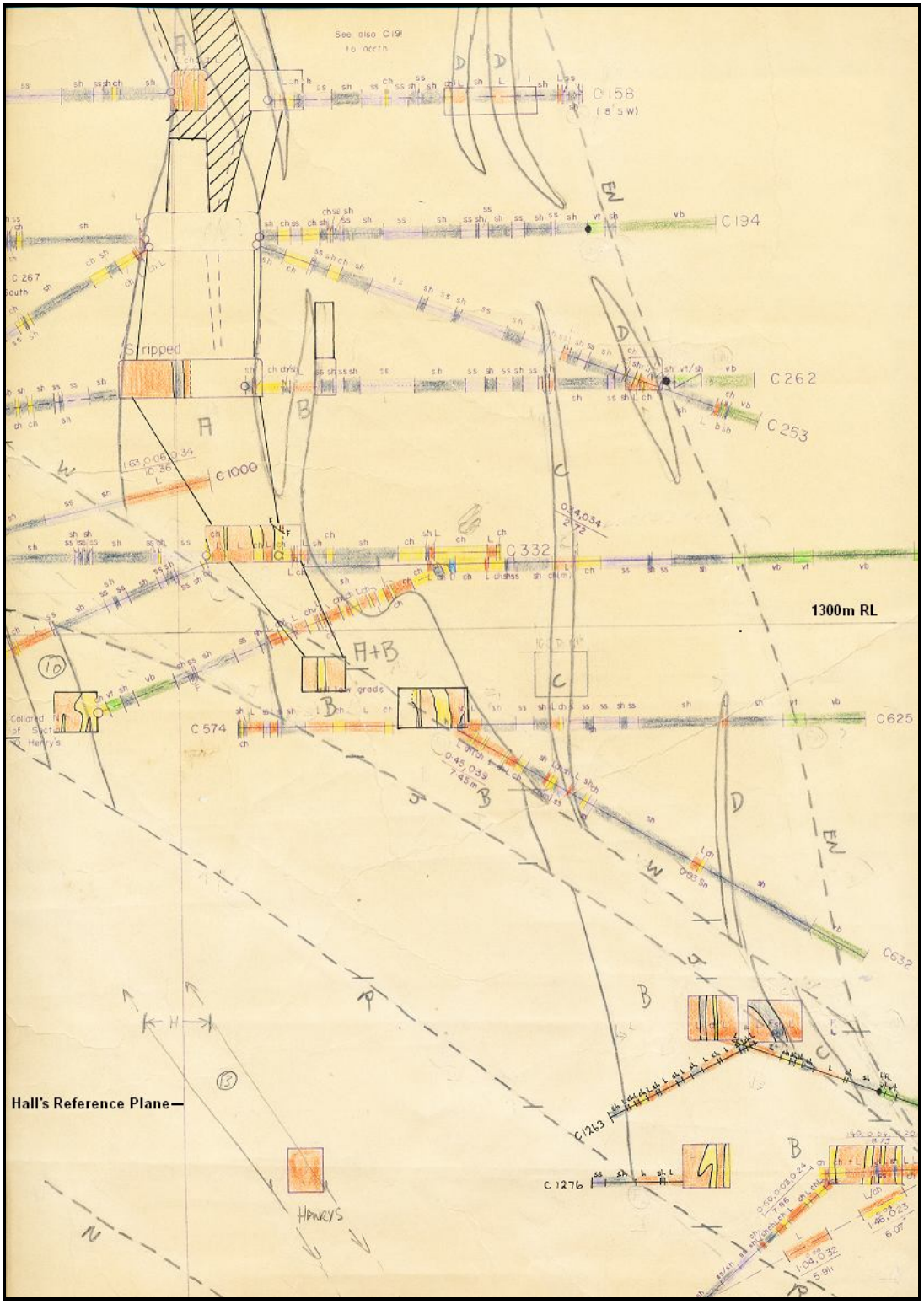


Figure 16 **Part of working cross-section K; the heights of the development are about 5 metres; a volcanic layer shaded in green on the drill holes appears to be unaffected by the faults marked R and N; the pencilled boundaries to the layer of volcanics are the author's.**

(Aberfoyle 1:500 working cross-sections)

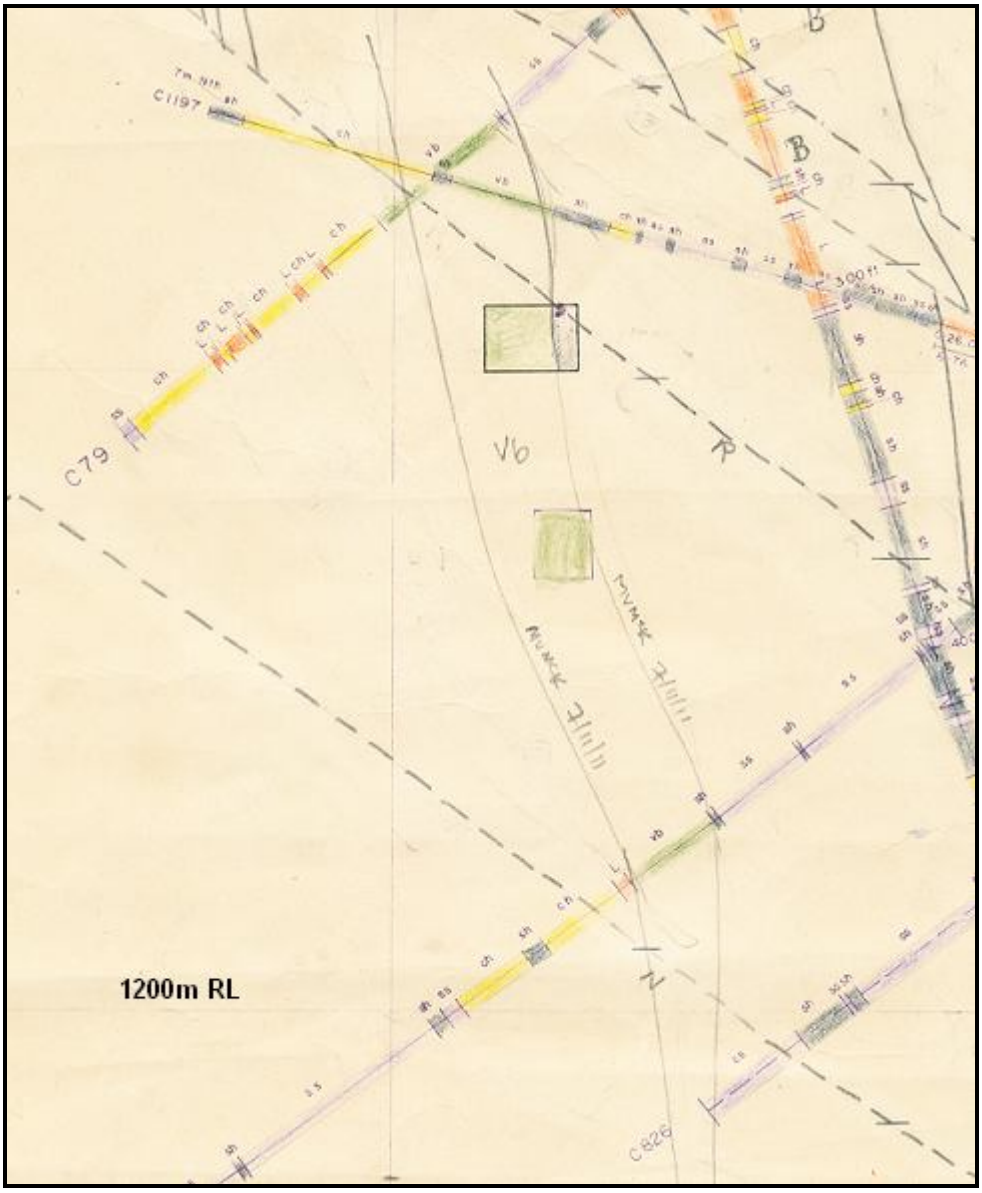


Figure 17 **Part of working section G: the heights of the development which is shown are about 5 metres; a suggested interpretation by the author is shown as synclinal fold closure pencilled in near the bottom of the figure; this interpretation would dispense with the requirement for the fault marked W on this section and to be fair this is the interpretation shown on working cross-section I.**

(Aberfoyle 1:500 working cross-sections)

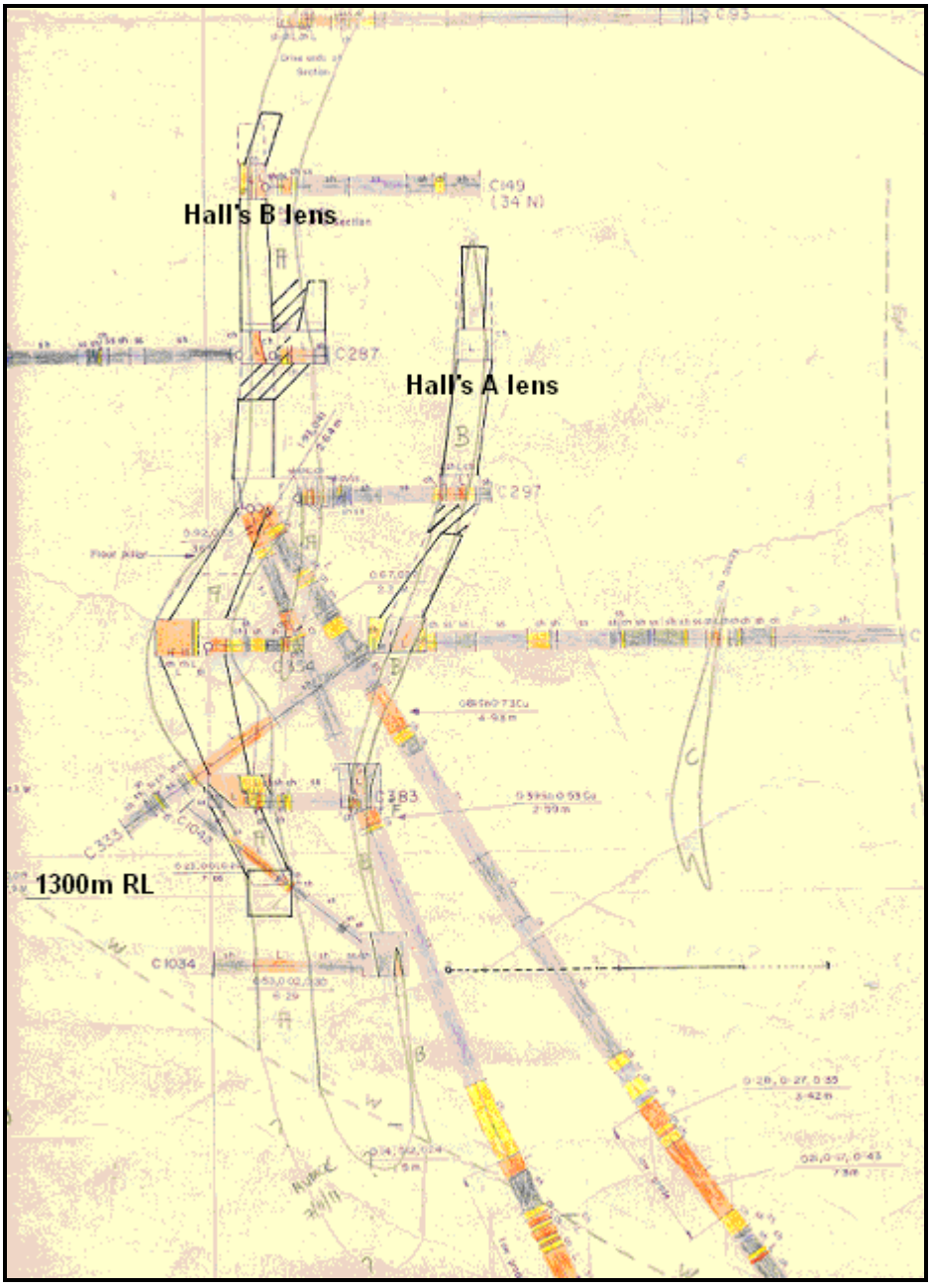


Figure 18 **Part of working cross-section N; it would be reasonable to connect the two pods of Henry's lode marked 1 to the pod marked 6.**

(Aberfoyle 1:500 working cross-sections)

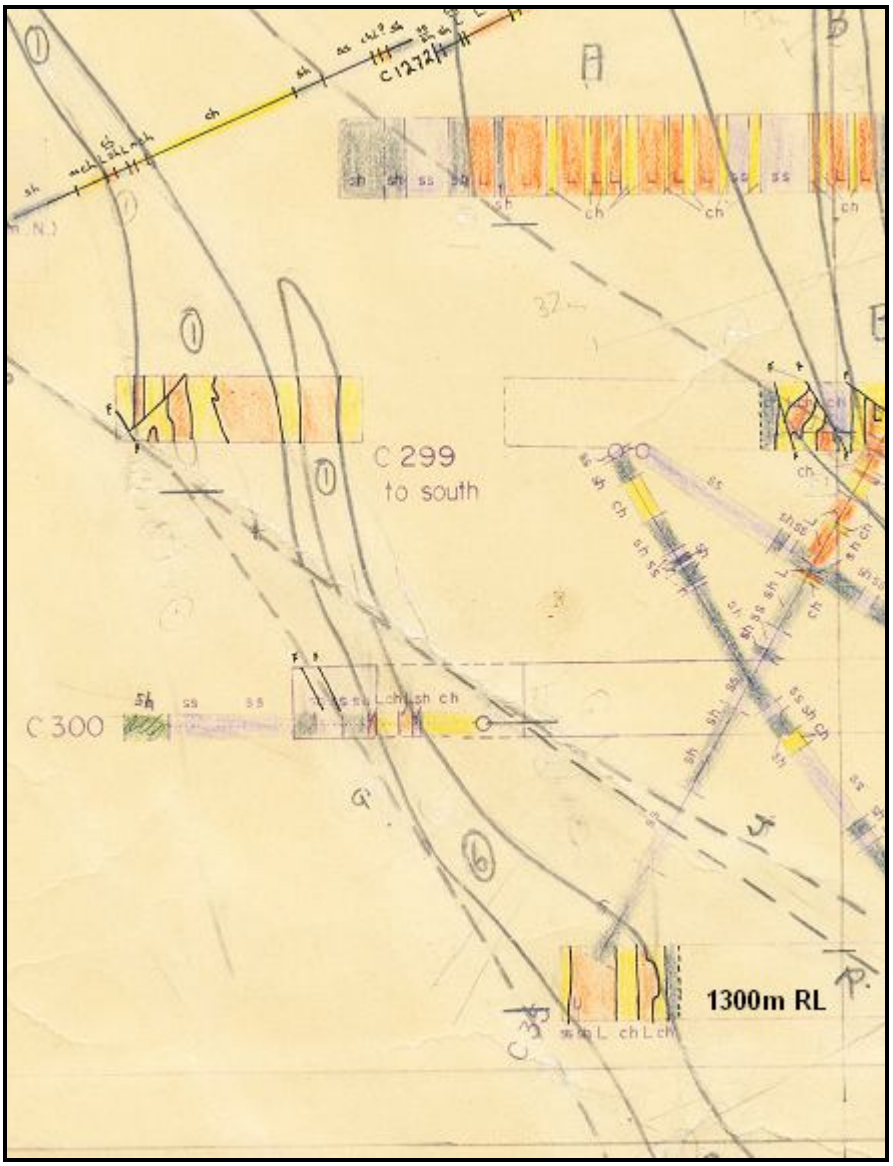
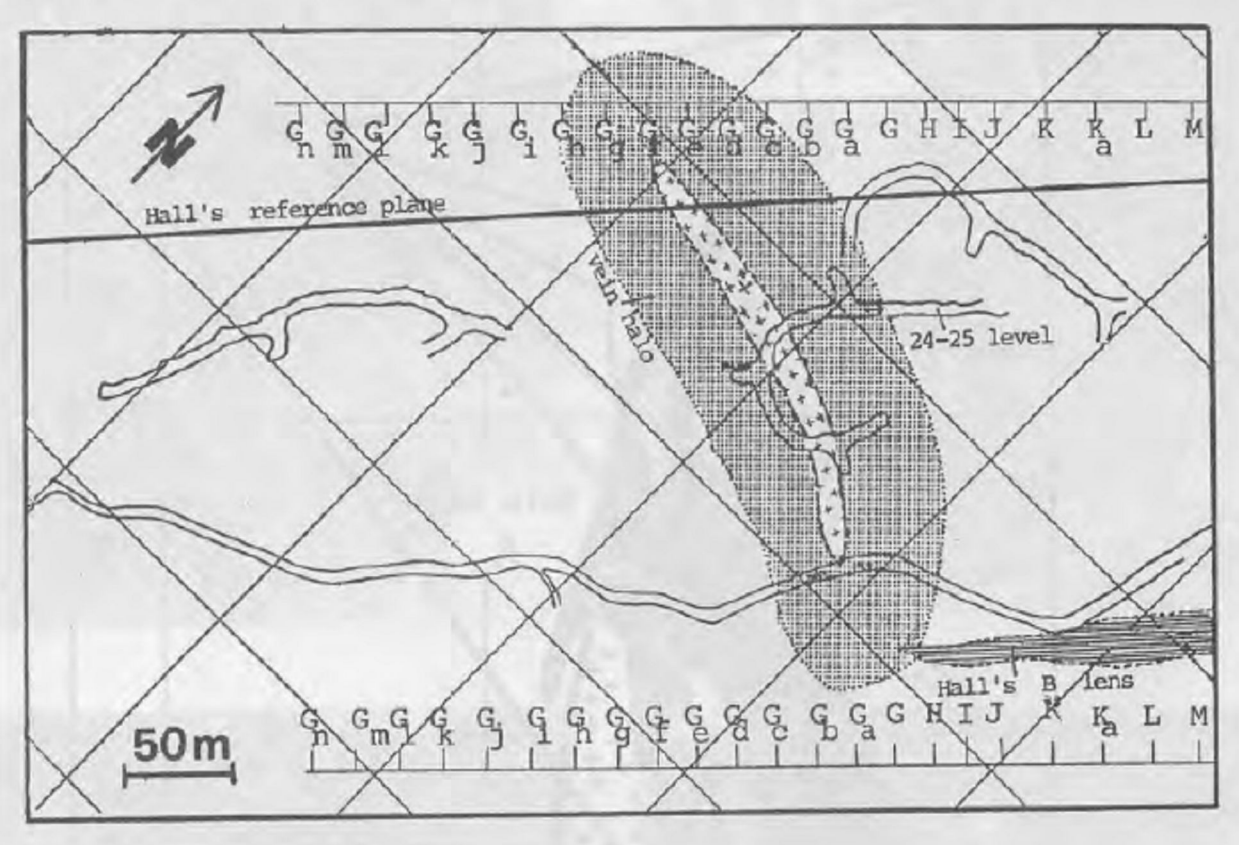


Figure 19 **Plan showing the quartz porphyry dyke and accompanying quartz vein halo and Hall's B lens.**

(Barth, 1986)



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5 DATABASE

5.1 Existing Data

Most of the information available for this report was compiled by Aberfoyle and associated parties over the period 1968 to 1986. There is a large repository of data and information regarding the Cleveland Mine which was accumulated by Aberfoyle and now held at the offices of the Burnie Research Lab, 39 River Road, Burnie, Tasmania. A catalogue of this data was made by Bright Phase and listed in a spreadsheet named "110723 BPRL Cleveland archive catalogue – Master.xlsx"

The Aberfoyle data includes drill logs, maps, reports and survey information. Drill logs exist for all holes drilled for geological purposes. A full set of 1:500 working cross-sections exists for the mine. ~~For the record, a complete set~~

MRT holds reports regarding exploration activity at and around Cleveland from around 1900 to the present day. These are all available via the Tiger Database on the MRT website. Many of these reports refer directly to the Cleveland Mine. Amongst the reports held by MRT is a report of the remaining resources made at mine closure (Dronseika, 1986).

MRT also holds many paper mine plans and sections. Of particular note is a set of plans and cross-sections showing the mine workings and bearing the date 1982. Despite the date on the plans, the plans appear to show the mine workings at mine closure, although this requires clarification. The mine plans show all development outlines and relevant survey station locations and numbers but not RLs. However, a file of survey station numbers with RLs was discovered in the Aberfoyle data held in Burnie; this data is considered critical and a copy of the spreadsheet of this data is attached (See Appendix 4).

MRT also holds drill core for 87 diamond drill holes at its Core Store at Mornington, Tasmania. For this report, samples taken from this core were used to verify the Aberfoyle assay data (See 5.2 Reliability of the Aberfoyle Data).

5.2 Reliability of the Aberfoyle Data

The Aberfoyle data was compiled during Aberfoyle's ownership of Cleveland from 1961 to 1986. During that time, Aberfoyle drilled 2040 diamond drill holes into the Cleveland deposit and mined about 5.65 million tonnes of ore over a period of 18 years, from 1968 to 1986. In the 1970s, Aberfoyle was one of the leading tin producers in Australia with four operating tin mines: Cleveland, the Storeys Creek and Aberfoyle mines in North-East Tasmania, and the Ardlethan mine in southern New South Wales. The author worked for Aberfoyle from 1970 to 1973 and was acquainted with many of the Aberfoyle staff who worked at Cleveland. He knows of no reason to doubt the technical competence of the geologists who worked at Cleveland~~.~~, in fact, Aberfoyle personnel were recognised as efficient operators with good record keeping and reporting practices.

During the work for this report, only one significant shortcoming in the data was discovered: only 1,547 of the drill logs included surveyed coordinates of the collars. However, it appears that all holes were plotted on the 1:500 working sections and, for the work for this report, the coordinates of 289 of the 493 holes which did not have records of surveyed coordinates were measured from the cross-sections. This meant that records of 204 holes were excluded from the database for the work for this report (See **Error! Reference source not found.**~~5.4~~ **Error! Reference source not found.**~~Data Used for the Creation of the Current Resource Block Model~~).

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Corollary validation of the data as it was used for the work for this report has confirmed the reliability of much of the data, for example, the collars of diamond drill holes drilled from the surface plot on the surface digital terrain model. There are discrepancies between the digital database and the data presented on the Aberfoyle working sections and these are discussed below (See 5.3 Digital Database).

An assessment of the validity of the Aberfoyle assay data was made by quartering some of the core held in the MRT Core Store and submitting the samples for assay at the Burnie Research Lab, a division of AMMTEC Ltd, and part of the ALS Group – a diversified international analytical laboratory group present in over 40 countries through a network of 140+ laboratories. Staff at the Burnie Research Lab are recognised experts in sample preparation and assaying for Sn.

111 samples were prepared by quartering drill core from parts of drill holes which had previously been split, sampled and assayed by Aberfoyle. The samples covered a range of Sn assays from about 0% to about 4% Sn. Sn content was determined by fused bead XRF, soluble Sn content by acid digest and AAS, and Cu content by AAS; the results are attached (See Appendix 6).

The length weighted average of the re-splits Sn assays was 0.84% compared with the length weighted average of the Aberfoyle Sn assays of 0.78%. As expected with smaller samples, the variance of the re-splits Sn assays was higher than the variance of the Aberfoyle Sn assays: 0.59 $\%^2$ compared with 0.44$\%^2$ (the “support effect”).

A graph of the two sets of Sn assays shows reasonable correlation between the two data sets with no obvious systematic error. Note that this is not a graph of re-assays of the same samples but a graph of samples taken, as far as possible and within the limits of the depth records in the core trays, adjacent to each other. Given these factors these results are a good confirmation of the reliability of the Aberfoyle Sn assay data.

The length weighted average of the re-splits Cu assays was 0.28% the same as the length weighted average of the Aberfoyle Cu assays. As expected with smaller samples, the variance of the re-splits Cu assays was higher than the variance of the Aberfoyle Cu assays: 0.21$\%^2$ compared with 0.13$\%^2$ (the “support effect”).

A graph of the two sets of Cu assays shows reasonable correlation between the two data sets with no obvious systematic error. Note, again, that this is not a graph of re-assays of the same samples but a graph of samples taken, as far as possible and within the limits of the depth records in the core trays, adjacent to each other. Given these factors these results are a good confirmation of the reliability of the Aberfoyle Cu assay data.

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Figure 20 Aberfoyle Sn Assays vs Re-splits Sn Assays
(111114 Cleveland drill logs – check assay comparison_MM.xls)

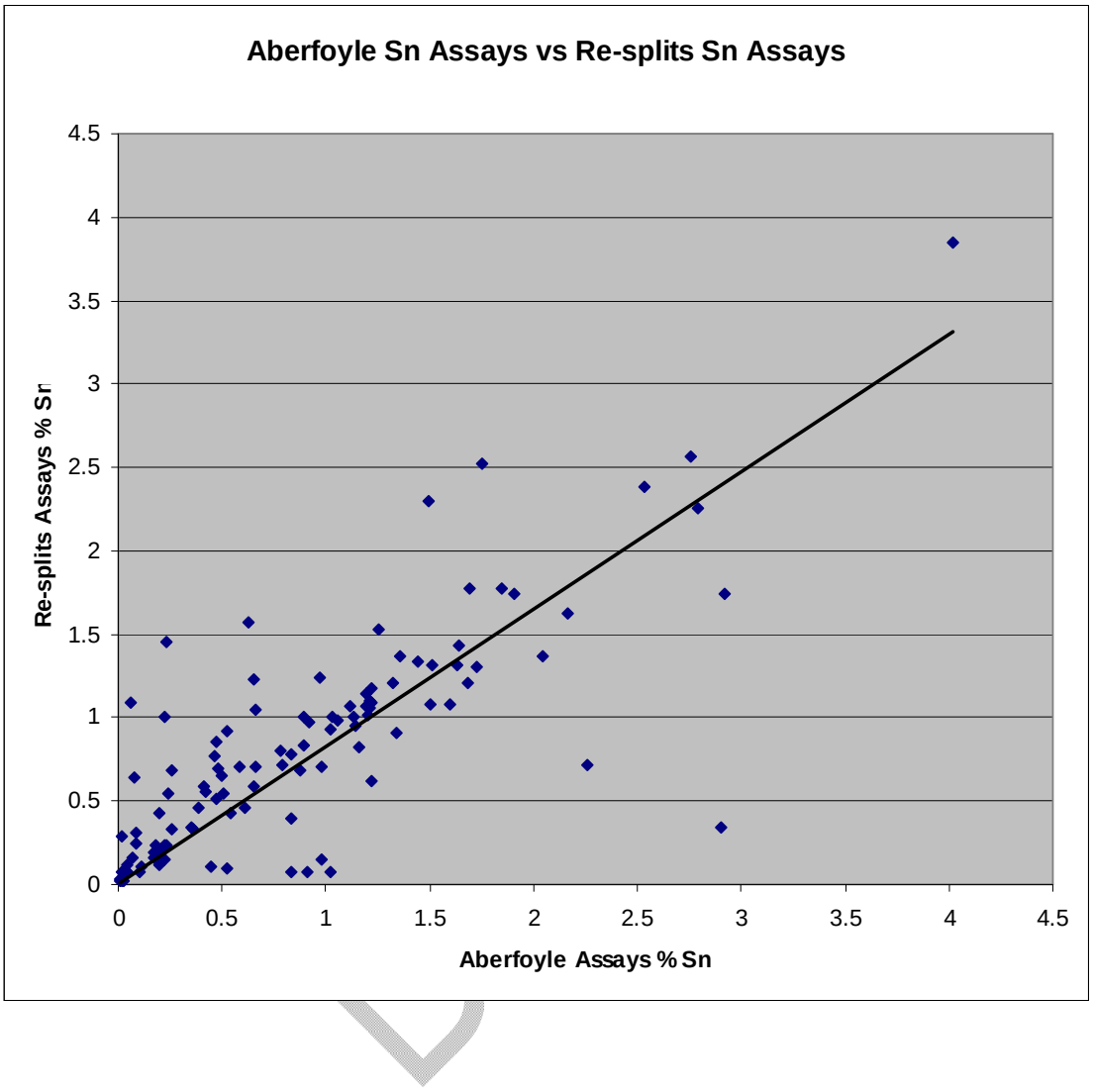
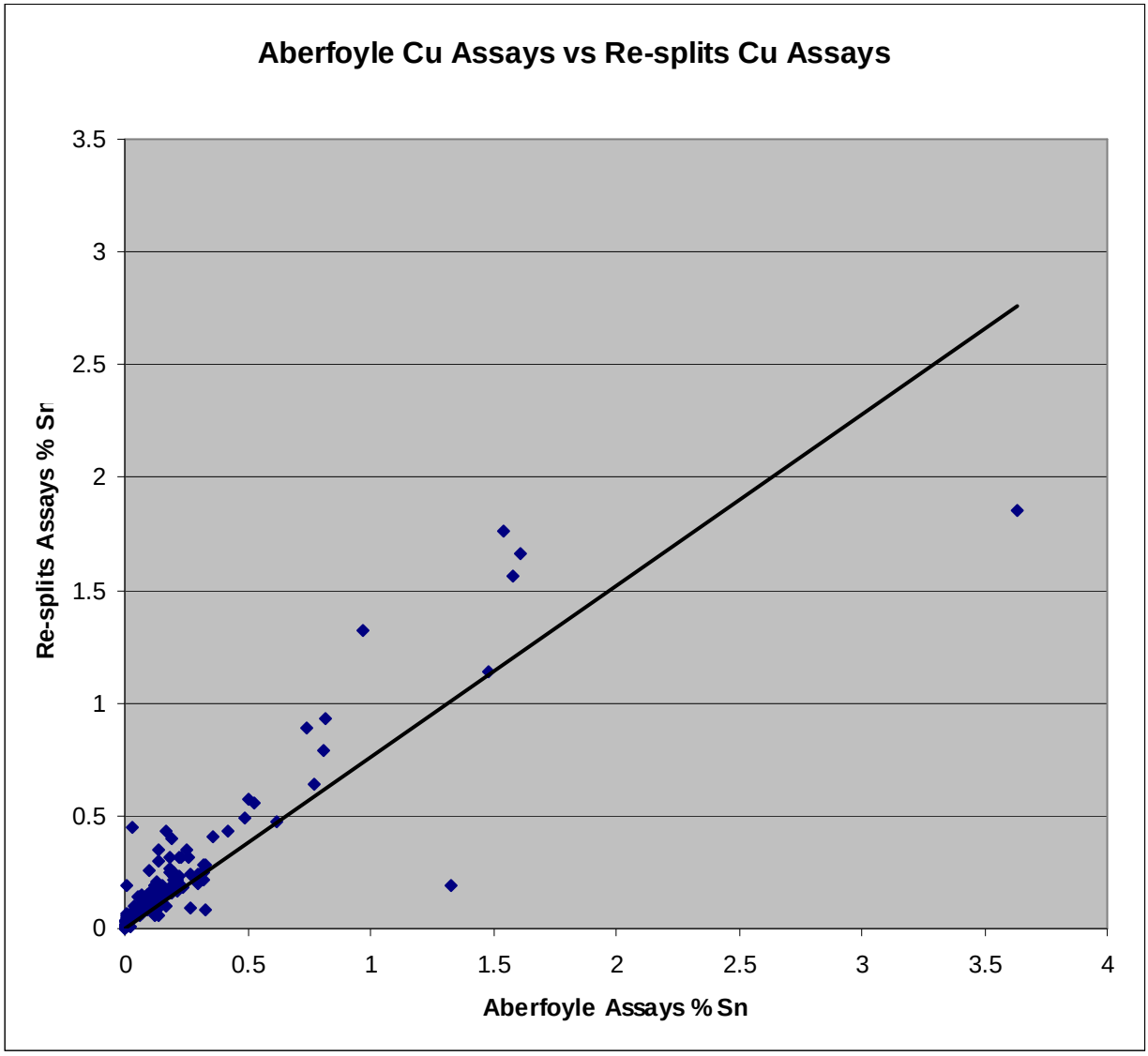


Figure 21 Aberfoyle Cu Assays vs Re-splits Cu Assays
(111114 Cleveland drill logs – check assay comparison_MM.xls)



5.3 Digital Database

Creation of a digital database of the Aberfoyle data is under way and the Aberfoyle data digitised so far includes:

- diamond drill hole collar locations;
- diamond drill hole surveys;
- assays of diamond drill core;
- lode intercepts, that is from depths and to depths of lodes as recorded by Dronseika in his 1986 resource report (Dronseika, 1986);

- mined out perimeters as recorded by Dronseika in his 1986 resource report (Dronseika, 1986);
- surface contours over the mine area;
- the location of the Cleveland Decline; this is correct in plan view but levels are approximate only.

As just mentioned, the drill hole database is still under way and, at present, records of 204 holes have been excluded from the database for the work infro this report (See 5.2 Reliability of the Aberfoyle Data). Also, during the work for this report, it was found that some of the drill hole data was incorrectly recorded or incorrectly entered into the database and, for now, data for holes with obvious errors have been excluded from the drill hole database; this has left data for 1819 drill holes in the database.

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6 MODELLING

6.1 Wireframes

Dronseika (1986) recorded 42 lodes (See Table 5). Of these, 11 were not modelled during the work for this report because they were small and, at this stage, continuity between cross-sections could not be assured.

Lode intercepts, that is depths from and depths to in drill holes, for Dronseika's 42 lodes were recorded in his resource report (Dronseika, 1986). These intercepts were plotted on cross-sections. Where fault traces were well defined on the 1:500 working cross-sections, they were also digitised.

Lode boundaries were interpreted on cross-sections in Surpac based on the following guides (For example, see Figure 22):

- drill hole plots of Dronseika's lode intercepts;
- drill hole plots of Sn assays;
- fault traces taken from the 1:500 working cross-sections;
- apparent stope limits based on the locations of the collars of some diamond drill holes, for example; see the lower part of Figure 22.

The lode boundaries were saved as Surpac strings.

The Surpac strings of the lode boundaries were linked to create wireframes, referred to in Surpac as digital terrain models ("DTMs") (See Figure 23).

The lode boundaries and wireframes are a first pass attempt only and clearly could be refined and extended. For example, the lodes which have not been modelled could be modelled and the boundaries of some lodes vary considerably from cross-section to cross-section (For example, see Figure 23). However, as a first attempt they are reasonable and, as discussed below (6.36.4 Global Resource EstimateResource Estimate) they provide reasonable confirmation of the Aberfoyle resource estimate made at mine closure (Dronseika, 1986)

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Table 5 **Lenses of lodes recorded by Dronseika; the lenses which have no Surpac wireframe file name in this table were not modelled for this report; note that Tulip, W, Ratchet, Nadir, Culshaw, En are all faults.**

(Dronseika, 1986)

Lens	Lens Code	Surpac Wireframe File Name
Henry's Lens Pod 1	HN01	
Henry's Lens Pod 2	HN02	
Henry's Lens Pod 3	HN03	
Henry's Lens Pod 3A	HN03A	
Henry's Lens Pod 5	HN05	
Henry's Lens Pod 6	HN06	lode06.dtm
Henry's Lens Pod 8	HN08	
Henry's Lens Pod 10	HN10	
Henry's Lens Pod 11	HN11	
Henry's West below Tulip	HNUT	lode10.dtm
Henry's West below Tulip	HNWUT	lode11.dtm
Henry's East below Tulip	HNEUT	lode12.dtm
Hall's A Lens above W Fault	HLA	lode13.dtm
Hall's B lens above W Fault	HLB	lode14.dtm
Hall's B Lens W – Ratchet Faults	HLBR	lode15.dtm
Hall's A1 Lens Ratchet – Nadir South of Culshaw	HLA1	lode16.dtm
Hall's A2 Lens Ratchet – Nadir South of Culshaw	HLA2	lode17.dtm
Hall's A2 Lens Ratchet – Nadir South of Culshaw	HLA3	lode18.dtm
Hall's A West Lens	HLAW	lode19.dtm
Hall's A East lens	HLAE	lode20.dtm
Hall's B lens Ratchet – Nadir South of Culshaw	HLBRN	lode21.dtm
Hall's B Lens West En - Tulip	HLBWT	lode22.dtm
Hall's B East Lens En - Tulip	HLBET	lode23.dtm
Hall's B lens below Tulip Fault	HLBUT	lode24.dtm

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Hall's B Lens above Ratchet Fault	HLCR	lode25.dtm
Hall's C Lens Ratchet - Nadir	HLCRN	lode26.dtm
Hall's C West Lens En - Tulip	HLCWT	lode27.dtm
Hall's C East Lens En - Tulip	HLCET	lode28.dtm
Hall's C Lens below Tulip Fault	HLCUT	lode29.dtm
Hall's D Lens above Ratchet	HLDR	lode30.dtm
Hall's D Lens En - Tulip	HLDT	lode31.dtm
Hall's D Lens Ratchet - Nadir	HLDRN	lode32.dtm
Hall's D Lens below Tulip	HLDUT	lode33.dtm
Hall's E Lens above Ratchet	HLER	
Hall's E lens En - Tulip	HLET	
Khaki West Lens	KKW	lode36.dtm
Khaki East Lens	KKE	lode37.dtm
Luck's Lode	LL	
B-South below 11	BS	lode39.dtm
Battery West Lens above 17 Level	BTW	lode40.dtm
Battery Lens Lens above 17 Level	BTE	lode41.dtm
Battery Lens below 17 Level	BT	

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Figure 22 **Part of cross-section G showing interpretation of Khaki East Lode in red; note that diamond drill holes C0848 and C0944 could reasonably be assumed to have been drilled from within a stope on Khaki East Lode.**

(cleveland.mdb, lode37.dtm)

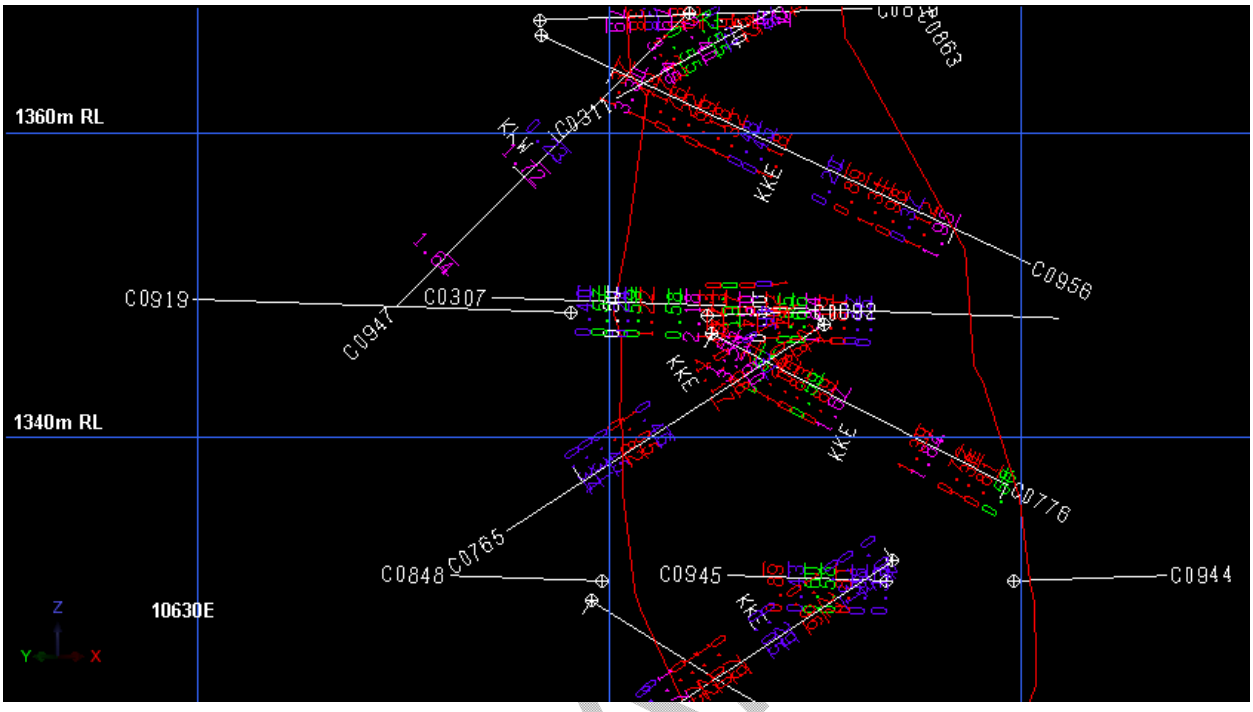

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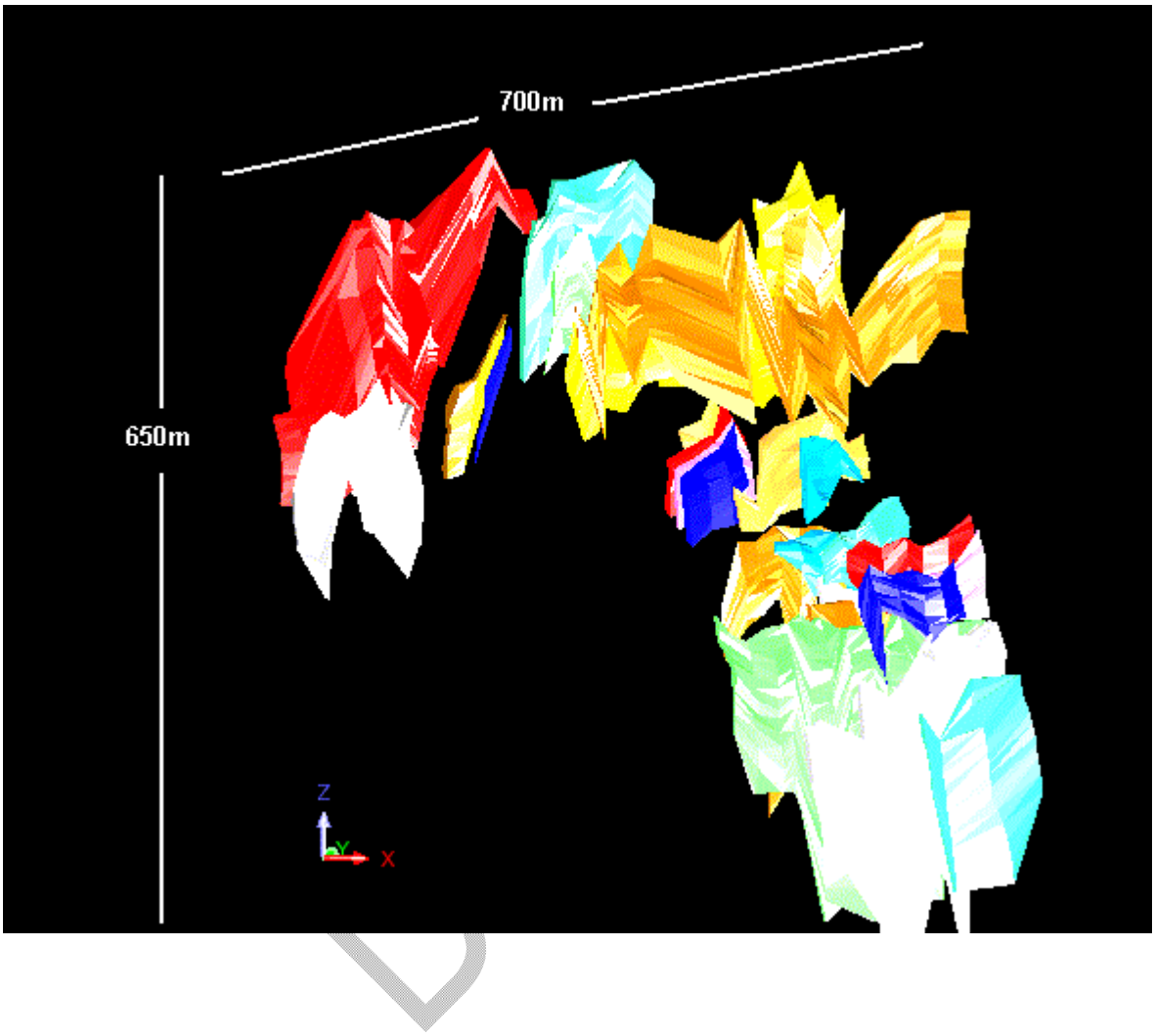
Figure 23 **Oblique view of the Surpac wireframes; note the orientation axes at the bottom right, Y is north and X is east; for example, Khaki East Lode is in red at the top left, and Hall's D Lens below; Tulip Fault is in pale blue at the bottom right.**



6.2 Block Model

6.2.1 Block Model Orientation and Block Size

A Surpac block model of the lodes was made using block model rotated to be parallel to the strike of Hall's Reference Plane.

The blocks in the model had the dimensions of 10m along strike, 10m vertically and 2m across strike with no sub-blocking allowed. Given the general cross-section spacing of about 20 to 25m, the relatively long dimensions of the lodes along strike and down dip compared to across trike, this block size was reasonable.

6.2.2 Attributes in the Block Model

Blocks were flagged with the attributes listed in Table 6.

Table 6 Attributes in Block model mocl1101.mdl (mocl1101.mdl)

Attribute	Description
lode_number	lode number as recorded in Table 5
bulk density	material density
mined_out	mined out flag: mined out = 1, not mined =0
sn_id2	Sn grade estimated by inverse distance squared method
cu_id2	Cu grade estimated by inverse distance squared method

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Lode numbers were assigned to appropriate blocks in the block model based on the wireframes listed in Table 5.

Bulk densities were allocated to air, waste rock and lodes:

- air = 0,
- waste rock = 2.7 tonnes per cubic metre, and
- lodes = 3.1 tonnes per cubic metre.

The lode bulk densities were based on those quoted in Dronseika (1986) of 3.05 tonnes per cubic metre for Henry's and Hall's Lodes and 3.08 tonnes per cubic metre for Khaki, B South and Battery Lodes. A density of 3.1 in a two component rock consisting of quartz and pyrrhotite only implies a S content due to pyrrhotite of about 8% which is reasonable given the mineral composition of the lodes.

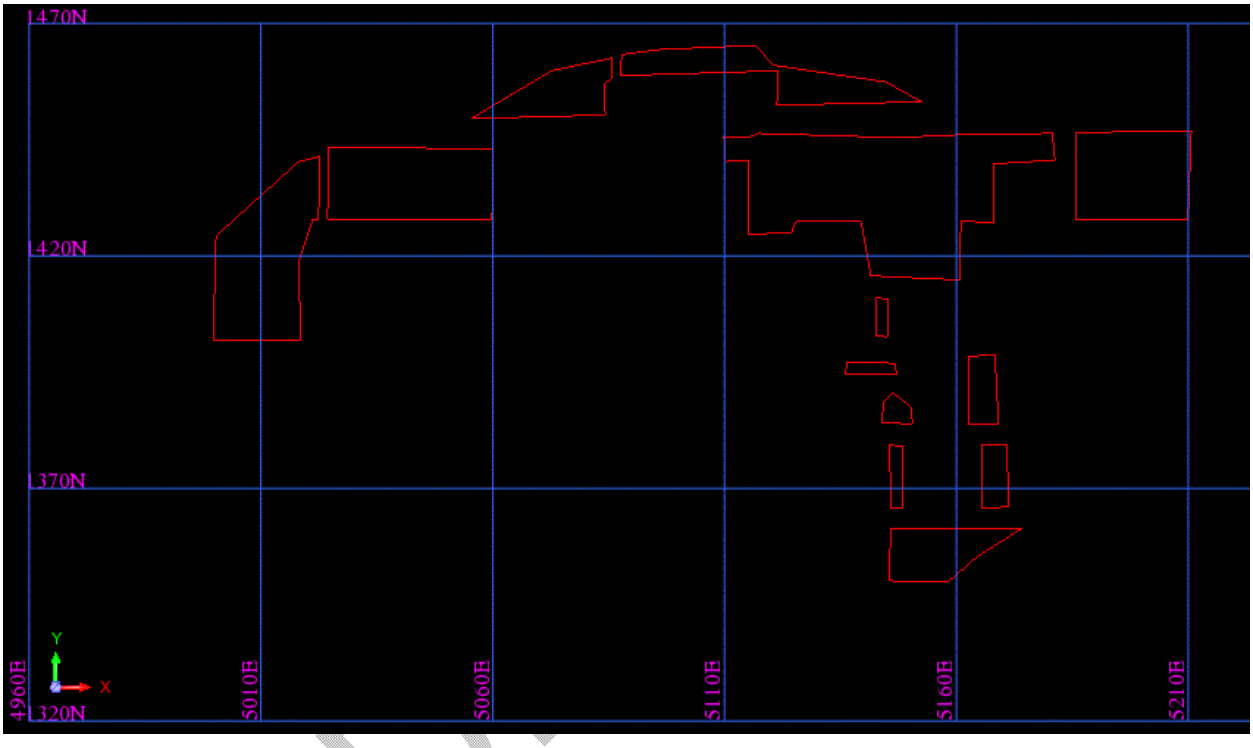
Two dimensional outlines of the mined-out parts of the lodes were included in Dronseika's closure resource report as longitudinal projections. These outlines were digitised (For example, see Figure 24) and used as cookie cutters to flag the blocks in the block model which had been mined out. No differentiation was made on the basis that some mine workings may not have

taken out the full width of the mineralisation and the full width of the mineralisation was depleted.

Interpolated Sn and Cu grades were stored in the attributes sn_id2 and cu_id2 and these are described below.

Figure 24 Depleted Parts of Hall's A Lens above W Fault: the depleted zones are outlined in red.

(lode_13_mined1.str)



6.2.3 Interpolation of Sn and Cu Grades into the Block Model

As mentioned above (5.3_Digital Database), Dronseika had listed the lode intercepts used for his 1986 resource estimate in his report and these had been taken into account for the geological interpretation and included in the database during the work for this report. These lode intercepts were used as flags to select the assays to be used for the grade interpolation for each of the 31 lenses modelled. For each lens, the assays were selected and composited to the appropriate length of 1.0m and used as the inputs to the Sn and Cu grade interpolations.

The locations of the composites generally coincided but tended to extend beyond the wireframes (For example, see **Error! Reference source not found.**~~Figure 25~~). This suggests that the digital interpretation used in the modelling work for this report requires refinement and will lead to an under-estimate of resources (See 6.3 Global Resource Estimate~~Resource Estimate~~). Some other composites plotted well away from their corresponding wireframes, suggesting errors during geological interpretation or data input. Despite, these kinds of error, given the time available for the creation of the block model for this report and the relatively low frequency of such error, no attempt to resolve the apparent errors was made which was reasonable for the purposes of this report.

Time did not permit a complete assessment of the basic statistics and geostatistics of the assays used for the grade interpolations for the block model, however, so far, preliminary statistics have provided one observation which will be useful in future resource estimates.

As expected the distribution of Sn assays in lodes is approximately log-normal but there appears to be more than one population of Sn assays within each lode (For example, see Figure 26): a lower grade population which probably represents assays of waste included within the lode boundaries, a middle grade population which constitutes the bulk of the assays, and, interestingly, a high grade population.

The existence of three populations of Sn assays, including a high grade population, is also illustrated by log-probability plots (For example, see Figure 27). This in turn reinforces an impression gained from scanning the assay database that higher grade assays of drill core tend to cluster together. The nature and extent of these higher grade Sn assays is currently not known.

The presence of mixed populations of Sn assays suggests that grade interpolations would best be made by multiple kriging runs or indicator kriging. Given the imperfect state of the digital drill hole database and the time available to prepare the block model for this report, variography adequate for any type kriging was not possible, so, grades were interpolated using a three dimensional inverse distance squared method. This method should result in a reasonably reliable estimate of global grades, that is grades of entire lodes but is less reliable in estimating lode grades above a cut-off grade.

Sn and Cu grades were interpolated using a search ellipsoid oriented with its major axis parallel to the general strike of the lodes, that is the strike of Hall's Reference Plane, its semi-major axis parallel to the general dip of the lodes, that is vertical, and its minor axis across the general dip of the lodes, that is perpendicular to Hall's Reference Plane. The search ellipse extended 100m along strike and down-dip and 10m across strike. Given the drill hole spacing, this search distance will ensure that most blocks are informed by multiple samples.

The minimum number of samples necessary to inform a block was set at 1 and the maximum number at 10.

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Figure 25 **Location of Samples used in the Grade Interpolation for Hall's C Lens above Ratchet Fault: the lode wireframe is in yellow, the composite sample locations are shown as blue crosses.**

(lode25.dtm and comps25.str)

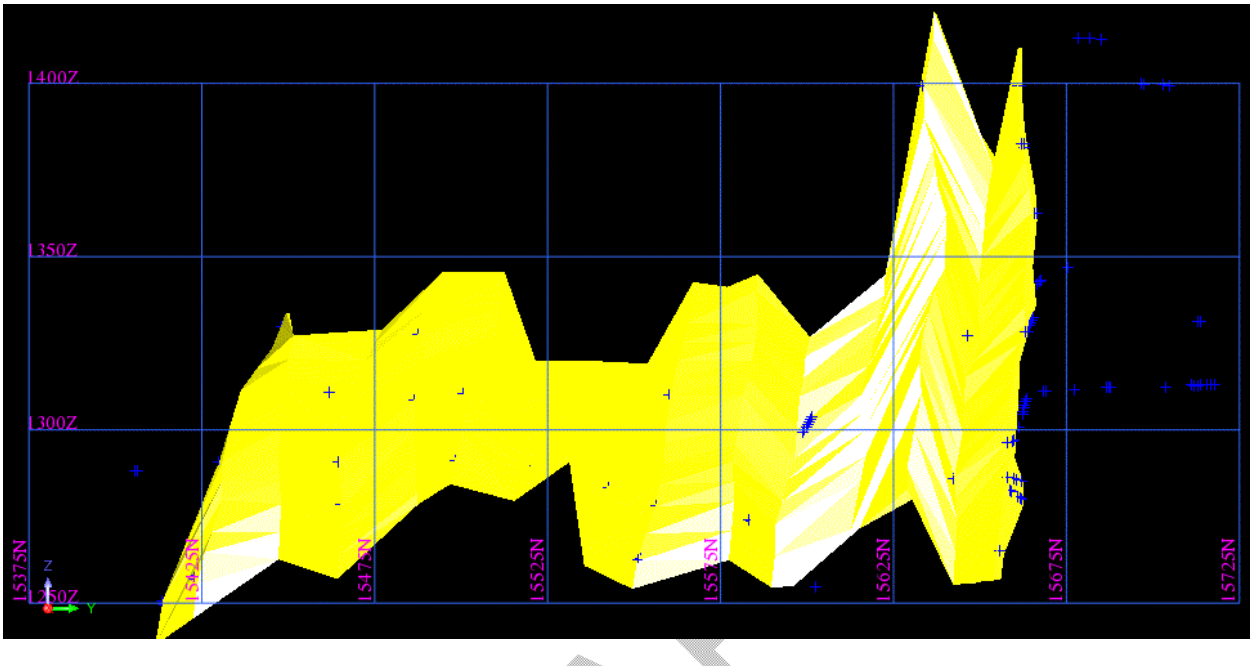

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Figure 26 **Histogram of log10(%Sn) in Composited Assays from Hall's C Lens above Ratchet Fault; note that the histograms slightly skewed and apparently contains more than one population of assays centred around -1.2 = about 0.1% Sn, 1.0 = 1.0% Sn, and 0.8 = 5.3% Sn.**

(comps25.str)

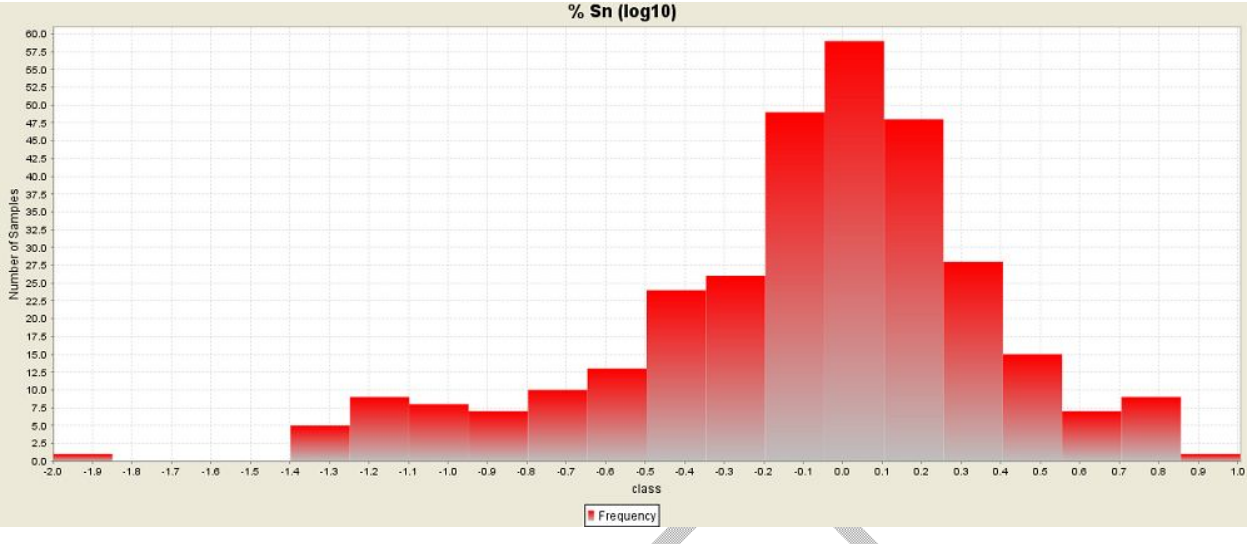
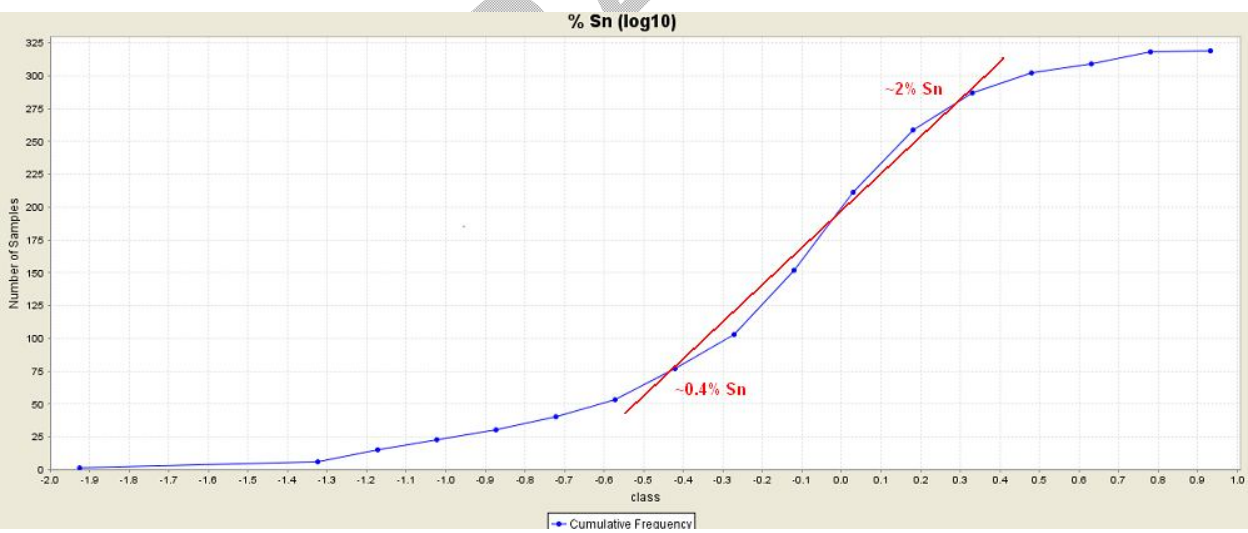


Figure 27 **Log-probability Plot of Composite assays from Hall's C Lens above Ratchet Fault: note the breaks in the distribution at about 0.4% Sn and 2.0% Sn.**

(comps25.str)



6.3 Global Resource Estimate

The global resource estimate from the current block model is listed in Table 7. The two estimates show very good agreement in grades and reasonable agreement in tonnes given that not all the lode mineralisation was modelled in the current block model. The Aberfoyle estimate of the remaining resource which was made at mine closure appears to be confirmed as a reasonable estimate.

An increase in the resource tonnage in the current block model will come from inclusion of mineralisation in:

- Currently un-modelled lenses: Henry's Lens Pods 1,2,3, 3A, 5, 8,10 and 11; Hall's E Lens above Ratchet and Hall's E Lens En – Tulip; Lucks Lode; Battery Lens below 17 Level.
- Extensions of current digital lode interpretations on cross-sections so that the lode interpretations are geologically continuous from cross-section to cross-section.
- Extensions of current digital lode interpretations along strike and down-dip so that the lode interpretations terminate in a geologically sensible way.

In addition, accurate digitising of the existing mine workings will add a small tonnage to the global resource as well as facilitating future mine planning.

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Table 7 Comparison of the Global Resource Estimate for this Report and the Aberfoyle 1986 Resource Estimate.

(mocl1101.mdl and global.xls and Dronseika, 1986)

Lode	This Estimate (no cut-off)			Aberfoyle Estimate (0.35% Sn cut-off)		
	tonnes	% Sn	% Cu	tonnes	% Sn	% Cu
Hall's	4,030,000	0.69	0.27	4,500,000	0.71	0.30
Henry's	1,120,000	0.70	0.48	450,000	0.81	0.47
Khaki and Luck's	500,000	0.70	0.22	720,000	0.70	0.22
Battery and B-South	240,000	0.55	0.25	810,000	0.64	0.25
Total	**4,900,000**	**0.69**	**0.27**	**6,500,000**	**0.70**	**0.31**

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7 EXPLORATION POTENTIAL

As the work for this report progressed, potential for future exploration in the Cleveland Mine became clearer:

There is potential for further lode discovery down-dip and a re-interpretation of the lode boundaries will assist with assessing likely down-dip targets.

Since the 1960s no new lodes have been discovered at Cleveland; all the additions to the resource have come from the delineation of down-dip extensions of the known lodes: Hall's, Henry's, Khaki, Luck's and battery lodes all of which were identified in outcrop. The replacement style of the lode mineralisation in a large package of sedimentary rocks and comparison with Renison suggest that this should not be so. There is potential to test for new lodes within the mine itself, along strike of, and between, the known lodes, and along strike beyond the limits of the known lode system. At Renison, the mineralisation plunges significantly both to the north and south of the mine and this could also be the case at Cleveland.

There is currently no reason why the mineralisation does not extend beyond the known limits. The granite beneath the mine has not been met with in drilling and, even if it were, it would not necessarily provide a base to the mineralisation, for example, in Cornwall many tin lodes extend down to be hosted in granite.

This report did not address the tungsten resource in Foley's Lode and the reader is referred to separate reports (Dronseika, 1983 and McKeown, 2011) for details of that mineralisation.

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8 REFERENCES

Barth, von Wolfgang H., 1986. Geology of the Cleveland tin mine, Tasmania, Australia with special reference to mineral chemistry and rare earth distribution. Doctoral thesis, University of Heidelberg, Germany.

Carey, S.W., 1945. Geological Report of the Mt. Cleveland Tin Mine. Unpublished Report, Tasmania Department of Mines, 10th April 1945.

Collins, P.L.F., 1981. The geology and genesis of the Cleveland tin deposit, Western Tasmania: fluid inclusion and stable isotope studies *in Economic Geology*, volume 76, pages 365-392.

Collins, P.L.F., Brown, S.G., Dronseika, E.V. and Morland, R., 1989. Mid-Palaeozoic Ore Deposits *in Geology and Mineral Resources of Tasmania (Eds. C.F. Burrett and E.L. Martin), Special Publication 15, Geological Society of Australia Incorporated.*

Cottle, V.M., 1953. Magnet silver-lead mine *in Geology of Australian Ore Deposits, Fifth Empire Mining and Metallurgical Congress Australia and New Zealand, 1953 (Ed. A.B. Edwards), The Australasian Institute of Mining and Metallurgy.*

Cox, R. and Glasson, K.R., 1967. The Geology and Mineralisation of Cleveland Mine in The Geology of Western Tasmania –a Symposium, University of Tasmania, Department of Geology, November 1967.

Dronseika, E.V., 1983. Geological assessment of the Foley zone mineralisation at Cleveland mine Tasmania, May 1983. Unpublished report for Cleveland Tin Ltd.

Dronseika, E.V., 1986. Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Unpublished report for Aberfoyle Resources Limited, Cleveland Division by E.V. Dronseika, Senior Mine Geologist.

Hughes, T.D., 1952. The Cleveland Mine. Unpublished Report, Tasmania Department of Mines, 4th November 1952.

Hughes, T.D., 1953a. The Mount Cleveland Mine. Unpublished Report, Tasmania Department of Mines, 13th July 1953.

Hughes, T.D., 1953b. Cleveland Mine. Unpublished Report, Tasmania Department of Mines, 123rd October 1953.

Hughes, T.D., 1954. The Mt. Cleveland Mine – Supplementary Report. Unpublished Report, Tasmanian Department of Mines, 2nd June 1954.

Jackson, P., Changkakoti, A., Krouse, H.R. and Gray, J., 2000. The origin of the greisen fluids of the Foleys zone, Cleveland tin deposit, Tasmania, Australia *in Economic Geology volume 95, pages 227-236.*

Keunecke, O. and Tate, K.H., 1954. Records 1954 No. 7. Geophysical Survey at Mt. Cleveland Mine, Waratah, Tasmania. Commonwelath of Australia, Department of National Development, Bureau of Mineral Resources, Geology and Geophysics.

Leaman, D.E. and Richardson, R.G., 1989. The granites of west and north-west Tasmania – a geophysical interpretation. Geological Survey Bulletin 66, Tasmania Department of Mines.

Leaman, D.E. and Richardson, R.G., 2003. A geophysical model of the major Tasmanian granitoids. Tasmanian Geological Survey Record 2003/11, Mineral Resources Tasmania.

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Mason, A.A.C., 1965. Tin ore deposits of Mount Cleveland *in Geology of Australian Ore Deposits, Eighth Commonwealth Mining and Metallurgical Congress, Australia and New Zealand, 1965 (Ed. John McAndrew), The Australasian Institute of Mining and Metallurgy.*

Mason, A.A.C., Glasson, K.R. and Hopwood, T., 1963. Outline of proposed exploratory development and ore testing programme. Aberfoyle Tin Development Partnership (Mount Cleveland Project), November 1963.

McKeown, M.V., 2011. Cleveland Mine, Luina, Tasmania, Independent Geologist's Report for Bright Phase Resources Pty ~~l~~Ltd.

Ransom, D.M. and Hunt, F.L., 1975. Cleveland tin mine in Knight, C.L. (editor), 1975, Economic Geology of Australia and Papua New Guinea, Monograph Series No. 5, The Australasian Institute of Mining and Metallurgy.

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Appendix 1

Grid Convention

MEMORANDUM

To:	**File**		
From:	**Mick McKeown**	**Date:**	**28 June 2011**
Project:	**Bright Phase Resources Limited – Cleveland Mine**		
Subject:	**ABERFOYLE GRIDS**		

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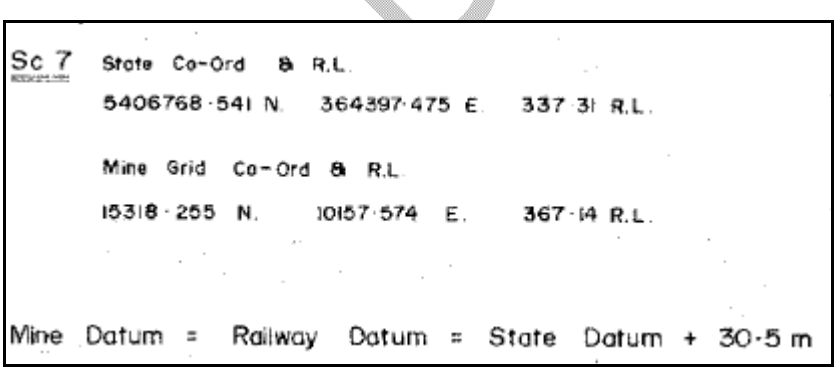
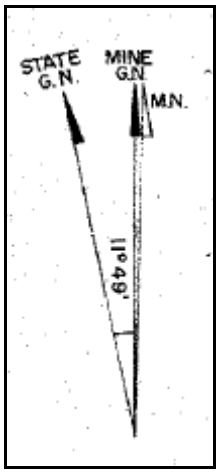
Cleveland Mine Grid

The relationship between the Cleveland Mine Grid and the Tasmanian State Grid was shown on a plan prepared by Aberfoyle Ltd in December 1980 (See below).

Note that the State Grid referred to on the Aberfoyle plan is the Australian Geodetic Datum 1966 known as AGD66. This is the older datum which was generally in use prior to 31 March 2003. Tasmania now operates on a new State Grid known as GDA94 and coordinates in the two systems are significantly different.

To convert form AGD66 to GDA94 or vice versa, there is a calculator on the Land Victoria website which can be accessed using this hyperlink: GDAit Online Coordinate Transformations.





The floor level at 7 Adit Portal is at approximately 343m RL.

References

Plan 216_010c Lease plan Dec 1980.pdf

Dronseika, E.V., 1986. Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Open file report for Aberfoyle Resources Limited, Cleveland Division by E.V. Dronseika, Senior Mine Geologist. (MRT 87_2624)

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Appendix 2

Aberfoyle Reference Planes and Cross-section Conventions

MEMORANDUM

To:	**File**		
From:	**Mick McKeown**	**Date:**	**8 November 2011**
Project:	**Bright Phase Resources Limited – Cleveland Mine**		
Subject:	**ABERFOYLE REFERENCE PLANES AND SECTION NUMBERS**		

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The relationship between the Cleveland Mine Grid and the Tasmanian State Grid is explained in a separate memo.

The Cleveland Mine Grid is not parallel to the strike of any of the mineralisation. Consequently, two reference planes were established for cross-sections and longitudinal projections:

- Hall's Reference Plane
- Battery Reference Plane

Hall's Reference Plane (Hall's, Henry's and Khaki Lodes)

Hall's Reference Plane strikes $42^{O}16'25" = 42.2736^{O}$ east of Cleveland Mine Grid north (for example, see Level Plan MLP-14Sa).

Hall's Grid was defined for work by Mining One:

- at G Section where Halls' Reference Plane and the section intersect at 5000N 3000E on Hall's Grid = 15446.4N 10774.7E on Cleveland Mine Grid.
- where Hall's Reference Plane at 5410.3N 3000E passes through 15750.0N 11050.7E as measured from mine level plans.

Cross-sections along Hall's Reference Plane are numbered from south-west to north-east (on the Cleveland Mine Grid) from Gp to Z and the cross-section planes are not regularly spaced, for example refer to Figure 1 below. Table 1 lists the coordinates of the cross-section planes on Hall's Reference Plane as noted in Aberfoyle data.

Coordinates for transformation from Hall's to mine Grid and back are:

Hall's Grid	Cleveland Mine Grid
Y1 = 5000	Y1 = 15446.4
X1 = 3000	X1 = 10774.7
Y2 = 5410.3	Y2 = 15750
X2 = 3000	X2 = 11050.7

Battery Reference Plane

Battery Reference Plane strikes 020.00^{O} relative to Cleveland Mine Grid north.

Table 2 Cross-section Coordinates on Battery Reference Plane; these were measured from a plan (Dronseika, 1985)

Cross-section on Battery Reference Plane	Cleveland Mine Grid Coordinates	
	north	east
D	15,333.5	10,810.5
F	15,381.5	10,827.5

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Table 1 Cross-section Coordinates on Hall's Reference Plane

Cross-section on Hall's Reference Plane	Reference Line Northing (G at 5000mN)	Distance south of G Section metres	Cleveland Mine Grid Coordinates	
			north	east
Gn	4732	-268		
Gm	4752	-248		
Gl	4772	-228		
Gk	4792	-208		
Gj	4812	-188		
Gi	4832	-168		
Gh	4852	-148		
Gg	4872	-128		
Gf	4890	-111		
Ge	4909	-91		
Gd	4927	-73		
Gc	4945	-55		
Gb	4963	-37		
Ga	4982	-18		
G	5000	0	15,446.4	10,774.7
H	5018	18		
I	5033	33		
J	5049	49		
K	5072	72		
Ka	5095	95		
L	5118	118		
M	5139	139		
N	5158	158		
O	5180	180		
P	5200	200		
Q	5222	222		

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Qa	5240	244		
Qb	5258	266		
R	5277	277		
S	5292	292		
T	5310	310		
Ta	5323	323		
U	5336	336		
V	5361	361		
Va	5384	384		
W	5407	407		
Wa	5437	437		
X	5457	457		
Y	5497	497		
Z	5517	517		

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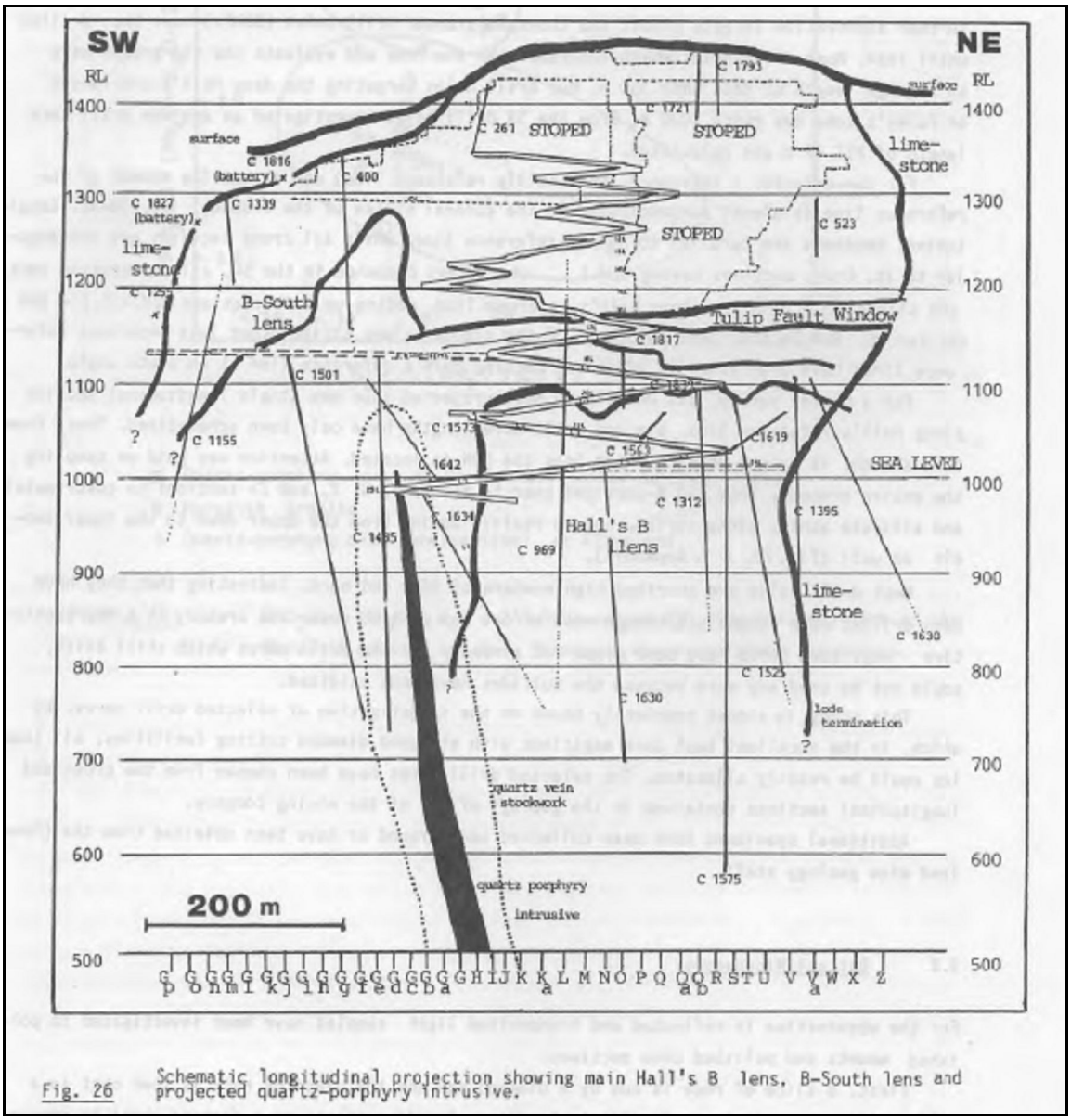
Figure 1 Drawing showing cross-section numbers along Hall's Reference Plane (Barth, 1986)


SW
NE
RL
1400
1300
1200
1100
1000
900
800
700
600
500
surface
C 1816
(battery)
C 400
C 1827
(battery)
C 1339
C 261
STOPED
C 1721
STOPED
C 1793
lime-
stone
C 523
STOPED
B-South
lens
Tulip Fault Window
C 1817
C 1501
C 1155
C 1573
C 1642
C 1634
C 1485
C 969
C 1561
C 1312
C1619
SEA LEVEL
C 1395
Hall's B
lens
lime-
stone
C 1630
C 1525
C 1630
lode
termination
quartz vein
stockwork
quartz porphyry
intrusive
C 1575
200 m
G G G

Battery Reference Plane

Battery Reference Plane strikes 020.00^{O} relative to Cleveland Mine Grid north.

Table 2 Cross-section coordinates on Battery Reference Plane

Cross-section on Battery Reference Plane	Cleveland Mine Grid Coordinates	
	north	east
D	15,333.5	10,810.5
F	15,381.5	10,827.5

References

Barth, von Wolfgang H., 1986. Geology of the Cleveland tin mine, Tasmania, Australia with special reference to mineral chemistry and rare earth distribution. Doctoral thesis, University of Heidelberg, Germany.

Dronseika, E.V., 1985. Plan: EL34/82 Cleveland Tin Ltd, Geological Interpretation 1:1000, August 1985.

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Appendix 3

Level Elevations in the Cleveland Mine

MEMORANDUM

To:	File		
From:	Mick McKeown	Date:	18 July 2011
Project:	Bright Phase Resources Limited – Cleveland Mine		
Subject:	ABERFOYLE LEVELS		

The RLs of the Cleveland Mine Levels currently assumed are listed in Table 1. There are no RLs shown on the plans received from MRT and dated 31 December 1981.

The levels were measured from a cross-section included in Collins et al, 1989.

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Table 1 Cleveland Mine – Levels and RLs

Level	Floor RL
1	
2	
3	
4	
5	
6	
7	1350 (portal 1343)
8	1330
9	1310
10	1290
11	1270
12	1250
13	1230
14	1210
15	1190
16	1170

17	1150
18	1130
19	1110
20	1090
21	1070
22	1050
23	1030
24	1010
25	990
26	970
27	950
28	930
29	910
30	890

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References

Collins, P.L.F., Brown, S.G., Dronseika, E.V. and Morland, R., 1989. Mid-Palaeozoic Ore Deposits in Geology and Mineral Resources of Tasmania (Eds. C.F. Burrett and E.L. Martin), Special Publication 15, Geological Society of Australia Incorporated.

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Appendix 4

Survey Station Numbers and Coordinates at Cleveland

Station Number	N	E	RL
715	1539?.?6	10892.58	
716	15419.04	10914.30	
717	15444.10	10939.35	
718	15479.62	10975.34	
719	15501.92	10986.87	
720	15511.91	10976.77	
801	15514.80	10960.00	
812	15493.69	10952.90	
830A	15445.79	10899.28	
831	15424.17	10893.42	
832	15415.45	10916.12	
901	15460.66	10958.81	
D9/1	15503.35	10998.59	
D9/2	15514.01	11018.02	
D9/3	15495.60	11030.60	
D9/4	15486.41	11028.24	
D9/5	15460.76	11003.93	294.925
D10/1	15438.29	10983.05	293.114
D10/2	15405.41	10954.14	288.127
D10/3	15394.56	10938.70	284.668
D10/4	15401.92	10919.79	281.675
D10/5	15420.30	10921.14	280.492
D10/6	15427.16	10927.52	279.172
D11/1	15460.32	10957.62	275.152
D11/2	15480.755	10976.816	270.485
D11/3	15486.969	10991.658	267.548
D11/4	15481.555	11003.022	266.000
D11/5B	15463.407	11008.902	264.004
D11/6A	15452.062	10996.205	262.371
D11/7A	15445.567	10947.914	256.718
D12/1	15548.607	10849.940	257.738
D12/3	15576.474	10817.521	251.718
D12/4	15572.670	10797.905	250.134
D12/5	15548.427	10788.307	247.468
D12/6	15516.181	10795.088	243.442
D12/7	15484.397	10805.050	239.229
D13/1	15460.962	10812.400	237.112
D13/2	15442.499	10818.155	234.588
D13/3	15416.596	10813.560	231.116

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D13/5	15412.560	10769.268	228.035
D13/6	1543?.?02	10757.870	226.076
D13/7	15454.?96	10765.355	223.760
D13/8	15466.299	10782.154	222.551
D14/2	15425.644	10819.330	216.836
D14/3	15393.362	10793.567	212.118
D14/4	15381.691	10778.591	208.520
D14/5	15386.270	10755.588	205.548
D14/6	15404.126	10750.086	204.690
D14/7	15411.891	10753.187	204.497
D14/8	15415.211	10756.061	204.677
D14/9	15431.017	10770.386	202.884
D14/10	15453.695	10790.654	201.762
D14/11	15464.235	10797.878	201.171
D15/1	15486.474	10814.501	197.157
D15/2	15478.494	10837.880	
D15/2A	15478.477	10837.878	196.083
D15/3	15455.780	10866.611	189.372
D15/4	15432.272	10890.393	185.571
D15/5	15432.405	10909.372	183.441
D16/1	15447.941	10922.317	182.179
D16/2	15468.725	10920.514	179.168
D16/2A	15473.978	10917.524	179.022
D16/3	15497.979	10904.576	174.284
D16/4	15516.437	10895.145	171.672
D16/5	15537.531	10896.973	168.422
D16/6	15552.502	10913.350	165.397
D16/7	15554.231	10932.572	163.122
D16/8	15538.735	10950.516	161.072
D16/9	15516.191	10953.475	158.502
D16/10A	15499.981	10938.725	155.238
D17/1	15484.971	10910.714	151.123
D17/2	15468.660	10880.519	146.933
D17/3	15458.109	10853.441	143.149
D17/4	15430.874	10833.491	139.454
D17/5	15402.641	10839.378	136.025
D17/6	15389.218	10857.095	132.820
D17/8A	15422.880	10905.396	
D17/7B	15388.944	10884.076	
D17/9A	15419.???	10903.153	127.38
D17/10	15466.?67	10909.266	121.772
D18/1	15504.242	10914.551	118.460
D18/2	15545.605	10921.331	113.900
D18/3	15583.049	10924.306	110.700

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D18/4	15606.887	10933.618	
D18/5	15610.642	10941.176	108.280
D18/6	15620.342	10955.823	106.058
LP18/1	15617.706	10962.568	
D18/6	15620.342	10955.823	106.058
D19/1	15612.118	10984.674	103.965
D19/2	15589.582	10995.583	101.480
D19/4	15524.929	10945.471	95.555
D20/1A	15494.375	10907.078	88.88
D20/2	15469.263	10877.330	82.945
D20/3	15441.416	10842.904	76.865
D20/4A	15417.938	10810.576	72.435
D20/5	15417.998	10789.319	69.50
D20/6A	15437.545	10771.593	66.534
D20/7	15461.271	10776.018	63.890
D20/8	15473.968	10787.754	61.975
D20/9	15477.305	10817.935	60.130
D20/10	15482.280	10859.102	55.040
D20/11	15484.073	10882.123	
D19/3A	15559.391	10985.746	
D22/1	15490.011	10888.556	51.834
D22/2	15510.627	10900.137	49.022
D22/3	15541.439	10917.146	46.098
D22/2A	15568.505	10837.872	254.339
D22/4	15569.607	10932.307	41.570
D22/5	15613.873	10956.648	34.285
D22/6	15621.438	10975.329	32.835
D22/7	15614.085	10999.617	vent covering
D22/8	15588.162	11008.640	28.565
D22/9	15561.412	10989.839	25.628
D23/1	15540.007	10959.992	22.770
D23/2	15518.806	10928.864	18.933
D24/1	15484.193	10883.302	13.333
D24/2	15448.547	10850.161	1007.999
D24/3	15408.024	10811.506	1000.13
D24/4	15386.128	10791.675	996.647
D25/1	15343.115	10812.922	990.964
D25/2	15347.366	10838.129	989.434
D25/3	15367.229	10848.834	985.665
D25/4	15408.071	10863.838	980.780
D25/5	15433.876	10873.308	977.485
25LP2	15441.666	10876.231	976.055
D26/1	15475.229	10888.484	972.865
D25/6	15354.593	10849.513	987.231

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D26/2	15488.802	10895.153	971.440
D26/3	15513.252	10892.958	967.610
D26/4	15526.855	10879.553	965.043
1450/1	15654.482	10946.346	1449.00
1450/2	15667.045	10932.096	1454.99
1442/1	15488.621	10817.214	1450.25
1442/2	15505.965	10824.919	1450.30
1442/3	15514.603	10836.731	1450.52
1442/4	15528.107	10844.188	1452.07
LP1442/1	15531.069	10847.279	1451.83
S1	15498.53	10913.76	
S2	15489.50	10927.33	
201	15512.11	10918.21	
202	15534.56	10908.58	
203	15538.30	10906.91	
204	15552.58	10891.61	
206	15566.38	10868.03	
207	15554.61	10856.04	
208	15584.07	10888.40	
209	15539.23	10843.55	
205A	15561.82	10872.86	
KD1	15574.25	10856.19	416.110
KD2	15576.59	10838.99	416.969
KD3	15565.27	10319.41	
KD4	15553.46	10793.21	418.329
KD5	15528.08	10750.44	423.715
KD6A	15509.547	10728.202	426.090
KD7	15492.521	10719.989	425.816
KD8	15503.420	10713.476	425.942
KD9	15508.404	10703.058	425.383
KD10	15502.184	10691.862	425.328
KD11	15487.529	10683.739	424.669
KD12	15504.541	10707.429	
LP2HI/1	15410.42	10824.66	1407.90
2HI/2	15414.869	10825.158	1408.89
2HI/3	15453.441	10826.405	1412.50
2HI/4	15502.595	10843.711	1414.60
2HI/5	15521.521	10849.964	1415.23
218	15570.30	10857.26	
219	15598.81	10857.58	1416.87
221	15647.88	10879.96	
220	15626.71	10866.62	1416.445
222	15651.93	10893.59	
223	15671.36	10882.67	

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2SL1	15631.245	10869.286	1429.35
2SL2	15627.384	10866.076	1429.73
2SL3	15635.133	10871.147	1429.40
301	15515.??	10931.78	1399.775
302	15521.76	10925.69	
302A	15521.76	10925.68	
303	15540.26	10905.49	
304	15564.73	10876.78	
305	15570.98	10865.36	
306	15576.282	10859.097	402.022
309	15577.127	10984.577	
310	15580.504	10980.878	
314	15596.527	10962.519	
315	15606.610	10951.183	
316	15625.187	10930.414	
321	15585.326	10849.459	
307	15550.03	10846.74	
308	15538.36	10843.45	
311	15579.58	10876.12	
312	15585.94	10882.22	
313	15601.92	10897.71	
317	15517.27	10835.63	
318	15500.40	10825.68	
319	15478.34	10811.47	
320	15455.78	10795.96	
322	15616.47	10918.86	
316A	15625.06	10930.28	
323	15641.07	10948.97	
324	15659.58	10966.14	
325	15671.33	10976.84	
326	15596.40	10848.58	402.193
329	15610.80	10861.16	402.284
327	15689.30	10995.99	
328	15699.33	11017.18	
330	15622.84	10879.61	
331	15642.27	10888.57	
T STN	15351.97	10696.49	
K301	15356.27	10683.88	401.925
K302	15370.16	10667.59	402.604
K303	15391.22	10648.24	
K304	15410.54	10655.93	
K305	15421.67	10661.40	405.329
K306A	15454.06	10663.00	
K307	15482.23	10673.47	406.103

DRAFT

K308	15491.20	10696.63	
K309	15432.85	10675.59	
314	15596.???	10962.519	
QA1	15589.672	10968.253	
QA2	15594.604	10963.337	
QA3	15598.092	10959.443	
QA4	15603.325	10953.637	
TS	15603.371	10954.822	
QA5	15606.790	10590.471	
QA6+1M?	15609.961	10948.677	
QA6	15610.029	10948.750	
350	15658.16	10902.50	1397.07
351	15664.50	10912.51	1398.58
352	15667.75	10917.87	1399.72
353	15670.84	10895.01	1403.74
354	15665.70	10891.72	1404.75
355	15672.59	10896.75	1403.96
303	15540.295	10905.494	
301	15515.423	10931.777	40?.925
CS1	15511.360	10957.594	
CS2	15501.666	10983.071	
405A	15537.295	10907.683	
407A	15561.214	10880.605	382.372
408A	15575.256	10864.426	382.067
435	15581.269	10872.554	382.183
4KD1	15600.882	10861.027	
4KD2	15594.215	10850.508	382.617
4KD3	15580.822	10833.141	382.056
4KD4	15565.924	10812.892	379.486
4KD5	15551.672	10795.538	379.370
4KD6A	15540.332	10775.075	380.025
4KD7	15520.348	10751.388	383.955
4KD8	15500.433	10723.241	386.352
4KD9A	15497.079	10696.610	
4KD5	15551.672	10795.538	379.370
5KD1	15523.911	10781.553	378.083
5KD2	15521.527	10767.088	376.809
5KD3	15508.163	10747.937	374.709
5KD4	15493.622	10729.489	
303	1554?.?95	10905.494	
301	15515.423	10931.777	
CS1	15511.360	10957.594	
CS2	15501.666	10983.071	
405A	15537.295	10907.683	

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407A	15561.214	10880.605	382.372
408A	15575.256	10864.426	382.067
435	15581.269	10872.554	382.183
4KD1	15600.882	10861.027	
4KD2	15594.215	10850.508	382.617
4KD3	15580.822	10833.141	382.056
4KD4	15565.924	10812.892	379.486
4KD5	15551.672	10795.538	379.370
4KD6A	15540.332	10775.075	380.025
4KD7	15520.348	10751.388	383.955
4KD8	15500.433	10723.241	386.352
4KD9A	15497.079	10696.610	388.842
K401	15471.358	10672.623	390.139
K402	15443.470	10657.052	391.283
K403	15409.028	10651.950	390.638
4KD9AB	15497.057	10696.569	388.842
K.401A	15471.343	10672.598	390.139
K.404	15464.520	10681.380	
K.405	15434.265	10665.945	
K406	15416.119	10667.429	
K407	15393.259	10643.283	
K408	15425.610	10640.785	390.396
450	15606.966	10871.442	1383.405
451	15650.648	10896.522	1383.602
SO18	15424.26	10994.85	
501	15446.56	10961.66	
502	15451.73	10958.07	
503	15460.10	10952.27	
504	15463.61	10949.77	
505	15505.65	10919.87	
506	15531.51	10901.57	363.038
507A	15561.47	10881.47	364.477
508	15572.70	10872.56	
510	15548.14	10868.80	
511	15570.35	10889.48	363.934
509	15563.01	10864.08	
513	15582.08	10904.68	364.288
512	15540.61	10849.72	
517	15514.91	10889.54	
518	15497.42	10825.57	365.175
519	15536.42	10898.13	363.535
514A	15596.38	10918.99	364.288
515A	15614.60	10936.36	365.437
516A	15632.44	10951.07	365.483

DRAFT

523	15525.77	10881.43	
524	15512.93	10880.48	
525	15494.78	10868.56	
527	15663.26	10970.30	
528	15673.93	10985.67	365.114
529	15611.28	10970.69	
531	15515.85	10818.30	
530	15475.62	10802.21	
520A	15552.42	10902.63	
521A	15557.40	10925.15	
526A	15583.88	10948.87	
533	15474.73	10801.48	364.623
534	15527.73	10881.64	
535	15511.17	10879.23	
536	15480.14	10865.87	
537	15467.48	10860.28	
538	15457.82	10856.63	
539	15462.89	10817.55	
540	15439.49	10841.78	
544	15585.60	10877.41	363.870
545	15455.26	10794.74	364.553
546	15441.36	10778.41	
514A	15681.06	10995.23	
544A	15642.?0	10994.93	
545A	15517.67	10911.51	
549	15673.96	10996.43	
550	15685.36	11010.20	
551	15714.02	11031.17	
552	15717.65	11055.60	
553	15609.22	10874.16	
560	15621.49	10888.16	
561	15640.63	10907.87	
562	15660.65	10918.04	
580	15589.95	10878.38	1364.64
581	15615.49	10871.29	1364.81
582	15604.76	10858.69	1364.08
583	15622.73	10891.30	1365.74
585	15624.84	10867.22	1364.33
586	15667.26	10902.21	1367.60
4KD5	15551.???	10795.538	379.370
5KD1	15523.911	10781.553	378.083
5KD2	15521.527	10767.088	376.809
5KD3	15508.163	10747.937	374.709
5KD4	15493.622	10729.489	371.711

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K501	15482.747	10698.180	
K501A	15484.346	10703.639	371.508
K502	15479.393	10684.300	371.231
K503	15461.532	10667.754	372.471
K504	15450.155	10678.483	371.956
K505	15430.150	10674.681	372.274
K506	15396.454	10650.940	372.834
K507	15439.126	10654.546	373.081
K508	15413.404	10642.882	372.526
K509	15393.910	10623.551	372.800
701			345.887
702	15363.23	10876.95	
703	15429.16	10898.76	246.802
704	15506.48	10925.14	
708	15532.62	10963.90	
707	15522.92	10949.28	347.475
710A	15535.13	10908.98	
714	15578.36	10906.59	
721	15537.55	10861.20	
T.S.1	15418.79	10893.43	
715	15397.36	10892.58	346.567
702	15363.25	10876.94	
716	15419.04	10914.30	344.02
717	15444.10	10939.35	
718	15479.62	10975.34	
719	15501.92	10986.87	
726A	15491.78	10820.02	
727A	15459.70	10792.82	349.694
733	15437.78	10778.63	
734	15530.27	10932.49	347.780
735	15553.00	10945.31	
739	15451.83	10809.91	350.118
740	15431.61	10797.46	350.523
742	15412.21	10790.28	351.398
743	15389.56	10785.78	350.630
744	15568.44	10952.72	351.273
745	15588.30	10955.12	349.270
746	15615.29	10966.04	350.422
748	15639.81	10984.47	352.605
749	15673.33	11001.45	352.516
737	15474.61	10824.61	349.426
738	15468.69	10815.99	349.130
728	15438.46	10773.94	
723	15585.30	10919.94	347.454

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713A	15517.30	10928.77	
711B	15557.60	10884.93	
741B	15596.88	10883.42	
750	15607.94	10879.01	
751	15622.56	10900.40	
752	15597.06	10862.05	348.536
754	15388.60	10838.35	
755	15584.48	10821.93	349.816
756	15577.03	10807.69	349.674
757	15543.95	10781.36	350.228
758	15523.62	10753.62	351.029
759	15506.79	10729.69	351.137
760	15496.452	10718.069	351.362
761	15483.472	10710.793	351.282
762	15474.074	10694.065	351.383
763	15450.173	10676.373	351.332
764	15426.820	10659.770	351.762
765	15399.428	10644.030	351.022
766	15374.736	10622.837	351.915
767	15445.603	10686.912	351.301
768	15417.710	10674.186	351.748
769	15384.143	10648.144	352.996
702	15363.255	10876.946	
Temp	15307.578	10863.490	
R/S Pin	15262.270	10831.050	
PM	15257.228	10818.629	
B1	15282.696	10814.567	
B2	15303.864	10796.813	
B3	15312.514	10798.972	
B4	15311.741	10818.523	
B5	15315.388	10820.163	
B6	15322.131	10820.957	
801	15514.??	10960.00	330.614
802	15520.67	10933.41	330.790
803	15523.77	10924.09	330.394
805B	15557.51	10888.73	330.668
808B	15588.04	10861.43	
838	15408.84	10809.83	
823	15461.48	10808.63	333.052
824	15429.46	10788.34	
825	15401.98	10785.86	
826	15368.12	10770.40	
838	15480.84	10809.83	333.01
839	15411.84	10736.32	

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841	15389.95	10724.49	
815	15572.17	10875.73	331.001
816A	15599.33	10870.19	
836	15591.13	10868.11	330.651
837A	15571.91	10831.16	332.550
840	15555.87	10808.90	332.812
806	15558.78	10898.64	330.711
807A	15586.88	10922.80	330.818
812	15493.684 15617.20	10943.14 10934.46	331.247
K801	15551.262	10778.440	333.305
K802	15536.894	10761.812	332.044
K803	15527.231	10758.649	331.954
K804	15501.206	10734.971	
K803A	15527.134	10758.600	332.021
K804A	15503.294	10734.104	332.478
K805	15476.744	10707.045	333.928
K806A	15444.588	10699.526	334.904
K807	15411.557	10691.133	334.501
K808	15421.460	10680.590	334.902
K809	15412.784	10654.393	335.572
K810	15388.732	10651.230	335.246
K810A	15388.727	10651.234	335.249
K811A	15370.613	10621.874	335.487
K812A	15342.961	10596.492	336.195
K813	15404.632	10673.214	335.149
K814	15377.097	10657.289	335.406
K815	15363.479	10628.431	335.094
901	15460.66	10958.81	311.852
901A	15478.42	10948.31	311.570
902A	15524.92	10922.25	311.067
903	15551.27	10895.92	312.478
904	15574.95	10917.74	312.825
905A	15596.41	10924.72	313.539
911A	15639.96	10951.19	314.788
920	15656.30	10983.96	314.566
921	15690.78	11016.51	
926	15662.57	10996.64	315.617
906A	15589.20	10931.96	312.761
909	15619.48	10940.77	314.788
917	15581.67	10953.11	313.286
918	15596.41	10961.82	
936	15579.97	10970.42	313.886
938	15600.58	10981.28	315.413

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940	15704.15	11025.91	
941	15700.59	11038.32	
907A	15524.13	10872.07	312.908
908	15511.38	10843.23	
919	15482.94	10817.64	314.163
922	15451.15	10782.44	314.755
927	15430.54	10760.33	314.587
929	15413.96	10742.33	
931	15399.84	10737.01	316.017
933	15381.63	10756.12	315.370
934	15366.08	10750.51	315.767
935	15340.40	10730.56	316.236
937	15314.98	10724.70	316.428
939	15293.18	10710.68	
915	15534.33	10915.14	311.682
916	15556.96	10925.88	
910A	15575.50	10871.15	313.13
923	15563.82	10859.34	
924	15561.83	10846.87	
925	15560.20	10824.46	314.532
928	15541.33	10804.32	314.465
932	15536.97	10786.19	315.215
942	15709.028	11049.330	
943A	15714.493	11074.613	
944	15443.827	10789.042	313.034
945	15419.928	10780.746	
946	15527.???	10775.367	314.918
947	15521.560	10762.564	315.04
948A	15502.889	10740.959	315.286
949	15480.123	10726.304	316.003
950	15459.828	10704.510	315.377
951	15430.814	10701.078	316.288
952	15418.434	10669.996	317.035
953	15407.899	10655.805	317.107
954	15413.437	10699.105	316.816
956	15388.466	10667.491	316.638
957	15367.923	10656.295	317.575
958	15354.349	10632.972	317.378
959	15352.309	10615.952	317.563
960	15314.714	10588.422	318.729
961	15524.93	10922.19	1311.07
962	15544.15	10944.06	1312.79
963	15550.42	10961.78	1312.92
9DSL1	15548.907	10953.040	1319.83

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9DSL2	15553.26	10952.50	1319.96
9DSL3	15553.50	10956.84	1320.38
D9/3	1549?.?00	11030.600	301.063
EX1	15512.504	11029.765	302.208
EX2	15520.932	11040.153	302.314
EX3	15539.248	11060.278	301.616
EX4	15558.754	11074.593	301.740
1002	1546?.42	10958.49	1292.922
1003	15481.08	10947.04	1293.416
1004	15522.87	10924.09	1293.318
1005	15540.45	10904.52	1293.556
1007	15554.84	10918.70	1293.922
1008	15573.95	10927.95	1294.199
1010	15533.46	10920.69	1292.696
1011	15538.95	10928.69	1293.669
1009A	15568.98	10877.28	1293.812
1012	15505.19	10866.98	1293.245
1014	15569.18	10947.23	1294.483
1020	15595.45	10961.95	1294.790
1021	15623.31	10970.35	1294.952
1019	15606.16	10936.82	1293.791
1006	15524.89	10885.87	1293.986
1012	15505.19	10866.83	1293.248
1015	15491.11	10853.14	1293.845
1016	15477.40	10827.33	1293.608
1018	15472.03	10817.44	1294.147
1019	15606.16	10936.82	1293.791
1022	15640.73	10983.22	1295.861
1023	15642.71	10999.97	1295.825
1024	15641.55	11013.99	1296.271
1025	15658.85	11033.76	1296.502
1026	15653.512	10979.710	1295.297
1027	15669.499	10997.655	1295.467
1028	15518.164	10897.160	1292.85
1031	15504.236	10891.086	
1032	15415.254	10770.719	1295.592
1033	15394.274	10762.259	1295.835
1034	15369.137	10744.729	1295.416
1035	15577.394	10936.566	1293.969
1036	15407.826	10762.729	1295.616
1037	15357.802	10728.662	1296.274
1039	15328.537	10716.085	1296.725
1038	15399.497	10732.128	1295.479
1040	15389.073	10718.802	

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1040A	15390.788	10717.529	1296.195
1042A	15407.804	10687.580	1296.632
1046A	15404.288	10664.440	296.695
1048	15384.960	10652.386	297.427
1050	15418.392	10676.030	297.004
1054	15350.311	10655.311	296.983
1052A	15354.218	10641.559	297.883
1041	15297.491	10701.979	298.618
1056A	15326.440	10629.843	298.629
1058	15323.238	10610.205	298.083
1060	15300.295	10598.814	298.749
1043	15308.291	10716.218	297.712
1045	15287.403	10706.445	298.941
1047	15264.694	10703.064	299.921
1061	15301.791	10619.693	298.822
1062	15514.016	10858.442	295.646
1063	15500.524	10844.527	297.678
1013A	15548.39	10856.15	293.689
1017B	15535.656	10840.110	294.578
1064	15480.762	10814.754	301.270
1065	15458.438	10790.505	302.424
1066	15437.017	10773.508	303.68
1029A	15457.520	10807.069	294.643
1032	15415.254	10770.719	295.592
1067A	15437.176	10833.766	295.738
1068A	15465.769	10863.331	297.48
10V1	15474.623	10952.732	
1051	15471.849	10864.687	1303.76
1052	15474.955	10867.573	1304.06
1053	15466.803	10860.949	1303.85
1054	15495.33	10879.65	1304.85
1069	15531.32	10888.42	1293.63
1017A	15535.681	10840.122	
11010	15469.??	10952.06	274.134
11030	15515.35	10925.42	273.792
11040	15526.63	10917.85	274.667
11050	15514.83	10933.01	272.851
11060	15543.84	10931.51	274.214
11070	15533.464	10958.380	273.541
11080	15560.326	10972.681	274.359
11090	15555.231	10950.296	273.595
11100	15566.152	10952.091	274.421
11110	15579.391	10983.806	274.720
11120	15586.134	10965.582	274.739

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11130	15545.426	10896.628	273.663
11140	15558.779	10883.180	274.164
11150	15602.586	10998.985	274.718
11160	15547.450	10869.132	274.691
11170	15615.459	10973.743	274.686
11180	15627.537	11012.951	274.840
11190	15636.484	10985.283	274.826
1120A0	15567.011	10937.928	274.705
11210	15552.048	10977.965	274.472
11220	15557.339	10984.937	274.781
1117A0	15615.430	10973.747	274.686
11230	15623.525	10945.897	274.343
11240	15615.785	10928.394	275.877
11V1	15498.437	11004.263	1268.90
11KD1	15506.???	10803.589	291.196
11KD2	15482.446	10774.039	287.57
11KD3	15471.407	10759.157	1285.98
11KD4	15448.934	10729.853	281.390
11KD5	15460.008	10744.732	284.03
11KD5	15460.008	10744.732	284.03
K1101	15406.639	10681.213	277.82
K1102	15387.736	10663.841	278.50
K1103	15368.951	10652.727	278.84
K1104	15352.899	10638.314	280.59
K1104	15352.899	10638.314	280.59
K1105	15323.891	10619.473	281.230
K1102	15387.736	10663.841	278.50
10½HP5/1	15481.028	10744.573	1284.80
10½HP5/2	15466.211	10732.905	1286.12
10½HP5/3	15457.669	10718.353	1287.20
BS11/01	15425.?28	10741.052	1281.08
BS1102	15390.471	10736.075	1276.82
BS1103	15367.673	10732.358	1275.95
BS1104	15357.301	10723.470	1276.250
BS1105	15329.859	10721.463	1276.665
BS1106	15290.138	10706.179	1276.790
BS1107	15243.077	10691.041	1277.630
BS1108	15210.008	10674.162	1279.120
BS1109	15181.597	10656.985	
BS1110	15325.065	10717.697	1277.49
12KD1	15318.728	10672.698	1271.72
12KD2	15314.221	10638.802	1269.49
11KE01	1540?.???	10734.260	278.10
11KE02	15394.859	10724.038	277.507

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11KE03	15400.972	10693.788	276.589
11KE04	15384.401	10675.069	277.227
11KE05	15340.468	10646.365	280.070
11KE06	15303.061	10628.559	281.30
11KE07	15387.887	10680.147	276.371
11KE08	15363.424	10676.831	277.850
1201	15450.0??	10922.476	255.960
1202	15472.641	10894.547	256.523
1203	15479.742	10886.369	256.834
1204	15490.478	10874.762	256.794
1206	15516.536	10863.577	257.439
1205B	15509.044	10916.850	257.448
D12/1	15548.607	10849.940	257.735
1207	15445.950	10933.488	255.832
1208	15529.011	10933.229	257.490
1211	15560.570	10955.311	257.467
1209	15522.752	10944.915	257.183
1210	15529.754	10958.989	257.625
1212	15556.211	10975.184	258.063
1213	15586.871	10963.415	257.963
1214	15575.722	10984.812	258.136
1216	15603.885	11005.147	258.331
1215	15608.924	10979.556	258.034
1218	15629.917	11013.728	258.670
1219	15620.006	10987.553	258.007
12E1	15456.189	10909.205	255.569
12E2	15448.643	10891.984	255.725
BP12/1	15529.525	10829.668	255.982
BP12/2	15499.467	10831.428	255.864
BP12/3	15465.561	10833.865	255.386
BP12/4	15443.370	10847.435	256.519
BP12/5	15432.252	10869.555	255.844
BP12/6	15427.176	10899.241	256.530
BP12/7	15431.202	10936.806	
1301	15471.?31	10818.992	239.860
1303	15471.985	10818.410	239.515
1302	15453.222	10839.256	239.406
1304	15495.107	10836.485	238.313
1305	15473.118	10870.702	240.392
1308	15460.795	10851.406	239.51
1305	15473.117	10870.699	240.392
1306C	15480.999	10894.884	240.510
1307	15503.094	10919.932	240.761
1309	15540.238	10935.216	241.239

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1310	15571.505	10950.870	241.868
1311	15483.712	10917.343	241.617
1312	15496.943	10930.154	241.239
1313	15605.334	10975.322	242.300
1314	15524.265	10944.241	241.805
1315	15541.983	10958.327	242.000
1316	15557.707	10982.722	243.278
1317	15581.291	10977.724	242.880
1318	15573.248	10991.168	243.785
1319	15586.917	11005.824	243.337
D13/8	15466.299	??782.154	222.551
1401	15458.408	10812.998	220.486
1401A	15458.406	10812.990	220.488
1401B	15458.404	10813.001	220.483
1402	15447.834	10850.927	220.320
1403	15449.340	10879.724	221.169
1404	15449.418	10902.217	221.101
1405	15470.989	10918.687	
1405A	15471.025	10918.714	222.028
1406	15503.537	10939.410	221.979
1407	15482.387	10913.450	222.228
1408	15520.996	10956.189	222.371
1409	15543.687	10968.796	222.988
1409A	15543.657	10968.775	223.026
1410	15533.180	10973.780	
1410A	15533.177	10973.806	223.306
1411	15536.911	10988.137	223.593
1409B	15543.671	10968.798	223.006
1409B	15543.671	10968.798	223.006
1412	15575.990	10982.441	224.102
1413	15602.573	11001.722	224.247
1411A	15556.915	10988.147	223.590
1414	15586.278	11009.148	
1415	15588.471	11010.089	224.396
1413A	15602.358	11002.682	224.711
1416	15615.492	11022.598	225.415
1417	15539.867	10943.160	223.071
1418	15557.585	10946.307	227.548
1419	15573.773	10949.625	230.837
1420	15595.165	10969.405	
1421	15605.578	10975.284	
14V1	15442.727	10917.457	1221.169
14V2	15458.143	10956.238	1221.006
14V3	15474.141	10990.423	1221.471

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E14/1	15374.077	10763.819	206.638
E14/3	15316.806	10733.139	211.037
E14/4	15281.311	10715.100	212.522
B1401	15248.989	10705.538	212.585
B1403	15203.234	10670.308	213.371
B1404	15171.725	10652.825	214.429
B1402A	15226.924	10680.039	
DP4/1	15187.362	10645.519	214.437
DP3/1	15207.023	10658.816	215.553
DP2/1	15222.205	10688.757	215.873
14X/1	15266.853	10702.133	
14X/2	15261.861	10691.859	
14LP/1	15244.881	10673.070	
14X/3	15236.489	10666.857	
14X/4A	15207.776	10645.764	
K1401	15228.443	10623.836	212.951
K1402A	15253.327	10589.430	215.443
K1403	15222.139	10580.094	1214.503
K1404	15279.193	10597.360	215.191
K1405	15241.721	10606.416	1213.805
K1406	15258.296	10628.390	1213.643
E14/2A	15348.579	10753.193	1208.435
K1302	15247.949	10581.331	1234.412
K1301	15251.737	10584.966	1228.904
K1303A	15252.705	10582.873	1234.16
K1304	15281.061	10601.120	
K1305	15277.560	10595.579	
K1306	15269.18	10588.55	1233.35
K1307	15228.94	10578.15	1231.47
K1308	15229.96	10574.04	1232.62
K1309	15238.83	10572.94	1245.12
K1310	15237.06	10572.91	1242.11
14D/1	1534?.??3	10721.834	1206.430
14D/2	15313.475	10696.245	1201.681
14D/3	15292.590	10660.481	1196.382
14D/4	15285.520	10653.528	1196.222
15D/1	15268.413	10641.871	1194.115
15D/2	15245.313	10645.681	1189.105
15D/3	15237.560	10667.920	1187.035
15D/4A	15244.643	10686.113	1184.48
15D/5	15269.355	10692.201	1180.50
15D/6	15272.146	10709.579	1177.90
15BS1	15270.609	10664.029	1196.780
15LP1	15268.621	10669.125	1195.850

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15BS2	15251.877	10709.426	1195.830
15BS3	15238.906	10712.522	1195.87
15BS4	15212.101	10679.033	1195.89
15BS5	15178.657	10663.958	1196.07
15BS6	15148.460	10654.388	1196.88
15D/6	15272.146	10709.579	1177.90
16BS1	15242.962	10745.597	1171.6
blank	1545?.?95	10790.654	201.762
1501	15460.116	10818.197	200.310
1502	15452.379	10832.992	200.105
1503	15435.543	10869.503	201.094
1505	15459.191	10921.880	200.766
D14/11	15464.235	10797.878	201.171
1506	15471.479	10933.606	201.877
1507	15488.217	10928.092	201.452
1508	15495.258	10955.119	200.977
1509	15511.258	10956.953	201.893
1510	15540.977	10976.036	202.915
1511	15571.974	10931.129	203.285
1512	15493.630	10953.129	201.067
1513	15532.667	10958.221	201.549
1514	15498.414	10974.787	201.796
1515	15497.392	10965.538	201.933
1516	15526.423	10980.001	202.953
1517	15543.977	10991.495	203.261
1518	15564.672	11002.318	203.157
1519	15590.595	11020.274	203.157
1520	15590.739	11028.450	203.297
1504A	15435.002	10900.219	
1512B	15493.662	10953.162	
15AA1	15525.355	10934.710	1202.395
1601	15460.??0	10933.944	178.729
1602	15486.943	10954.263	179.310
1603	15493.165	10956.170	
1604	15500.693	10980.233	178.883
1605	15528.153	10988.794	
1606	15520.292	10986.153	181.133
1607	15544.151	10999.159	183.483
1608	15542.562	10978.331	184.506
1609	15552.202	10988.852	186.481
1610	15482.368	10953.017	178.847
1610	15482.368	10953.018	178.847
1611A	15485.038	10983.675	180.533
1612	15496.131	10996.635	181.388

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1613	15528.617	11012.100	183.102
1614	15543.015	11016.395	183.44
1615	15566.470	11035.110	184.96
1616	15586.357	11051.566	
1617	15607.439	11070.105	
1618	15484.700	10973.394	1179.602
16SL1	15500.452	10951.327	1156.107
16SL2	15489.829	10956.999	1157.675
16SL3	15475.404	10975.658	1159.230
16SL4	15462.787	10957.000	1162.605
16SL5	15464.184	10982.483	1160.700
16SL6	15443.701	10930.848	1162.968
16SL7	15448.068	10924.370	1164.162
LB17/1	15463.523	10846.150	
1702	15488.187	10930.162	
BS17/1	15369.041	10893.694	124.354
BS17/2	15356.732	10884.367	126.033
BS17/3	15351.438	10857.333	130.871
LP17/1	15336.925	10815.347	
LP17/2	15332.701	10803.146	132.699
LP17/3	15306.488	10746.044	
BS17/5	15311.852	10752.921	132.767
BS17/6	15286.252	10705.516	133.182
BS17/7	15274.836	10682.542	134.824
BS17/8	15260.198	10651.570	133.897
BS17/9A	15245.492	10640.852	133.965
BS17/10	15227.237	10623.889	135.180
BS17/11	15214.976	10622.203	136.200
BS17/12	15318.169	10766.537	
BS17/13	15180.607	10609.076	135.890
BS17/14	15151.181	10596.880	135.475
BS17/15B	15223.271	10677.187	
BS17/16	15197.323	10659.311	
BS17/17	15181.476	10661.320	
1703	15477.020	10895.648	1149.173
1704	15450.657	10926.047	1148.438
1705A	15443.934	10946.849	1148.145
1707	15456.885	10950.979	1146.286
1708	15469.171	10930.414	1143.365
1709	15481.455	11000.728	1148.03
1711	15538.430	11048.000	1148.392
1713	15509.459	10998.964	1147.95
1714	15532.954	11024.732	1149.37
1715	15564.400	11041.259	

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1716	15452.053	10969.930	1146.65
1709	15481.463	11000.704	1144.45
1717	15506.226	11016.989	1148.76
1718	15493.101	11008.897	1148.56
1719	15489.680	11019.544	1146.58
1720	15534.854	11060.293	1148.82
1801	154??.501	10920.205	121.038
D17/10A	15480.?47	10909.701	120.731
1801	15471.501	10920.205	121.038
1802	15454.274	10942.845	121.457
1803	15453.934	10960.515	122.505
1804	15460.587	10983.533	122.946
1805	15476.010	11004.298	123.262
1806	15501.149	10996.795	122.608
1807	15539.012	11023.865	123.67
1809	15499.485	11029.915	
1808C	15490.191	11015.967	123.821
1809	15499.485	11029.915	123.635
1810	15513.140	11051.912	123.763
1811	15536.548	11074.718	124.358
1814	15558.426	11137.231	124.900
19LP1	15553.2??	10993.513	99.887
19LP2	15540.896	11005.821	99.001
19/1	15505.174	11040.824	99.889
19/2	15516.252	11053.640	99.604
19/3	15528.659	11020.946	1099.511
19/4	15556.758	11045.172	1099.866
19/6	15526.374	11053.555	1099.66
19/7	15548.019	11073.788	1102.6
19/8	15522.539	11102.209	1104.7
19/5A	15575.158	11051.808	1099.96
19/9	15565.480	11057.481	1099.75
19/10	15503.382	10988.571	1104.744
19/11	15480.335	10984.444	1107.034
19/12	15540.614	11082.096	1103.73
19/13	15542.118	11103.616	1104.05
19/14	15516.238	11053.637	1099.60
19/15	15512.614	11069.629	1099.68
19/16	15559.9	11119.7	1104.6
DD1901	15634.405	11010.170	102.499
DD1902	15653.637	11031.511	103.195
DD1903	15705.808	11040.179	103.345
DD1904	15733.630	11057.630	102.652
2001	15469.881	10913.939	1088.380

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2002	15437.??8	10951.193	1090.376
2001A	15469.914	10913.630	1088.501
2002	15437.468	10951.193	1090.376
2003	15446.401	10952.139	1089.787
2005A	15456.643	10972.933	
2004	15410.884	10981.162	
2006	15398.274	10999.884	1092.361
2008	15360.695	10972.995	1091.571
2009	15408.900	10986.471	
2010	15475.353	10984.027	1090.29
2011	15480.252	11003.563	1090.51
2012A	15462.889	11022.134	1091.13
2014	15363.731	10956.433	1091.58
2015	15352.258	10959.721	
2016	15451.420	11032.542	1090.515
2017	15477.866	10974.635	1091.010
2018	15497.535	10985.610	1087.870
2019	15515.560	11006.954	1084.585
21LP1	15496.671	10993.59	
2020	15494.222	10983.054	1089.24
20FLP2	15495.422	10993.585	1088.287
2021	15500.536	11034.958	1082.58
2019	15515.5??	11006.954	1084.585
IMP	15540.???	11017.251	
2101	15557.835	11033.014	
2102	15554.323	11047.614	
2103	15572.309	11045.600	
2104	15550.331	11061.108	
2105	15485.768	11059.688	1080.377
2106	15530.203	11088.402	1080.60
21B1	15398.?74	10796.288	1072.317
LP21B1	15381.??9	10794.14	1073.010
LP21B2	15376.10	10793.26	1072.829
LP21B3	15345.90	10789.21	1072.75
LP21B4	15341.46	10788.61	1072.94
21B2	15303.638	10784.843	1073.505
21B3	15287.091	10780.551	1074.246
21B4	15281.424	10778.834	1074.818
21B5	15230.829	10765.961	1075.037
21B6	15219.414	10755.230	1075.607
21B7	15195.878	10703.360	1075.920
FLP21B7	15193.497	10700.567	1076.363
2201	15471.499	10900.178	51.048
D22/1	15490.0??	10888.556	51.982

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2204	15473.785	10973.323	52.647
2205	15497.093	10986.842	54.407
2206	15477.859	11009.976	53.885
2207	15532.149	11005.827	53.332
2202A	15448.648	10923.887	
2208	15550.355	11023.629	53.877
2210	15452.697	11040.586	55.712
2213	15577.356	11065.042	53.932
2214	15577.992	11083.814	
2209	15539.626	11019.839	1053.747
2212A	15402.417	11011.019	1054.452
2215	15373.203	10989.967	1055.177
2216	15349.705	10973.609	1054.732
2217	15470.187	11019.734	1053.679
2218	15454.146	11033.624	1054.48
2219	15456.291	11050.216	1054.28
2220	15509.577	11090.485	1054.59
2221	15541.674	11123.605	1055.985
2222	15523.152	11101.556	1056.360
2223	15558.688	11154.462	1056.870
2224	15515.247	11114.752	1055.530
2225	15530.242	11150.798	1056.035
2226	15504.768	11053.540	
2228	15455.943	11060.182	1054.97
2229	15479.063	11086.879	1054.465
2301	15529.043	10986.120	
2302	1551?.??0	10986.091	1026.909
2303	15495.853	10993.657	1025.92
2305	15515.322	11006.729	1026.375
2306	15533.453	11010.359	1025.850
2307	15553.657	11035.498	1026.535
2304A	15479.715	11014.583	1028.348
2309	15445.246	10039.085	1031.900
2308A	15467.814	11031.249	
2309	15445.244	11039.081	1031.900
2310	15438.834	11063.760	1033.175
2311	15464.115	11090.453	1034.740
2312			
2313	15544.067	11047.699	1026.71
2314	15548.146	10986.495	1025.1
2315	15548.278	11001.647	1025.05
2316	15511.042	11002.558	1026.370
2317	15519.159	11048.360	1027.70
FLP2315	15556.546	11010.671	1025.63

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2401A	15458.726	10919.565	1013.638
2402A	15459.449	10961.445	1014.058
2403	15460.181	10988.112	1014.673
2404	15460.482	11024.526	1014.248
2405	15444.107	11047.530	1015.972
2406	15419.739	11024.301	1015.446
2407	15395.877	11022.242	1015.954
2408	15386.995	11003.495	1017.473
2409	15363.512	10992.637	
2409A	15365.270	10990.562	1017.413
2410	15355.192	10970.998	1017.503
2411	15485.365	11074.656	1015.775
2412	15500.047	11094.523	1016.343
2413	15550.792	11129.853	1016.983
2414	15518.418	11107.499	1016.598
2415	15379.977	10998.405	1017.173
2416	15381.767	10977.133	1017.383
2419	15359.004	10952.484	
2417	15508.564	11119.208	
2418	15501.848	11125.260	1016.665
2420	15525.604	11140.135	
2421	15391.409	11020.352	1016.679
2422	15517.280	11152.362	1017.565
24LP3	15393.273	11013.648	1016.459
24LP1	15410.621	11025.086	1015.464
2423	15540.352	11159.212	
2424	15490.853	11136.961	1016.805
2425	15454.954	11014.254	1015.273
2426	15441.131	11012.827	1015.493
D25/4	15408.071	10863.838	980.780
DD2601	15422.674	10874.097	978.335
25DDP1	15402.962	10799.866	998.265
25DDP2	15405.278	10791.433	997.72
25DDP4	15437.711	10773.060	998.79

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Appendix 6

Repeat Sampling and Assaying of Drill Core

The assays by Burnie Research Lab are headed ALS, the assays by Aberfoyle as Orig. Soluble Sn, that is tin as stannite, assays are headed Sn (sol) %.

Comparison of Original and Check assays

Sample	From	To	Length	Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1308	0.00	1.13	1.13	1.44	1.34	0.03	0.03	0.17	0.43
C1308	19.95	20.28	0.33	0.2	0.12	0.01	0.01	0.32	0.22
C1308	108.23	109.20	0.97	1.21	1.10	0.01	0.01	0.04	0.10
C1308	109.20	110.39	1.19	0.79	0.72	0.00	0.02	0.07	0.09
C1308	110.39	111.27	0.88	1.36	1.37	0.01	0.02	0.14	0.16
C1308	111.27	112.06	0.79	0.07	0.16	0.01	0.01	0.01	0.06
C1308	112.06	113.23	1.17	1.14	0.95	0.01	0.02	0.11	0.08
C1308	113.23	114.11	0.88	0.52	0.92	0.00	0.03	0.11	0.16
C1308	114.11	115.10	0.99	1.02	0.93	0.01	0.03	0.07	0.13
C1308	115.10	116.30	1.20	0.47	0.51	0.00	0.02	0.12	0.09
C1308	116.30	117.27	0.97	0.78	0.80	0.01	0.02	0.09	0.09
C1308	117.27	117.81	0.54	1.68	1.21	0.02	0.04	1.48	1.14

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1356	0.00	1.00	1.00	0.36	0.33	0.00	0.02	0.13	0.08
C1356	1.00	2.00	1.00	0.39	0.46	0.00	0.03	0.13	0.11
C1356	2.00	3.00	1.00	0.42	0.56	0.00	0.02	0.09	0.08
C1356	3.00	4.00	1.00	0.61	0.46	0.00	0.03	0.01	0.07
C1356	4.00	5.00	1.00	0.22	0.21	0.00	0.03	0.04	0.06
C1356	5.00	6.00	1.00	0.83	0.40	0.01	0.30	0.14	0.06
C1356	6.00	7.00	1.00	0.50	0.65	0.02	0.04	0.07	0.11
C1356	7.00	7.30	0.30	0.65	1.23	0.02	0.04	0.11	0.13
C1356	7.30	8.00	0.70	0.19	0.21	0.00	0.02	0.01	0.04

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1393	129.09	129.65	0.56	0.04	0.07	0.00	0.01	0.07	0.11
C1393	129.65	130.64	0.99	2.92	1.74	0.00	0.02	1.58	1.56
C1393	130.64	131.75	1.11	1.19	1.07	0.00	0.02	0.82	0.93
C1393	133.96	135.07	1.11	0.17	0.19	0.00	0.02	0.07	0.15
C1393	135.07	136.14	1.07	0.21	0.19	0.00	0.02	0.13	0.15
C1393	136.14	137.12	0.98	0.09	0.25	0.01	0.02	0.01	0.19
C1393	137.92	139.24	1.32	0.11	0.11	0.00	0.02	0.02	0.06
C1393	139.24	139.88	0.64	0.02	0.03	0.00	0.02	0.19	0.40
C1393	142.30	143.28	0.98	2.16	1.63	0.00	0.02	0.17	0.17
C1393	143.28	144.33	1.05	0.20	0.18	0.00	0.03	0.81	0.79
C1393	144.33	145.30	0.97	0.18	0.23	0.01	0.03	1.33	0.19

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C1393	145.30	146.54	1.24	0.08	0.64	0.00	0.03	0.32	0.25
C1393	147.07	148.30	1.23	0.46	0.77	0.00	0.02	0.24	0.18
C1393	148.60	149.06	0.46	0.10	0.08	0.00	0.03	0.14	0.35
C1393	150.46	151.50	1.04	0.52	0.10	0.00	0.02	0.06	0.14
C1393	152.85	153.94	1.09	0.41	0.59	0.00	0.02	0.12	0.14
C1393	153.94	154.99	1.05	2.90	0.34	0.00	0.02	0.13	0.14
C1393	154.99	156.10	1.11	1.49	2.30	0.00	0.02	0.13	0.21
C1393	156.10	157.15	1.05	2.04	1.37	0.00	0.01	0.17	0.15
C1393	157.15	158.17	1.02	0.63	1.57	0.00	0.02	0.21	0.21
C1393	158.17	159.05	0.88	0.24	0.54	0.00	0.02	0.20	0.22

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1534	27.60	28.55	0.95	0.88	0.68	0.00	0.03	0.10	0.16
C1534	28.75	29.80	1.05	1.34	0.91		0.02	0.08	0.10
C1534	29.90	31.10	1.20	1.06	0.98	0.00	0.03	0.09	0.15
C1534	35.70	36.20	0.50	2.53	2.38	0.00	0.03	0.12	0.19
C1534	66.40	67.20	0.80	1.75	2.52	0.00	0.02	0.18	0.16
C1534	67.20	68.05	0.85	0.66	1.05	0.01	0.03	0.06	0.08
C1534	69.20	69.90	0.70	2.26	0.72	0.01	0.02	0.15	0.14

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1537	41.10	42.00	0.90	1.69	1.77	0.00	0.00	0.20	0.23
C1537	42.00	42.70	0.70	2.76	2.57	0.00	0.00	0.15	0.19
C1537	44.60	44.90	0.30	1.19	1.14	0.00	0.00	0.10	0.26

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1541	4.20	4.60	0.40	0.22	0.15	0.02	0.02	0.30	0.22
C1541	4.70	4.90	0.20	4.02	3.85	0.04	0.06	0.13	0.19

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1570	27.50	30.00	2.50	0.04	0.07	0	0.00	0.02	0.01
C1570	30.00	32.50	2.50	0.35	0.34	0	0.01	0.02	0.07

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1757	0.00	1.00	1.00	0.22	0.23	0.01	0.00	0.33	0.28
C1757	1.00	2.00	1.00	0.26	0.33	0.01	0.00	0.01	0.05
C1757	2.00	3.00	1.00	0.83	0.78	0.00	0.00	0.31	0.25
C1757	3.00	4.00	1.00	0.26	0.68	0.02	0.00	0.03	0.06
C1757	4.00	5.00	1.00	1.20	1.02	0.01	0.01	0.30	0.20
C1757	5.00	6.00	1.00	1.32	1.21	0.01	0.00	0.22	0.32

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C1757	6.00	7.00	1.00	1.50	1.08	0.00	0.01	0.17	0.10
C1757	7.00	8.00	1.00	1.64	1.43	0.02	0.02	0.30	0.24
C1757	8.00	9.00	1.00	2.79	2.26	0.02	0.02	0.12	0.19
C1757	9.00	10.00	1.00	1.63	1.31	0.01	0.01	0.09	0.11
C1757	10.00	11.00	1.00	0.97	1.24	0.00	0.01	0.15	0.17
C1757	11.00	12.00	1.00	1.85	1.77	0.02	0.02	0.18	0.18
C1757	12.00	13.00	1.00	1.51	1.32	0.03	0.03	0.26	0.32
C1757	13.00	13.90	0.90	1.60	1.08	0.04	0.04	0.27	0.24
C1757	26.30	27.70	1.40	1.73	1.30	0.03	0.04	1.54	1.76

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1854	42.70	43.10	0.40	0.22	1.01	0.01	0.00	0.03	0.45
C1854	43.10	43.50	0.40	0.06	1.09	0.00	0.01	0.06	0.06
C1854	43.50	44.50	1.00	0.83	0.08	0.08	0.06	0.22	0.23
C1854	44.50	45.50	1.00	0.91	0.08	0.11	0.13	0.23	0.32
C1854	45.50	46.70	1.20	1.13	1.00	0.06	0.08	0.25	0.35

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1858	31.80	32.80	1.00	0.89	1.01	0.06	0.06	0.20	0.25
C1858	32.80	33.80	1.00	1.22	1.09	0.08	0.07	0.18	0.25
C1858	33.80	34.20	0.40	1.02	0.08	0.05	0.04	0.21	0.17
C1858	34.20	35.00	0.80	0.02	0.08	0.00	0.00	0.02	0.05
C1858	35.00	36.00	1.00	1.03	1.00	0.09	0.10	0.21	0.22
C1858	36.00	37.00	1.00	0.92	0.97	0.06	0.08	0.21	0.19
C1858	37.00	37.50	0.50	0.09	0.31	0.02	0.04	0.19	0.16
C1858	54.30	55.30	1.00	1.25	1.53	0.11	0.15	0.42	0.43
C1858	55.30	56.30	1.00	1.16	0.82	0.10	0.10	0.49	0.49
C1858	56.30	57.30	1.00	0.58	0.71	0.06	0.08	0.53	0.56
C1858	57.30	58.30	1.00	0.20	0.43	0.01	0.03	0.50	0.57
C1858	58.30	58.80	0.50	1.22	0.62	0.05	0.05	0.18	0.32
C1858	58.80	59.20	0.40	0.45	0.11	0.06	0.02	0.33	0.08
C1858	59.20	59.80	0.60	0.23	1.45	0.01	0.09	0.14	0.30
C1858	59.80	60.00	0.20	0.98	0.15	0.08	0.01	0.27	0.09
C1858	60.00	60.50	0.50	1.12	1.07	0.02	0.06	0.05	0.14
C1858	60.50	61.20	0.70	0.04	0.12	0.01	0.00	<0.01	0.03

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1867	23.70	24.70	1.00	0.98	0.71	0.05	0.04	0.36	0.41
C1867	24.70	25.70	1.00	0.89	0.83	0.04	0.03	0.07	0.10
C1867	25.70	26.70	1.00	0.47	0.86	0.03	0.03	0.32	0.28
C1867	26.70	27.70	1.00	0.54	0.43	0.03	0.02	0.18	0.27
C1867	27.70	28.70	1.00	0.51	0.54	0.02	0.01	0.06	0.09

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Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1936	0.00	1.40	1.40	0.23	0.23	0.01	0.00	0.02	0.03
C1936	1.40	2.40	1.00	0.03	0.02	0.01	0.00	<0.01	0.01
C1936	2.40	3.40	1.00	0.02	0.02	0.01	0.00	<0.01	0.00
C1936	3.40	4.50	1.10	0.01	0.02	0.01	0.00	0.01	0.01
C1936	4.50	5.00	0.50	0.17	0.16	0.01	0.00	0.07	0.07
C1936	5.00	6.40	1.40	0.01	0.03	0.01	0.00	<0.01	0.02
C1936	6.40	7.70	1.30	0.66	0.71	0.02	0.00	0.74	0.89
C1936	7.70	8.70	1.00	1.91	1.74	0.01	0.00	1.61	1.66
C1936	8.70	9.70	1.00	1.21	1.06	0.01	0.00	0.97	1.32
C1936	9.70	10.70	1.00	0.48	0.69	0.01	0.00	0.62	0.47
C1936	10.70	11.70	1.00	0.65	0.59	0.02	0.00	3.63	1.85
C1936	11.70	12.80	1.10	1.22	1.18	0.01	0.00	0.77	0.64
C1936	12.80	13.40	0.60	0.02	0.29	0.01	0.02	0.12	0.06

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Appendix 2 – EPBC documentation, NOI, Correspondence from Federal Department of Sustainability, Environment, Water, Population and Communities

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

Referral of proposed action

What is a referral?

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) provides for the protection of the environment, especially matters of national environmental significance (NES). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the matters of NES without approval from the Australian Government Environment Minister or the Minister's delegate. (Further references to 'the Minister' in this form include references to the Minister's delegate.) To obtain approval from the Environment Minister, a proposed action should be referred. The purpose of a referral is to obtain a decision on whether your proposed action will need formal assessment and approval under the EPBC Act.

Your referral will be the principal basis for the Minister's decision as to whether approval is necessary and, if so, the type of assessment that will be undertaken. These decisions are made within 20 business days, provided that sufficient information is provided in the referral.

Who can make a referral?

Referrals may be made by or on behalf of a person proposing to take an action, the Commonwealth or a Commonwealth agency, a state or territory government, or agency, provided that the relevant government or agency has administrative responsibilities relating to the action.

When do I need to make a referral?

A referral must be made for actions that are likely to have a significant impact on the following matters protected by Part 3 of the EPBC Act:

- World Heritage properties (sections 12 and 15A)
- National Heritage places (sections 15B and 15C)
- Wetlands of international importance (sections 16 and 17B)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A)
- Protection of the environment from nuclear actions (sections 21 and 22A)
- Commonwealth marine environment (sections 23 and 24A)
- Great Barrier Reef Marine Park (sections 24B and 24C)
- The environment, if the action involves Commonwealth land (sections 26 and 27A), including:
    - actions that are likely to have a significant impact on the environment of Commonwealth land (even if taken outside Commonwealth land);
    - actions taken on Commonwealth land that may have a significant impact on the environment generally;
- The environment, if the action is taken by the Commonwealth (section 28)
- Commonwealth Heritage places outside the Australian jurisdiction (sections 27B and 27C)

You may still make a referral if you believe your action is not going to have a significant impact, or if you are unsure. This will provide a greater level of certainty that Commonwealth assessment requirements have been met.

To help you decide whether or not your proposed action requires approval (and therefore, if you should make a referral), the following guidance is available from:

- the Policy Statement titled Significant Impact Guidelines 1.1 – Matters of National Environmental Significance. Additional sectoral guidelines are also available.
- the Policy Statement titled Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies.

- the interactive map tool (enter a location to obtain a report on what matters of NES may occur in that location).

Can I refer part of a larger action?

In certain circumstances, the Minister may not accept a referral for an action that is a component of a larger action and may request the person proposing to take the action to refer the larger action for consideration under the EPBC Act (Section 74A, EPBC Act). If you wish to make a referral for a staged or component referral, read 'Fact Sheet 6 Staged Developments/Split Referrals' and contact the Referral Business Entry Point (1800 803 772).

Do I need a permit?

Some activities may also require a permit under other sections of the EPBC Act or another law of the Commonwealth. Information is available on the Department's web site.

Is your action in the Great Barrier Reef Marine Park?

If your action is in the Great Barrier Reef Marine Park it may require permission under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act). If a permission is required, referral of the action under the EPBC Act is deemed to be an application under the GBRMP Act (see section 37AB, GBRMP Act). This referral will be forwarded to the Great Barrier Reef Marine Park Authority (the Authority) for the Authority to commence its permit processes as required under the Great Barrier Reef Marine Park Regulations 1983. If a permission is not required under the GBRMP Act, no approval under the EPBC Act is required (see section 43, EPBC Act). The Authority can provide advice on relevant permission requirements applying to activities in the Marine Park.

The Authority is responsible for assessing applications for permissions under the GBRMP Act, GBRMP Regulations and Zoning Plan. Where assessment and approval is also required under the EPBC Act, a single integrated assessment for the purposes of both Acts will apply in most cases. Further information on environmental approval requirements applying to actions in the Great Barrier Reef Marine Park is available from http://www.gbrmpa.gov.au/ or by contacting GBRMPA's Environmental Assessment and Management Section on (07) 4750 0700.

The Authority may require a permit application assessment fee to be paid in relation to the assessment of applications for permissions required under the GBRMP Act, even if the permission is made as a referral under the EPBC Act. Further information on this is available from the Authority:

Great Barrier Reef Marine Park Authority

2-68 Flinders Street PO Box 1379
Townsville QLD 4810
AUSTRALIA

Phone: + 61 7 4750 0700
Fax: + 61 7 4772 6093

www.gbrmpa.gov.au

What information do I need to provide?

Completing all parts of this form will ensure that you submit the required information and will also assist the Department to process your referral efficiently.

You can complete your referral by entering your information into this Word file.

Instructions

Instructions are provided in green text throughout the form.

Attachments/supporting information

The referral form should contain sufficient information to provide an adequate basis for a decision on the likely impacts of the proposed action. You should also provide supporting documentation, such as environmental reports or surveys, as attachments.

Coloured maps, figures or photographs to help explain the project and its location should also be submitted with your referral. Aerial photographs, in particular, can provide a useful perspective and context. Figures should be good quality as they may be scanned and viewed electronically as black and white documents.

Maps should be of a scale that clearly shows the location of the proposed action and any environmental aspects of interest.

Please ensure any attachments are below two megabytes (2mb) as they will be published on the Department's website for public comment. To minimise file size, enclose maps and figures as separate files if necessary. If unsure, contact the Referral Business Entry Point for advice. Attachments larger than two megabytes (2mb) may delay processing of your referral.

Note: the Minister may decide not to publish information that the Minister is satisfied is commercial-in-confidence.

How do I submit a referral?

Referrals may be submitted by mail, fax or email.

Mail to:

Referral Business Entry Point
Environment Assessment Branch
Department of Sustainability, Environment, Water, Population and Communities
GPO Box 787
CANBERRA ACT 2601

- If submitting via mail, electronic copies of documentation (on CD/DVD or by email) are appreciated.

Fax to: 02 6274 1789

- Faxed documents must be of sufficiently clear quality to be scanned into electronic format.
- Address the fax to the mailing address, and clearly mark it as a 'Referral under the EPBC Act'.
- Follow up with a mailed hardcopy including copies of any attachments or supporting reports.

Email to: epbc.referrals@environment.gov.au

- Clearly mark the email as a 'Referral under the EPBC Act'.
- Attach the referral as a Microsoft Word file and, if possible, a PDF file.
- Follow up with a mailed hardcopy including copies of any attachments or supporting reports.

What happens next?

Following receipt of a valid referral (containing all required information) you will be advised of the next steps in the process, and the referral and attachments will be published on the Department's web site for public comment.

The Department will write to you within 20 business days to advise you of the outcome of your referral and whether or not formal assessment and approval under the EPBC Act is required. There are a number of possible decisions regarding your referral:

The proposed action is NOT LIKELY to have a significant impact and does NOT NEED approval

No further consideration is required under the environmental assessment provisions of the EPBC Act and the action can proceed (subject to any other Commonwealth, state or local government requirements).

The proposed action is NOT LIKELY to have a significant impact IF undertaken in a particular manner

The action can proceed if undertaken in a particular manner (subject to any other Commonwealth, state or local government requirements). The particular manner in which you must carry out the action will be identified as part of the final decision. You must report your compliance with the particular manner to the Department.

The proposed action is LIKELY to have a significant impact and does NEED approval

If the action is likely to have a significant impact a decision will be made that it is a *controlled action*. The particular matters upon which the action may have a significant impact (such as World Heritage values or threatened species) are known as the *controlling provisions*.

The controlled action is subject to a public assessment process before a final decision can be made about whether to approve it. The assessment approach will usually be decided at the same time as the controlled action decision. (Further information about the levels of assessment and basis for deciding the approach are available on the Department's web site.)

The proposed action would have UNACCEPTABLE impacts and CANNOT proceed

The Minister may decide, on the basis of the information in the referral, that a referred action would have clearly unacceptable impacts on a protected matter and cannot proceed.

Compliance audits

If a decision is made to approve a project, the Department may audit it at any time to ensure that it is completed in accordance with the approval decision or the information provided in the referral. If the project changes, such that the likelihood of significant impacts could vary, you should write to the Department to advise of the changes. If your project is in the Great Barrier Reef Marine Park and a decision is made to approve it, the Authority may also audit it. (See "*Is your action in the Great Barrier Reef Marine Park,"* p.2, for more details).

For more information

- call the Department of Sustainability, Environment, Water, Populations and Communities Community Information Unit on 1800 803 772 or
- visit the web site www.environment.gov.au/epbc

All the information you need to make a referral, including documents referenced in this form, can be accessed from the above web site.

Referral of proposed action

Project title: Cleveland Tin Mine - Tailings Mining and Reprocessing Project

1 Summary of proposed action

NOTE: You must also attach a map/plan(s) showing the location and approximate boundaries of the area in which the project is to occur. Maps in A4 size are preferred. You must also attach a map(s)/plan(s) showing the location and boundaries of the project area in respect to any features identified in 3.1 & 3.2, as well as the extent of any freehold, leasehold or other tenure identified in 3.3(i).

1.1 **Short description**

Use 2 or 3 sentences to uniquely identify the proposed action and its location.

Bright Phase Resources Ltd (BPRL) is proposing to mine and reprocess 4 million tonnes of old tailings contained in two large tailings storage facilities (TSF) at the closed Cleveland Mine at Luina in northwest Tasmania.

The aims of the project are:

- to recover and realise the significant mineral resource still contained in the TSFs
- to reduce the significant acid mine drainage emissions to the Whyte River which flows to the Pieman River at Corinna which in turn flows to the west into the Southern Ocean
- to store the treated and relatively benign tailings in more secure and stable facilities to ANCOLD and best practice standards
- to reuse or store the sulphidic tailings in more secure and stable facilities to ANCOLD and best practice standards
- to dewater and explore the old underground workings to determine if underground mining and mineral processing can recommence at the mine.

1.2 **Latitude and longitude**

Latitude and longitude details are used to accurately map the boundary of the proposed action. If these coordinates are inaccurate or insufficient it may delay the processing of your referral.

	Latitude			Longitude		
location point	degrees	minutes	seconds	degrees	minutes	seconds
Northwest corner	41	27	50	145	22	10
Southwest corner	41	29	10	145	22	10
Northeast corner	41	27	50	145	23	52
Southeast corner	41	29	10	145	23	52

Cleveland Mine is located within the bounding box defined by these coordinates (**WGS_1984** coordinate system)

The Interactive Mapping Tool may provide assistance in determining the coordinates for your project area.

If area less than 5 hectares, provide the location as a single pair of latitude and longitude references. If area greater than 5 hectares, provide bounding location points.

If the proposed action is linear (eg. a road or pipeline), provide coordinates for each turning point.

Do not use AMG coordinates.

1.3 **Locality and property description**

Provide a brief physical description of the property on which the proposed action will take place and the project location (eg. proximity to major towns, or for off-shore projects, shortest distance to mainland).

The location of the proposed project is shown in **Attachment A**: *Cleveland Tin Mine regional location map.*

The site is currently Crown Land – State Forest, managed by Forestry Tasmania.

1.4 **Size of the development footprint or work area (hectares)**

The 156 ha extent of the proposed project area will be used in the permit application and Mining Lease application and is delineated by the polygon in **Attachment B**.

The maximum project disturbance footprint will be approximately 81 ha inside the 156 ha project area proposed for the permit and mining lease applications. The final actual disturbance area will be less than the 81 ha, once preliminary geotechnical surveys and clay resource requirements are available for the new tailings storage facilities. The disturbed area footprint and plant layout is contained in **Attachment C**.

A marginally larger polygon was initially delineated and used for the Aboriginal Heritage and ecological surveys (before private land ownership was identified and excluded).

1.5 **Street address of the site**

There is no street address. The site is located immediately south of Waratah Road, at Luina.

1.6 **Lot description**

Describe the lot numbers and title description, if known.

The site is located on the Exploration Licence EL7/2005, covering an area of 18 km^2. The exploration licence and other relevant site appreciation information are contained in **Attachment D**.

Although the exploration licence is 18 km^2, the proposed project and mining lease application area will be approximately 156 ha inside the EL.

The site is currently Crown Land – State Forest, managed by Forestry Tasmania.

1.7 **Local Government Area and Council contact (if known)**

If the project is subject to local government planning approval, provide the name of the relevant council contact officer.

Waratah-Wynyard Council, Contact:

Mr Paddy Kennedy
Executive Manager Development Services
Contact Details: (03) 6443 8340
http://www.circularhead.tas.gov.au/site/page.cfm?u=401

1.8 **Time frame**

Specify the time frame in which the action will be taken including the estimated start date of construction/operation.

The following timeframe is currently anticipated:

- 2011: submission and approval of a Mining Lease Application (MLA) and submission and approval of a land use permit (supported by a Development Proposal and Environmental Management Plan (DPEMP)
- 2012: commencement construction and commissioning of operations
- 2012 to 2017: minimum 4 to 5 year project life, based on current planning
- Further exploration work on the lease may result in an extension of the anticipated life of the operation, including reopening of the mine.

1.9	**Alternatives to proposed action** Were any feasible alternatives to taking the proposed action (including not taking the action) considered but are not proposed?	✓	No
			Yes, you must also complete section 2.2
1.10	**Alternative time frames etc** Does the proposed action include alternative time frames, locations or activities?	✓	No
			Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3.3 (where relevant).
1.11	**State assessment** Is the action subject to a state or territory environmental impact assessment?		No
		✓	Yes, you must also complete Section 2.5
1.12	**Component of larger action** Is the proposed action a component of a larger action?	✓	No
			Yes, you must also complete Section 2.7
1.13	**Related actions/proposals** Is the proposed action related to other actions or proposals in the region (if known)?	✓	No
			Yes, provide details:
1.14	**Australian Government funding** Has the person proposing to take the action received any Australian Government grant funding to undertake this project?	✓	No
			Yes, provide details:
1.15	**Great Barrier Reef Marine Park** Is the proposed action inside the Great Barrier Reef Marine Park?	✓	No
			Yes, you must also complete Section 3.1 (h), 3.2 (e)

2 Detailed description of proposed action

NOTE: It is important that the description is complete and includes all components and activities associated with the action. If certain related components are not intended to be included within the scope of the referral, this should be clearly explained in section 2.7.

2.1 Description of proposed action

This should be a detailed description outlining all activities and aspects of the proposed action and should reference figures and/or attachments, as appropriate.

The original Cleveland tin mine opened near Waratah in 1908 and operated until 1917. Aberfoyle later reopened Cleveland in 1968, continuing to work the deposit until 1986 and processed about 5.7 million tonnes of ore. Hard rock mining operations ceased in 1986 due to the collapse of tin prices.

Due to technical limitations the original mining activities were not able to recover more than approximately 60% of the tin from the mined ore. Significant advances in minerals processing since that time have enabled the opportunity to reprocess the old mine tailings to win the previously unrecoverable mineral values. The project resource consists of approximately 4 million tonnes of historic mill tailings.

Bright Phase Pty Ltd proposes to mine and reprocess the tailings at the old Cleveland Tin Mine at a rate up to 100 tonnes per hour (tph) or approximately 900,000 tonnes per year (t/y). The initial rate of processing, based on the use a modular type plant, will be approximately 35 tph or 300,000 tt/y. The production rate will be increased by adding extra modular sections onto the preliminary plant.

The proposed operation will consist of the following:

- Infrastructure development - power, water, site access and transport
- Installation of a new modern modular processing plant
- Construction of a new TSF with dedicated cells for the different reprocessed tailings disposal streams
- Commissioning of new plant and new TSF
- Tailings reclamation
- Tailings disposal to new higher standard facilities
- Product transport and sales
- Metallurgical processes optimisation
- Mine dewatering for exploration.

A conceptual project layout is shown in **Attachment C**.

Tailings reclamation

The tailings are currently contained in two TSFs, known as the No. 1 Tailings Dam and the No. 2 Tailings Dam.

Reclamation of the tailings material will be undertaken utilizing a conventional excavator, dozer and high-shear pump hopper slurry bin mining method. The contents of both facilities are heterogeneous and will require mining by a “strip” method, where the slimes, fines and sands will be blended at the TSF subject to a defined ore typing protocol.

The different zones in the old TSFs will be mined and blended *in situ* and fed across a skid mounted vibratory grizzly screen to remove trash material such as residual vegetation and other waste materials, which will go to a dedicated disposal site.

The tailings will be transported by pumping to the processing mill feed tank via a pipeline. A skid mounted high-shear mixer and pumping system will be used to slurry and pump the tailings to the processing plant. The tailings will then undergo secondary screening and cleaning before the mineral processing operation.

Plant and new tailings dam locations

The general project area is heavily disturbed from the previous mining activities, with the existing old mill floor, some concrete pads, roads, culverts and bitumen around the old plant area. The new plant and infrastructure will be in the same location as the old plant, subject to the outcome of hydrological and other assessments conducted as part of the project detailed design studies.

Expert consultants will be engaged to develop a hydrogeological model for the Cleveland Project to be utilised for mine, process and tailings storage facility design.

Tailings, from which sulphide minerals have been removed, will be paste thickened and initially pumped to a dedicated cell in a new TSF to be constructed at a potentially suitable site within the proposed project area (see 'potential dams and clay borrow pits' in Attachment D).

These relatively benign tailings (sulphides removed) will then be disposed of into newly constructed cells made available on the old TSFs as mining makes space available. These new cells will be constructed sequentially in the old TSF sites to modern standards for permanent disposal.

As mining of the old tailings proceeds, sufficient space should become available for the construction of new sequential cells in the old TSFs. The rate of mining and processing will match the tailings disposal rate. Once sufficient space is available, the rate of mining and mineral processing will not affect the disposal rate and capacity.

High-sulphide tailings (not immediately reused in the process or for potential future sulphur production) will be stored, in the short-term, in a separate, dedicated, lined cell of the new TSF. Long-term disposal of the high-sulphide tailings will be underwater in known spent stopes in the old underground mine workings. The higher-grade underground mine stopes will not be used for tailings disposal but kept for possible future mining, subject to acceptable hydrogeological and resource exploration studies.

The TSFs and their dedicated cells will be designed, constructed and operated in accordance with ANCOLD standards and best practice environmental management.

After mining and processing of all the old tailings, the new cells in the new TSF as well as the new cells in the original TSFs will be closed, capped and revegetated to an agreed scope in consultation with the land manager, regulators, key stakeholders and interested parties. The mine is likely to be allowed to flood to natural levels. The closure and rehabilitation plan will be designed and implemented using best practice in mining guidelines, the Tasmanian EPA closure plan guidelines and the Strategic Framework for Mine Closure, Australian and New Zealand Minerals and Energy Council & Minerals Council of Australia guidelines. Retreatment of the tailings can also be viewed as a clean-up operation, with the additional benefit of helping alleviate future ongoing acid drainage issues.

Cleveland tailings, like many base-metal sulphide abandoned mine sites, contain acid-generating components that can result in acid mine drainage (AMD). A Cleveland tailings retreatment project will have a major positive impact on the long-term environmental pollution from the historic mine workings by removing acidic sulphide and metal contaminants at source, a key incentive for project to proceed.

Metallurgical processes

The operation will require the application of modern micro-characterization, ore typing and mineral processing techniques as well as access to the fast turnaround of specialist assays and metallurgical testing. An indicative process schematic diagram is shown in **Attachment E**.

A range of particle liberation, separation and concentration techniques will be used, incorporating a blend of established wisdom and modern commercially-proven innovations. Front-end processing will be required for the tailings reprocessing. The base case process diagram shows the recovery of coarse cassiterite using centrifugal gravity separators and fine cassiterite with fine froth flotation and centrifugal concentrators. Copper will be recovered upfront as a concentrate and a sulphide-rich concentrate will be also produced by fine froth flotation.

Modular process plant

The project will initially deploy a small conventional mobile modular gravity/flotation plant capable of a nominal 35 tph (300,000 t/y) throughput, sourced from an Australian company. The planned maximum rate of approximately 100 tph (900,000 t/y) will be achieved by retrofitting extra modules to the plant. The plant will process tailings in a suitably extended commissioning phase to simulate the finer hard rock component and hence derisk the operation technically and economically for any potential future underground hard rock ore processing.

Milling and attritioning

Blended tailings slurry will be fed initially at the initial nominal 35 tph into a trommel (a revolving cylinder screen used to separate materials by size). Oversize reject at +2 mm will be produced from this

beneficiation. Some disaggregation of cemented particles will also occur via the scrubbing action within the trommel. The trommel discharge will be fed into a ball mill with the Derrick screen oversize recycle.

As mentioned earlier, the throughput rate will be increased to approximately 100 t/h incrementally over time with the use of extra modules. A regrind mill will be used on the bulk sulphide flotation tail to promote liberation of cassiterite. Stirred milling will be employed as the most efficient method for this operation.

Gravity separation

Tin processing relies on the high specific gravity (the SG of cassiterite is 6.9 g/cm3) compared with the lighter gangue minerals (quartz, micas, chlorite ~2.6 g/cm3) and the iron-containing minerals (pyrite, pyrrhotite, hematite ~5 g/cm3). Hydrocyclones will be used on the reground bulk sulphide float tail to produce a coarse particle stream containing gravity recoverable cassiterite and fine particle stream containing flotation-recoverable cassiterite.

Coarse gravity recovery will be used on deslimed material to generate a high-grade coarse tin concentrate and conventional proven centrifugal concentration (C Falcon Separators) will be used for recovery of coarse cassiterite after liberation by stirred milling and classification.

Gravity separation of fine cassiterite in final flotation concentration will be undertaken as a final cleaning stage using UF Falcon centrifugal separators.

Flotation

Magnetic separation will be used for the removal of magnetic iron oxide minerals and some magnetic iron sulphides and conventional differential sulphide flotation will be used for the generation of a copper concentrate and removal of deleterious iron sulphide minerals.

Cassiterite flotation has been deployed at many commercial installations over the last fifty years. Addition of collector, depressant and frother reagents will be made to an aerated pulp in a suitably designed cell to ensure adherence of value mineral particles to bubbles for recovery as a froth overflow, whilst allowing the gangue minerals not to adhere to bubbles and to separate via gravity. A combination of roughers, cleaners and scavenging cells will be typically used for the separation.

Modern flotation reagents have been developed that are more selective than those historically used. Modern commercially-proven fine-particle flotation devices allowing fines to be more readily floated and will also be used as secondary scavenger cells.

Fine valuable mineral particles will be recovered from recleaners using fine particle gravity and flotation devices, selected from metallurgical test work results.

Products

Tin concentrates from the gravity and flotation processes will be recovered by thickening and filtration and blended to provide a bulk tin concentrate that will be bagged and transported for sale. Copper concentrate will also be recovered by thickening and filtration and blended to provide a bulk copper concentrate.

Tailings storage facilities

The proposed process life of the Cleveland Tailings Retreatment Project will be approximately 5 years, with a finite old tailings storage raw material resource of approximately 4 million tonnes.

Tailings engineering will include the necessary environmental considerations, such that mine tailings are impounded safely, responsibly and cost-effectively and the design process will include:

- Permitting and licensing.
- Tailings pumping, piping, initial earthworks, drainage and decant facilities and return water storage and pumping.
- Operating manuals specific to each facility.
- Closure planning, dam abandonment and site rehabilitation.

The design philosophy will incorporate:

- Risk-based design methods considering the high precipitation and environmentally sensitive region.
- Consideration of the acid mine drainage (AMD) producing properties of the material and site-wide.
- Optimisation of the disposal technique in minimizing water usage.
- Industry best-practice closure and rehabilitation plan.

Infrastructure

The current tailings are situated near the old mine and consequently the area is well accessed by existing infrastructure. The tailings area is only 15 kilometres from the nearest small town (Waratah) and 50 km from the nearest city (Burnie). Onsite roads will require minor refurbishment. Power runs very near the mine site; access is under discussion with the relevant parties.

The process plant will need a reliable supply of water throughout the year to be drawn from the Whyte River, which will supply an adequate amount of water. A water licence under the Tasmanian *Water Management Act 1999* will be required as part of the project approval.

A settlement dam and limestone neutralization facility will be provided to ensure that excess water from the reclamation and plant operations is captured and discharged according to the applicable regulations and Tasmanian *State Policy on Water Quality Management 1997* (State Water Policy). In this way, the current AMD issue from the historical operation will be positively impacted.

Only relatively small quantities of chemicals such as flotation reagents, flocculants and grinding media will be required. These will be easily supplied, given that several other operating mines and processing plants exist in the general area.

Exploration and geotechnical investigations

The historic Cleveland mine on the site is closed. Any future potential hard rock mining at Cleveland will be subject to exploration and geotechnical investigations and will be separate from this project. This project will however include the dewatering of the mine so that exploration and geotechnical assessment can proceed at some future date.

During the life of the tailings reprocessing operations, the historic Cleveland Mine workings will be investigated with a view to provide an ongoing resource to the processing plant once the tailings reprocessing is completed.

It is proposed to undertake surface and underground exploration drilling to determine if viable and economic tin, copper and tungsten resources exist, particularly in an area known as the 'Foley Zone'. In order to undertake the underground mine resource exploration and ground stability investigations, the mine will need to be dewatered and the water discharged to either Washington Creek or the Whyte River.

Mine dewatering and discharge

The mine dewatering will require a specific monitoring and management regime. The regime will consist of, as a minimum, the following practices.

- Daily monitoring of the physical water quality parameters such as pH, EC, turbidity
- Weekly monitoring of sulphate and heavy metals
- Maximising the volume of the mine water reused in the processing plant
- Minimising the volume of mine water for discharge
- Measuring the discharge flow rate to the receiving waters
- Controlling the discharge rate of the mine water to Washington Creek or the Whyte River in accordance with the *State Policy on Water Quality Management 1997* (State Water Policy)
- If necessary, establishing a discharge regime that achieves a water quality objective at the edge of a designated mixing zone in accordance with the State Water Policy
- If necessary, treating the mine water to a quality that allows for the implementation of the above practices.

Mine access

Mine access will be via the main mine portal. The currently closed portal will be reopened and the mine will be accessed down the main decline as the water level is lowered.

The water will be removed from the mine by two potential pumping operations. One by surface mounted diesel powered pumps with long reinforced suction hoses installed into the workings. The second by transportable skid mounted diesel powered pumps installed underground in the mine and moved as the level falls. The dewatering may ultimately involve both modes of operations or the use of submersible pumps.

The dewatering pump suction lines will be flexible reinforced hoses with air tight sealed fittings. The delivery lines are expected to be flexible black poly type lines that will deliver the mine water to flow detention ponds and settling ponds if required.

The mine will be accessed in a manner that minimises the risk of sludge disturbance which has the potential to affect mine water quality. No sludge is expected to be encountered in the upper levels of the old mine workings. If necessary, settling basins will be installed in the mine and outside of the mine to minimise the risk of mine sludge sediment loss from the operation.

The diesel for the diesel power supply or diesel drives for the pumps will be transported, stored and used in accordance with the dangerous goods requirements.

Any diesel or chemical spills over 20 L will be contained, cleaned up, reported and disposed of in accordance with the notification and waste management requirements of the *Environmental Management and Pollution Control Act 1994*.

Mine exploration & investigation
Any exploration above and below ground will be undertaken in accordance with the Tasmanian Exploration Code of Practice.

2.2 Alternatives to taking the proposed action
This should be a detailed description outlining any feasible alternatives to taking the proposed action (including not taking the action) that were considered but are not proposed (note, this is distinct from any *proposed* alternatives relating to location, time frames, or activities – see section 2.3).

There are no feasible alternatives. The "no action" alternative would result in the benefits of the valuable resource being foregone.

2.3 Alternative locations, time frames or activities that form part of the referred action
If you have identified that the proposed action includes alternative time frames, locations or activities (in section 1.10) you must complete this section. Describe any alternatives related to the physical location of the action, time frames within which the action is to be taken and alternative methods or activities for undertaking the action. For each alternative location, time frame or activity identified, you must also complete (where relevant) the details in sections 1.2-1.9, 2.4-2.7, 3.3 and 4. Please note, if the action that you propose to take is determined to be a controlled action, any alternative locations, time frames or activities that are identified here may be subject to environmental assessment and a decision on whether to approve the alternative.

Not applicable.

2.4 Context, planning framework and state/local government requirements
Explain the context in which the action is proposed, including any relevant planning framework at the state and/or local government level (e.g. within scope of a management plan, planning initiative or policy framework). Describe any Commonwealth or state legislation or policies under which approvals are required or will be considered against.

State Legislation:
The Tasmanian Resource Management and Planning System (RMPS) was established to achieve sustainable outcomes from the use and development of the State's natural and physical resources. Several pieces of legislation embody the aims of the RMPS.

Within the context of this development proposal, there are a number of applicable statutes:

- *State Policies and Projects Act 1993*
- *Land Use Planning and Approvals Act 1993*
- *Environmental Management and Pollution Control Act 1994* (see discussion in section 2.5).

State Policies and Projects Act 1993

The *State Policies and Projects Act 1993* establishes the process to put in place State Policies in relation to the Resource Management and Planning System of Tasmania. State policies seek to ensure a consistent and coordinated approach and incorporate the minimum amount of regulation necessary to achieve their objectives of managing natural resources. State Policies are implemented through their integration into Local Government Planning Schemes.

Currently there are three State Policies:

- *State Coastal Policy 1996* (Coastal Policy)
- *State Policy on Water Quality Management 1997* (Water Quality Policy)
- *State Policy on Protection of Agricultural Land 2009* (PAL Policy).

***State Coastal Policy 1996* (Coastal Policy)**

The purpose of the *State Coastal Policy 1996* is to implement the sustainable development objectives of the RMPS in Tasmania's coastal areas.

The Policy is based on the following three core principles that address these objectives:

- "Natural and cultural values of the coast shall be protected;
- The coast shall be used and developed in a sustainable manner; and
- Integrated management and protection of the coastal zone is a shared responsibility."

The Coastal Policy is applicable to all Tasmanian State waters and land (excepting Macquarie Island) within one kilometre inland of the high-water mark. The Coastal Policy is not applicable to any part of this proposal as no part of the site is within one kilometre of the high-water mark.

***State Policy on Water Quality Management 1997* (Sate Water Policy)**

The purpose of the Water Quality Policy is to achieve the sustainable management of Tasmania's surface water and groundwater resources by protecting or enhancing their qualities while allowing for sustainable development in accordance with the objectives of the RMPS.

A baseline surface water monitoring program has been implemented to investigate water quality data and to ensure that any potential project impacts on the waterways are monitored, controlled or managed appropriately (Refer: Section 4, Measures to avoid or reduce impacts). Groundwater monitoring will be installed before the main pit is developed and processing commences.

The management measures that will be applied to ensure compliance with the State Water Policy include:

1. Construction areas will be clearly demarcated in contract documents so that disturbed areas are kept to a minimum and no unnecessary soil or vegetation disturbance occurs;
2. Where required, erosion and sediment control measures such as silt stop fencing, sediment traps and erosion control matting will be installed prior to the commencement of construction activities;
3. Overland drainage flow will be diverted away from disturbed areas and bare soil to outfalls with sediment traps to reduce the potential for erosion;
4. Rehabilitation and revegetation of disturbed areas will occur as soon as practicable on completion of construction to reduce the potential for ongoing soil erosion to occur;
5. Stockpiled materials will be managed to ensure that dust and potential runoff is minimised and does not enter watercourses;
6. Erosion control measures and sediment traps will be regularly monitored; sediment material will be collected and disposed of on site.

The mine dewatering will involve a specific monitoring and management regime to ensure all water discharged as a result is fully compliant with the State Water Policy. The mine water will be treated, if necessary, to ensure the appropriate water quality objectives are met in accordance with the Water Quality Policy.

***State Policy on Protection of Agricultural Land 2009* (PAL Policy)**

The purpose of the PAL Policy is to "conserve and protect agricultural land so that it remains available for the sustainable development of agriculture, recognising the particular importance of prime agricultural land". The main objective of the PAL Policy is to ensure that the productive capacity of agricultural land is appropriately recognised and protected in the use and development of agricultural land.

The PAL Policy focuses on protecting prime agricultural land (land capability classes 1, 2 and 3) from conversion to non-agricultural uses or from being fettered from being used for agricultural activities. There is no prime agricultural land in the area of the proposed development.

Land Use Planning and Approvals Act 1993 (LUPAA)

Under LUPAA, Councils are required to administer the development and use of land within their municipal boundary. The assessment of development and use is undertaken in accordance with the relevant planning scheme(s).

The proposed development is located within the boundaries of the Waratah-Wynyard Municipality. The proposed use and development within the municipality will be assessed in accordance with the *Waratah-Wynyard Planning Scheme 2000*.

Waratah-Wynyard Planning Scheme 2000
The Mining Lease and surrounding area are within the Primary Industries Zone of the *Waratah-Wynyard Planning Scheme 2000* (the Scheme).

The intent (clause 9.2) of the Primary Industries Zone is:

> *(a) To protect and allow for the sustainable use and development of the natural and non-natural resources on which agriculture, aquaculture, forestry and mining depend; and*
> *(b) To allow a range of other uses in ways and in locations that do not affect the viability of use or development associated with the primary uses of the zone.*

The proposed development is defined by the Scheme as Resource Development, which is a primary use class in this zone.

The Resource Development Use Class is defined as:

> *Use of land for primary production which involves the use, and the planting, growing, harvesting or extraction of natural resources and processing of primary produce.*
>
> *It includes but is not necessarily limited to:*
> *animal husbandry, cropping, forestry, extraction of rocks and minerals, grain and vegetable production, grazing, horticulture, marine farming and aquaculture. It includes buildings and works directly associated with these uses.*

2.5 Environmental impact assessments under Commonwealth, state or territory legislation
If you have identified that the proposed action will be or has been subject to a state or territory environmental impact statement (in section 1.11) you must complete this section. Describe any environmental assessment of the relevant impacts of the project that has been, is being, or will be carried out under state or territory legislation. Specify the type and nature of the assessment, the relevant legislation and the current status of any assessments or approvals. Where possible, provide contact details for the state/territory assessment contact officer.
Describe or summarise any public consultation undertaken, or to be undertaken, during the assessment. Attach copies of relevant assessment documentation and outcomes of public consultations (if available).

Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999

Tasmanian State Legislation

Environmental Management and Pollution Control Act 1994
The project is a level 2 activity under Schedule 2 of the *Environmental Management and Pollution Control Act 1994* and a Development Proposal and Environmental Management Plan (DPEMP) will be submitted to Environment Protection Authority for assessment and approval.

Aboriginal Relics Act 1975
A search of the Tasmanian Aboriginal Site Index has been undertaken by Aboriginal Heritage Tasmania (the Tasmanian State Government Department responsible for the management of Aboriginal Heritage. This search indicated that there are no Aboriginal heritage sites recorded within or close to the property.

The correspondence from Aboriginal Heritage Tasmania regarding this matter is included as **Attachment F**.

Threatened Species Protection Act 1995
No flora species, listed as threatened under the Tasmanian *Threatened Species Protection Act 1995* were recorded from the study area. The following species have previously been recorded from within 5 km of the study area:

- *Comesperma defoliatum* (leafless milkwort)
- *Epacris glabella* (smooth heath)
- *Hypolepis muelleri* (harsh groundfern)
- *Micrantheum serpentinum* (western tridentbush)
- *Viola cunninghamii* (alpine violet)

No fauna species, listed as threatened under the Tasmanian *Threatened Species Protection Act 1995* were recorded from the study area. The following species have previously been recorded from within 5 km of the study area:

- *Sarcophilus harrisii* (tasmanian devil)
- *Beddomeia hullii* (hydrobiid snail – Heazlewood River)
- *Dasyurus maculatus* subsp. *maculatus* (spotted-tailed quoll)
- *Lathamus discolor* (swift parrot)
- *Phrantela annamurrayae* (hydrobiid snail – Heazlewood River)
- *Phrantela marginata* (hydrobiid snail – Heazlewood River)

Historic Cultural Heritage Act 1995
There are no known or anticipated features of historic heritage significance in the area of the proposed mine development.

Forest Practices Act 1985

For many activities a Forest Practices Plan (FPP) is required under the *Forest Practices Act 1985* where the clearing of forest is in excess of 1 hectare or 100 tonnes of timber (in areas of 'vulnerable land' these thresholds are lower). However, mining operations are explicitly excluded from this requirement where a LUPAA permit is in place, which will be the case for this project.

2.6 Public consultation (including with Indigenous stakeholders)
Your referral must include a description of any public consultation that has been, or is being, undertaken. Where Indigenous stakeholders are likely to be affected by your proposed action, your referral should describe any consultations undertaken with Indigenous stakeholders. Identify the relevant stakeholders and the status of consultations at the time of the referral. Where appropriate include copies of documents recording the outcomes of any consultations.

Consultation has been undertaken with:

- Mineral Resources Tasmania
- Tasmanian EPA (several presentations)
- Forestry Tasmania
- Crown Land Services (in relation to land ownership)
- Waratah-Wynyard Council
- Tasmania Police
- The Tarkine Coalition

2.7 A staged development or component of a larger project

If you have identified that the proposed action is a component of a larger action (in section 1.12) you must complete this section. Provide information about the larger action and details of any interdependency between the stages/components and the larger action. You may also provide justification as to why you believe it is reasonable for the referred action to be considered separately from the larger proposal (eg. the referred action is 'stand-alone' and viable in its own right, there are separate responsibilities for component actions or approvals have been split in a similar way at the state or local government levels).

Not applicable.

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest.

Your assessment of likely impacts should refer to the following resources (available from the Department's web site):

- specific values of individual World Heritage properties and National Heritage places and the ecological character of Ramsar wetlands;
- profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;
- *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*; and
- associated sectoral and species policy statements available on the web site, as relevant.

Note that even if your proposal will not be taken in a World Heritage area, Ramsar wetland, Commonwealth marine area, the Great Barrier Reef Marine Park or on Commonwealth land, it could still impact upon these areas (for example, through downstream impacts). Consideration of likely impacts should include both direct and indirect impacts.

3.1 (a) World Heritage Properties

Description

There are no places within or adjacent to the proposed mine development that are contained in World Heritage lists.

Nature and extent of likely impact

Address any impacts on the World Heritage values of any World Heritage property.

Not applicable

3.1 (b) National Heritage Places

Description

There are no listed National Heritage places within or adjacent to the proposed mine development.

The proposal project does not fall within the Tarkine Wilderness Area, listed on the Register of the National Estate (RNE).

Nature and extent of likely impact

Address any impacts on the National Heritage values of any National Heritage place.

Not applicable

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

There are no wetlands of international importance (declared Ramsar wetlands) in the vicinity of the proposed development.

Nature and extent of likely impact

Address any impacts on the ecological character of any Ramsar wetlands.

Not applicable

3.1 (d) Listed threatened species and ecological communities

Description

There are no vegetation communities, flora or fauna listed under either State or Commonwealth legislation located in the area.

Nature and extent of likely impact

Address any impacts on the members of any listened threatened species (except a conservation dependent species) or any threatened ecological community, or their habitat.

Not applicable

3.1 (e) Listed migratory species

Description

No listed migratory species have been recorded from the area.

Nature and extent of likely impact

Address any impacts on the members of any listed migratory species, or their habitat.

Not applicable

3.1 (f) Commonwealth marine area
(If the action is in the Commonwealth marine area, complete 3.2(c) instead. This section is for actions taken outside the Commonwealth marine area that may have impacts on that area.)

Description

Not applicable

Nature and extent of likely impact

Address any impacts on any part of the environment in the Commonwealth marine area.

3.1 (g) Commonwealth land
(If the action is on Commonwealth land, complete 3.2(d) instead. This section is for actions taken outside Commonwealth land that may have impacts on that land.)

Description

If the action will affect Commonwealth land also describe the more general environment. The Policy Statement titled *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* provides further details on the type of information needed. If applicable, identify any potential impacts from actions taken outside the Australian jurisdiction on the environment in a Commonwealth Heritage Place overseas.

Not applicable

Nature and extent of likely impact

Address any impacts on any part of the environment in the Commonwealth land. Your assessment of impacts should refer to the *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* and specifically address impacts on:

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage values of places; and
- the social, economic and cultural aspects of the above things.

3.1 (h) The Great Barrier Reef Marine Park

Description

Not applicable

Nature and extent of likely impact

Address any impacts on any part of the environment of the Great Barrier Reef Marine Park.

Note: If your action occurs in the Great Barrier Reef Marine Park you may also require permission under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act). If so, section 37AB of the GBRMP Act provides that your referral under the EPBC Act is deemed to be an application under the GBRMP Act and Regulations for necessary permissions and a single integrated process will generally apply. Further information is available at www.gbrmpa.gov.au

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3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

You must describe the nature and extent of likely impacts (both direct & indirect) on the whole environment if your project:

- is a nuclear action;
- will be taken by the Commonwealth or a Commonwealth agency;
- will be taken in a Commonwealth marine area;
- will be taken on Commonwealth land; or
- will be taken in the Great Barrier Reef marine Park.

Your assessment of impacts should refer to the *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* and specifically address impacts on:

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage values of places; and
- the social, economic and cultural aspects of the above things.

3.2 (a)	**Is the proposed action a nuclear action?**	✓	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (b)	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?**	✓	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (c)	**Is the proposed action to be taken in a Commonwealth marine area?**	✓	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))

3.2 (d)	**Is the proposed action to be taken on Commonwealth land?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))		

3.2 (e)	**Is the proposed action to be taken in the Great Barrier Reef Marine Park?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))		

3.3 Other important features of the environment

Provide a description of the project area and the affected area, including information about the following features (where relevant to the project area and/or affected area, and to the extent not otherwise addressed above). If at Section 2.3 you identified any alternative locations, time frames or activities for your proposed action, you must complete each of the details below (where relevant) for each alternative identified.

3.3 (a) Flora and fauna

An ecological assessment of the site has been undertaken by Environmental Consulting Options Tasmania[1]. A copy of this report is included as **Attachment G**. The key findings of this investigation are as follows:

- Threatened flora:
  - No flora species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
- Threatened fauna:
  - No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
  - The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil, but it is unlikely that features such as nests or dens are present within the study area itself.
  - The wider area supports potential nesting habitat for the wedge-tailed eagle (Aquila audax subsp. fleayi). No wedge-tailed eagle nest sites were identified during the course of the field assessment or two aerial searches. Please refer to the Ecological Assessment in Attachment G for further details.

3.3 (b) Hydrology, including water flows

Drainage:
Drainage in the area is via the Whyte River, which flows to the southwest to the confluence with the Pieman River just above Corinna. The Pieman River flows west to the Southern Ocean.

Water flows:
There is no water flow data currently available for the Whyte River. However, "normal flow" in the Whyte River is estimated to be of the order of 0.1 cumecs to about 2 cumecs.

Bright Phase has recently initiated a water monitoring program in the area.

3.3 (c) Soil and Vegetation characteristics

[1] ECO*tas* (2011). *Ecological Assessment of Proposed Tailings Reprocessing Project, Cleveland Mine, Luina, Northwest Tasmania*. Report by Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd.

Soils:

The proposed mine site and surrounding areas are located on the following land system, as mapped by Richley[2]:

824241 Huskisson River
This land system has developed on the deeply dissected Cambrian sedimentary and volcanic rocks in an area with an average annual rainfall of 2000 – 2500 mm. The vegetation on this land system is typically tall closed forest, with gum-topped stringybark, myrtle, sassafras, dogwood, leatherwood, horizontal scrub and soft tree ferns.

Stony, gravelly, friable, yellowish red gradational soils have developed on the steep upper slopes (average sidelslope of 18^0). These soils have a peaty loam surface texture, high permeability and a high susceptibility to sheet erosion. These soils have an average depth of 1.0 m, but vary considerably in depth, ranging from 0.5 m to >2 m.

The soils in the swales (average sideslope 14^0) are gravelly, strong brown gradational soils with a peaty loam surface texture, moderate permeability, an average depth of 1.3 m and a high susceptibility to sheet erosion.

On the footslopes (average sideslope 10^0) the soils are gravelly, yellowish brown gradational soils with a peaty loam surface texture, moderate permeability, an average depth of 1.8 m and a high susceptibility to sheet erosion.

The soils in the flowlines are stony, yellowish brown gradational soils that have developed on fluviatile Tertiary basalt (average sideslope 1^0), derived from the Tertiary basalt capping on adjoining areas. These soils have a peaty loam surface texture, moderate permeability, an average depth of 1.5 m and are subject to moderate flooding and siltation.

Land Capability:

Although a land capability survey has not been undertaken for this area, an estimation of the likely land capability classes can be made, based on the known geology, land systems and land usage. As the area is currently protected in either State Forest, it would be excluded from agricultural use (classified as Exclusion Areas in land capability mapping).

If any of this land was capable of being converted to an agricultural land classification, it would likely be classified as land capability Class 7 (*land with very severe to extreme limitations which make it unsuitable for agricultural use*) or Class 6 (*land marginally suitable for grazing because of severe limitations*).

3.3 (d) Outstanding natural features

There are no outstanding natural features, including caves, or features of geological conservation significance in the vicinity of the proposed mine development.

3.3 (e) Remnant native vegetation

The area is predominantly cleared land associated with the old Luina Township or revegetation from the rehabilitation of old mining areas. A site appreciation can be gained from the aerial photographs and relevant documents contained in Attachment D.

The ecological assessment of the site (depicted in Figure 4, p12 of **Attachment G**):

- Identified the following five native vegetation mapping units:
    - *Acacia melanoxylon* forest on rises (TASVEG code: NAR)
    - *Eucalyptus obliqua* dry forest and woodland (TASVEG code: DOB)
    - *Eucalyptus obliqua* forest with broad-leaf shrubs (TASVEG code: WOB)
    - *Eucalyptus obliqua* forest over rainforest (TASVEG code: WOR)

[2] Richley, LR. 1978. *Land Systems of Tasmania Region 3*. Department of Agriculture, Tasmania.

  - *Nothofagus-Arherosperma* rainforest (TASVEG code: RMT)

- Identified the following three non-native vegetation groups
  - Extra-urban miscellaneous (TASVEG code: FUM)
  - Permanent easement (TASVEG code: FPE)
  - Regenerating cleared land (TASVEG code: FRG)
- None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)

Elevation varies considerably over the site, ranging from approximately 290 m AHD to 400 m AHD. Gradients are greatest on the eastern side of the site, particularly on the southeastern section of the site where it extends up across Crescent Spur.

3.3 (g) Current state of the environment

Include information about the extent of erosion, whether the area is infested with weeds or feral animals and whether the area is covered by native vegetation or crops.

Weeds:
The following four species classified as "declared weeds" within the meaning of the Tasmanian *Weed Management Act 1999* where observed in the ecological study area:

- *Erica lusitanica* (spanish heath)
- *Cytisus scoparius* (english broom)
- *Rubus fruticosus* .agg (blackberry)
- *Salix* sp. (willow)

These weeds generally occur in and around the old Luina township.

Other potentially invasive species recorded include:

- *Chasmanthe floribunda* (african cornflag)
- *Cirsium vulgare* (scotch thistle)
- *Cotoneaster* sp. (cotoneaster)
- *Digitalis purpurea* (foxglove)

Disease:
There was no symptomatic evidence of the root-rot pathogen *Phytophthora cinnamomi* observed in the ecological study area. Due to the disturbed nature of the vegetation and the lack of plant species susceptible to the pathogen, no special management prescriptions are considered warranted.

No evidence of myrtle wilt was recorded from within the study area.

Feral animals:
No feral animals have been observed in the area.

Cover of the area:
Cover of the area comprises the old Luina township, extensive roads, rehabilitation and revegetation areas, the Cleveland Mine site and some limited old growth forest.

Erosion:
The soils of the area have a high susceptibility to sheet erosion.

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values

There are no Commonwealth Heritage Places or other places recognised as having heritage values in the area of the proposed mine development.

3.3 (i) Indigenous heritage values

There are no identified Aboriginal cultural heritage values identified in the area (see correspondence from Aboriginal Heritage Tasmania included as Attachment F).

3.3 (j) Other important or unique values of the environment

Describe any other key features of the environment affected by, or in proximity to the proposed action (for example, any national parks, conservation reserves, wetlands of national significance etc).

There are no other important or unique values of the environment on the site. The EPBCA *Protected Matters Area* report (SEWPAC 2011) indicates that the "Tarkine TAS" (indicative place) and "Tarkine Wilderness Area TAS" (registered) are adjacent to but outside the project area.

The area of proposed development has low environmental values due to long term disturbance associated with past mining activities.

The project has the potential to remediate historic site degradation and improve the quality of the local environment and fauna habitat.

3.3 (k) Tenure of the action area (eg freehold, leasehold)

All the land in the area of the proposed mining and mineral processing activities is Crown land – State Forest, managed by Forestry Tasmania. It contains an informal reserve in the project area which will be addressed in consultation with Forestry Tasmania (the land manager) as part of the approvals process.

3.3 (l) Existing land/marine uses of area

The wider area is currently used for forestry and conservation activities.

3.3 (m) Any proposed land/marine uses of area

The proposed land use in the area the subject of this EPBC referral is for a mining and mineral processing operation. There are no other proposals for the area.

4 Measures to avoid or reduce impacts

Note: If you have identified alternatives in relation to location, time frames or activities for the proposed action at Section 2.3 you will need to complete this section in relation to each of the alternatives identified.

Provide a description of measures that will be implemented to avoid, reduce, manage or offset any relevant impacts of the action. Include, if appropriate, any relevant reports or technical advice relating to the feasibility and effectiveness of the proposed measures.

For any measures intended to avoid or mitigate significant impacts on matters protected under the EPBC Act, specify:

- what the measure is,
- how the measure is expected to be effective, and
- the time frame or workplan for the measure.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of important habitat, specific design measures, or adoption of specific work practices.

Provide information about the level of commitment by the person proposing to take the action to implement the proposed mitigation measures. For example, if the measures are preliminary suggestions only that have not been fully researched, or are dependent on a third party's agreement (e.g. council or landowner), you should state that, that is the case.

Note, the Australian Government Environment Minister may decide that a proposed action is not likely to have significant impacts on a protected matter, as long as the action is taken in a particular manner (section 77A of the EPBC Act). The particular manner of taking the action may avoid or reduce certain impacts, in such a way that those impacts will not be 'significant'. More detail is provided on the Department's web site.

For the Minister to make such a decision (under section 77A), the proposed measures to avoid or reduce impacts must:

- clearly form part of the referred action (eg be identified in the referral and fall within the responsibility of the person proposing to take the action),
- be must be clear, unambiguous, and provide certainty in relation to reducing or avoiding impacts on the matters protected, and
- must be realistic and practical in terms of reporting, auditing and enforcement.

More general commitments (eg preparation of management plans or monitoring) and measures aimed at providing environmental offsets, compensation or off-site benefits CANNOT be taken into account in making the initial decision about whether the proposal is likely to have a significant impact on a matter protected under the EPBC Act. (But those commitments may be relevant at the later assessment and approval stages, including the appropriate level of assessment, if your proposal proceeds to these stages).

Avoidance of native vegetation and habitat:
To ensure avoidance and reduced impacts to native vegetation and fauna habitat, a project site assessment was undertaken by ECOTas environmental consultancy. The report is contained in **Attachment G**.

No endangered or high value flora was identified on the proposed project site. Key findings for the habitat survey are summarised below. While there will be a loss of some potential habitat for some species (modified already), the loss is not such that it is likely to:

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat
- introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species.

The conceptual project layout has been designed to avoid impacts on potential habitat occurring in native vegetation.

The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil. However, no evidence of these species was identified from within the study area and it is unlikely that features such as nests or dens are present. No wedge-tailed eagle nest sites were identified during the course of the field assessment or two aerial searches undertaken for the project area and a 1 km buffer of potential habitat.

Table 1 below identifies the quantum and type of vegetation being impacted in relation to the actual area surveyed.

Vegetation Type	**Flora/fauna habitat study area (Hectares)**	**Maximum potential project impacted area (Hectares)**
Extra-urban miscellaneous (FUM)	17.92	6.41
Permanent easement (FPE)	3.71	1.63
Regenerating cleared land (FRG)	48.57	43.2
Sub-total	70.20	51.24
Acacia melanoxylon forest on rises (NAR)	8.36	1.25
Eucalyptus obliqua dry forest (DOB)	4.29	3.86
Eucalyptus obliqua forest with broadleaf shrubs (WOB)	49.31	23.7
Eucalyptus obliqua forest over rainforest (WOR)	27.71	1.26
Nothofagus- Atherosperma rainforest (RMT)	1.90	0.04
Sub-total	91.57	30.11
Total	161.77	81.35

The conceptual project layout will avoid the native vegetation to the maximum extent possible and mainly impact on non-native anthropogenic derived vegetation (approximately 51.24 hectares). The currently stated extent of clearance is based on the worst case scenario. It is expected that the project area will be reduced following detailed project design. The elements likely to reduce in dimension are the 'potential tailings dam and clay borrow pits' - this area is mapped as *Eucalyptus obliqua* forest with broadleaf shrubs (WOB), so the 23.7 ha of impact may in fact be significantly lower following detailed design.

Extra-urban miscellaneous (FUM) is used to describe the quarry areas and old infrastructure sites, which are common across the site. Permanent easement (FPE) is used to describe the large power transmission line that crosses the centre of the study area. The vegetation associated with the power lines is managed with regular fire management clearing occurring. Regenerating cleared land (FRG) is the dominant mapping unit

across the study area. FRG in this case is used to describe the actively rehabilitated tailings dump areas, old quarry sites, run-of-mine pad, old mill and crusher plant, processing plant and workshops areas which are being recolonised by native plant species or have had native seed sown to encourage rehabilitation.

The maximum possible impact on native vegetation (maximum approximately 30.11 hectares) has been minimised and will occur on the edge of contiguous vegetation communities existing in the broader landscape. It may be the case that the areas of native vegetation identified to be impacted in Table 1, may not actually be impacted to the extent delineated (this is especially the case with the larger extent of *Eucalyptus obliqua* forest with broadleaf shrubs (WOB)). This is because the area for the 'potential tailings dam and clay borrow pits' area is initially overestimated until the detailed geotechnical details are available and the amount of clay resource required for the project is verified.

Any potential reductions in the development footprint will therefore occur in the WOB native forest component. When clearance of high value native vegetation does occur it will be staged and proceed after the site clearance measures articulated below are implemented.

Site clearance measures:
It is unlikely that suitable threatened fauna habitat is present within the study area itself. However, as some native vegetation will be cleared in future stages, it is important that appropriate safeguards are put in place to identify any threatened fauna habitat (for example denning opportunities, habitat trees or nests) which may come to exist between the original ECOTAS survey and when clearance actually takes place.

When native vegetation is proposed to be cleared, preclearance surveys will be undertaken by a suitably qualified person. Appropriate mitigation and avoidance measures to reduce impacts on threatened fauna habitat will be implemented as required and recommended by a suitably qualified ecologist.

Road kill
The transport route is via the Waratah Road, Ridgley Highway, Massey Greene Road (heavy truck road) and the Bass Highway to the Burnie wharf area (see **Attachment H** for map of transport route).

Increased vehicular movements associated with the proposed action may potentially increase the risk of road kill for both the tasmanian devil and spotted-tailed quoll. However, in the case of this proposed action it is unlikely a significant impact will occur. This is based on a combination of factors associated with the proposed transport activity and the proposed transport route as summarised below:

- Daylight operation of product transport - product transport trucks will only operate during daylight hours - even in the shorter months of winter. Road kill for both the tasmanian devil and spotted tailed quoll is more likely to occur between dusk and dawn
- The utilisation of a worker transport bus - instead of individual workers commuting to the site, they will be required to use a worker transport bus. This will reduce the volume of traffic movements therefore lowering the risk of road kill along the transport route
- Steep terrain - the product transport trucks and worker transport bus are unlikely to exceed 40 km per hour along Waratah Road for the 4 km section east of Luina. This section of road is steep and windy and it is unlikely that trucks and buses would be able to travel at fast speeds. Higher speeds (particularly over 60 km/h) increases the risk of road kill
- The proposed action does not significantly increase the volume of traffic along the transport route compared to already existing traffic movements - product transport from the operating mine has been estimated to be in the order of a maximum of 6 truck movements per day (3 loads to Burnie per day). The worker transport bus has been estimated to be in the order of 4 bus movements per day (2 trips to Burnie per day). It could also be the case that this may not be an additional increase as the workers may utilise the bus service already operating between Burnie and the Savage River mine
- Miscellaneous traffic (for example subcontractors, visitors etc.) has been estimated to be in the order of 8 movements per day (4 trips to Burnie per day). Therefore, the total movements along the transport route are estimated to be in the order of 18 movements per day with the worst case scenario likely to a maximum of 12 movements potentially occurring just before dawn and just after dark especially in winter and in the order of 6 truck movements occurring during daylight hours
- The construction phase is not expected to have a much higher traffic load than the operating mode. Construction workers and equipment transport to the site will be minimal due to the modular nature of the plant and the basic nature and establishment of the mining and other infrastructure.

- An analysis of the traffic movements along the transport route has been undertaken (using data supplied from the Tasmanian Department of Infrastructure, Energy and Resources) which indicates Annual Average Daily Traffic[3] (AADT) for the relevant sections of the Waratah Road to be 250 and Ridgley Highway 1602
- The potential AADT increase on Waratah Road is approximately 7% (18/250 x100). The potential AADT increase on the Ridgley Highway is approximately 1% (18/1602 x 100)

Weed management measures:

A weed management and spread prevention plan will be developed for the site in order to manage the containment or spread of weeds identified above.

Site rehabilitation:

A conceptual rehabilitation plan and closure plan will be included in the development proposal and environmental management plan (DPEMP) to be submitted for State Government approval of the project. A more detailed rehabilitation plan will be prepared following project approval and detailed project design.

Site rehabilitation and closure planning will involve the closure, capping and revegetation of the old and new TSFs to an agreed scope and design in consultation with the land manager, regulators, key stakeholders and interested parties. It is expected that the mine will be allowed to flood to natural levels.

The closure and rehabilitation plan will be designed and implemented using best practice in mining guidelines, the Tasmanian EPA closure plan guidelines and the Strategic Framework for Mine Closure, Australian and New Zealand Minerals and Energy Council & Minerals Council of Australia guidelines.

Retreatment of the tailings can essentially be viewed as a clean-up operation by proxy, with the additional benefit of helping alleviate future acid drainage issues.

Water quality management:

The Whyte River is currently heavily impacted from the acid mine drainage from the original Cleveland Mine TSFs. Baseline water quality and flow data is currently being gathered for inclusion in the project DPEMP.

The protected environmental values of all Tasmanian surface waters have been established by the Tasmanian EPA Board in accordance with the *State Policy on Water Quality Management 1997*. The baseline data will be used to establish water quality objectives in accordance with the ANZECC guidelines.

The DPEMP will include a water quality monitoring regime expected to include as a minimum upstream and downstream monitoring of the Whyte River as well as designated aqueous emission sources.

Ground water monitoring will also be undertaken.

[3] The number of vehicles (including commercials) summed over all the available lanes in both directions at the specified site, averaged over all days of the year.

5 Conclusion on the likelihood of significant impacts

Identify whether or not you believe the action is a controlled action (ie. whether you think that significant impacts on the matters protected under Part 3 of the EPBC Act are likely) and the reasons why.

5.1 Do you THINK your proposed action is a controlled action?

✓	No, complete section 5.2
	Yes, complete section 5.3

5.2 Proposed action IS NOT a controlled action.

Specify the key reasons why you think the proposed action is NOT LIKELY to have significant impacts on a matter protected under the EPBC Act.

The proposed action, the development of the tailings reprocessing facility, is not considered to be a controlled action for the following reasons:

Vegetation communities:

There are no vegetation communities of national (*Environment Protection and Biodiversity Conservation Act 1999*) significance within the proposed site.

Flora:

No species of national (*Environment Protection and Biodiversity Conservation Act 1999*) significance were recorded from within the study area.

Fauna:

The study area may form part of the home range of the masked owl, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil[4]

- The masked owl potential habitat is lowland dry sclerophyll forests with old growth components, although it has been recorded in wet forest types. The development will not result in substantial removal of potential foraging or nesting habitat. There were no nesting opportunities found during the survey. Despite this, a conservative approach of pre-clearance surveys has been proposed to ensure (beyond doubt) that no masked owl nesting opportunities will be lost as a result of the limited clearance associated with the proposed development.
- Potential habitat for the spotted-tailed quoll is wetter forest types, coastal heath and bush-pasture interfaces. At a local scale the proposed development will result in a small loss of potential habitat when compared to the larger expanses of habitat in the wider area. The development will not result in a significant impact on the species habitat.
- No wedge-tailed eagle nest sites were identified during the course of the field assessment; however it is likely that the area is used as foraging habitat. Potential habitat is described as "large tracts (more than 10 ha) of eucalypt or mixed forest" (FPA 2011). This habitat is extensive surrounding the study area[5]. In addition to the ground based surveys, two aerial searches were undertaken for the project area and a 1 km buffer of potential habitat. No nests were detected. Please refer to the Ecological Assessment in Attachment G for further details.
- No evidence of Tasmanian devils was identified in the study area and the surrounding vegetation (dense wet sclerophyll, mixed forest and rainforest) suggests that the area surrounding the proposed development is unlikely to be prime habitat for the species. The proposed development will re-work and rehabilitate old mine workings. The development will not introduce or lead to long term disease, reduce the area of occupancy, fragment an existing population, fragment an existing habitat or interfere with the recovery of the species.

[4] ECO*tas* (2011). *Ecological Assessment of Proposed Tailings Reprocessing Project, Cleveland Mine, Luina, Northwest Tasmania*. Report by Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd.
[5] ECO*tas* (2011).

The extent of vegetation clearance is minimal, and predominantly involves minor 'edge clearance' directly adjacent to the existing disturbed areas. None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The Ecological Assessment concluded that the proposed development would not constitute a "significant impact" because:

> "...while there will be a loss of some potential habitat of these species (modified already), the loss is not such that it is likely to lead to a long-term decrease in the size of an important population of a species, reduce the area of occupancy of an important population, fragment an existing important population, fragment an existing important population into two or more populations, adversely affect habitat critical to the survival of a species, disrupt the breeding cycle of an important population, modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat, introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species."[6]

Proposed avoidance and mitigation measures:

The conceptual project layout largely avoids impacts on potential fauna habitat. The study area may form part of the home range of species such as the masked owl, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil. However, no evidence of these species was identified from within the study area and it is unlikely that features such as nests or dens are present. When native vegetation is proposed to be cleared preclearance surveys will be undertaken by a suitably qualified person. Appropriate mitigation and avoidance measures to reduce impacts on threatened fauna habitat will be implemented as required and recommended by a suitably qualified ecologist.

The conceptual project layout will mostly avoid the native vegetation and mainly impact on non-native anthropogenic derived vegetation (approximately 51.24 hectares).

The project will be approved and regulated in accordance with Tasmanian legislation and Policies. A DPEMP will outline the mitigation measures required to protect the area values. This will also include water quality monitoring and a rehabilitation and closure plan.

It is expected that on completion the project will result in a cleaner, a more chemically, physically and biologically stable site and potentially more acceptable site for future flora and fauna habitat establishment.

5.3 Proposed action IS a controlled action

Type 'x' in the box for the matter(s) protected under the EPBC Act that you think are likely to be significantly impacted. (The 'sections' identified below are the relevant sections of the EPBC Act.)

	Matters likely to be impacted
	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Great Barrier Reef Marine Park (sections 24B and 24C)
	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)

[6] ECO*tas* (2011). *Ecological Assessment of Proposed Tailings Reprocessing Project, Cleveland Mine, Luina, Northwest Tasmania*. Report by Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd.

	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

Specify the key reasons why you think the proposed action is likely to have a significant adverse impact on the matters identified above.

6 Environmental record of the responsible party

NOTE: If a decision is made that a proposal needs approval under the EPBC Act, the Environment Minister will also decide the assessment approach. The EPBC Regulations provide for the environmental history of the party proposing to take the action to be taken into account when deciding the assessment approach.

		Yes	No
6.1	**Does the party taking the action have a satisfactory record of responsible environmental management?**		✓

Provide details

As Bright Phase has not yet been involved in the development of a mine, the company has no track record of responsible environmental management. However company personnel, in particular Dr Mike Adams and Dr Will Goodall, have had extensive experience in environmental management associated with mining operations.

Dr Adams is recognised as a world expert for his work in the environmental management of cyanide:

- Published fourteen peer-reviewed papers in the field
- Consulted to industry on environmental impact and treatment of cyanide effluents:
    - Australia: Boddington, Beaconsfield, KCGM, Lawlers, Plutonic, Darlot, Kanowna Belle, Stawell, Jundee, St Ives, Granny Smith, Telfer, KCGM
    - Brazil: Anglo American of South America, Rio Paracatu Mineracao
    - Finland: Riddarhyttan
    - France: Salsigne
    - New Zealand: Waihi
    - Romania: Rosia Montana
    - South Africa: Fairview, Kinross
    - Turkey: Ovacik
    - Phillipines: Puro
    - USA: Phoenix
- Assisted three mine sites in obtaining compliance with the International Cyanide Management Code via a peer-reviewed MERIWA study:
    - Australia: Kanowna Belle, St Ives, Granny Smith
- Currently consults with Maelgwyn Mineral Services in developing a new cyanide destruction process
- Acid Mine Drainage consulting and mitigation:
    - Mt Gordon, Australia – initiation and process development of a 240 m^3/h plant for removal of metals from AMD that operated commercially for over twelve months
    - Mt Lyell, Australia – consulted to technology developers
- Identification and analysis of respirable dusts:
    - South Africa – determined crystobalite presence in nuisance dust, cause of pneumoconiosis in workers at a silicon plant
- Removal of mercury from plant streams:
    - China – process development, design and commissioning of a mercury treatment plant at a gold mine
    - Australia and North America – design setpoint for mercury on kiln and calciner off-gases to enable design of appropriate scrubbing systems

Dr Will Goodall:

- Has three years experience in analysis of mining-caused environmental problems
- Author of the paper "Automated mineralogy in the prediction of acid mine drainage: Accessible mineralogy using QEMSCAN", presented at the SME conference in Salt Lake City, Utah, USA in 2008
- Is currently undertaking acid base accounting (ABA) work for Aura Energy on the Haggan Uranium Project, Sweden

6.2	**Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?**		✓

	If yes, provide details		
6.3	**If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework?** **If yes, provide details of environmental policy and planning framework** Bright Phase is currently in the process of preparing their environmental policy and planning framework. These documents are not yet available.	✓	
6.4	**Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?** **Provide name of proposal and EPBC reference number (if known)**		✓

7 Information sources and attachments

(For the information provided above)

7.1 References

- List the references used in preparing the referral.
- Highlight documents that are available to the public, including web references if relevant.

Richley, LR., 1978. *Land Systems of Tasmania Region 3*. Department of Agriculture, Tasmania.

ECOtas, 2010. *Ecological Assessment of Proposed Tailings Reprocessing Project, Cleveland Mine, Luina, Northwest Tasmania*. Report by Environmental Consulting Options Tasmania (ECOtas) for Bright Phase Resources Ltd, 16 August 2011.

7.2 Reliability and date of information

For information in section 3 specify:

- source of the information;
- how recent the information is;
- how the reliability of the information was tested; and
- any uncertainties in the information.

Information Sources

- Information sources utilised consist of published reports and the results of surveys commissioned for this particular project.
- The sources of the information are shown in section 7.1 (references) and in the relevant sections within the report.

Information Dates

- The dates of preparation / publication of the information sources are shown in section 7.1 (references) and in the relevant sections within the report.

Reliability of the Information

- The environmental investigations have been managed by **pitt&sherry** under their ISO9001 Quality System and their ISO14001 Environmental Management System.
- The ecological survey (flora, fauna) has been undertaken by a highly experienced consultant in accordance with accepted practice.

Uncertainties

- Following the ecological assessment, uncertainty existed regarding presence/absence of wedge-tailed eagle nest(s) on the proposed mine site.

Reduction of Uncertainties

- Two opportunistic helicopter based eagle nest search was recently undertaken to address this uncertainty. No eagle nests were located on the site during this survey. The results of this survey are included in the ecological assessment report in Appendix G. The findings are summarised below.

7.3 Attachments

Indicate the documents you have attached. All attachments must be less than two megabytes (2mb) so they can be published on the Department's website. Attachments larger than two megabytes (2mb) may delay the processing of your referral.

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the project locality (section 1)	✓	Attachment A Regional location map Attachment B Project area maps
	figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 3)	✓	Attachment C: Conceptual layout Attachment D: Site appreciation Attachment E: Indicative process schematic diagram Attachment H: Transport route map
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)	✓	Attachment F Correspondence from Aboriginal Heritage Tasmania
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)		
	copies of any flora and fauna investigations and surveys (section 3)	✓	Attachment G Ecological assessment
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3 and 4)	✓	Attachment G Ecological assessment
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)		

Attachment A: Location map
Attachment B: Project area maps
Attachment C: Conceptual project layout
Attachment D: Site appreciation information
Attachment E: Indicative process schematic diagram
Attachment F: Aboriginal Heritage Tasmania advice
Attachment G: Ecological assessment report
Attachment H: Transport route map

8 Contacts, signatures and declarations

NOTE: Providing false or misleading information is an offence punishable on conviction by imprisonment and fine (s 489, EPBC Act).

Under the EPBC Act a referral can only be made by:

- the person proposing to take the action (which can include a person acting on their behalf); or
- a Commonwealth, state or territory government, or agency that is aware of a proposal by a person to take an action, and that has administrative responsibilities relating to the action[7].

Project title:

8.1 Person proposing to take action

This is the individual, government agency or company that will be principally responsible for, or who will carry out, the proposed action.

If the proposed action will be taken under a contract or other arrangement, this is:

- the person for whose benefit the action will be taken; or
- the person who procured the contract or other arrangement and who will have principal control and responsibility for the taking of the proposed action.

If the proposed action requires a permit under the Great Barrier Reef Marine Park Act[8], this is the person requiring the grant of a GBRMP permission.

The Minister may also request relevant additional information from this person.

If further assessment and approval for the action is required, any approval which may be granted will be issued to the person proposing to take the action. This person will be responsible for complying with any conditions attached to the approval.

If the Minister decides that further assessment and approval is required, the Minister must designate a person as a proponent of the action. The proponent is responsible for meeting the requirements of the EPBC Act during the assessment process. The proponent will generally be the person proposing to take the action[9].

Name	Chris Dunks
Title	Managing Director
Organisation	Bright Phase Pty Limited
ACN / ABN (if applicable)	127 819 710
Postal address	PO Box 256 HOLLAND PARK QLD 4121
Telephone	+61 410 435 554
Email	chrisd@brightphase.com.au
Declaration	I declare that the information contained in this form is, to my knowledge, true and not misleading. I agree to be the proponent for this action.
Signature	Date

[7] *If the proposed action is to be taken by a Commonwealth, state or territory government or agency, section 8.1 of this form should be completed. However, if the government or agency is aware of, and has administrative responsibilities relating to, a proposed action that is to be taken by another person which has not otherwise been referred, please contact the Referrals Business Entry Point (1800 803 772) to obtain an alternative contacts, signatures and declarations page.*

[8] *If your referred action, or a component of it, is to be taken in the Great Barrier Reef Marine Park the Minister is required to provide a copy of your referral to the Great Barrier Reef Marine Park Authority (GBRMPA) (see section 73A,* EPBC Act*). For information about how the GBRMPA may use your information, see http://www.gbrmpa.gov.au/privacy/privacy_notice_for_permits.*

[9] *If a person other than the person proposing to take action is to be nominated as the proponent, please contact the Referrals Business Entry Point (1800 803 772) to obtain an alternative contacts, signatures and declarations page.*

8.2 Person preparing the referral information (if different from 8.1)

Individual or organisation who has prepared the information contained in this referral form.

Name	Dr Michael Pollington
Title	Senior Environmental Scientist
Organisation	pitt&sherry
ACN / ABN (if applicable)	77 009 586 083
Postal address	GPO Box 94
	HOBART TAS 7001
Telephone	(03) 6210 1412
Email	mpollington@pittsh.com.au

Declaration I declare that the information contained in this form is, to my knowledge, true and not misleading.

Signature Date

Notice of Intent
Cleveland Mine
Tailings Reprocessing and Mine Exploration Project 2011

Prepared for:	Bright Phase Pty Ltd
Prepared by:	Linda Drummond & Jim Lockley December 2011

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Attachment A Project Area Maps
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Attachment C Conceptual Project Layout
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Attachment F Aboriginal Heritage Tasmania Correspondence
Attachment G Ecological Report
Attachment H Transport Route

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Authorised by: _____ Date: 20 December 2011
Jim Lockley

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1. Introduction

Bright Phase Pty Ltd (Bright Phase) is a wholly owned subsidiary of Bright Phase Resources Ltd (BPRL). Bright Phase is proposing to mine and reprocess approximately 4 million tonnes of tailings contained in two historic tailings storage facilities (TSF) at the closed Cleveland Mine at Luina in northwest Tasmania.

Bright Phase is also proposing during the life of the tailings reprocessing operation to dewater and explore the historic Cleveland Mine, which is currently flooded, to determine the viability of any future underground hard rock mining.

It is proposed to locate the reprocessing facilities in the area of the original mill site. The tailings from the reprocessing will be returned to the mined out historic TSFs and the TSFs will then be rehabilitated. Sulphidic tailings resulting from the tailings reprocessing will be stored in new TSF cells. By reprocessing the tailings the acid producing metals and sulphides will be removed which should reduce the existing acid mine drainage in the area.

The aims of the project are:

- To recover and realise the significant mineral values contained in the historic TSFs
- To reduce the significant acid mine drainage emissions to the Whyte River which flows to the Pieman River at Corinna which in turn flows to the west into the Southern Ocean
- To store the treated and relatively benign tailings in more secure and stable facilities to ANCOLD and best practice standards
- To reuse or store the sulphidic tailings in more secure and stable facilities to ANCOLD and best practice standards
- To dewater and explore the old underground workings to determine if underground mining and mineral processing can recommence at the mine.

2. Notice of Intent

The NOI has been developed in accordance with the Tasmanian Environment Protection Authority NOI guidelines and the requirements of Section 27B of the *Environmental Management and Pollution Control Act 1994*.

The general NOI requirements are addressed in this section in the order that the requirements appear in the guidelines.

2.1 Contact Details

"1. The name and contact details of the person lodging the application."

Dr Mike Adams – Technical Director
Bright Phase Pty Ltd
PO Box 374, Guildford WA 6935
Phone: +61 417 776 095
Email: mikea@brightphase.com.au

2.2 Project Name and its Location

"2. The name of the proposed project and its location."

The project name will be the Cleveland Mine – Tailings Reprocessing and Mine Exploration Project. The designated project area of 156 ha is located on the Exploration Licence EL7/2005 which covers an area of 18 km^2. The project area is shown in Figure 1 below and **Attachment A.**

The exploration licence, former mining lease and other relevant site appreciation information are contained in **Attachment B**. The designated project area is on Crown Land – State Forest, managed by Forestry Tasmania.

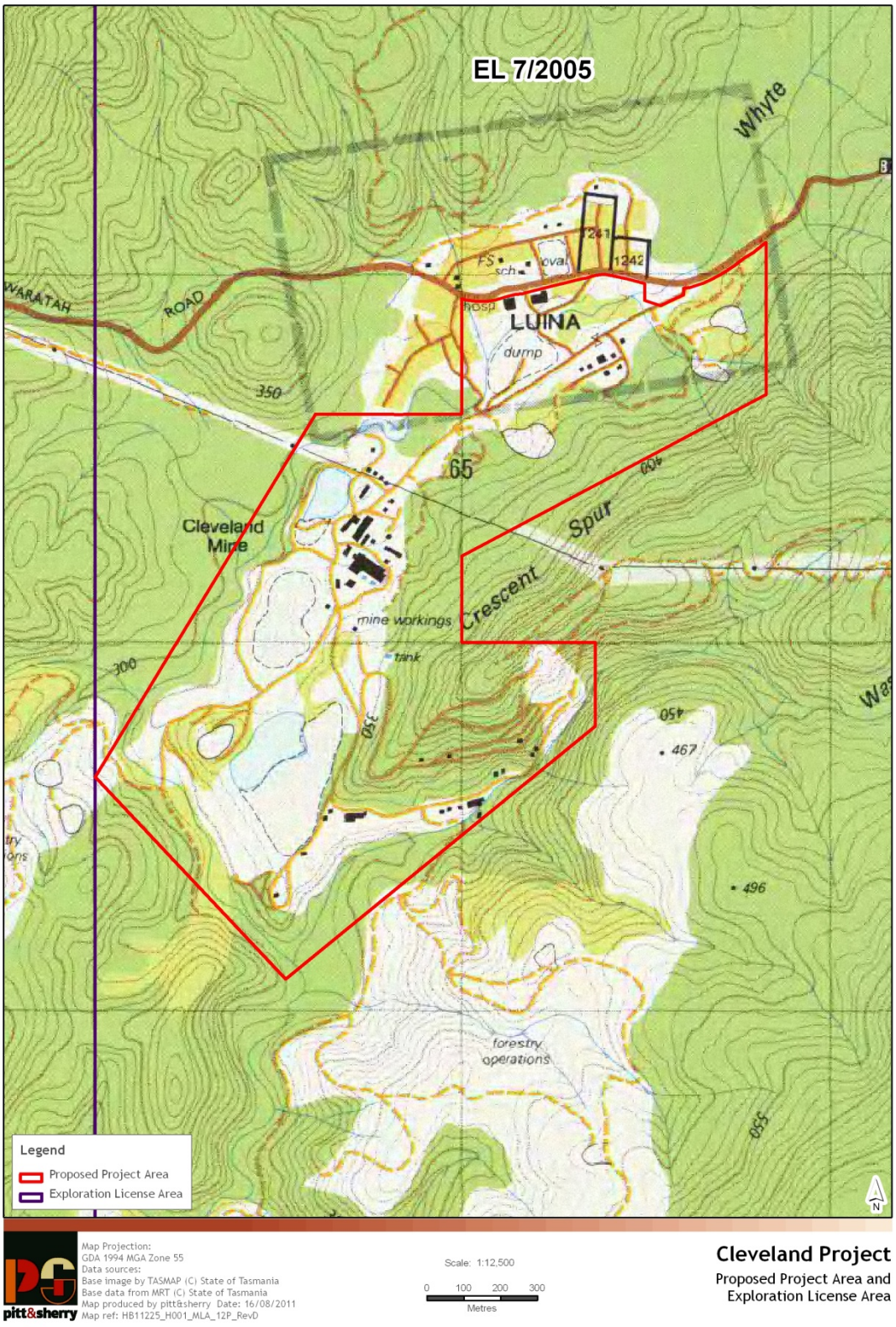


Figure 1 - Cleveland Mine – Tailings Reprocessing and Mine Exploration Project

2.3 Proponent Background

"3. Background of the project proponent, including details of the proponent's experience and financial capacity to undertake the project and his, her or its contact details."

Bright Phase Pty Ltd (Bright Phase) is a company involved with the development of mineral resources projects and is a wholly owned subsidiary of Bright Phase Resources Limited, a public unlisted Australian-based company.

Bright Phase has an exclusive agreement covering staged ownership and the rights to develop the Cleveland Project, based around the historic Cleveland tin-copper mine located in North Western Tasmania.

Bright Phase has not yet been involved in the development of a mine. The company has no track record of operational experience. However, company personnel have had extensive experience in metallurgical processes and environmental management associated with mining operations.

Contact details are contained in Section 2.1.

2.4 Project Description

" 4. A description of the proposed project, including its key physical components."

The original Cleveland tin mine opened near Waratah in 1908 and operated until 1917. Aberfoyle Resources Limited later reopened Cleveland in 1968, continuing to work the deposit until 1986 and processed about 5.7 million tonnes of ore. Underground hard rock mining operations ceased in 1986 due to the collapse of tin prices.

Due to technical limitations at the time, the original mining activities were not able to recover more than approximately 60% of the tin from the mined ore. Significant advances in minerals processing since that time have enabled the opportunity to reprocess the old mine tailings to win the previously unrecoverable mineral values. The project resource consists of approximately 4 million tonnes of historic mill tailings.

Bright Phase Pty Ltd proposes to mine and reprocess the tailings at the old Cleveland Tin Mine at a rate up to 100 tonnes per hour (tph) or approximately 900,000 tonnes per year (t/y). The initial rate of processing, based on the use a modular type plant, will be approximately 35-40 tph or 300,000-500,000 t/y. The production rate will be increased by adding extra modular sections onto the preliminary plant.

The proposal will consist of the following:

- Infrastructure development - power, water, site access and transport
- Installation of a new modern modular processing plant
- Construction of a new TSF with dedicated cells for the different reprocessed tailings disposal streams
- Commissioning of new plant and new TSF
- Tailings reclamation
- Tailings disposal to new higher standard facilities
- Product transport and sales
- Metallurgical processes optimisation
- Mine dewatering for exploration.

A conceptual project layout is shown in **Attachment C**.

Tailings reclamation

The tailings are currently contained in two TSFs, known as the No. 1 Tailings Dam and the No. 2 Tailings Dam. The tailings material from both dams will be reclaimed using an excavator feeding a pump hopper along with process water.

The tailings will be transported by pumping a slurry of the tailings to the processing mill feed tank via a pipeline. The tailings will then undergo secondary screening and cleaning before the mineral processing operation.

Plant and new tailings dam locations

The designated project area contains areas that have been heavily disturbed from the historic mining, mineral processing and rehabilitation activities. The location of the old mill footprint, concrete pads and footings, roads, culverts and bitumen sealed areas around the old plant area dictates that these areas should be used again.

The new plant and infrastructure will therefore be in the same location as the old plant, subject to the outcome of hydrological and other assessments conducted as part of the project detailed design studies.

Tailings from which sulphide minerals have been substantially removed will be paste thickened and initially pumped to a dedicated cell in a new TSF to be constructed within the proposed project area marked 'potential dams and clay borrow pits' in **Attachment C**.

The tailings containing sulphides will be paste thickened and pumped to dedicated cells in a new TSF to be constructed within the proposed project area marked as 'potential dams and clay borrow pits' in **Attachment C**.

The TSFs and their dedicated cells will be designed, constructed and operated in accordance with ANCOLD standards and best practice environmental management.

As the mining and reprocessing of the old tailings progresses, it is expected that the reprocessed tailings (from which the sulphides have been substantially removed) will be stored in new cells created in the historic TSFs once space has been made available.

The individual cells and ultimately the TSFs will be closed, capped and revegetated to an agreed scope in consultation with the land manager, regulators, key stakeholders and interested parties.

Should the underground mine be dewatered and mining recommenced, then on closure the underground mine will be allowed to flood to natural levels, as currently exist.

The closure and rehabilitation plan will be designed and implemented using best practice in mining guidelines, the Tasmanian EPA closure plan guidelines and the Strategic Framework for Mine Closure, Australian and New Zealand Minerals and Energy Council & Minerals Council of Australia guidelines.

The retreatment of the tailings can be viewed as a clean-up operation, with the additional benefit of helping alleviate future ongoing acid drainage issues.

Metallurgical processes

The operation will require the application of modern micro-characterization, ore typing and mineral processing techniques as well as access to the fast turnaround of specialist assays and metallurgical testing. An indicative process schematic diagram is shown in **Attachment D**.

A range of particle liberation, separation and concentration techniques will be used, incorporating a blend of established and modern commercially-proven innovations. Basic front-end process preparation will be required before the tailings enter the reprocessing plant proper. The process will result in the recovery of coarse cassiterite using conventional and centrifugal gravity separators and fine cassiterite with fine froth flotation and centrifugal concentrators. Copper will be recovered upfront as a concentrate and a copper sulphide-rich concentrate will be also produced by fine froth flotation.

Modular process plant

The project will initially deploy a small conventional mobile modular gravity/flotation plant capable of a nominal 35-40 tph (300,000-500,000 t/y) throughput. A reprocessing rate of up to approximately 100 tph (equivalent to 900,000 t/y) may be achieved, subject to techno-economic assessment, by retrofitting extra modules to the plant.

During the tailings reprocessing activity, the plant will also serve to gather techno-economic data for any potential future underground hard rock ore processing operation.

Milling and attritioning

A blended tailings slurry will be fed at an initially rate 35-40 tph into a trommel (a revolving cylindrical screen). Some disaggregation of cemented particles will also occur via the scrubbing action within the trommel. Oversize material >2 mm will be discharged from the end of the trommel and will be fed into a ball mill along with the Derrick screen oversize recycle from the process. The <2 mm size material passing through the trommel will proceed to the next unit process operation.

At this stage it is not proposed to treat any HMS Float material that may remain stored on site. However if it is treated in future, it will be fed at a nominal 10-16 tph into a bin feeding a hammer mill screening at 12 mm for feeding into the tailings processing plant ball mill (separate or blended with the old tailings mill feed).

A regrind mill will be used on the bulk sulphide flotation tail to promote liberation of cassiterite. Stirred milling for a nominal feed rate of 35-40 tph will be employed as the most efficient method for this operation.

Gravity separation

Tin ore processing typically relies on the high specific gravity of the tin ore (the S.G. of cassiterite is 6.9 g/cm^3) compared with the lighter gangue minerals (quartz, micas, chlorite S.G. ~2.6 g/cm^3) and the iron-containing minerals (such as pyrite, pyrrhotite, hematite S.G. ~5 g/cm^3).

Hydrocyclones will be used on the reground bulk sulphide float tail to produce a coarse particle stream containing gravity-recoverable cassiterite and fine-particle stream containing flotation-recoverable cassiterite.

Coarse gravity recovery will be used on de-slimed material to generate a high-grade coarse tin concentrate and conventional proven centrifugal concentration (e.g. Falcon C Series Separators) will be used for recovery of coarse cassiterite after liberation by stirred milling and classification.

Gravity separation of fine cassiterite in final flotation concentration will be undertaken as a final cleaning stage using Falcon UF series centrifugal separators.

Flotation

Magnetic separation, using wet high intensity magnetic separators, will be used for the removal of magnetic iron oxide minerals and some magnetic iron sulphides. Following this conventional differential sulphide flotation will be used for the generation of a copper concentrate and removal of deleterious iron sulphide minerals.

Cassiterite flotation has been deployed at many commercial installations over the last fifty years. Addition of collector, depressant and frother reagents will be made to an aerated pulp in a suitably designed cell to ensure adherence of value mineral particles to bubbles for recovery as a froth overflow, whilst allowing the gangue minerals not to adhere to bubbles and to separate via gravity. A combination of roughers, cleaners and scavenging cells will be typically used for the separation.

Modern flotation reagents have been developed that are more selective than those historically used. Modern commercially-proven fine-particle flotation devices allowing fines to be more readily floated will also be used as secondary scavenger cells.

Fine valuable mineral particles will be recovered from re-cleaners using fine particle gravity and flotation devices, selected from metallurgical test work results.

Products

Tin concentrates from the gravity and flotation processes will be recovered by thickening and filtration and blended to provide a bulk tin concentrate that will be bagged and transported for sale.

Copper concentrate will also be recovered by thickening and filtration and blended to provide a bulk copper concentrate.

Tailings storage facilities

The proposed life of the Cleveland Mine Tailings Reprocessing and Mine Exploration project will be approximately 5 years (up to approximately 10 years), with a finite old tailings storage and raw material resource of approximately 4 million tonnes.

Tailings storage engineering will include the necessary environmental considerations, such that mine tailings are impounded safely, responsibly and cost-effectively and the design process will include:

- Design approvals
- Tailings pumping, piping, initial earthworks, drainage and decant facilities and return water storage and pumping
- Operating manuals specific to each facility
- Closure planning, dam abandonment and site rehabilitation.

The design philosophy will incorporate:

- Hazard rating
- Risk-based design methods considering the high precipitation and environmentally sensitive region
- Consideration of the acid mine drainage (AMD) producing properties of the individual tailings materials
- Optimisation of the disposal technique in minimizing water usage
- Industry best-practice closure and rehabilitation plan.

Infrastructure

The historic tailings are situated near the old mine and mill areas and consequently the area is well accessed by historic infrastructure. The project area is only 13 kilometres from the nearest town (Waratah) and approximately 60 km from the nearest city (Burnie) and will be serviced by the existing sealed roads.

Onsite roads will require refurbishment. High voltage power lines run through the project area; access is under discussion with the relevant parties. The process plant will need a reliable supply of water throughout the year. This will be drawn from the Whyte River, which is expected to have the capacity to supply an adequate amount of water. A water licence under the Tasmanian *Water Management Act 1999* will be required as part of the project approval.

It is likely that a limestone neutralization facility will be required for the treatment of strong process bleed offs, if present. For low strength discharges it is likely that passive treatment will be adopted followed by a settlement dam and wetlands.

Appropriate treatment is proposed to ensure that discharge water from the plant operations and mine dewatering will be discharged in accordance to the Tasmanian *State Policy on Water Quality Management 1997* (State Water Policy). In this way, the current AMD issue from the historical operation will be positively impacted.

Only relatively small quantities of chemicals such as flotation reagents, flocculants and grinding media will be required under the current plan. These will be easily supplied, given that several other operating mines and processing plants exist in the general region.

Exploration and geotechnical investigations

The historic Cleveland underground mine is currently closed and flooded to natural levels. Any future underground hard rock mining at Cleveland will be subject to exploration and geotechnical investigations and is separate from this project. This project will however include the dewatering of the mine so that exploration and geotechnical assessment can proceed at some future date.

During the tailings reprocessing operations, exploration and geotechnical investigations of the historic Cleveland Mine workings will be undertaken with a view to provide an ongoing resource to the processing plant once the tailings resource approaches depletion.

It is proposed to undertake surface and underground exploration drilling to determine if viable and economic tin, copper and tungsten resources exist, both in known remaining tin lodes and in an area of tungsten mineralisation known as the 'Foley Zone'. In order to undertake the underground exploration and ground stability investigations, the mine will need to be dewatered and the water discharged to either Washington Creek or the Whyte River.

Mine dewatering and discharge

The mine dewatering will require a monitoring and management regime. It is expected that the mine water quality monitoring will consist of the following practices.

- Daily monitoring of the physical water quality parameters such as pH, EC, turbidity
- Weekly monitoring of sulphate and heavy metals
- Maximising the volume of the mine water reused in the processing plant
- Minimising the volume of mine water for discharge
- Measuring the discharge flow rate to the receiving waters

- Controlling the discharge rate of the mine water to Washington Creek or the Whyte River in accordance with the State Policy on Water Quality Management 1997 (State Water Policy)
- If necessary, establishing a discharge regime that achieves a water quality objective within a designated mixing zone in accordance with the State Water Policy
- If necessary, treating the mine water to an appropriate discharge quality.

Mine access

Mine access will be via the main mine portal. The currently closed portal will be reopened and the mine will be accessed down the main decline as the water level is lowered.

The water will be removed from the mine by potentially two pumping methods. One by surface mounted diesel powered pumps with long reinforced suction hoses installed into the historic workings or in new shafts. The second by transportable skid mounted diesel powered pumps deployed underground and moved down into the mine as the level falls. The dewatering may ultimately involve both modes of operations as well as the use of submersible pumps.

The dewatering pump suction lines will be flexible reinforced hoses with air tight sealed fittings. The delivery lines are expected to be flexible black poly type lines that will deliver the mine water to flow detention ponds and settling ponds for reuse in the process or for discharge.

The mine will be accessed in a manner that minimises the risk of sludge disturbance which has the potential to affect mine water quality. No sludge is expected to be encountered in the upper levels of the old mine workings. If necessary, settling basins will be installed in the mine and outside of the mine to minimise the risk of mine sludge sediment loss from the operation.

The diesel for the diesel power supply or diesel drives for the pumps will be transported, stored and used in accordance with the dangerous goods requirements.

Any diesel or chemical spills over 20 L will be contained, cleaned up, reported and disposed of in accordance with the notification and waste management requirements of the *Environmental Management and Pollution Control Act 1994*.

Mine exploration & investigation

Any exploration above and below ground will be undertaken in accordance with the Tasmanian Mineral Exploration Code of Practice.

2.5 Project Location

"5. An outline of the proposed location of the project and a general site location map."

The proposed project area of 156 ha is located on the Exploration Licence EL7/2005. EL7/2005 is located over the former Luina township area and covers an area of approximately 18 km^2. The project lies in Western Tasmania to the west of Waratah and southwest of Burnie (TASMAP 1:25,000 series, Luina map sheet 3640).

Access to the site from Burnie is via the following major sealed roads:

- Bass Highway;
- Massey Green Development Road;
- Ridgley Highway; and
- Waratah Road.

The project regional setting is shown in Figure 2 below and **Attachment E**. The local setting is shown in Figure 3 below.

The locations of the project infrastructure have already been indicated in **Attachment A** and **Attachment C**.

Figure 2 Regional setting

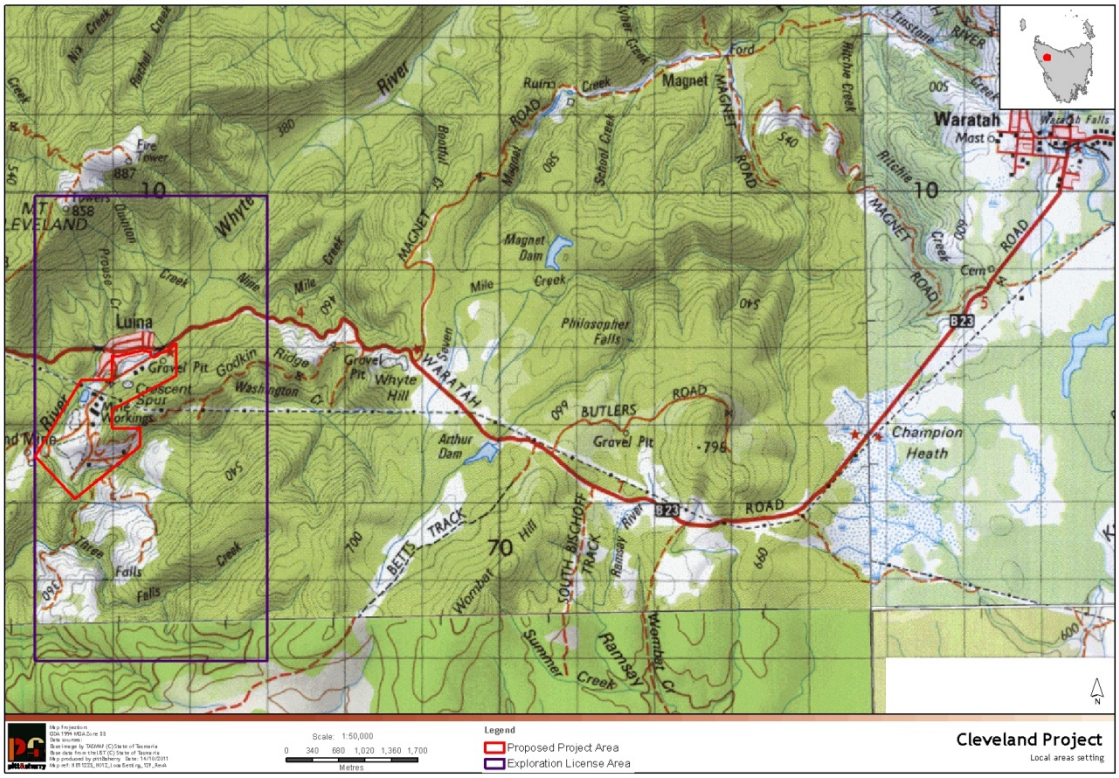


Figure 3 Local setting

2.6 Stakeholder Consultation

"6. An outline of the stakeholder consultation process undertaken or proposed to be undertaken, including the consultation method, stakeholders consulted or to be consulted and the issues raised or to be raised."

Consultation has been undertaken with key stakeholders and regulators including:

- Aboriginal Heritage Tasmania
- Crown Land Services
- Commonwealth Department of Sustainability, Environment, Water, Population and Communities (EPBC referral)
- Forestry Tasmania
- Mineral Resources Tasmania
- Tasmanian EPA
- Tasmanian Police
- Tarkine National Coalition
- Waratah-Wynyard Council.

2.7 Physical Environment

"7. A general description of the physical environment that may be affected by the project."

The proposed mine site is located on predominantly disturbed and rehabilitated land associated with the former Luina township and historic mining and mineral processing areas. A site appreciation can be gained from aerial photographs and relevant documents contained in **Attachment B**.

Elevation varies considerably over the site, ranging from approximately 290 m AHD to 400 m AHD. Gradients are greatest on the eastern side of the project area, particularly where it extends up across Crescent Spur.

Drainage in the areas is via the Whyte River and Washington Creek, a tributary of the Whyte River. The Whyte River flows to the southwest to the confluence with the Pieman River just above Corinna. The Pieman River flows into the Southern Ocean.

As the proposed mining of the tailings will use the existing infrastructure, there should not be a large impact on the existing physical environment.

The project is not located in the 'Tarkine' as registered on the national estate but is surrounded by the 'Tarkine' and a forest reserve exists in the project area which will require assessment and management in consultation with Forestry Tasmania.

2.8 Key Issues

"8. The key environmental, health, economic and social issues identified for the project to date."

Environmental issues

The key potential environmental issues identified for the project are:

- Aboriginal heritage. Aboriginal Heritage Tasmania has undertaken a desktop assessment and no further assessment is deemed necessary. The AHT correspondence is contained in Attachment F
- The project area may form part of the home range of species including the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil, but it is highly unlikely that features such as nests or dens are present within the study area itself. Refer to the ecological assessment in Attachment G for further details
- The wider area supports potential nesting habitat for the wedge-tailed eagle (Aquila audax subsp. fleayi). Please refer to the Ecological Assessment in Attachment G for further details
- Soils of the area have a high susceptibility to sheet erosion
- Maximum possible impact on native vegetation is approximately 30 ha. None of the potentially impacted native vegetation communities are listed as threatened under the Schedule 3A of the Nature Conservation Act 2002 or under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999
- Weed management
- PC management. Not likely to be an issue on the site. Refer to Attachment G Management plans will be implemented if required
- Materials transport, storage and handling
- Road kill due to increased traffic movements
- Surface water management
- Acid Mine Drainage
- Stable landform establishment
- Dust management.

The project has the potential to remediate historic site degradation and improve the quality of the local environment and fauna habitat.

Cleveland tailings, like many base-metal sulphide abandoned mine sites, contain acid-generating components that can result in acid mine drainage (AMD). A Cleveland tailings retreatment project will have a major positive impact on the long-term environmental pollution into the Whyte River from the historic mine workings by removing acidic sulphide and metal contaminants at source, a key incentive for project to proceed.

Health issues

The potential health impacts identified to date are:

- Potential dust generation
- Slight increase in traffic movements on existing road infrastructure.

Economic and social issues

There appears to be no economic or social downside to the project, and there is the potential to provide economic and social benefits at the local, regional and state levels. It is predicted that

- ~50 jobs will be created during construction
- ~30 jobs will be created when operational.

The estimated cost of the project will be in the order of $18M. The estimated value of the resource based on the current resource understanding and forecast prices is approximately $350M.

2.9 Surveys and Studies

"9. The surveys and studies proposed or underway in relation to the key issues for the project."

The following surveys and studies have been completed, are underway, or are proposed, in order to address the key issues identified with the project:

- Flora and fauna assessment: completed September 2011
- Helicopter based eagle nest survey: completed September 2011
- Baseline surface water quality surveys: commenced Feb 2010
- Tailings dams exploration drilling Round 2 proposed
- Pre-feasibility geotechnical surveys and mine planning: proposed
- Operational surface water quality monitoring: proposed
- Operational mine water monitoring: proposed
- Groundwater monitoring: proposed
- Detailed geotechnical surveys: proposed
- Detailed project design: proposed.

2.10 Proposed Timetable

"10. The proposed timetable for the project."

The following timetable is currently anticipated:

- Late 2011 / early 2012: NOI submission to EPA Board for issuing of project specific Development Proposal and Environmental Management Plan (DPEMP) guidelines
- Late 2011 / early 2012: Mining Lease Application (MLA) to Mineral Resources Tasmania (MRT)
- Early 2012: Receipt of EPA Board DPEMP guidelines
- Early 2012: Drafting of the DPEMP
- First Quarter 2012: Finalising DPEMP with proponent and EPA
- First quarter 2012: DA application to Waratah Wynyard Council (supported by DPEMP)
- Mid 2012: Project planning and environmental approval
- Mid 2012: Commencement of construction early works
- Late 2012: Commissioning of operations
- Late 2012 to 2017: Planned 5 year project life (may be up to ~10 years)
- 2012 – 2017: Dewatering and exploration of old underground mine workings.

Exploration of the underground workings may result in reopening of the mine. This reopening and further ongoing underground exploration work may result in an extension of the anticipated life of the project.

Exploration on other areas of the lease may also result in an extension of the project life.

2.11 Commonwealth Approval

11. Any other details that the Board may consider relevant to the project. For the purposes of Section 27B(2)(k) of the EMPC Act, the Board has specified that a NOI is to contain the following relevant details:

a) Whether the project requires or is likely to require approval under the *Environment Protection and Biodiversity Conservation Act 1999* (which will be determined by the project's potential to impact upon matters of national environmental significance or upon Commonwealth land); and

b) Whether the proponent has or intends to refer the project to the Commonwealth Government for a determination on whether approval under the *Environment Protection and Biodiversity Conservation Act 1999* is required.

Nationally listed species

The project area may form part of the home range of species including:

- Tyto novaehollandiae subsp. castanops (masked owl) - vulnerable
- Aquila audax subsp. fleayi (wedge-tailed eagle) - endangered
- Dasyurus maculatus subsp. maculatus (spotted-tailed quoll) - vulnerable
- Sarcophilus harrisii (tasmanian devil) - endangered.

The wider area supports potential nesting habitat for the wedge-tailed eagle (*Aquila audax* subsp. *fleayi*).

The project has been referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities for approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA).

The referral dated 28 September 2011 was posted to SEWPC 29 September 2011.

SEWPC notified the proponent 14 November 2011 that the project was a controlled action under the EPBCA. The SEWPC is yet to advise if the project will be assessed under the bilateral agreement between the State and the Commonwealth governments under the EPBCA.

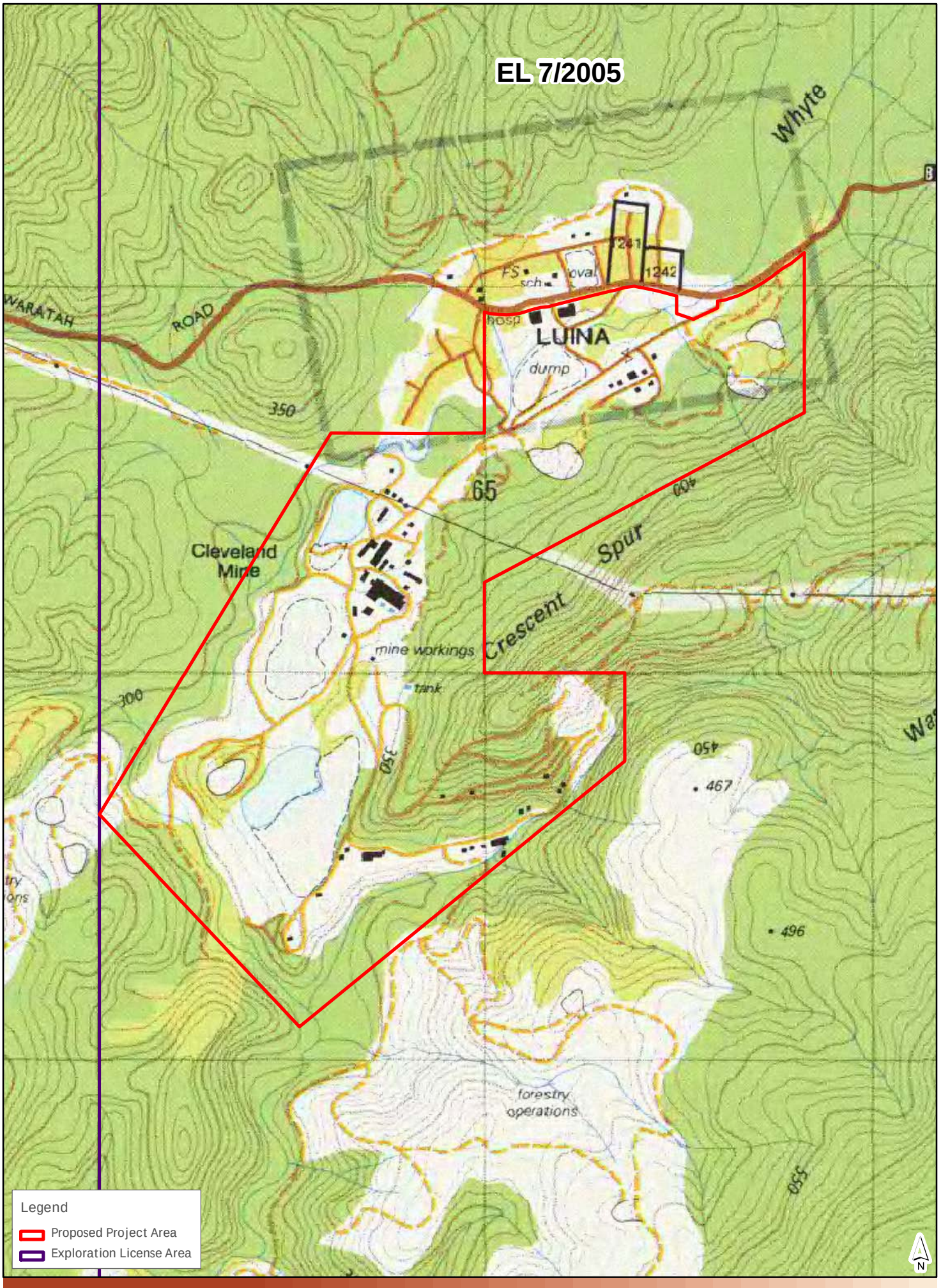
3. Extra Project Details

The traffic impact is expected to be minimal as only a maximum of 3 truckloads of tin concentrate and copper concentrate will be transported to Burnie each day. A desktop traffic impact assessment will be undertaken as part of the DPEMP.

The transport route is shown in **Attachment H.**

Attachment A

Project Area Maps



Map Projection:
GDA 1994 MGA Zone 55
Data sources:
Base image by TASMAP (C) State of Tasmania
Base data from MRT (C) State of Tasmania
Map produced by pitt&sherry Date: 16/08/2011
Map ref: HB11225_H001_MLA_12P_RevD

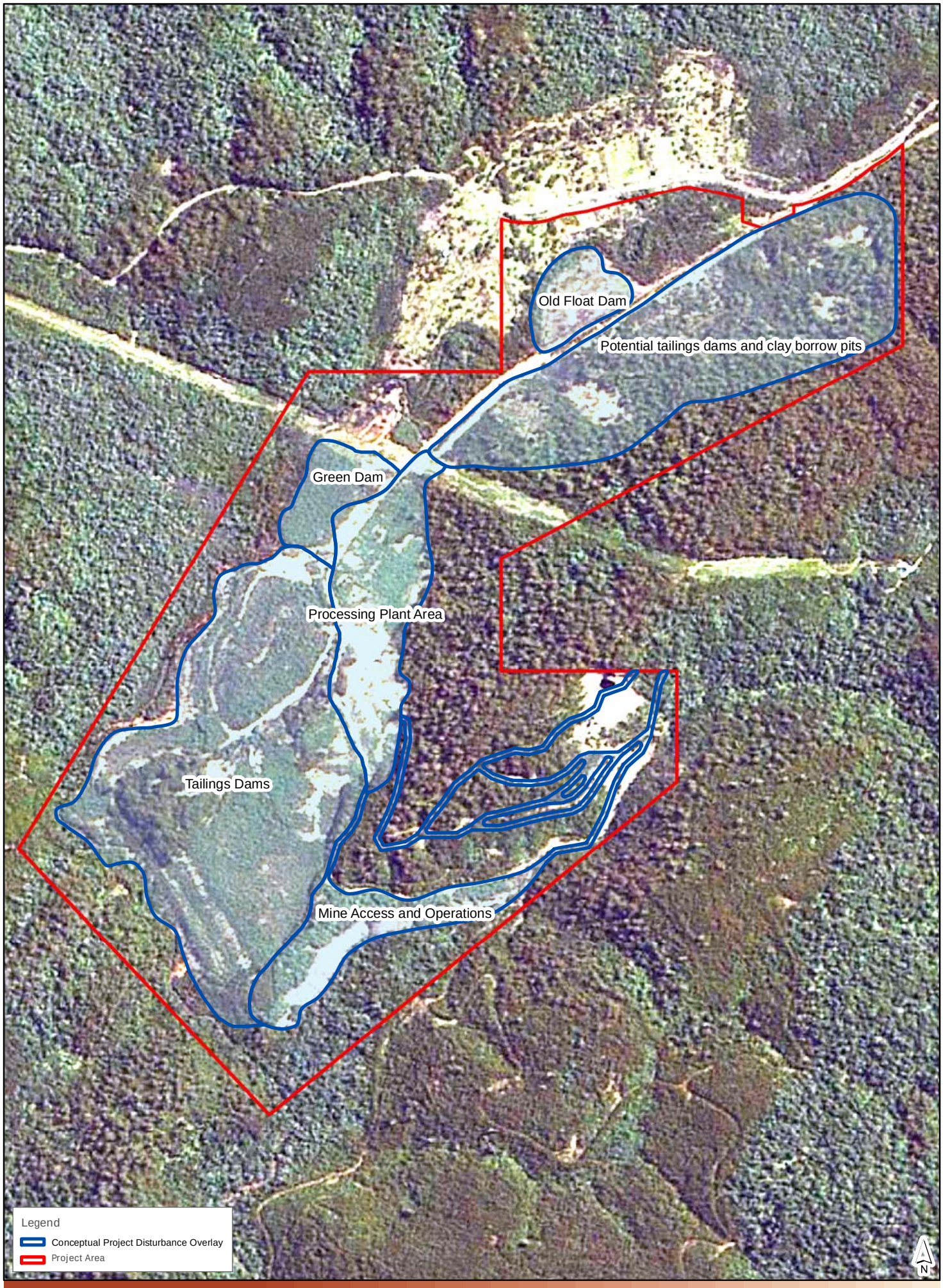
pitt&sherry

Scale: 1:12,500

0 100 200 300
Metres

Cleveland Project

Proposed Project Area and
Exploration License Area



Map Projection:
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Base data from theLIST (C) State of Tasmania
Map produced by pitt&sherry Date: 8/09/2011
Map ref: HB11225_H010_ProjectFootprint_Aerial_12P_RevC

Scale: 1:10,000

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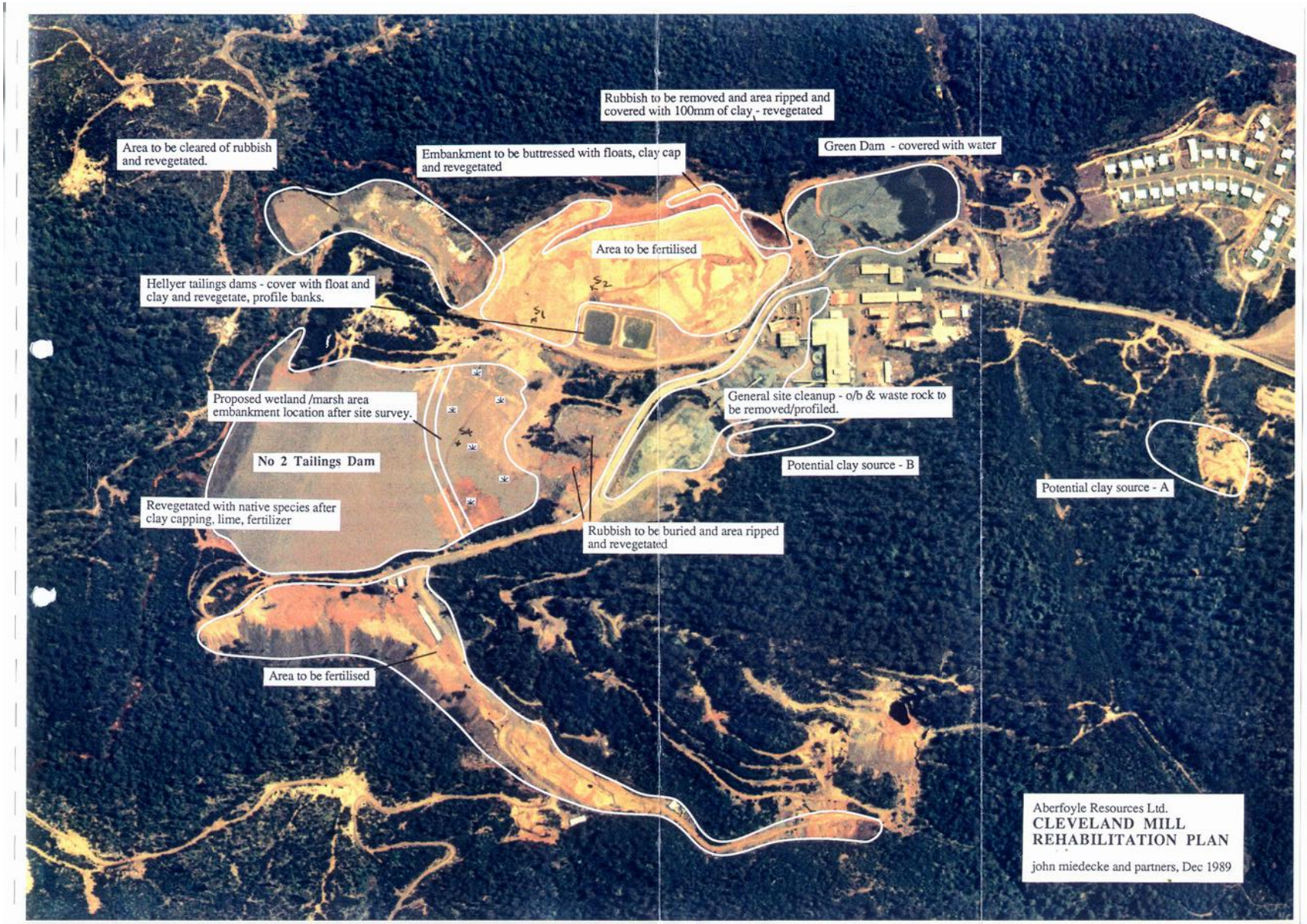
Metres

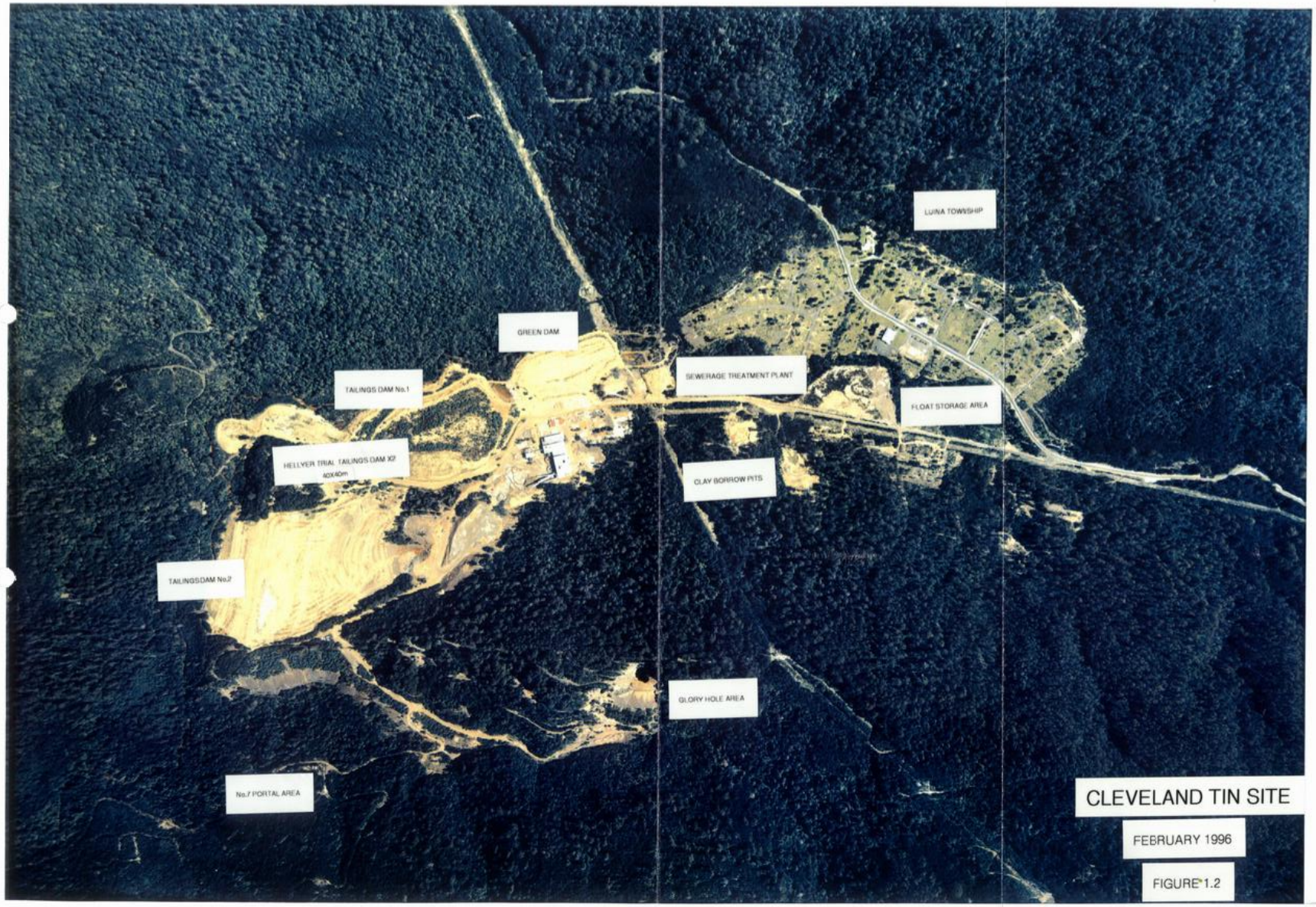
Cleveland Project

Conceptual Project Disturbance Overlay

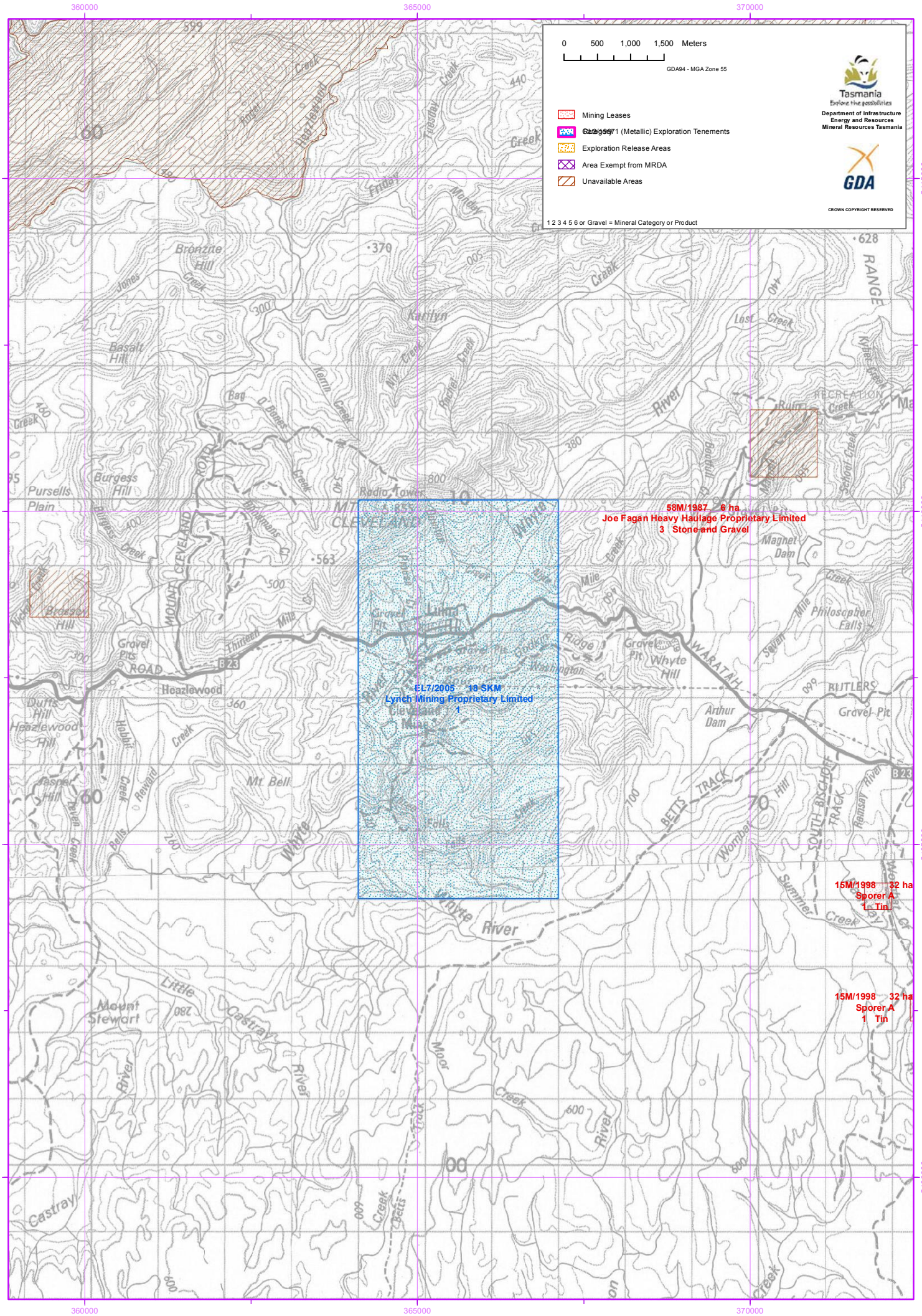
Attachment B

Site Appreciation Information


Rubbish to be removed and area ripped and covered with 100mm of clay - revegetated
Area to be cleared of rubbish and revegetated.
Embankment to be buttressed with floats, clay cap and revegetated
Green Dam - covered with water
Area to be fertilised
Hellyer tailings dams - cover with float and clay and revegetate, profile banks.
Proposed wetland /marsh area embankment location after site survey.
General site cleanup - o/b & waste rock to be removed/profiled.
No 2 Tailings Dam
Potential clay source - B
Potential clay source - A
Revegetated with native species after clay capping, lime, fertilizer
Rubbish to be buried and area ripped and revegetated
Area to be fertilised
Aberfoyle Resources Ltd.
CLEVELAND MILL
REHABILITATION PLAN
john miedecke and partners, Dec 1989


LUINA TOWNSHIP
GREEN DAM
SEWERAGE TREATMENT PLANT
TAILINGS DAM No.1
FLOAT STORAGE AREA
HELLYER TRIAL TAILINGS DAM X2
40X40m
CLAY BORROW PITS
TAILINGSDAM No.2
GLORY HOLE AREA
No.7 PORTAL AREA
CLEVELAND TIN SITE
FEBRUARY 1996
FIGURE 1.2

Photos of acid drainage from tailings dam wall to Whyte River.


0 500 1,000 1,500 Meters
GDA94 - MGA Zone 55
Tasmania
Department of Infrastructure Energy and Resources
Mineral Resources Tasmania
GDA
CROWN COPYRIGHT RESERVED
Mining Leases
Exploration Licences
Current (Metallic) Exploration Tenements
Exploration Release Areas
Area Exempt from MRDA
Unavailable Areas
1 2 3 4 5 6 or Gravel = Mineral Category or Product
360000
365000
370000
5415000
5410000
5405000
5400000
58M/1987 6 ha
Joe Fagan Heavy Haulage Proprietary Limited
3 Stone and Gravel
EL7/2005 18 SKM
Lynch Mining Proprietary Limited
1
15M/1998 32 ha
Sporer A
1 Tin
15M/1998 32 ha
Sporer A
1 Tin
Cleveland
Mount Cleveland
Heazlewood
Pursells Plain
Burgess Hill
Bronzite Hill
Basalt Hill
Fraser Hill
Duffs Hill
Heazlewood Hill
Jasper Hill
Mt. Bell
Whyte River
Mount Stewart
Castray River
Little Castray River
Whyte Hill
Arthur Dam
Magnet Dam
Philosopher Falls
Gravel Pit
Gravel Pits
Radio Tower
ROAD
B23
BETTS TRACK
SOUTH BISCHOFF TRACK
RANGE
RECREATION

Tasmania

DEPARTMENT *of*
TOURISM, ARTS *and the* ENVIRONMENT

MEMORANDUM

File No: 038262

TO: Warren Jones
CC: Anthony Brown, Carol Bacon, Wojciech Grun, Robin Halfacre, Floyd Browne, David Mitchell
FROM: Bruce Terry **EXT:** 2411

DATE: **1 December 2006**

SUBJECT: **Cleveland Mine Rehabilitation & ARD Seepages**

Background

This document is in response to the memorandum from Wojciech Grun (WG), addressed to the Director of Mines with CC to the Director of Environmental Management, dated 7 July 2006 and titled 'Luina tailings, seepage into Whyte River'. WG's memorandum outlines an inspection he did with Robin Halfacre on 23 June 2006 at the former Cleveland Tin tailings storage facility (TSF). WG highlighted issues with the rehabilitation and the water quality. The recommended action proposed was to establish the need for remediation works and a thorough joint inspection between MRT and DTAE at the site.

Some of the images from WG's inspection, showing acid rock drainage (ARD) seepages, were used by the Director of Environmental Management in the presentation at the Tasmanian Minerals Council Sustainable Development Conference on 15 September 2006.

With an aim of confirming the observations made by WG, and collecting evidence to assist with future decision making, I undertook a subsequent inspection on 21 September 2006. Several hours were spent looking at the condition of rehabilitation, taking photos and collecting water samples.

Synthesis

Analysis of the information collected during the inspection on 21 September 2006 confirms the observations made by WG, notably there is ARD generation on site and some of the rehabilitation is failing. It would appear that the site is degrading and presents a liability to the State.

More work is required to fully quantify the issues on site. Once sufficient information is obtained on the issues then a fully informed decision can be made on what course of action is required. One of the key criteria that needs to be established for any future work, is the need to document what lessons can be learnt from the remediation at the Cleveland Mine, including why current issues exist and how they can be prevented in the future. This is especially important as we try and move forward with establishing closure criteria for other mines. Other important outcomes include, what remediation needs to be done to improve the existing

site and through this what mechanisms can be identified to ensure successful remediation can be achieved here and elsewhere.

Rehabilitation

Aerial photos taken in 1980 and 2000 [Figure 1a and Figure 1b] show differences between an active operation and a site that has had buildings decommissioned and rehabilitation started. Figure 1b highlights some of the area which were not revegetated 6 years ago, some of these areas remain clear of vegetation in 2006. Figure 1b also shows orange discolouration at the toe of the TSF, due to iron oxide precipitation. Some of the observations made at the site from the 21 September are:

- Access is still good. Vehicles can be driven easily across the mine to Deep Creek (adjacent to portal road). Tracks south of Deep Creek are still open to foot traffic.
- The revegetation is variable; some areas have diverse, healthy and stable vegetation, while other areas are sparse, with little sign that that revegetation actually commenced. Photo 1 (in Attachment 1), depicts the diverse vegetation community that has established in areas of the site, in this case on top of the TSF. Stability is inferred from the moss cover and the build up of organic litter. Photo 2 (in Attachment 1) depicts the unfinished rehabilitation near to the former mill site. Iron oxide precipitation and cementation are evident at this site, showing the effect from weathering. Photo 4 (in Attachment 1) is taken near to Photo 2 and shows a sparse cover of wattle species, which has become established at this site; the amount of exposed soil indicates it is still unfavourable for some of the pioneering species.
- The TSFs were closed as a dry cover system. The drainage from the top of the TSF appears to be directed to the north of the disturbed area, past the transmission lines. The effectiveness of this drainage system is not known. The former settling pond, adjacent to the transmission line remains boggy and requires further investigation.
- Erosion is active in places due to lack of suitable revegetation or unstable soil. The soil in the area was friable, and many exposed areas remained unpopulated with moss. Photo 3 (in Attachment 1) depicts erosion of the TSF wall, due to failure of a contour drain combined with the unstable nature of the gravel and soil on the TSF wall.

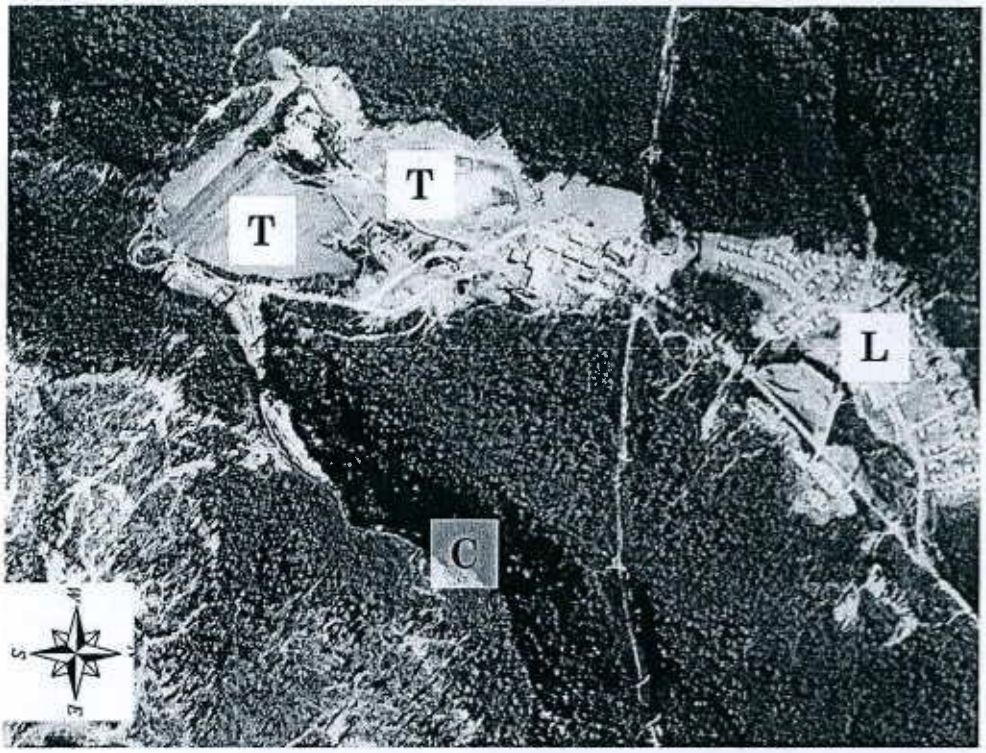


Figure 1a. Photo of Lunia (L) and the Tailings Dams (T), when Cleveland Mine (C) was operating. Year 1980 (est).

Figure 1b. Photo of Lunia and Cleveland Mine, after rehabilitation. Year 2000 (est).

Water Quality

Historical water monitoring data indicates that there was reduced water quality being discharged from site and the precursors to development of ARD evident. To establish the current water quality 5 sites were sampled and analysed for a general suit of parameters. The five water sampling sites are shown in Figure 2 and the results shown in Table 1.

The details[1] of the 5 sites sampled on the 21 September 2006, are:

- Whyte River above site (WR Above), 365722mE, 5408172mN. The purpose of this sample is to show the background water quality of the Whyte River. The sample was taken approximately 20m upstream of the bridge, on the eastern bank. The water level on the gauging board, 10m upstream of the site was 0.85m. This depth of the gauging board was used to estimate the flow. The water was moving fast and moderately turbid. It is estimated this sample was taken near to where previous compliance monitoring was done, that site was called WRA.
- Transmission lines over Whyte River site (Trans). The purpose of this site is to show the impact of some site runoff on the Whyte River. The sample was taken adjacent to an old access track, used for establishing the transmission lines, but is now heavily revegetated.
- Whyte River below site (WR Below), 364637mE, 5405924mN. The purpose of this sample is to show the water quality in the Whyte River after inputs from site. The sample was taken on the eastern bank approximately 500m south of the Whyte River/Deep Creek confluence or approximately 800m south of the toe of the TSF. It is thought that previous compliance monitoring (WRB) was taken a further 300m to the south of this site.
- Sump near mill site (Sump), 364775mE, 5407306mN. The purpose of this sample is to show the water quality from surface runoff from the former mill site. The sample was taken on the eastern side of the road. The water was clear, but filamentous algae was common.
- Toe of Tailings Dam site (Toe), 364467mE, 5406570mN. The purpose of this sample is to show the water quality seeping from the toe of the TSF. The water was clear, though there was abundant flocculated material at the bottom of the 'pond'

The results of the water samples show that the inputs from seepages have increased the level of some pollutants in the Whyte River. The increase in some pollutants has occurred despite the large difference in flow rates. The evaluated sulphate and metal concentration and low pH of the Toe and Sump samples indicate that ARD has developed on site. The development of ARD on site may inhibit or decrease any further revegetation.

Another observation from the results is that TSS is elevated in several samples. Heavy rainfall the day before sampling may have elevated the TSS in the Whyte River. The high TSS result in the Sump sample is attributed to iron oxide precipitation, as it was later (after analysis) observed by laboratory staff, that other samples were starting to precipitate.

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[1] Co-ordinates are expressed in GDA94, Zone 55. There may be some displacement error due to poor satellite coverage, though the sites did generally fit well with topographic features.

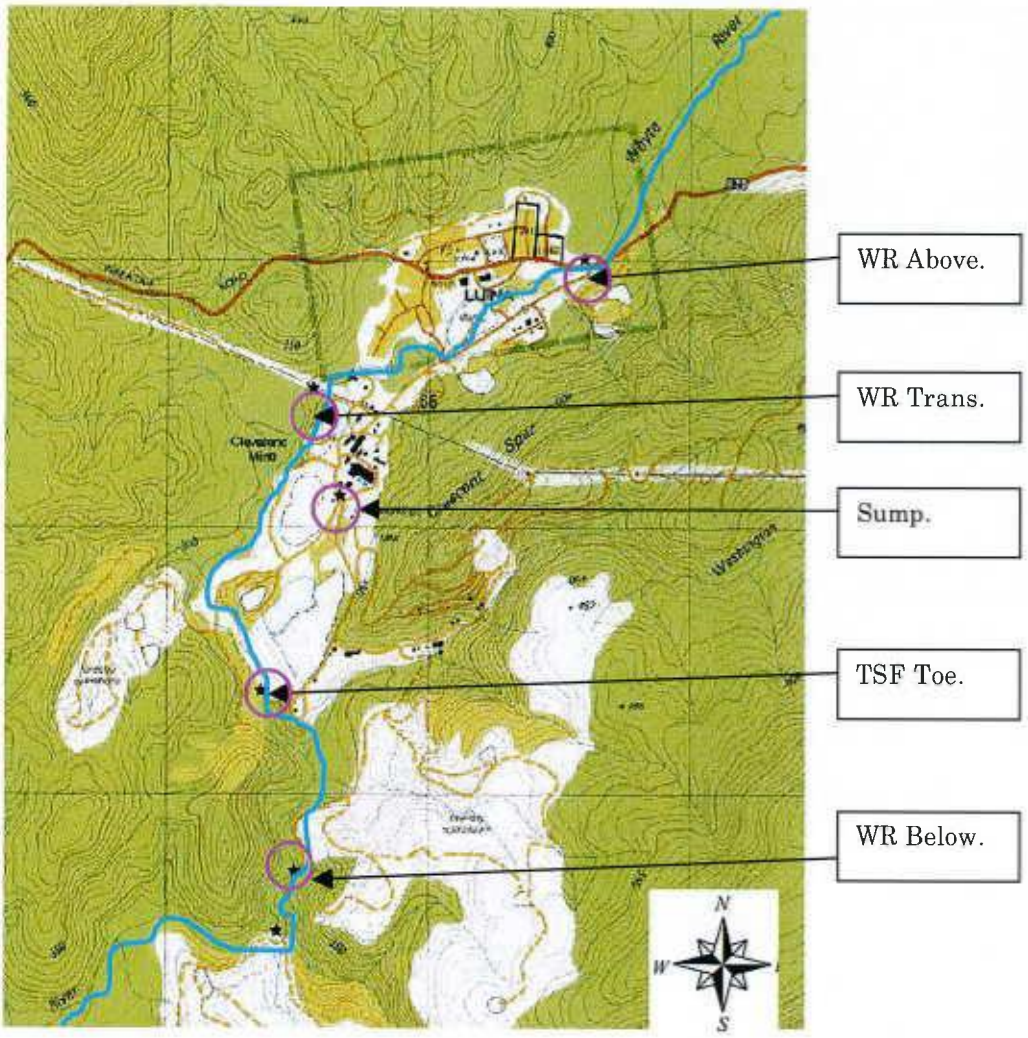


Figure 2. Plan of area with water sample sites.

	Sample Id.	WR Above	WR Trans	WR Below	TSF Toe	Sump
Field Parameters	temp (degC)	7.4	7.5	7.5	11.8	15
	est. flow L/sec	12750	12750	15000	?	2
	pH (units	6.5	6.6	6.7	5.3	2.8
	Cond (us/cm	75	85	96.8	2850	2700
Parameters analysed at AST, expressed as totals in mg/L	TSS	13	14	14	43	
	Sulphate	1.8	3.9	**11.5**	2100	1750
		1.13	1.13	1.11	16.3	74.6
	As	0.005	0.005	0.005	0.014	0.564
	Cd	0.001	0.001	0.001	0.001	0.264
	Co	0.001	0.001	0.001	0.319	0.316
	Cr	0.012	0.011	0.01	0.003	0.093
	Cu	0.002	0.005	0.004	0.001	2.35
	Fe	1.37	1.42	**3.28**	518	189
	Mn	0.387	0.789	1.57	66.8	21.7
	Ni	0.011	0.012	0.01	0.21	0.986
	Pb	0.005	0.005	0.005	0.03	0.415
	Zn	0.004	0.189	**0.101**	0.41	138

Table 1. Water sampling results.

Recommendations

The Cleveland Mine is an abandoned site and is the responsibility of the State. It should therefore be the State who ensures that the liabilities are managed appropriately. A study should be conducted to establish current liability at Luina, in particular identifying:

What remediation work were done, what forms of remediation are effective, what remediation failed and if it failed, why;

- Water quality under different flow conditions and establishing more water monitoring sites. The sample taken at WR Below, is a long distance (800m) from the source of contamination (TSF); and
- What practical and economically feasible options could be undertaken to reduce the current liabilities; including identification of possible funding sources to carry out such works.

In recent years it has been the 'Rehabilitation of Abandoned Mining Lands Trust Fund Committee' who has dealt with reducing the liability of abandoned mines such as Luina. The previously small budget of the Committee has now been reduced, so tackling this sort of project is likely too prohibitive. It is therefore recommended that an initial study be undertaken jointly by Environment Division and MRT. Further assistance could be sort from Educational Institutes (in the form of a thesis) or consultants, if the expertise is required and there was the funding available.

Despite the findings of a future study, it is important that the State Government learn from the success or failure of the rehabilitation at Luina. The learning from this site could help develop:

Closure conditions, such as quantifying the success of rehabilitation though mechanisms such as a form of land function analysis;

A further review of the bond calculation; and

- Guidelines and procedures for the mining industry.

Attachment 1. Rehabilitation

Photo 1, stable landscape on top of TSF

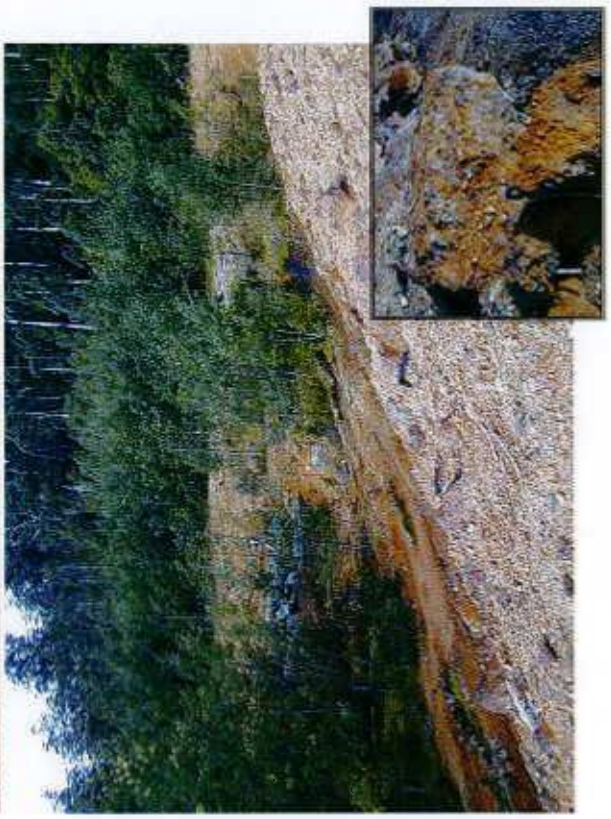


Photo 2, near the mill site, close up (insert) of cementation from iron oxide.

Photo 3, erosion on dam wall

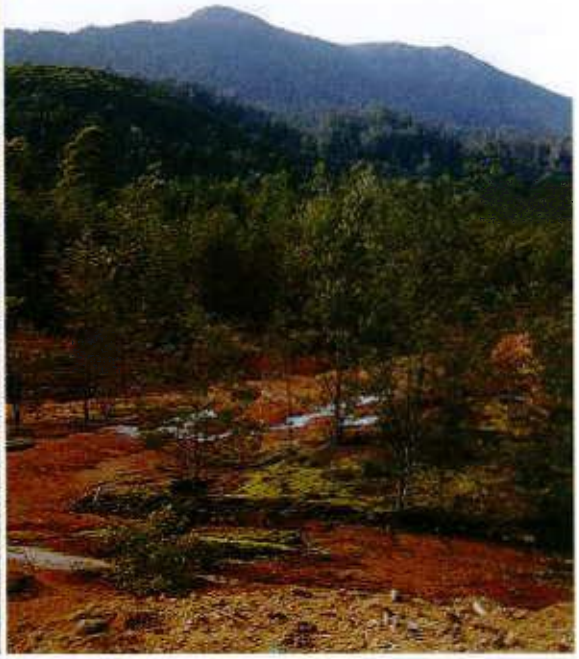


Photo 4, sparse revegetation. View from mill site to Mt Cleveland.

Attachment 2. Water Monitoring Sites

Photo 5, White River above operation

Photo 6, White River below operation

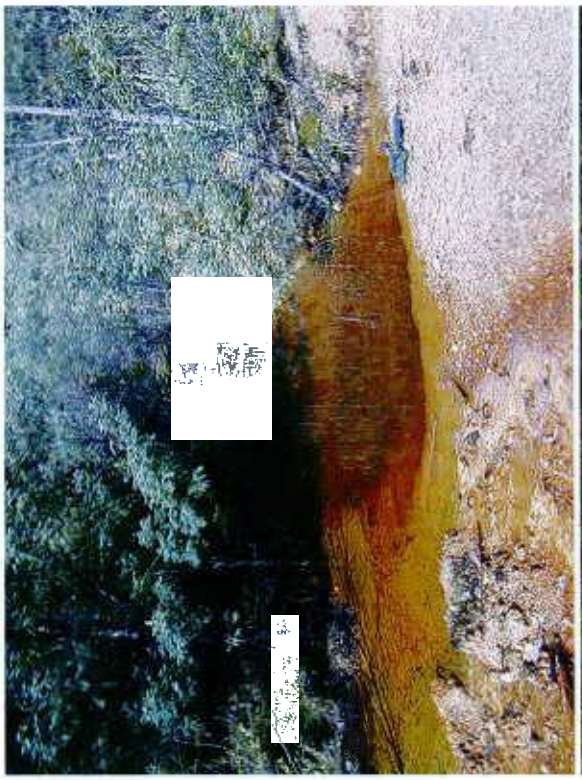
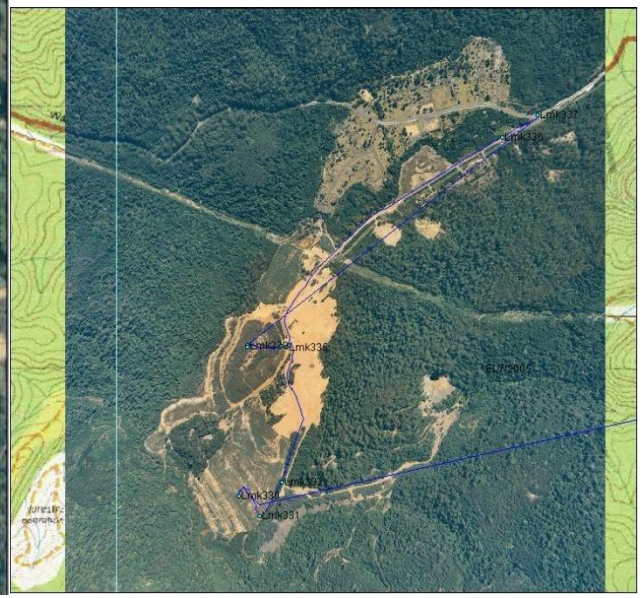


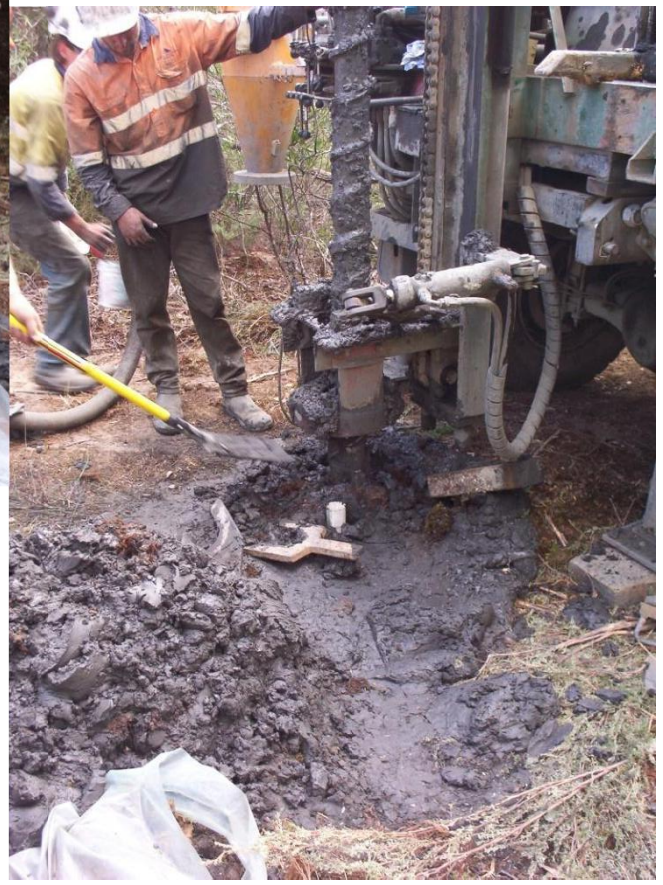
Photo 7, Sump near mill site

Photo 8, Toe of tailings dam

Luina tailings piezometer installation March 2008



Luina tailings piezometer installation March 2008



No2 dam 31.5 metres

Luina tailings piezometer installation March 2008

Luina tailings dam No1 piezometer dissolved water quality 8th October 2008

pH		6.9		Cu	ug/L	<1
Conductivity	uS/cm	2430		Fe	ug/L	18600
Alkalinity	mg CaCO3	54		K	mg/L	13.5
Acidity	mg CaCO3	9		Mg	mg/L	91.2
Sulphate	Mg/L	1590		Mn	ug/L	763
Hardness	mg CaCO3	1620		Na	mg/L	22.5
Al	ug/L	42		Ni	ug/L	<10
Ca	mg/L	498		Pb	ug/L	<7
Cd	ug/L	<1		Zn	ug/L	60
Cr	ug/L	<1		Hg	ug/L	<0.05

Luina tailings dam No2 piezometer dissolved water quality 8th October 2008

pH		6.2	6.3		Cu	ug/L	20	8
Conductivity	uS/cm	2150	2110		Fe	ug/L	304000	29400
Alkalinity	mg CaCO3	86	92		K	mg/L	3.78	3.82
Acidity	mg CaCO3	29	24		Mg	mg/L	216	219
Sulphate	Mg/L	1380	1350		Mn	ug/L	28600	28900
Hardness	mg CaCO3	1300	1320		Na	mg/L	20.2	20.4
Al	ug/L	271	172		Ni	ug/L	203	57
Ca	mg/L	165	166		Pb	ug/L	<7	<7
Cd	ug/L	<1	<1		Zn	ug/L	265	92
Cr	ug/L	2	3		Hg	ug/L	<0.05	<0.05

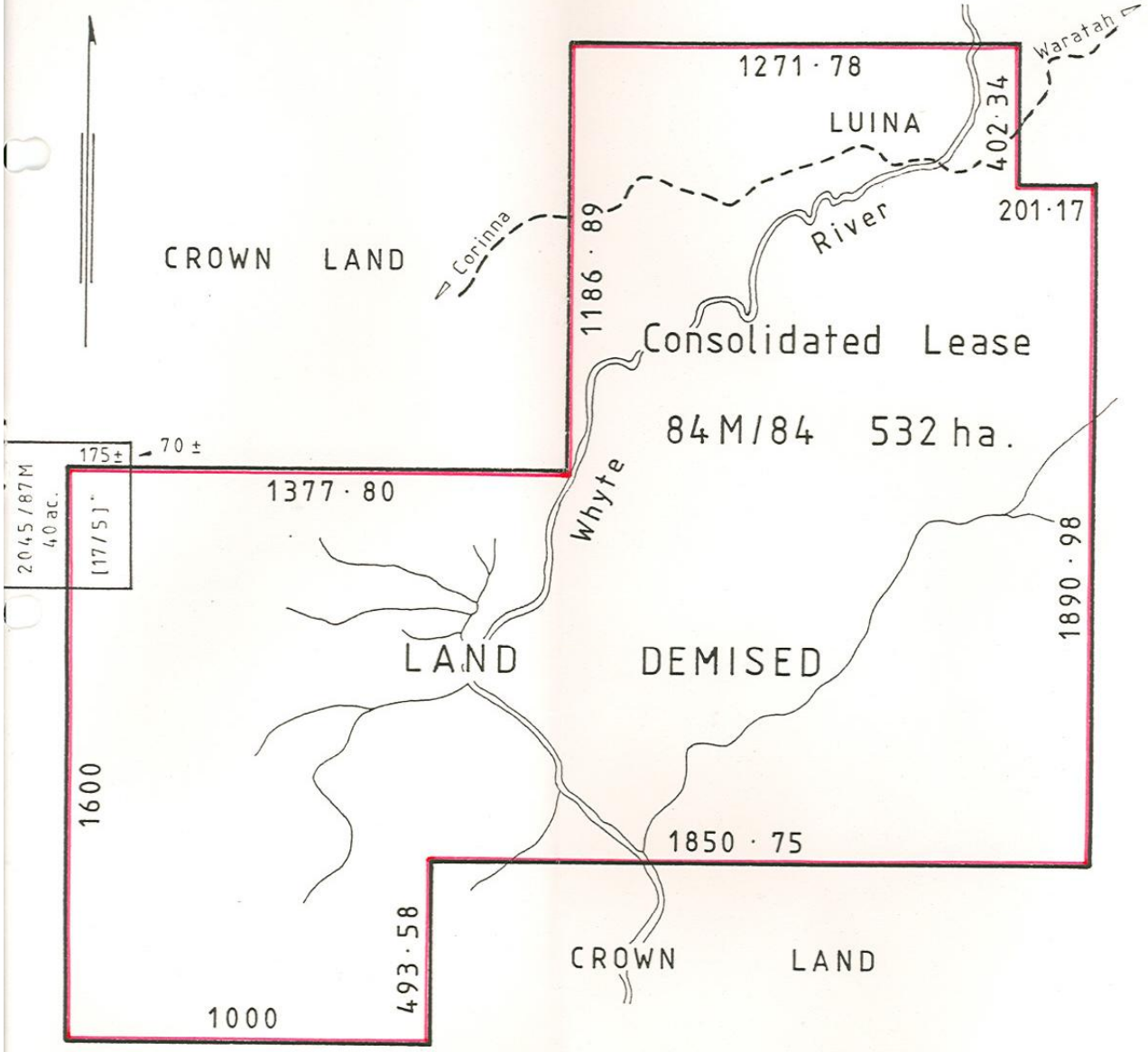
DEPARTMENT OF MINES—TASMANIA

SUBJECT TO SURVEY

LAND DISTRICT OF	RUSSELL
VICINITY OF	LUINA
APPLICATION No.:	CONSOLIDATED LEASE 84M/84 532 hectares
APPLICANT	CLEVELAND TIN LIMITED

DESCRIPTION

Subject to survey the area demised may be described as follows:—



Drawn by D.R.B. Examined G.A.T 19.7.85 Surveyed

Entered on chart D.R.B. 18·7·85 Vol.: 50 Folio 24

Chart Heazlewood .. Scale:— 1 : 15 840

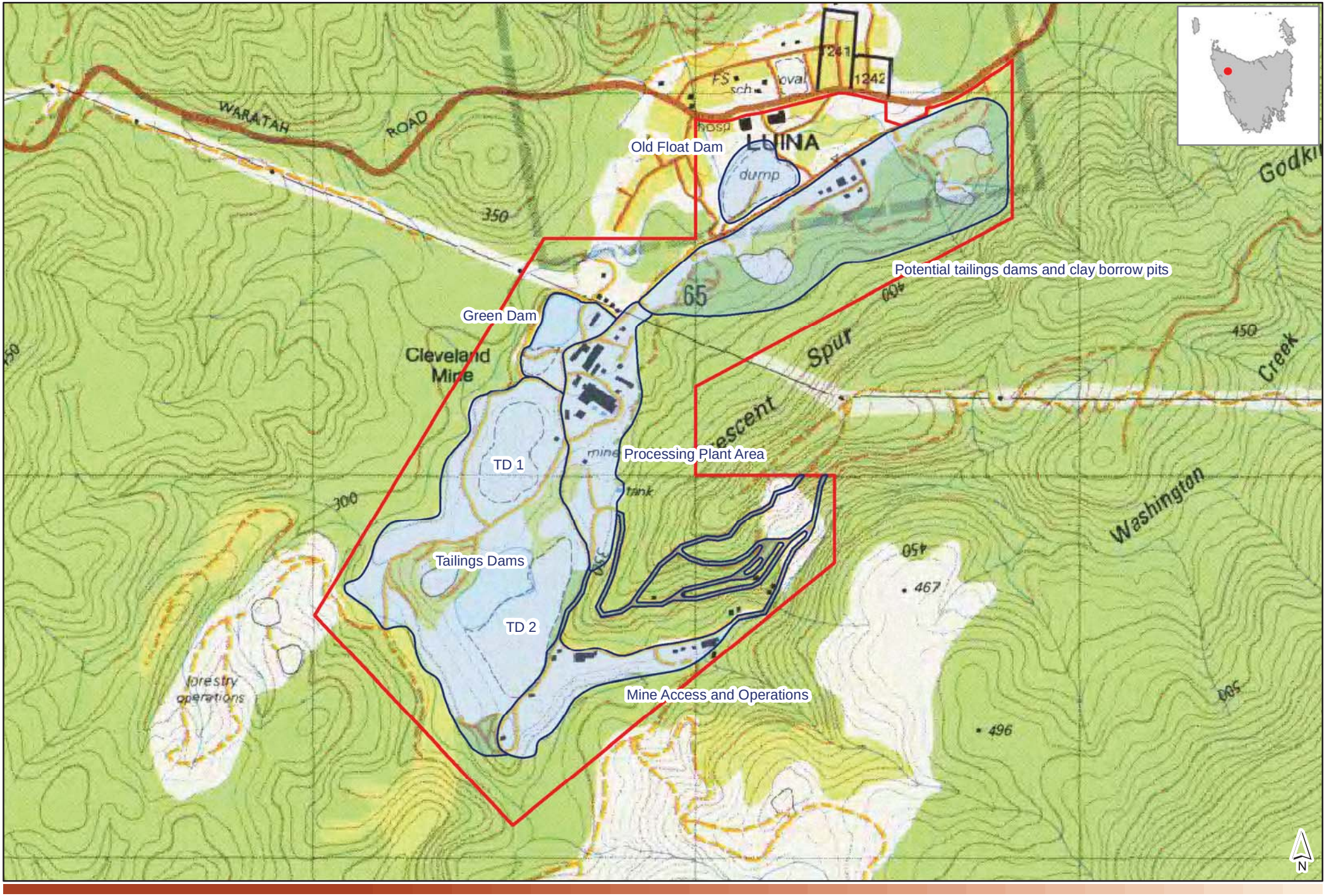
Approved

Director of Mines

19/7/85

Attachment C

Conceptual Project Layout



Map Projection:
GDA 1994 MGA Zone 55
Data sources:
Base image by TASMAP (C) State of Tasmania
Base data from theLIST (C) State of Tasmania
Map produced by pitt&sherry Date: 18/08/2011
Map ref: HB11225_H006_ConceptML_12P_RevB

pitt&sherry

Scale: 1:12,500

0 100 200 300

Metres

Legend

Proposed Project Area

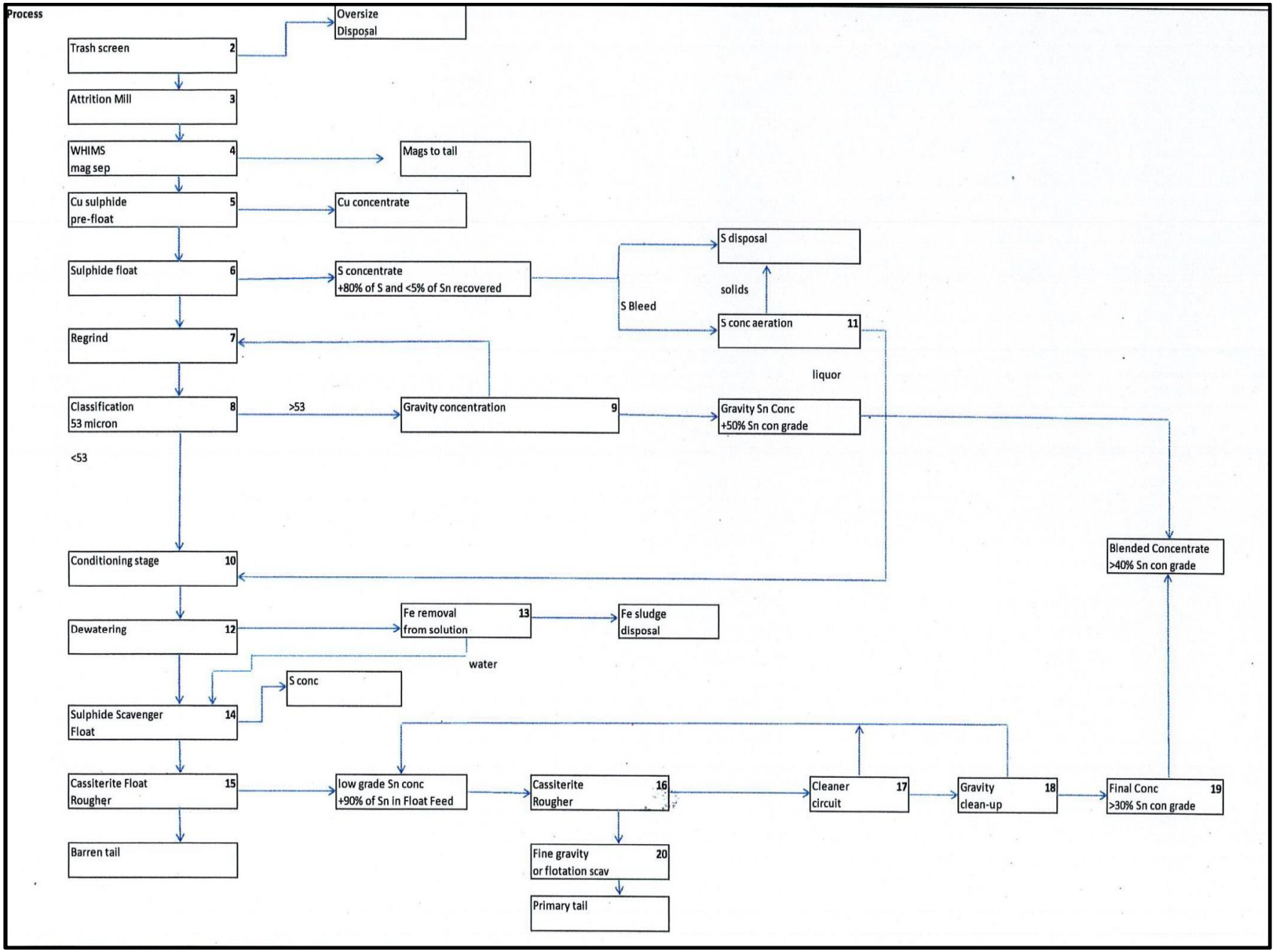
Conceptual Project Layout

Cleveland Mine

Conceptual Project Layout

Attachment D

Indicative Process Schematic Diagram


Process
Trash screen 2
Oversize Disposal
Attrition Mill 3
WHIMS mag sep 4
Mags to tail
Cu sulphide pre-float 5
Cu concentrate
Sulphide float 6
S concentrate +80% of S and <5% of Sn recovered
S disposal
solids
S Bleed
S conc aeration 11
Regrind 7
liquor
Classification 53 micron 8
>53
Gravity concentration 9
Gravity Sn Conc +50% Sn con grade
<53
Blended Concentrate >40% Sn con grade
Conditioning stage 10
Dewatering 12
Fe removal from solution 13
Fe sludge disposal
water
S conc
Sulphide Scavenger Float 14
Cassiterite Float Rougher 15
low grade Sn conc +90% of Sn in Float Feed
Cassiterite Rougher 16
Cleaner circuit 17
Gravity clean-up 18
Final Conc >30% Sn con grade 19
Barren tail
Fine gravity or flotation scav 20
Primary tail

Attachment E

Regional Setting

Map Projection:
GDA 1994 MGA Zone 55
Data sources:
Base image by TASMAP (C) State of Tasmania
Mining Lease data from MRT (C) State of Tasmania
Map produced by pitt&sherry Date: 19/08/2011
Map ref: HB11225_H007_MLA_RegionalSetting_12P_RevA

Scale: 1:400,000
0 2.5 5
Kilometres

Legend
Cleveland Tin Mine Location

Cleveland Mine
Regional Setting

Attachment F

Aboriginal Heritage Tasmania Correspondence

Attachment E

Correspondence from Aboriginal Heritage Tasmania

RE: ABORIGINAL HERITAGE DESKTOP ASSESSMENT

Notice of Intent, Cleveland Mine reopening

Dear Michael

Aboriginal Heritage Tasmania has completed a search of the Tasmanian Aboriginal Site Index (TASI) regarding the proposed Cleveland mine reopening at Luina and can advise that there are no Aboriginal heritage sites recorded within or close to the property. Due to the area being highly disturbed as a result of previous mining activities, it is believed that the area has a low probability of Aboriginal heritage being present.

Accordingly there is no requirement for an Aboriginal heritage investigation and Aboriginal Heritage Tasmania have no objection to the project proceeding as per the information provided. Should the project expand beyond the former Cleveland mine/Luina site however, an investigation may be warranted and the proponent would be advised the contact AHT again for further advice.

Please be aware that all Aboriginal heritage is protected under the *Aboriginal Relics Act 1975*. If at any time during works you suspect Aboriginal heritage, cease works immediately and contact Aboriginal Heritage Tasmania for advice.

If you have any queries please do not hesitate to contact Aboriginal Heritage Tasmania.

Kind Regards,

Emily Smith
Archaeologist
Aboriginal Heritage Tasmania
Department of Primary Industries, Parks, Water and Environment
5th Floor, Marine Board Building, 1 Franklin Wharf
GPO Box 771, Hobart, TAS, 7001

p 03 6233 5595 f 03 6233 2287
e emily.smith@heritage.tas.gov.au

www.aboriginalheritage.tas.gov.au

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Attachment G

Ecological Report

ECOLOGICAL ASSESSMENT OF PROPOSED TAILINGS REPROCESSING PROJECT, CLEVELAND MINE, LUINA, NORTHWEST TASMANIA

Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd

26 September 2011

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CITATION

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AUTHORSHIP

Field assessment: Brian French, Mark Wapstra

Report production: Brian French, Mark Wapstra

Vegetation and habitat mapping: Brian French

Base data for mapping: TasMap, DPIPWE, GoogleEarth, Pitt & Sherry

Digital photography: Brian French

ACKNOWLEDGEMENTS

Jim Lockley (Pitt & Sherry) and Mike Adams (Bright Phase Resources Ltd) provided background information and maps on the proposal and access to the site. Emma Barker and Ronny Tyquin (Forestry Tasmania) provided information on the status of the informal reserve on State forest and the currency of aerial searches for wedge-tailed eagle nests in the vicinity of the study area. Staff of Bright Phase, Pitt & Sherry, Forestry Tasmania and Tasmanian Helicopters assisted with aerial surveys for wedge-tailed eagle nests.

COVER ILLUSTRATION

Cover image: typical regenerating forest on the old tailings areas dominated by silver wattle (*Acacia dealbata*).

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SUMMARY

General

Bright Phase Resources Ltd (via Jim Lockley, Pitt & Sherry) engaged Environmental Consulting Options Tasmania to undertake an assessment of ecological values associated with a proposal to reprocess the old mine tailings at the Cleveland Mine site, Luina, northwest Tasmania.

The proposal is to reprocess the original mine tailings from the Cleveland Mine. There is approximately 4 million tonnes of tailings on the sites which is proposed to be mined and reprocessed on the site. The processing facilities are proposed to be located on the original mill site. The tailings from the reprocessing will be returned to the mined tailings area and the area rehabilitated. The reprocessing of the tailings on the site also proposes to alleviate the problem of acid mine drainage on the site by removing the acid producing metals and sulphides as the processing occurs.

The study area was assessed on 19 July 2011.

Summary of key findings

Threatened flora

- No flora species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.

Threatened fauna

- No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
- The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and Tasmanian devil, but it is unlikely that features such as nests or dens are present within the study area itself (no such features were detected), and no special management prescriptions are recommended (noting that rehabilitation of the area will be required).
- The wider area supports potential nesting habitat for the wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) but surveys did not detect any nests within the study area or within 1 km of the study area, so no deleterious impact on the species is anticipated.

Vegetation types

- Eight mapping units were identified from the study area (Figure 4), namely:
  - "*Acacia melanoxylon* forest on rises" (TASVEG code: NAR);
  - "*Eucalyptus obliqua* dry forest and woodland" (TASVEG code: DOB);
  - "*Eucalyptus obliqua* forest with broad-leaf shrubs" (TASVEG code: WOB);
  - "*Eucalyptus obliqua* forest over rainforest" (TASVEG code: WOR);
  - "*Nothofagus-Atherosperma* rainforest" (TASVEG code: RMT);
  - "extra-urban miscellaneous" (TASVEG code: FUM);
  - "permanent easement" (TASVEG code: FPE);
  - "regenerating cleared land" (TASVEG code: FRG).

- None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Weeds

- Several species of "declared" weed species, and some other exotic species with potential to act as "environmental weeds", were detected from the study area. Inclusion of weed management prescriptions in the DPEMP is recommended.

Plant and animal disease

- No evidence of plant and animal disease was noted. Inclusion of disease management prescriptions in the DPEMP is recommended.

Reserves

- The study area is within an "Informal Reserve" managed by Forestry Tasmania – some additional planning assessment protocols will need to be applied to satisfy Forestry Tasmania's internal protocols. In our opinion, the proposed works will result in a temporary modification of some native vegetation types but these are all already regrowth facies of the various communities after previous mining activities. As such, complex offsets are not recommended, provided that the area is rehabilitated to similar vegetation types.

Recommendations

The following values should be further considered, as part of DPEMP preparation:

- undertake an analysis of the potential risk of increase in mammal roadkill as a consequence of product transportation activities;
- include weed management and disease minimisation protocols in the DPEMP;
- liaise further with Forestry Tasmania and Mineral Resources Tasmania on the required management of the informal reserve;
- adhere to the *Quarry Code of Practice June 1999* (DPIWE 1999) and other recommendations applied by planning authorities in relation to mineral extraction works, transport of product and site rehabilitation.

BACKGROUND INFORMATION

Purpose

Bright Phase Resources Ltd (via Jim Lockley, Pitt & Sherry) engaged Environmental Consulting Options Tasmania to undertake an assessment of ecological values associated with a proposal to reprocess the old mine tailings at the Cleveland Mine site, Luina, northwest Tasmania.

The present report is primarily intended to allow Bright Phase Resources Ltd to take account of any identified ecological values in land use planning decisions and to later facilitate approvals under environmental planning systems including Commonwealth, State and local government processes, should such approvals become necessary.

Scope

This report relates to:

- flora and fauna species of conservation significance, including a discussion of listed threatened species potentially present, and other species of conservation significance/interest;
- vegetation types (forest and non-forest, native and exotic) present, including a discussion of the distribution, condition, extent, composition and conservation significance of each community;
- plant disease and weed management issues; and
- an initial discussion of some of the policy and legislative implications of the identified ecological values to facilitate further land use planning decisions.

This report follows, in a general sense, the government-produced *Guidelines for Natural Values Assessments* (DPIPWE 2009) in anticipation that the report (or extracts of it) may be used as part of various approval processes that may be required for activities on the site, including by the Department of Primary Industries, Parks, Water & Environment. The report format will also be applicable to other assessment protocols as required the Commonwealth Department of Sustainability, Environment, Water, Population & Communities (for any referral/approval that may be required under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*). Note that this level of assessment should also be appropriate to meet local government planning processes in relation to ecological values. The information contained in this report can also be used to satisfy the reporting and assessment protocols of Forestry Tasmania's State Forest Activity Assessments (SFAAs).

Limitations

In the case of the present assessment, there were no limitations with respect to access to the study area. Access was from existing access roads and tracks, and through easily traversed vegetation types.

The flora survey was undertaken on the 19 July 2011. Many plant species have ephemeral or seasonal growth or flowering habits, or patchy distributions (at varying scales), and it is possible that some species were not recorded for this reason (especially late spring-summer flowering grasses, herbs and lilies). However, every effort was made to sample the range of habitats present in the survey area to maximise the opportunity of recording the majority of species present (particular those of conservation significance). The authors are satisfied that the timing of the survey is appropriate to detect the majority of threatened flora species potentially present, based on several assessments of many parts of the north west region in recent years. The survey was also limited to vascular species: species of mosses, lichens and liverworts were not recorded.

However, a consideration is made of species (vascular and non-vascular) likely to be present (based on habitat information and database records) and reasons presented for their apparent absence. The fauna survey was restricted to an assessment of potential habitat only.

Qualifications

Except where otherwise stated, the opinions and interpretations of legislation and policy expressed in this report are made by the authors and do not necessarily reflect those of the relevant agency. The client should confirm management prescriptions with the relevant agency before acting on the content of this report.

Permit

All plant material was collected under DPIPWE permit TFL 10110 (in the name of Brian French). Relevant data will be entered into DPIPWE's *Natural Values Atlas* database by the authors. Some plant material may be lodged at the Tasmanian Herbarium by the authors.

THE STUDY AREA

The study area comprises of the old Luina township, extensive roads, rehabilitation areas, regrowth forest and oldgrowth forest with the Cleveland Mine site, Luina, northwest Tasmania (Figure 1), centred on 364834mE 5407369mN (GDA94, Luina 3640 1:25000 Tasmap).

The study area is underlain by Quaternary alluvial sand, gravel and mud, Cambrian ultramafic complexes, Cambrian basalts, and Cambrian mafic volcaniclastics. Much of the original geology and ground levels have been overlain by tailings from both the Clevelend Mine and introduced from the Hellyer Mine. Elevation is approximately 290 to 480 m a.s.l.

Land tenure and other categorisations of the study area are as follows:

- State forest;
- City of Waratah-Wynyard municipality;
- West and Southwest Bioregion (according to the description of IBRA 4 boundaries in the Forest Botany Manual);
- West Bioregion (according to the IBRA 5 boundaries used by several government agencies).

THE PROPOSAL

The proposal is to reprocess the original mine tailings from the Cleveland Mine (Figure 2) as the original mining from 1969 to 1986 by Aberfoyle did not claim more than 60% of the tin. Advances in mineral processing techniques have made it viable to reprocess mine tailings to win more ore. There is approximately 4 million tonnes of tailings on the sites which is proposed to be mined and reprocessed on the site. The processing facilities are proposed to be located on the original mill site. The tailings from the reprocessing will be returned to the mined tailings area and the area rehabilitated. The reprocessing of the tailings on the site also proposes to alleviate the problem of acid mine drainage on the site by removing the acid-producing metals and sulphides as the processing occurs.

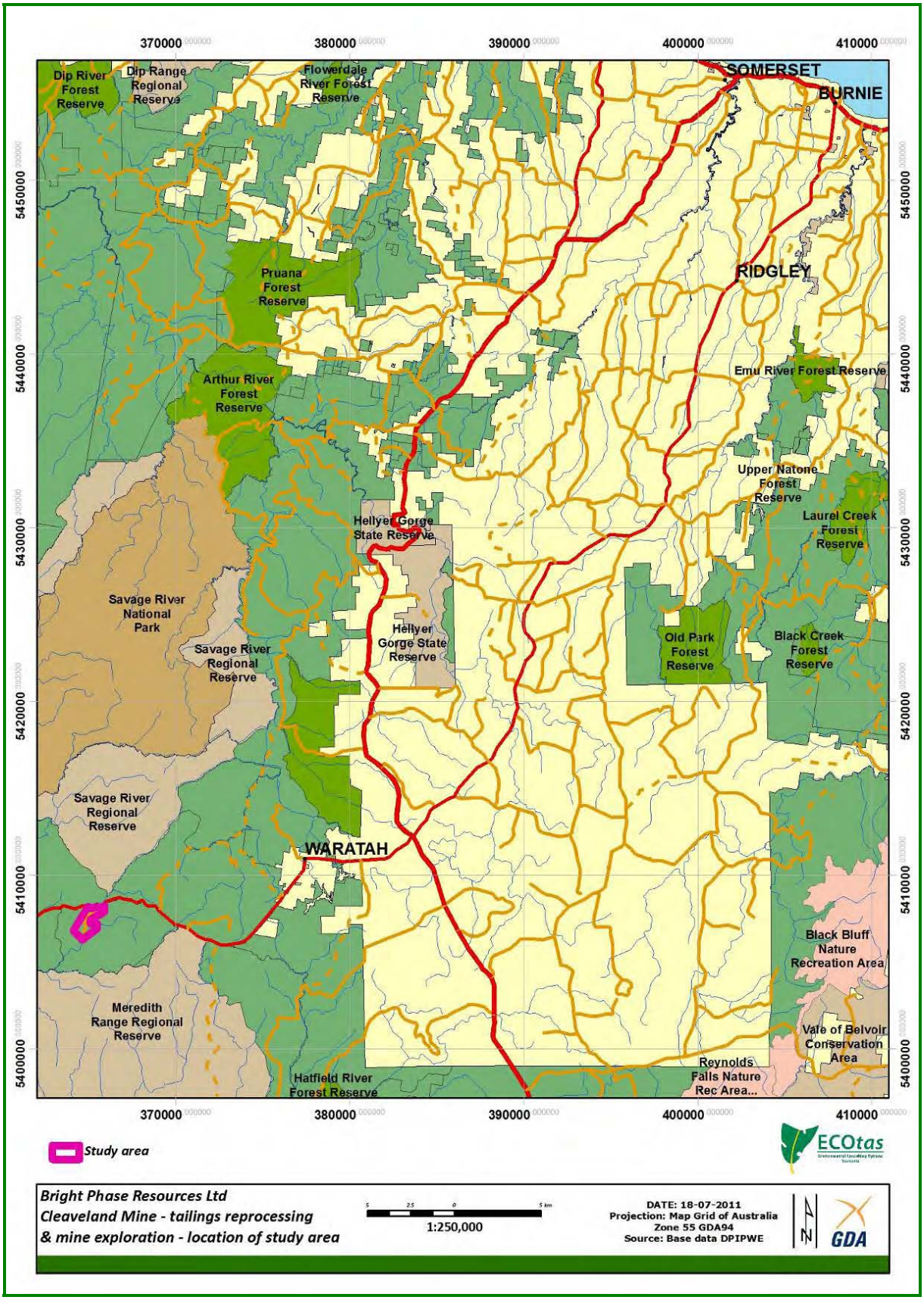


Figure 1. Location of the study area

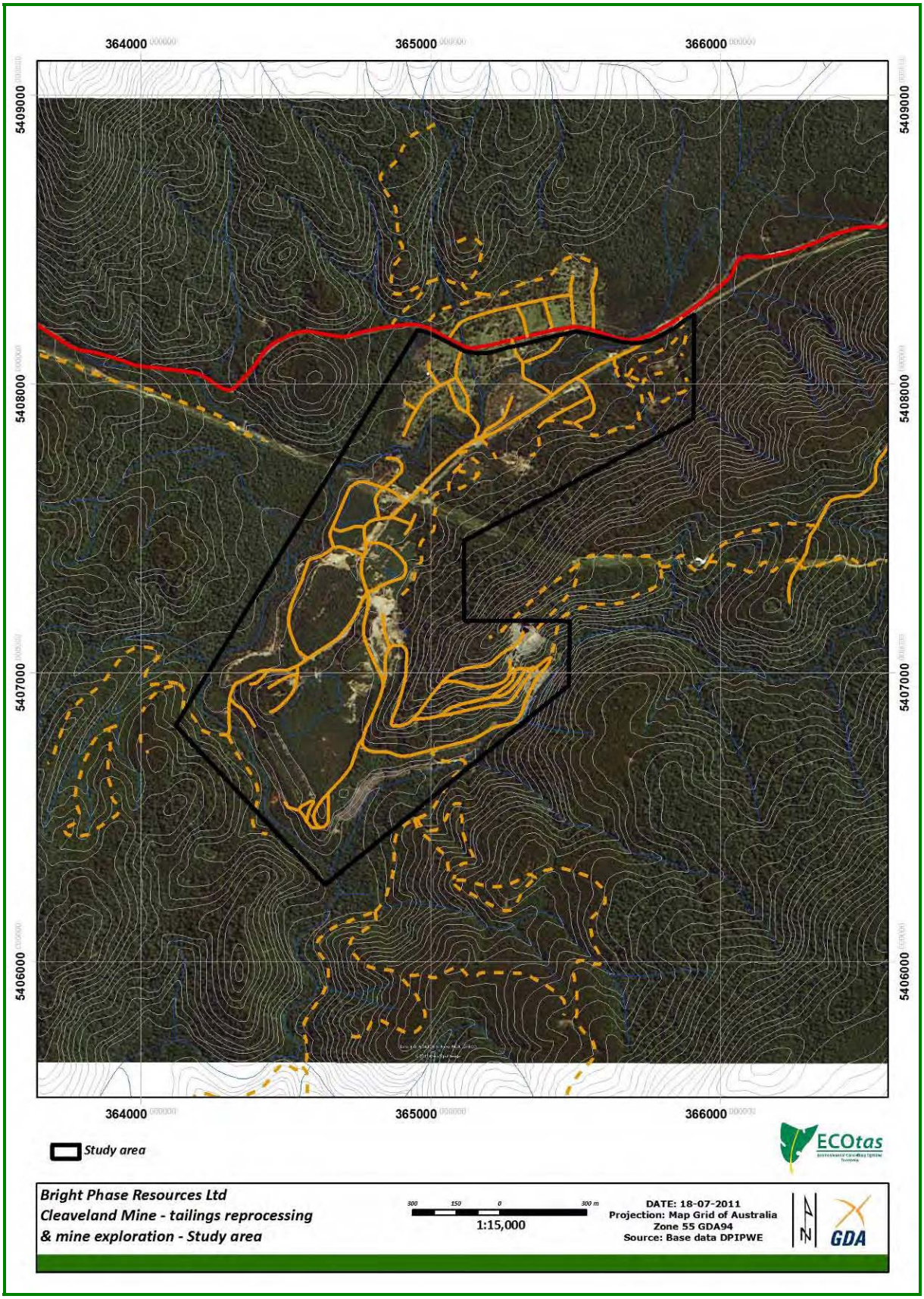


Figure 2. More detailed location of the study area

METHODS

Nomenclature

All grid references in this report are in GDA94, except where otherwise stated. Vascular species nomenclature follows Baker & Duretto (2011) for scientific names and Wapstra *et al.* (2005) for common names. Fauna species scientific and common names follow the listings in the cited *Natural Values Atlas* reports (DPIPWE 2011). Vegetation classification follows TASVEG, as described by Harris & Kitchener (2005).

Database analysis

The following sources holding ecological values information were interrogated, namely:

- the Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas*, accessed through the online Natural Values Report feature, producing a report titled *42807_ECOtas_Cleveland Mine_290711* (DPIPWE 2011; Appendix C);
- the Forest Practices Authority's online version of the *Threatened Fauna Manual* (now referred to as the *Fauna Values Database*) accessed through FPA's website (Luina 3640 1:25000 mapsheet report accessed 9 August 2011 (FPA 2011; Appendix D);
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Report* for coordinates: -41.46649,145.38134 -41.46641,145.38309 -41.46717,145.38476 -41.46717,145.38621 -41.46649,145.38887 -41.46664,145.39002 -41.46695,145.39139 -41.46679,145.39238 -41.46649,145.39352 -41.46557,145.39519 -41.46999,145.39481 -41.47288,145.38507 -41.47502,145.38491 -41.47517,145.38887 -41.47882,145.38895 -41.48461,145.37821 -41.47898,145.37212 -41.46649,145.38149 -41.46649,145.38134 dated 9 August 2011 (DEWHA 2011; Appendix E);
- the Department of Primary Industries, Parks, Water & Environment's *Conservation of Freshwater Ecosystem Values* database, accessed on 9 August 2011 (CFEV database, v1.0 2005; Appendix F);
- GoogleEarth aerial imagery (accessed by the author 19 July 2011).

Botanical survey

Botanical assessment of the study area took place on 19 July 2011 by Brian French (ECO*tas*). The primary purpose of the botanical assessment was to enable the production of a vegetation map showing the extent, condition and classification of each of the forest vegetation types present. Detection and confirmation of sites for threatened flora was also an objective of the assessment.

The survey aimed to assess the range of habitat types present in the study area (at the broad scale e.g. vegetation type, altitude variation, and at the finer scale e.g. microhabitats such as drainage depressions, disturbed sites, etc.).

Reference to topographic maps (Luina 3640 1:25000 Tasmap), vegetation maps (i.e. TASVEG) and aerial photography (GoogleEarth) established the approximate range and distribution of topographic and habitat variation present in the study area.

Detailed plots recording all vascular species, vegetation structure and site characteristics were undertaken in representative vegetation types. Running species lists, and additional species associated with specific vegetation types, habitat features or sites (e.g. drainage depressions etc.), were also recorded on the route through the study area. Plot data and species lists can be supplied on request (but note that relevant information is included in the report text).

Zoological survey

Potential habitat for threatened fauna (as listed on databases referred to above) was assessed by reference to the vegetation types and site characteristics present. The presence of mammals, birds, frogs and reptiles was determined by opportunistic discovery (e.g. sightings and calls) during the main botanical assessment, and evidence such as tracks, scats and other signs.

RESULTS

Vegetation types

Comments on TASVEG mapping

The following section, which comments on the existing TASVEG mapping for the study area, is included to highlight the differences between existing mapping and the more recent mapping from the present study to ensure that any parties assessing land use proposals (via this report) do not rely on existing mapping. Note that TASVEG mapping, which was mainly a desktop mapping exercise based on aerial photography, is often substantially different to ground-truthed vegetation mapping, especially at a local scale.

TASVEG mapping (as shown in the cited *Natural Values Atlas* report) dominantly maps the area as "*Eucalyptus obliqua* wet forest (undifferentiated)' (TASVEG code: WOU), "*Nothofagus-Phyllocladus* short rainforest" (TASVEG code: RMS) and "*Nothofagus-Atherosperma* rainforest (undifferentiated)" (TASVEG code: RMU) in the native forest areas within and adjacent to the study area west, "Extra-urban miscellaneous" (TASVEG code: FUM) and "Agricultural land" (TASVEG code: FAG) around the old mine workings and township and "Permanent easement" (TASVEG code: FPE) for power line easements at the site (Figure 3). The TASVEG mapping of the area is based on mapping from 2002 from aerial photography in 1995. "*Nothofagus-Atherosperma* rainforest undifferentiated" (RMU) is no longer listed as a TASVEG community by Harris & Kitchener (2005). The vegetation types recorded within the study area are discussed in detail below.

Vegetation types recorded as part of the present study

Vegetation types have been classified according to Harris & Kitchener (2005) *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. Conservation priorities alluded to in Table 1 are taken from Schedule 3A of the Tasmanian *Nature Conservation Act 2002* (DPIPWE 2011b). Table 1 provides information on the vegetation types identified from the study area with notes provided on condition. Further information on the vegetation types present and the vascular species composition in the different vegetation types is presented at Appendices A and B, respectively.

Figure 3 indicates the existing vegetation within the study area (as per TASVEG mapping) and Figure 4 indicates the revised vegetation mapping of the study area.

Eight mapping units were identified from the study area (Figure 4), namely:

- "*Acacia melanoxylon* forest on rises" (TASVEG code: NAR);
- "*Eucalyptus obliqua* dry forest and woodland" (TASVEG code: DOB);
- "*Eucalyptus obliqua* forest with broad-leaf shrubs" (TASVEG code: WOB);
- "*Eucalyptus obliqua* forest over rainforest" (TASVEG code: WOR);
- "*Nothofagus-Atherosperma* rainforest" (TASVEG code: RMT);
- "extra-urban miscellaneous" (TASVEG code: FUM);
- "permanent easement" (TASVEG code: FPE);
- "regenerating cleared land" (TASVEG code: FRG).

None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* (DPIPWE 2011b) or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. There are no management implications under State or Commonwealth vegetation legislation and policy.

Table 1. Vegetation communities present in study area

Areal values – top, bold (total hectares in study area); middle and bottom, italics (maximum hectares/percentage proportion likely to be disturbed – see also Figure 7)

Floristic code (FPA 2005)	**RFA Equivalent** (Anon 1997)	**TASVEG Equivalent** (Harris & Kitchener 2005)	**Conservation priority** FBM (FPA 2005) RFA (Anon 1997) TASVEG (DPIPWE 2011b)	**Area (ha)**	**Comments**
Non-forest	Non-forest	Extra-urban miscellaneous (FUM)	np N Not threatened	**17.92 ha** *6.41 ha* *35.77%*	This mapping unit is used to describe the quarry areas and old infrastructure sites, which are common across the site. Weed species were noted from a number of sites in and around the old Luina township area.
Non-forest	Non-forest	Permanent easement (FPE)	np N Not threatened	**3.71 ha** *1.63 ha* *43.97%*	FPE describes the large power transmission lines that cross the centre of the study area. The vegetation associated with the power lines is "managed" with regular fire management clearing occurring. There were no weed species noted from this mapping unit.
Non-forest	Non-forest	Regenerating cleared land (FRG)	np N Not threatened	**48.57 ha** *43.20 ha* *88.94%*	FRG is the dominant mapping unit across the study area. FRG in this case is used to describe the actively rehabilitated tailings dump areas, old quarry sites and workshop areas which are being "recolonised" by native plant species or have had native seed sown to encourage rehabilitation.
SWAMP-D4	*Acacia melanoxylon* forest on rises (BR)	*Acacia melanoxylon* forest on rises (NAR)	np N Not threatened	**8.36 ha** *1.25 ha* *14.96%*	NAR occurs on the slopes around Washington Creek in the south of the study area and along the Whyte River in the north of the study area.
DRY-shOB	Dry *Eucalyptus obliqua* forest (O)	*Eucalyptus obliqua* dry forest (DOB)	np N Not threatened	**4.29 ha** *3.86 ha* *89.78%*	DOB is a localised small remnant of forest in the south of the study area. DOB occupies the relatively dry northern slopes of the hill above an old quarry area. No weed species were noted at this site.

Floristic code (FPA 2005)	**RFA Equivalent** (Anon 1997)	**TASVEG Equivalent** (Harris & Kitchener 2005)	**Conservation priority** FBM (FPA 2005) RFA (Anon 1997) TASVEG (DPIPWE 2011b)	**Area (ha)**	**Comments**
WET-OB2	Tall *Eucalyptus obliqua* forest (OT)	*Eucalyptus obliqua* forest with broad-leaf shrubs (WOB)	np N Not threatened	**49.31 ha** *23.7 ha* *48.06%*	WOB is common on the relatively dry northern slopes of Crescent Spur and also as a transitional community between the rainforest (RMT) and mixed forest (WOR) communities across the study area (see below). This community is in good condition with no weeds recorded.
WET-OB1000	Tall *Eucalyptus obliqua* forest (OT)	*Eucalyptus obliqua* forest over rainforest (WOR)	np N Not threatened	**27.71 ha** *1.26 ha* *4.55%*	WOR occurs in the moist and fertile lower slopes on the southern end of Crescent Spur and adjacent to the Whyte River and Washington Creek in the south. This community is gradational with WOB as moisture availability decreases and RMT in moist, fertile and undisturbed sites. This community is in good condition with no weeds recorded.
RAIN-C1.1	Callidendrous & thamnic rainforest on fertile sites (M+)	*Nothofagus-Atherosperma* rainforest (RMT)	np N Not threatened	**1.90 ha** *0.04 ha* *2.10%*	RMT occurs in small areas in the west of the study area, adjacent to the Whyte River. This community occurs on the moist and fertile lower slopes where disturbance has not occurred for a very long time period. This community is in good condition and no weeds species were recorded.

Plant species

General observations

A total of 86 vascular plant species were recorded from the study area, comprising 53 dicotyledons (including 12 endemic and 5 exotic species), 14 monocotyledons (including 0 endemic and 1 exotic species), 1 gymnosperm (endemic), and 18 pteridophytes (all native).

Priority species recorded from the study area

No species, listed as threatened on the Tasmanian *Threatened Species Protection Act* 1995 or the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, were recorded from the study area. The vegetation types identified from the study area (Table 1, Figure 4) are not usually strongly associated with threatened flora, especially disturbed and disclimax facies of the vegetation types present.

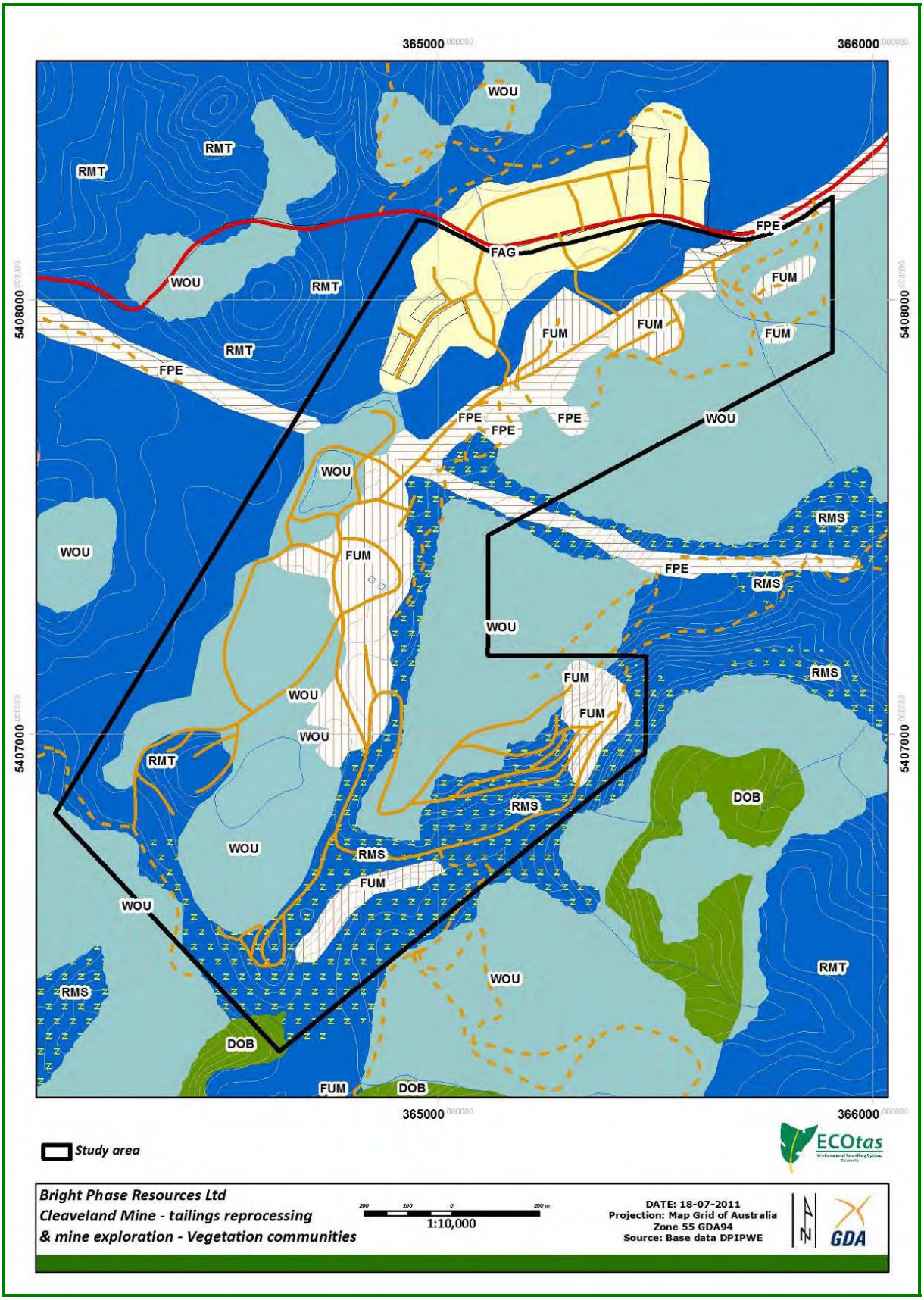


Figure 3. Existing TASVEG vegetation mapping of the broader study area

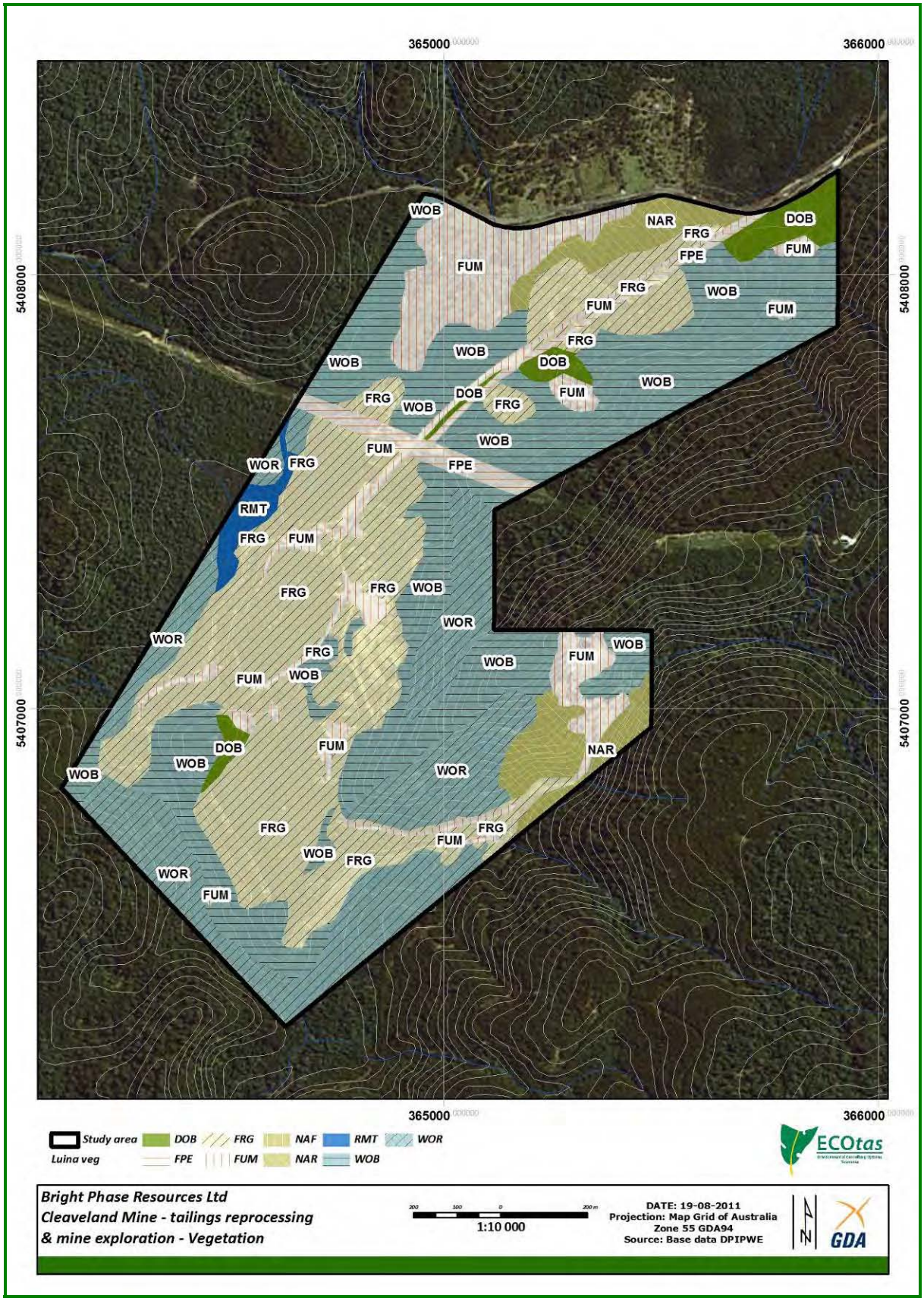


Figure 4. Revised vegetation mapping of the study area

Priority flora recorded from databases

Table 2 provides a listing of priority flora from within 500 m and 5000 m of the study area, with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded. Note that the survey was not restricted to the species listed in Table 2 but considered the potential presence of any threatened flora.

Table 2. Priority flora records from within 5000 m of boundary of study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas* (DPIPWE 2011a) and other sources where indicated. Habitat descriptions are taken from TSU (2003), except where otherwise indicated.

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
Records within the study area			
There are no records within the study area.			
Records within 500 m of the study area			
There are no records within 500 m of the study area.			
Records within 5000 m of study area			
Comesperma defoliatum (leafless milkwort)	r -	1 record alongside the Heazlewood River to the west of the study area	The preferred habitat of this species (heathy forests, heathlands and moorlands) is absent from the study area. This record is very old (c. 1930) and where the record is located is not the preferred habitat of this species. There are no other records for this species in the area. This species was not detected.
Epacris glabella (smooth heath)	e EN	Numerous records in the Caudrys Hill/Heazlewood River area to the west of the study area	This endemic species is only known from the ultramafic serpentinite substrates to the west of the study area in heathy moorlands, scrub and heathy *Eucalyptus nitida* woodlands. These habitat types are entirely absent from the study area. This species was not detected.
Hypolepis muelleri (harsh groundfern)	r -	1 record on the northern slopes of Mt Cleveland in O'Bones Creek	This species has the potential to occur in any of the wet forest types that occur within the study area. This distinct fern species was not detected..
Micrantheum serpentinum (western tridentbush)	r -	Numerous records in the Caudrys Hill/Heazlewood River area to the west of the study area	This endemic species is only known from the ultramafic serpentinite substrates to the west of the study area in heathy moorlands, scrub and heathy *Eucalyptus nitida* woodlands. These habitat types are entirely absent from the study area. This species was not detected.
Viola cunninghamii (alpine violet)	r -	1 record on the plains to the west of Waratah	This species is under taxonomic revision due to a large number of misidentifications in the past. The main known habitat for this species is subalpine meadows and grassy woodlands, habitat types entirely absent from or near the study area. The common *Viola hederacea* was recorded from within the study area.

Priority fauna

Priority species recorded from the study area

No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were recorded from within the study area. The area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil, but it is unlikely that features such as nests or dens are present (see discussion in Table 3 for more details).

Priority fauna recorded from databases

Table 3 lists threatened fauna species recorded from within 5 km of the study area and discusses the potential of these species to be present on the site, based on the predicted vegetation types, site characteristics derived from the information provided, ecological assessment of nearby areas, and the author's knowledge of the species and the wider area.

Table 3. Priority fauna records from within 5000 m of boundary of study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the DPIPWE's *Natural Values Atlas* (DPIPWE 2011a) and FPA (2011).

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
Records within the study area			
There are no records within the study area.			
Records within 500 m of the study area			
There are no records within 500 m of the study area.			
Records within 5000 m of the study area			
Sarcophilus harrisii (tasmanian devil)	e EN	1 database record	Potential habitat (which is virtually any vegetation type) is present within the study area. The study area is likely to form part of the home range of one or more individuals or pairs. No evidence of the species (including sightings, scats, dens and latrine sites) was detected from the study area. See discussion below table for further information on this species.
Potential habitat within 5000 m of the study area			
Accipiter novaehollandiae (grey goshawk)	e -	No database records	FPA (2011) and DPIPWE (2011a) indicate the potential for this species to occur in the area. FPA (2011) describes potential habitat as "wet eucalypt forest with blackwood/myrtle

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
			understorey, blackwood swamp, *E. brookeriana* wet forest, melaleuca and leptospermum forest". Based on the field assessment, some of these habitat elements are present in the study area. No nest sites were detected during the course of the field assessment. It is unlikely that the proposed development will result in a significant impact on potential foraging and nesting habitat at a local scale because the majority of works will be restricted to previously disturbed areas.
Aquila audax subsp. *fleayi* (wedge-tailed eagle)	e EN	No records within 5000 m of the study area.	Potential habitat is described as "large tracts (more than 10 ha) of eucalypt or mixed forest" (FPA 2011). This habitat is extensive surrounding the study area. No nest sites were detected during the course of the field assessment. It is likely that the area is used as foraging habitat. See discussion below table for recommendations on additional search requirements.
Beddomeia bellii (hydrobiid snail – Rapid River)	r -	No database records	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2011). The study area is within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Beddomeia hullii (hydrobiid snail - Heazlewood River)	r -	6 database records	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2010a). The study area is 2 km from the known locality of this species (Thirteen Mile Creek) and is not within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Dasyurus maculatus subsp. *maculatus* (spotted-tailed quoll)	r VU	5 database records	Potential habitat is described (for both the eastern and spotted-tailed quolls) as "all wetter forest types, coastal heath and bush-pasture interfaces" (FPA 2011). The study area meets this broad habitat description and is likely to form part of the home range of one or more individuals or pairs. However, at a local scale, the proposed tailings mining and the loss of potential habitat is small relative to the large expanses of habitat in the wider area. The works would not result in a "significant impact" on the habitat of the species, as defined by the guidelines (CofA 2009) related to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Lathamus discolor (swift parrot)	e EN	1 database record	Potential habitat is described as "Breeding range (comprising foraging and nesting habitat) is within 10 km of the coastline (nearest coast including shores, bays, inlets or peninsulas). Foraging habitat: all *Eucalyptus ovata – E. viminalis* shrubby forest (OV), grassy *E. globulus* forest (GG) and *E. globulus* wet forest floristic communities

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
			(subsumed into R) or any forest type with >10% *E. globulus* canopy cover. Nesting habitat: *Eucalyptus* trees present > 70 cm dbh, with hollows present" (FPA 2011). The database record most likely represents a sighting of a migrating/dispersing/vagrant individual. The study area is outside the predicted range of the species (FPA 2011). The proposed development will have no impact on this species.
Oreixenica ptunarra (ptunarra brown butterfly)	v -	No database records	Potential habitat, which is described as "native grasslands or grassy woodlands with tussock grass (*Poa*) cover of more than 15%" (FPA 2011), is absent from within or adjacent to the study area.
Phrantela annamurrayae (hydrobiid snail – Heazlewood River)	r -	1 record	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2011). The study area is 6.5 km from the known locality of this species (Heazlewood River) and is not within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Phrantela marginata (hydrobiid snail – Heazlewood River)	r -	2 database records	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2010a). The study area is 5 km from the known locality of this species (Heazlewood River) and is not within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Sarcophilus harrisii (tasmanian devil)	e EN	5 database records	See comments in section below table.
Thylacinus cynocephalus (thylacine)	x EX	2 database records	Species presumed extinct – no further comments.
Tyto novaehollandiae subsp. *castanops* (Tasmanian masked owl)	e VU	No database records	Potential habitat is described as "lowland dry sclerophyll forest with old growth components" (FPA 2011), although the species can extend into wetter forest types. The forests surrounding the study area are wetter forest types with old-growth components present. The study area may form part of the home range of one or more pairs, and provide foraging, nesting and/or roosting habitat. However, the proposed development will not result in the substantial removal of potential foraging, roosting or nesting habitat.
Additional species from* Protected Matters Report *(DSEWPC 2011), and not considered in above sections			
Apus pacificus (fork-tailed swift)	Migratory Marine Species	No database records	Aerial foraging bird that rarely lands – proposed development will have no significant impact.
Ardea alba (great egret)	Migratory Wetland & Marine Species	No database records	Potential habitat absent – proposed development will have no significant impact.

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
Ardea ibis (cattle egret)	Migratory Wetland & Marine Species	No database records	Potential habitat absent – proposed development will have no significant impact.
Botaurus poiciloptilus (australian bittern)	- EN	No database records	Potential habitat absent – proposed development will have no significant impact.
Ceyx azureus subsp. *diemensis* (Tasmanian azure kingfisher)	e EN	No database records	Potential habitat (tree-lined major river systems) marginally present adjacent to the study area but the stream stretches are unsuitable for both foraging and nesting by the species due to the existing levels of disturbance and combination of habitat characteristics (Wapstra et al. 2010).
Gallinago hardwickii (lathams snipe)	Migratory Wetland Species	No database records	Potential habitat absent – proposed development will have no significant impact.
Hirundapus caudacutus (white-throated needletail)	Migratory Terrestrial Species	No database records	Aerial foraging bird that rarely lands – proposed development will have no significant impact.
Prototroctes maraena (australian grayling)	v VU	No database records	Potential habitat absent (lower to middle reaches of rivers and streams, FPA 2011) – proposed development will have no significant impact.

Wedge-tailed eagle

The forests surrounding the study area support suitable potential nesting habitat for the wedge-tailed eagle. Generally, the forests on the steeper slopes are dominated by *Eucalyptus obliqua* with an old-growth element present consisting of very old senescent trees with suitable nesting sites present. A ground-based survey was conducted of suitable habitat surrounding the study area, which consisted of a visual assessment from open ground in the Luina/Cleveland mine site area using binoculars and walking to more inaccessible gullies that had suitable nesting habitat. No nests were located, however, it should be noted that visibility was impeded in some areas due to the thick understorey of the forest communities present.

Figure 5 indicates the area of forest recommended for aerial searching for the possible presence of wedge-tailed eagle nests. The area is based on an interpretation of PI (photo-interpretation) forest types, vegetation maps, topography maps, aerial imagery and experience of the veracity of such sources at the local scale (based on the recent vegetation mapping undertaken as part of the present assessment). A 1 km buffer was employed because the proposed mine site is a long-term feature in the landscape rather than a short-term disturbance, and there is potential for nest sites within 1 km that may be in line-of-sight (one of the important management considerations). Ground-based searches in dense wet forests is not recommended (FPA 2006). Aerial (helicopter) searching is the most appropriate means of maximising the opportunity of nest detection. It should be noted that Forestry Tasmania have not conducted searches for nests within the last 3 years in the areas indicated in Figure 5 (E. Barker, Forestry Tasmania, pers. comm. August 2011).

Two opportunities to undertake aerial searches were presented because (1) suitably qualified personnel were able to accompany a pre-planned flight by Helicopters Tasmania to the west coast for other reasons, and (2) Bright Phase personnel were undertaking aerial reconnaissance of the lease area. As part of these flights, the lease area was assessed from the air (primarily for project appreciation and exploration lease investigation including assessing acid mine drainage extent down river systems and context of lease area relative to land tenure and roads, etc.), which provided the opportunity to survey the recommended forest patches for nests (based on Figure 5 but adapted in the air according to actual suitability for supporting nests). No nests were detected as a consequence of these surveys, which are reported in Figure 5 and Table 4.

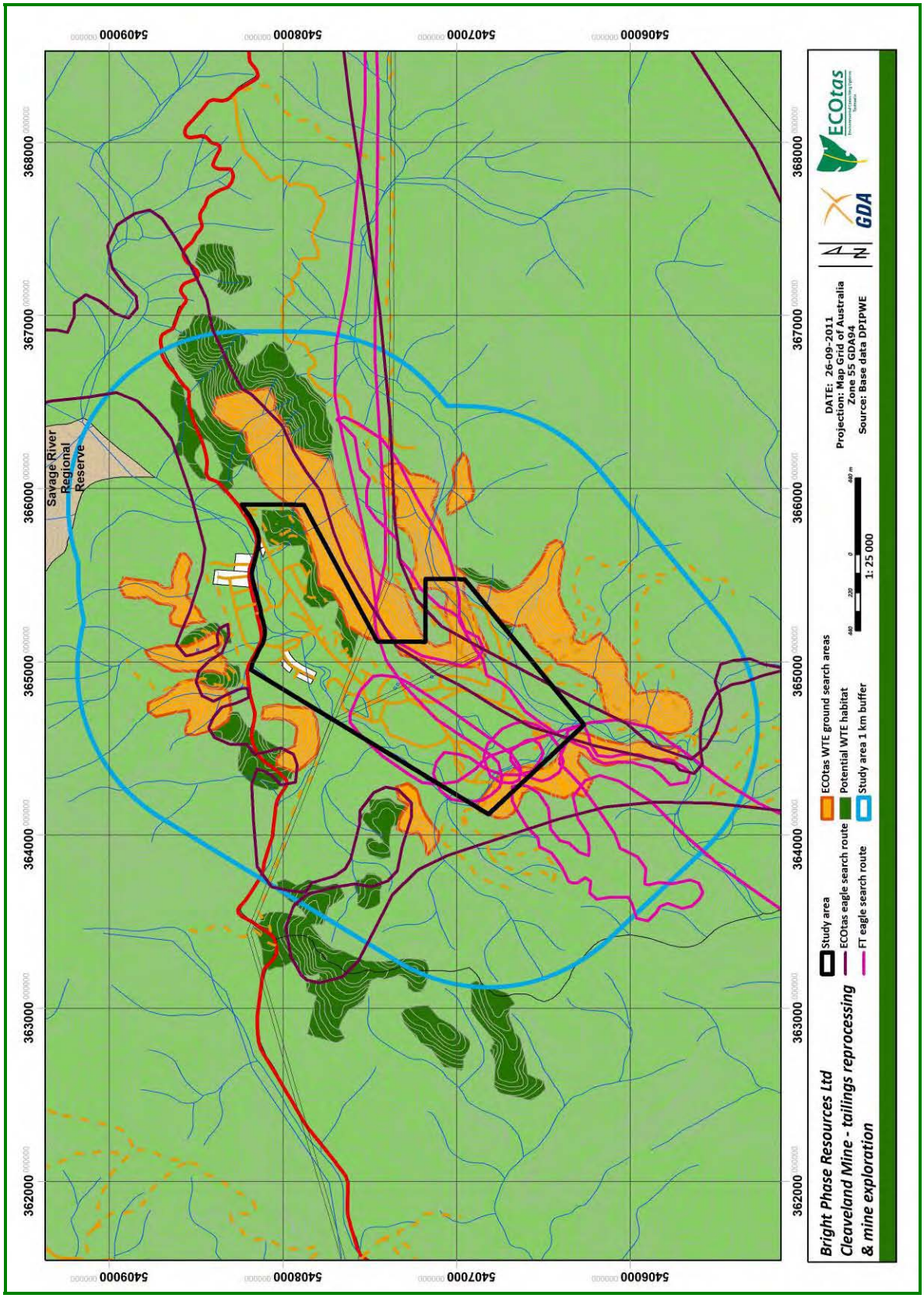


Figure 5. Maximum recommended search areas for wedge-tailed eagle nests indicating actual search area – the map should be read in conjunction with Table 4, which describes the survey area in more detail (buffers indicating sightability distance on the aerial routes not shown for readability reasons)

Table 4. Summary of surveys for wedge-tailed eagle nests within and adjacent to the study area

Action	*Date*	*Personnel*	*Findings*
Previous searches of study area			
Liaison between ECO*tas* and Forestry Tasmania	N/A	N/A	Correspondence between Mark Wapstra and Emma Barker (Forestry Tasmania, Murchison District) established that Forestry Tasmania have not undertaken aerial or ground-based searches for wedge-tailed eagle nests from any part of the recommended search area in the last 3 years
Potential nesting habitat assessment			
Map-based habitat assessment supplemented with field knowledge	15/08/2011	Brian French (ECO*tas*)	See Figure 5 and explanatory notes above – map produced is conservative and targets all areas of forest cover apparently supporting patches of more mature eucalypt forest, virtually irrespective of topographic (shelter) features
Map-based habitat assessment	27/08/2011	Simon McNamara (Forestry Tasmania)	Utilised Forestry Tasmania's PI (photo-interpretation) maps pf forest structure and composition to delineate potential nesting habitat (this map produced a smaller recommended search area that that shown in Figure 5 because it targeted definitive old-growth patches rather than the broader more conservative map of mature eucalypt patches shown in Figure 5) – both methods of pre-assessment are appropriate
Search of potential nesting habitat			
Ground-based	19/07/2011	Brian French (ECO*tas*)	Entire lease area searched for nests during routine ecological assessment – majority of vegetation within lease area highly unsuitable (disturbed regrowth forest) – **no nests detected** Limited searching of forest patches visible with binoculars from Waratah Road, township of Luina and powerline easement but visibility into dense forest patches hampered by density of vegetation and topography – aerial survey indicated as necessary – **no nests detected**
Ground-based	27/08/2011 31/08/2011	Mike Adams, Will Goodall (Bright Phase)	Ground-based search of forested slopes along c. 500 m of Waratah Road east of the old Luina township – **no nests detected**
Aerial search	26/08/2011	Simon McNamara (Forestry Tasmania) Mike Adams, Will Goodall (Bright Phase) Darryl Taylor (Tasmanian Helicopters – pilot)	Helicopter-based search of potential nesting habitat: • **no nests detected** • search path shown in Figure 5 • search time c. 45 minutes • weather suitable for most of survey with visibility of several hundred metres either side of flight path; closed in near end limiting visibility and flight safety indicating further searching required
Aerial search	22/09/2011	Mark Wapstra (ECO*tas*) Mike Adams, Will Goodall (Bright Phase) Bruce Colwell (Tasmanian Helicopters – pilot)	Helicopter-based search of potential nesting habitat: • **no nests detected** • search path shown in Figure 5 • search time c. 45 minutes • weather ideal for detecting nests, visibility several hundred metres on either side of flight path

Tasmanian devil

The Tasmanian devil has a widespread distribution, occurring in a range of vegetation types. FPA (2011) describes potential habitat as including "dry to damp forest, woodlands and grassy woodlands, coastal scrub, and riparian areas". Some of these habitat elements are present within and surrounding the study area, although it is noted that the majority of the study area and surrounds are dominated by anthropogenically created vegetation types and wet eucalypt and rainforest vegetation types.

No evidence of the species was detected from the study area. This evidence includes sightings (e.g. live animals, roadkill, skulls, etc.), scats (which, if present, would have been easily detected along the numerous old tracks and open areas), latrine sites (as for scats), and dens. Dens can be difficult to detect because they can be cryptic (e.g. old wombat burrows, underneath piles of logs, etc.) but no likely sites were observed. It is possible that surrounding areas support dens but the predominance of dense wet sclerophyll, mixed forest and rainforest types is suggestive that surrounding areas are unlikely to be prime habitat for the species.

The Commonwealth Department of Sustainability, Environment, Water, Population & Communities provides a *Significant Impact Guidelines* policy statement (CofA 2006) to determine if referral to the department is required in relation to the Tasmanian devil for development proposals, as follows (noting that the guidelines were developed in 2006 when the species was listed as Vulnerable – it is now listed as Endangered):

Significant impact criteria – vulnerable species

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- introduce disease that may cause the species to decline
- lead to a long-term decrease in the size of an important population of the species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of the species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat *or*
- interfere substantially with the recovery of the species.

Examples of activities that *may require* referral under the EPBC Act in relation to the Tasmanian Devil include any actions that may assist or accelerate the spread of DFTD (such as the moving of diseased individuals into an area which is currently disease-free), the construction of new roads or substantial upgrades to existing roads in sensitive locations, and any actions that involve the loss or intensified use of large or important areas of Tasmanian Devil habitat such as clearing for urban development, flooding associated with dam building, or the intensifying or changing of agricultural land use.

In relation to the Tasmanian Devil, the EPBC Act is unlikely to apply to the death of individuals along existing roads – see *What about Tasmanian Devils being killed on roads?* for further details. The EPBC Act is also unlikely to apply to minor new works that will only affect a small number of Tasmanian Devils in areas that are disease-free. However, in areas affected by DFTD where only a few breeding females may remain, an action that will have or is likely to have an impact on even a small number of Tasmanian Devils may be significant, and therefore the EPBC Act may apply.

Actions undertaken as part of official disease suppression programmes, such as removing diseased individuals from wild populations and establishing disease-free captive populations, are not regarded by the Department of the Environment and Heritage to be likely to have a major adverse impact on Tasmanian Devil populations.

Individuals and organisations should consider the particular facts and circumstances of their activities in deciding whether there is a need to make a referral under the EPBC Act. You must make a referral for an activity if you think it may be likely to have a significant impact on a listed threatened species.

The current development proposal will essentially re-work and rehabilitate old mine workings, and no specific evidence of occupation by the Tasmanian devil has been detected. The current proposal will not: (1) introduce disease that may cause the species to decline; (2) lead to a long-term decrease in the size of an important population of the species (no evidence of the species within the study area); (3) reduce the area of occupancy of an important population (as for 2, and in the long-term the extent of potential habitat will not be reduced – potential habitat likely to be increased through rehabilitation activities); (4) fragment an existing important population into two or more populations (as for 2, and proposed works will not actually fragment habitat in the short or long term); (5) adversely affect habitat critical to the survival of the species (as for 2, 3 and 4); (5) disrupt the breeding cycle of an important population (no evidence of a breeding population being present); (6) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline (as for 2, 3, 4, 5); (6) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat (the proposed works will not alter the access to the study area and will effectively only re-work old mine workings); (7) interfere substantially with the recovery of the species (the study area does not form part of a specific element of the recovery program of the species).

Weed species

Four species classified as "declared weeds" within the meaning of the Tasmanian *Weed Management Act 1999* were recorded:

- *Erica lusitanica* (spanish heath);
- *Cytisus scoparius* (english broom);
- *Rubus fruticosus* .agg (blackberry); and
- *Salix* sp. (willow).

All of the weeds generally occur in and around the old Luina township. It is likely that *Erica lusitanica* (spanish heath) is a garden escapee with a widespread occurrence in the old town area (Figure 6). *Rubus fruticosus* .agg (blackberry) is scattered and is not considered a management problem at the present and *Salix* sp. (willow) is isolated to one small tree in a wet area on the northern area of the mine workings (Figure 6).

Other potentially invasive species recorded include:

- *Chasmanthe floribunda* (african cornflag);
- *Cirsium vulgare* (scotch thistle);
- *Cotoneaster* sp. (cotoneaster); and
- *Digitalis purpurea* (foxglove).

These species were also confined to the old Luina town site. These species are not listed on the Tasmanian *Weed Management Act 1999*. Currently, these species do not pose a management threat. However, long term management should be considered for all the species whilst they are confined to a small area within the Luina township and are easily accessible.

The study area falls within the Waratah-Wynyard municipality, for which the following criteria apply to the detected species:

- *Erica lusitanica* (spanish heath): Zone A ("localised infestations");
- *Cytisus scoparius* (english broom): Zone B ("widespread infestations");
- *Rubus fruticosus* (blackberry): Zone B ("widespread infestations"); and
- *Salix* spp. (willows): Zone B ("widespread infestations").

Figure 6. Weed locations within the study area

In relation to "Zone A" species, "eradication", within the meaning of the *Weed Management Act 1999*, is the most appropriate management objective for municipalities who have localised and moderate infestations and where effective management is feasible. The management outcome for these municipalities is ongoing eradication and prevention of the spread of declared weeds from existing infestations to areas free or in the process of becoming free of these weeds.

In relation to "Zone B" species, "containment", within the meaning of the *Weed Management Act 1999*, is the most appropriate management objective for municipalities who have problematic infestations but no plan and/or resources to undertake control actions at a level required for eradication. The management outcome for these municipalities is ongoing prevention of the spread of declared weeds from existing infestations to areas free or in the process of becoming free of these weeds.

The main concern is to minimise the risk of invasive exotic species becoming more widely established in the municipality. Follow up management (e.g. hand-spraying of weed outbreaks) should be considered for these species to inhibit invasion to surrounding forest areas. A more complex site-specific weed management plan is not considered warranted at this stage but should form part of the DPEMP.

Disease management

Phytophthora cinnamomi

The *Forest Botany Manual* (FPA 2005) and Rudman (2005) indicate that "*Eucalyptus obliqua* dry forest" (DOB) is moderately susceptible to the root-rot pathogen *Phytophthora cinnamomi.* No evidence of the pathogen was noted. Due to the disturbed nature of the vegetation and the lack of susceptible plant species to the pathogen, no special management prescriptions are considered warranted.

Myrtle wilt

Myrtle wilt, caused by a wind-borne fungus (*Chalara australis*), occurs naturally in rainforest where myrtle (*Nothofagus cunninghamii*) is present. The fungus enters wounds in the tree, usually caused by damage from wood-boring insects, wind damage and forest clearing. The incidence of myrtle wilt often increases forest clearing events.

No evidence of myrtle wilt was recorded from within the study area. The proposed mining activities have the potential to increase the susceptibility of the surrounding rainforest areas to become infected with myrtle wilt, although given that the majority of works will be undertaken in heavily disturbed forest (e.g. old tailings sites), no special management prescriptions are considered warranted.

Chytrid fungus and other freshwater pathogens

Native freshwater species and habitat are under threat from freshwater pests and pathogens including *Phytophthora cinnamomi* (root rot), *Batrachochytrium dendrobatidis* (Chytrid frog disease), *Mucor amphibiorum* (platypus Mucor disease) and the freshwater algal pest *Didymosphenia geminata* (Didymo) (Allan & Gartenstein 2010). Freshwater pests and pathogens are spread to new areas when contaminated water, mud, gravel, soil and plant material or infected animals are moved between sites. Contaminated materials and animals are commonly transported on boots, equipment, vehicles tyres and during road construction and maintenance activities. Once a pest pathogen is present in a water system it is usually impossible to eradicate. The manual *Keeping it Clean - A Tasmanian Field Hygiene Manual to Prevent the Spread of*

Freshwater Pests and Pathogens (Allan & Gartenstein 2010) provides information on how to prevent the spread of freshwater pests and pathogens in Tasmanian waterways wetlands, swamps and boggy areas. At present there are no specific guidelines for mineral extraction works but minimising the spread of soil, gravel and water between catchments is strongly recommended. It is noted that the study area does not support, and is not likely to support, threatened frog species.

Other matters of potential ecological significance

Matters of National Environmental Significance – threatened ecological communities

The EPBCA *Protected Matters Area* report (DSEWPC 2011) indicates that "Alpine Sphagnum Bogs and Associated fens" (classified as Endangered under the EPBCA) may occur within the area. No such vegetation types were identified from within or close to the study area.

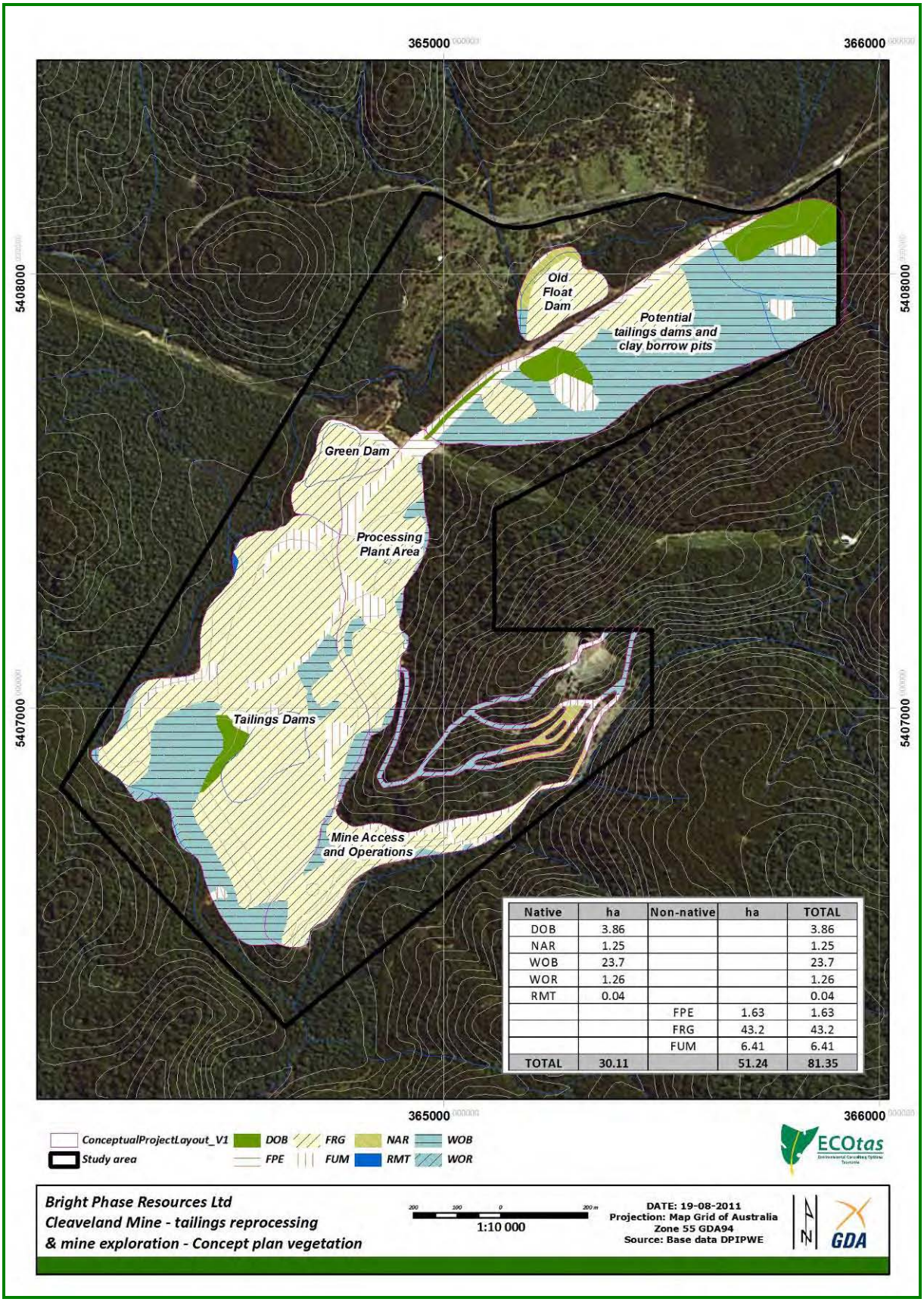
Matters of National Environmental Significance – places on the Register of the National Estate

The EPBCA *Protected Matters Area* report (DSEWPC 2011) indicates that the "Tarkine TAS" (indicative place) and "Tarkine Wilderness Area TAS" (registered) are potentially within the vicinity of the study area. While the Luina township area is embedded within the "Tarkine Might Have Values Area", the entirety if the study area is actually excluded from the MHV area (see http://www.environment.gov.au/heritage/ahc/national-assessments/tarkine/pubs/tarkine-map-2011.pdf).

Informal reserve on State Forest

The entirety of the study area is indicated as being part of an "Informal Reserve on State Forest". Advice received from Forestry Tasmania (email from Ronny Tyquin to Pitt & Sherry, and also confirmed from an email from Emma Barker to Mark Wapstra) indicated that the area has been dedicated as an "Informal Reserve" primarily for "flora values", possibly as a result of the Community Forest Agreement. Forestry Tasmania have internal planning processes for assessing non-wood production activities within reserved managed by that agency. Bright Phase Resources Ltd (either direct or through Pitt & Sherry) will need to liaise further with Forestry Tasmania through Mineral Resources Tasmania. A possible "offset" for loss of flora values has been suggested as a planning approval requirement. In this case, our report has indicated that the flora values present have low conservation significance (see Table 1 and Figure 4 for list of vegetation types – all not threatened or of regional conservation significance; and Table 2 for list of threatened flora potentially present – none actually detected). In our opinion, if mining activities are essentially restricted to disturbed areas (and mainly non-forest vegetation types, exotic mapping units, regrowth forest or disclimax forest) and re-worked areas are rehabilitated to native vegetation, formal offsetting should not be required.

Figure 7 shows the predicted maximum extent of disturbance associated with the development proposal, which was overlain with our revised vegetation mapping (Figure 4). The table on Figure 7 clearly indicates that the majority of disturbance will occur on anthropogenically created mapping units. Activities in native vegetation mapping units will be more limited. Note that no such areas are mapped as oldgrowth, and that rehabilitation works will require revegetation to a similar vegetation type (i.e. replacing one age of regrowth forest with a younger age). The extent of clearing in native vegetation units is slightly less than indicated because we did not separate most old tracks from the broader vegetation unit (simply because of the practicality of the scale of mapping required to do this).



Native	ha	Non-native	ha	TOTAL
DOB	3.86			3.86
NAR	1.25			1.25
WOB	23.7			23.7
WOR	1.26			1.26
RMT	0.04			0.04
		FPE	1.63	1.63
		FRG	43.2	43.2
		FUM	6.41	6.41
TOTAL	30.11		51.24	81.35

Figure 7. Possible maximum extent of disturbance to each vegetation mapping unit within the study area

DISCUSSION & RECOMMENDATIONS

Summary of key findings

Threatened flora

- No flora species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.

Threatened fauna

- No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
- The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and Tasmanian devil, but it is unlikely that features such as nests or dens are present within the study area itself (no such features were detected), and no special management prescriptions are recommended (noting that rehabilitation of the area will be required).
- The wider area supports potential nesting habitat for the wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) but surveys did not detect any nests within the study area or within 1 km of the study area, so no deleterious impact on the species is anticipated.

Vegetation types

- Eight mapping units were identified from the study area (Figure 4), namely:
  - "*Acacia melanoxylon* forest on rises" (TASVEG code: NAR);
  - "*Eucalyptus obliqua* dry forest and woodland" (TASVEG code: DOB);
  - "*Eucalyptus obliqua* forest with broad-leaf shrubs" (TASVEG code: WOB);
  - "*Eucalyptus obliqua* forest over rainforest" (TASVEG code: WOR);
  - "*Nothofagus-Atherosperma* rainforest" (TASVEG code: RMT);
  - "extra-urban miscellaneous" (TASVEG code: FUM);
  - "permanent easement" (TASVEG code: FPE);
  - "regenerating cleared land" (TASVEG code: FRG).
- None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Weeds

- Several species of "declared" weed species, and some other exotic species with potential to act as "environmental weeds", were detected from the study area. Inclusion of weed management prescriptions in the DPEMP is recommended.

Plant and animal disease

- No evidence of plant and animal disease was noted. Inclusion of disease management prescriptions in the DPEMP is recommended.

Reserves

- The study area is within an "Informal Reserve" managed by Forestry Tasmania – some additional planning assessment protocols will need to be applied to satisfy Forestry Tasmania's internal protocols. In our opinion, the proposed works will result in a temporary modification of some native vegetation types but these are all already regrowth facies of the various communities after previous mining activities. As such, complex offsets are not recommended, provided that the area is rehabilitated to similar vegetation types.

Legislative and policy implications

Some commentary is provided below with respect to the key threatened species and vegetation management legislation and polices. Note that there may be other relevant policy instruments in addition to those discussed. It is assumed that the proposed mine site will comply with the relevant provisions of legislation and policy instruments related to mineral exploration and mining activities and these are not discussed herein.

Tasmanian *Threatened Species Protection Act 1995*

A permit will not be required under Section 51 of this Act because no threatened species listed on the Act will be disturbed.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth Department of Sustainability, Environment, Water, Population & Communities provides a *Significant Impact Guidelines* policy statement (CofA 2009) to determine if referral to the department is required. In our opinion, with respect to the Tasmanian devil, spotted-tailed quoll and masked owl, the proposed development will not constitute a "significant impact" because while there will be a loss (more correctly a temporary disturbance) of some potential habitat of these species (modified already), the loss is not such that it is likely to lead to a long-term decrease in the size of an important population of a species, reduce the area of occupancy of an important population, fragment an existing important population into two or more populations, adversely affect habitat critical to the survival of a species, disrupt the breeding cycle of an important population, modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat, introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. The proponent may need to demonstrate that the proposed works will not result in a significant alteration to the potential incidence of roadkill on public roads between Luina and Burnie, especially with respect to the Tasmanian devil and spotted-tailed quoll. Referral to the DSEWPC map be required if a significant increase in roadkill of these species is anticipated.

Tasmanian *Nature Conservation Act 2002*

The study area does not support any vegetation types classified as threatened under Schedule 3A of this Act. There are no constraints under this Act on the proposed activities.

Tasmanian *Wildlife Regulations 2010*

No species, or products (e.g. nests, dens, etc.) of species, listed on schedules of the Regulations (i.e. "specially protected wildlife", "protected wildlife", "partly protected wildlife"), will be knowingly disturbed. There are no constraints under this Act on the proposed activities

Tasmanian *Forest Practices Act 1985* and associated regulations

A Forest Practices Plan (FPP) is required for most "clearing" activities in areas of forest and woodland (and for some activities within threatened non-forest native vegetation). However, changes to the Act (25 November 2009), as stated below, indicate additional circumstances in which an FPP is not required, including mining activities.

> 4. Circumstances in which forest practices plan, &c., not required
>
> For the purpose of section 17(6) of the Act, the following circumstances are prescribed:
>
> (i) [Regulation 4 Amended by S.R. 2009, No. 135, Applied:25 Nov 2009] the harvesting of timber or the clearing of trees on any land, or the clearance and conversion of a threatened native vegetation community on any land, in the course of mineral exploration activities, or mining activities, that are authorised under –
>
> (i) a permit granted under the *Land Use Planning and Approvals Act 1993*; or
>
> (ii) an exploration licence within the meaning of the *Mineral Resources Development Act 1995*; or
>
> (iii) a retention licence within the meaning of the *Mineral Resources Development Act 1995*; or
>
> (iv) a mining lease within the meaning of the *Mineral Resources Development Act 1995*.

Recommendations

The following values should be further considered, as part of DPEMP preparation:

- undertake an analysis of the potential risk of increase in mammal roadkill as a consequence of product transportation activities;
- include weed management and disease minimisation protocols in the DPEMP;
- liaise further with Forestry Tasmania and Mineral Resources Tasmania on the required management of the informal reserve;
- adhere to the *Quarry Code of Practice June 1999* (DPIWE 1999) and other recommendations applied by planning authorities in relation to mineral extraction works, transport of product and site rehabilitation.

REFERENCES

Allan, K. & Gartenstein, S. (2010). *Keeping It Clean: A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens.* NRM South, Hobart.

Anon. (1997). *Tasmanian Regional Forest Agreement between the Commonwealth of Australia and the State of Tasmania*. Commonwealth of Australia and the State of Tasmania, Canberra.

Baker, M.L. & Duretto, M.F. (2011). *A Census of the Vascular Plants of Tasmania and Index to* The Student's Flora of Tasmania. Tasmanian Herbarium, Hobart. (2011 web edition as downloaded from http://www.tmag.tas.gov.au/Herbarium/TasVascPlants.pdf).

CFEV (2005). *Conservation of Freshwater Ecosystem Values Project, CFEV database, v1.0*. Water Resources Division, Department of Primary Industries & Water, Tasmania.

Department of Sustainability, Environment, Water, Population & Communities (DSEWPC) (2011). Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Report* for - Coordinates: -41.46649,145.38134 -41.46641,145.38309 -41.46717,145.38476 -41.46717,145.38621 -41.46649,145.38887 -41.46664,145.39002 -41.46695,145.39139 -41.46679,145.39238 -41.46649,145.39352 -41.46557,145.39519 -41.46999,145.39481 -41.47288,145.38507 -41.47502,145.38491 -41.47517,145.38887 -41.47882,145.38895 -41.48461,145.37821 -41.47898,145.37212 -41.46649,145.38149 -41.46649,145.38134 dated 9 August 2011. [appended for reference]

Commonwealth of Australia (CofA) (2009). *Matters of National Environmental Significance. Significant Impact Guidelines 1.1* Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment, Water, Heritage and the Arts, Canberra.

Department of Primary Industries, Parks, Water & Environment (DPIPWE) (2011a). *Natural Values Report No* 42807_ECOtas_Cleveland Mine_290711. [appended for reference]

Department of Primary Industries, Parks, Water & Environment (DPIPWE) (2011b) *Threatened Native Vegetation Communities List April 2007* as per Schedule 3A of the *Nature Conservation Act 2002.* http://www.dpiw.tas.gov.au/inter.nsf/WebPages/AWAH-6547ZL?open

Department of Primary Industries, Parks, Water & Environment (DPIPWE) (2009). *Guidelines for Natural Values Assessments, Reporting on the Impact of Proposed Activities on the Natural Values and Providing Recommendations for Mitigating Impacts on these Values*. Development and Conservation Assessment Branch, Department of Primary Industries, Parks, Water and Environment.

Department of Primary Industries, Water and Environment (DPIWE) (1999). *Quarry Code of Practice June 1999*. Department of Primary Industries, Water & Environment in association with Mineral Resources Tasmania, Hobart.

Duretto, M.F. (Ed.) (2009+) *Flora of Tasmania Online*. Tasmanian Herbarium, Tasmanian Museum & Art Gallery: Hobart. www.tmag.tas.gov.au/floratasmania.

Forest Practices Authority (FPA) (2011). *Threatened Fauna Manual Mapsheet Display Luina 3640 current as at 9 August 2011,* and hyperlinked species profiles and range boundary maps. http://www.fpa.tas.gov.au/index.php?id=20. [appended for reference]

Forest Practices Authority (FPA) (2006). *Eagle Nest Searching, Activity Checking and Nest Management. Fauna Technical Note No. 1.* Forest Practices Authority, Hobart. (FPA reference FPA/07/307/002 Record 2009/39250)

Forest Practices Authority (FPA) (2005). *Forest Botany Manual: Module 8 – West and Southwest Region*. Forest Practices Authority, Tasmania.

Harris, S. & Kitchener, A. (editors) (2005). *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. Department of Primary Industries, Water and Environment, Hobart.

Rudman T. (2005). *Interim* Phytophthora cinnamomi *Management Guidelines*. Nature Conservation Report 05/7, Biodiversity Conservation Branch, Department of Primary Industries, Water & Environment, Hobart.

Threatened Species Unit (TSU) (2003). *Notesheets for* various threatened species listed in Table 2. DPIPWE, Hobart.

Wapstra, H., Wapstra, A., Wapstra, M. & Gilfedder, L. (2005, updated annually online). *The Little Book of Common Names for Tasmanian Plants*. Department of Primary Industries, Water & Environment, Hobart.

APPENDIX A. Vegetation community structure and composition

Note: The table below indicates the species that were the dominants within the community recorded. Refer to Appendix B for a full list of vascular species recorded from the vegetation type. A description of the non-forest "artificial" mapping unit "extra –urban miscellaneous" (FUM) is not provided.

Regenerating cleared land (TASVEG code: FRG)

Regenerating cleared land (FRG) is the dominant vegetation type across the study area. The mapping unit is either native species re-colonising disturbed sites such as quarries or rehabilitation species which have been introduced to the site via hydro mulching. Silver wattle (Acacia dealbata) is the dominant species across the areas (see images below) with only sparse scattered shrubs and grasses present in the understorey.

FRG is characterised by a sparse, shrubby understorey with scattered trees of *Acacia dealbata* (both images). In some areas, the regeneration has been poor (LHS) due to high levels of disturbance in the past and toxic soils from acid mine drainage.

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	8-15 m 20%	*Acacia dealbata* – note that this layer can be absent on the poor sites as indicated in the left hand image above.
Tall shrubs	4-6 (<8) m 30%	*Acacia dealbata*, *Acacia mucronata*, *Acacia melanoxylon*, *Leptospermum scoparium*
Shrubs	<2 m 20%	*Acacia mucronata*, *Leptospermum nitida*, *Leptospermum scoparium*
Grasses/graminoids	1-2 (<3) <5%	*Gahnia grandis*, *Baloskion tetraphyllum* (in wet areas and acid mine drainage sites)

Acacia melanoxylon forest on rises (TASVEG code NAR)
Floristic code: SWAMP-D4

Acacia melanoxylon forest on rises (NAR) is common on the slopes above Washington Creek and in the Whyte River in the north of the study area. This community is likely to be a disturbance related community that will gradually change into rainforest over time.

NAR on the dominating the slopes to the south of Washington Creek

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	18-25 m 25%	*Acacia melanoxylon*
Trees	8-10 m 30%	*Acacia melanoxylon, Nothofagus cunninghamii, Atherosperma moschatum, Nematolepis squamea*
Tall shrubs	~6 m 50 %	*Pomaderris apetala, Olearia argophylla, Nothofagus cunninghamii*
Ferns	<2 m 30%	*Dicksonia antarctica, Polystichum proliferum, Blechnum nudum*

Eucalyptus obliqua dry forest and woodland (TASVEG code: DOB)
Floristic code: DRY-shOB

Eucalyptus obliqua dry forest and woodland (DOB) was localised to a relatively dry north-facing slope in the south of the study area. This community is a remnant in an area that is surrounded by rehabilitation areas over the old mine tailings dumps. This community is in good condition with no weed species recorded. It is likely that DOB is a result of fire and other disturbance in the past as the dominant tree layer is a regrowth structure. It is likely that DOB would successionally change into a wet forest community without disturbance.

DOB above an old quarry in the south of the study area – this localised community is characterised by a shrubby understorey with thin soils

Stratum	**Height (m)** **Cover (%)**	**Species** (underline = dominant, parentheses = sparse)
Trees	22 m 15%	*Eucalyptus obliqua*
Trees	8-14 m 20%	*Eucalyptus obliqua, (Eucalyptus delegatensis)*
Tall shrubs	4-5 (<8) m 15%	*Acacia mucronata, Monotoca glauca, Leptospermum scoparium, Banksia marginata*
Shrubs	<2 m 10%	*Lomatia tinctoria, Pomaderris elliptica, Bauera rubioides*
Grasses/graminoids	1 m 25%	*Dianella tasmanica*
Ferns	<1 m 15%	*Pteridium esculentum*

Eucalyptus obliqua forest with broad-leaf shrubs (TASVEG code: WOB)
Floristic codes: WET-OB2

Eucalyptus obliqua forest with broad-leaf shrubs (WOB) is common on the periphery of the disturbed tailings and mining areas. Generally, WOB occurs as a factor as past disturbance from fire and mining activities and is regenerating from these events. This community is characterised by a regrowth layer of *E. obliqua* in the most disturbed sites with a shrubby understorey and old-growth *E. obliqua* in the relatively undisturbed areas. WOB is gradational with WOR on more sheltered, moist, fertile and undisturbed sites.

WOB to the south of the Glory Hole

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	30-35 m 20%	<u>*Eucalyptus obliqua*</u> – occurring as a dominant layer over undisturbed sites. This layer is absent in the more disturbed areas around the mine/tailings areas.
Trees	16-18 m 20%	<u>*Eucalyptus obliqua*</u>, *Acacia melanoxylon*
Trees/tall shrubs	6-10(<8) m 45%	<u>*Nematolepis squamea*</u>, *Acacia melanoxylon, Acacia dealbata, Monotoca glauca, (Nothofagus cunninghamii), Zieria arborescens, Cassinia aculeata*
Shrubs	<2 m <5%	*Coprosma quadrifida, Pimelea drupacea*
Grasses/graminoids	<2.5 m 25%	*Dianella tasmanica, Gahnia grandis, Libertia pulchella* var. *pulchella*
Ferns	<1 m 30%	*Blechnum nudum, Polystichum proliferum, (Pteridium esculentum)*

Eucalyptus obliqua forest over rainforest (TASVEG code: WOR)
Floristic codes: WET-OB1000

Eucalyptus obliqua forest over rainforest (WOR) is common as a gradational community between WOB (see above) and RMT on undisturbed sites (see below). This community is characterised by the dominance of *E. obliqua* old-growth trees over a rainforest layer dominated by *Nothofagus cunninghamii*. This community has some mild disturbance in the past (mining tracks in the Crescent Spur area), but is in good condition with no weeds recorded.

WOR on the south-facing slopes of Crescent Spur

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	30-35 m 20%	<u>*Eucalyptus obliqua*</u> – occurring as a dominant layer over undisturbed sites. This layer is absent in the more disturbed areas around the mine/tailings areas.
Trees	16-18 m 20%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, Acacia melanoxylon, (Acacia dealbata* – on disturbed margins)
Trees/tall shrubs	8-13(<15) m 50%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, Acacia melanoxylon, Phyllocladus aspleniifolius, Monotoca glauca*
Shrubs	<2 m <5%	*Coprosma quadrifida, Pimelea drupacea*
Grasses/graminoids	<2.5 m 25%	*Dianella tasmanica, Gahnia grandis, Libertia pulchella* var. *pulchella*
Ferns	<1 m 15%	*Blechnum nudum, Polystichum proliferum, Histiopteris incisa*

Nothofagus-Atherosperma rainforest (TASVEG code: RMT)
Floristic codes: RAIN-C1.1

Nothofagus-Atherosperma rainforest (WOR) is localised to the western side of the Whyte River in the west of the study area. This community is characterised by the dominance of *Nothofagus cunninghamii* with no eucalypt species present. RMT has not been disturbed in the recent past and is in good condition with no weeds recorded.

RMT on the western side of the Whyte River

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	22-30 m 35%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum*
Trees	16-18 m 50%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, (Acacia melanoxylon* – on disturbed margins)
Tall shrubs	8-13(<15) m 50%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, Acacia melanoxylon, Phyllocladus aspleniifolius*
Grasses/graminoids	<2.5 m 25%	*Libertia pulchella* var. *pulchella, (Gahnia grandis)*
Ferns	<1 m 25%	*Blechnum nudum, Polystichum proliferum, Histiopteris incisa*

APPENDIX B. Vascular plant species recorded from study area

Botanical nomenclature follows *A Census of the Vascular Plants of Tasmania* (Baker & Duretto 2011), updated to reflect the nomenclatural changes recognised in the *Flora of Tasmania Online* (Duretto 2009+); common nomenclature follows Wapstra et al. (2005).

Total species = 86; dicotyledons = 53 (including 12 endemic, 5 exotic); monocotyledons = 214 (including 0 endemic, 1 exotic);gymnosperms = 1 (native); pteridophytes = 18 (all native)

i = introduced/naturalised; e = endemic; t = in Australia, present only in Tasmania

DICOTYLEDONAE		
	ARALIACEAE	
	Hydrocotyle hirta	hairy pennywort
	Hydrocotyle sibthorpioides	shining pennywort
	ASTERACEAE	
	Cassinia aculeata subsp. *aculeata*	common dollybush
i	*Cirsium vulgare*	spear thistle
	Euchiton collinus	common cottonleaf
	Olearia argophylla	musk daisybush
	Olearia stellulata	sawleaf daisybush
	ATHEROSPERMATACEAE	
	Atherosperma moschatum subsp. *moschatum*	sassafras
	CUNONIACEAE	
	Bauera rubioides	wiry bauera
e	*Eucryphia lucida*	leatherwood
	ELAEOCARPACEAE	
e	*Aristotelia peduncularis*	heartberry
	ERICACEAE	
	Epacris gunnii	coral heath
	Epacris impressa	common heath
i	*Erica lusitanica*	spanish heath
	Gaultheria hispida	copperleaf snowberry
t	*Leptecophylla juniperina* subsp. *juniperina*	common pinkberry
	Monotoca glauca	goldey wood
e	*Trochocarpa gunnii*	fragrant purpleberry
	FABACEAE	
	Acacia dealbata subsp. *dealbata*	silver wattle
	Acacia melanoxylon	blackwood
e	*Acacia mucronata* subsp. *dependens*	blunt caterpillar wattle
	Acacia mucronata subsp. *mucronata*	erect caterpillar wattle
	Acacia verticillata subsp. *verticillata*	prickly moses
i	*Cytisus scoparius*	english broom
	Pultenaea juniperina	prickly beauty
	LAMIACEAE	
	Prostanthera lasianthos var. *lasianthos*	christmas mintbush
	MYRTACEAE	
e	*Eucalyptus delegatensis* subsp. *tasmaniensis*	gumtopped stringybark
e	*Eucalyptus nitida*	western peppermint
	Eucalyptus obliqua	stringybark
e	*Leptospermum glaucescens*	smoky teatree
	Leptospermum lanigerum	woolly teatree
e	*Leptospermum nitidum*	shiny teatree
	Leptospermum scoparium var. *scoparium*	common teatree
	Melaleuca squamea	swamp honeymyrtle
	Melaleuca squarrosa	scented paperbark
	NOTHOFAGACEAE	
	Nothofagus cunninghamii	myrtle beech

	PITTOSPORACEAE	
	Pittosporum bicolor	cheesewood
	PLANTAGINACEAE	
i	*Digitalis purpurea*	foxglove
	PROTEACEAE	
	Banksia marginata	silver banksia
e	*Hakea epiglottis subsp. epiglottis*	beaked needlebush
e	*Lomatia tinctoria*	guitarplant
e	*Telopea truncata*	tasmanian waratah
	RANUNCULACEAE	
	Clematis aristata	mountain clematis
	RHAMNACEAE	
	Pomaderris apetala subsp. *apetala*	common dogwood
	Pomaderris elliptica var. *elliptica*	yellow dogwood
	ROSACEAE	
	Acaena novae-zelandiae	common buzzy
i	*Cotoneaster franchetii*	grey cotoneaster
	Rubus fruticosus .agg	blackberry
	RUBIACEAE	
	Coprosma quadrifida	native currant
	RUTACEAE	
	Nematolepis squamea subsp. *squamea*	satinwood
	Zieria arborescens subsp. *arborescens*	stinkwood
	THYMELAEACEAE	
	Pimelea drupacea	cherry riceflower
	VIOLACEAE	
	Viola hederacea subsp. *hederacea*	ivyleaf violet
	WINTERACEAE	
	Tasmannia lanceolata	mountain pepper
	GYMNOSPERMAE	
	PODOCARPACEAE	
e	*Phyllocladus aspleniifolius*	celerytop pine
	MONOCOTYLEDONAE	
	CYPERACEAE	
	Gahnia grandis	cutting grass
	Gymnoschoenus sphaerocephalus	buttongrass
	HEMEROCALLIDACEAE	
	Dianella tasmanica	forest flaxlily
	IRIDACEAE	
i	*Chasmanthe floribunda*	african cornflag
	Libertia pulchella var. *pulchella*	pretty grassflag
	JUNCACEAE	
	Juncus bassianus	forest rush
	Juncus pallidus	pale rush
	Juncus pauciflorus	looseflower rush
	POACEAE	
i	*Agrostis stolonifera*	creeping bent
i	*Holcus lanatus*	yorkshire fog
	Microlaena stipoides var. *stipoides*	weeping grass
	Poa gunnii	gunns snowgrass
	Poa labillardierei var. *labillardierei*	silver tussockgrass
	RESTIONACEAE	
	Baloskion tetraphyllum subsp. *tetraphyllum*	tassel cordrush
	PTERIDOPHYTA	
	BLECHNACEAE	
	Blechnum fluviatile	ray waterfern
	Blechnum minus	soft waterfern
	Blechnum nudum	fishbone waterfern
	Blechnum penna-marina subsp. *alpina*	alpine waterfern

Blechnum wattsii	hard waterfern
DENNSTAEDTIACEAE	
Histiopteris incisa	batswing fern
Pteridium esculentum	bracken
DICKSONIACEAE	
Dicksonia antarctica	soft treefern
DRYOPTERIDACEAE	
Polystichum proliferum	mother shieldfern
GLEICHENIACEAE	
Gleichenia microphylla	scrambling coralfern
Sticherus tener	silky fanfern
GRAMMITIDACEAE	
Grammitis billardierei	common fingerfern
HYMENOPHYLLACEAE	
Hymenophyllum australe	southern filmyfern
Hymenophyllum cupressiforme	common filmyfern
Hymenophyllum flabellatum	shiny filmyfern
Hymenophyllum rarum	narrow filmyfern
POLYPODIACEAE	
Microsorum pustulatum subsp. *pustulatum*	kangaroo fern

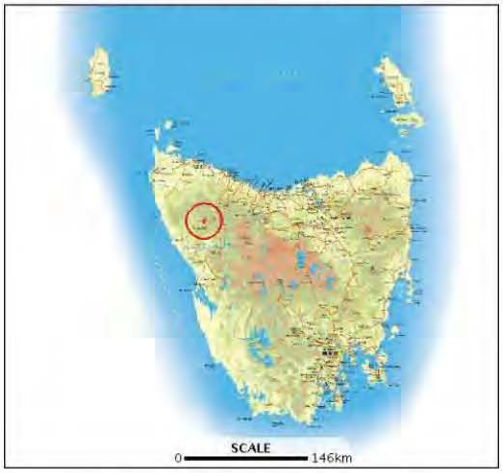
APPENDIX C. DPIPWE's *Natural Values Atlas* report for study area

Natural Values Atlas Report

Authoritative, comprehensive information on Tasmania's natural values.

Report number: 42807
Reference: ECOtas_Cleveland Mine_290711
Requested For: Brian French
Timestamp: 02:44:51 PM Friday 29 July 2011

Threatened Flora: buffers 500m and 5000m
Threatened Fauna: buffers 500m and 5000m
Conservation Significance Flora: Not requested
Conservation Significance Fauna: Not requested
Weeds: buffers 500m and 5000m
TasVeg: buffer 1000m
Threatened Communities: buffer 1000m
Geoconservation: buffer 1000m
Tasmanian Reserve Estate: buffer 1000m



The centroid for this query **GDA94 364958,5407301** falls within:
1:25000 Map: 3640 LUINA
Property: 7004215 CORINNA ROAD, LUINA TAS 7321

Department of Primary Industries, Parks, Water *and* Environment

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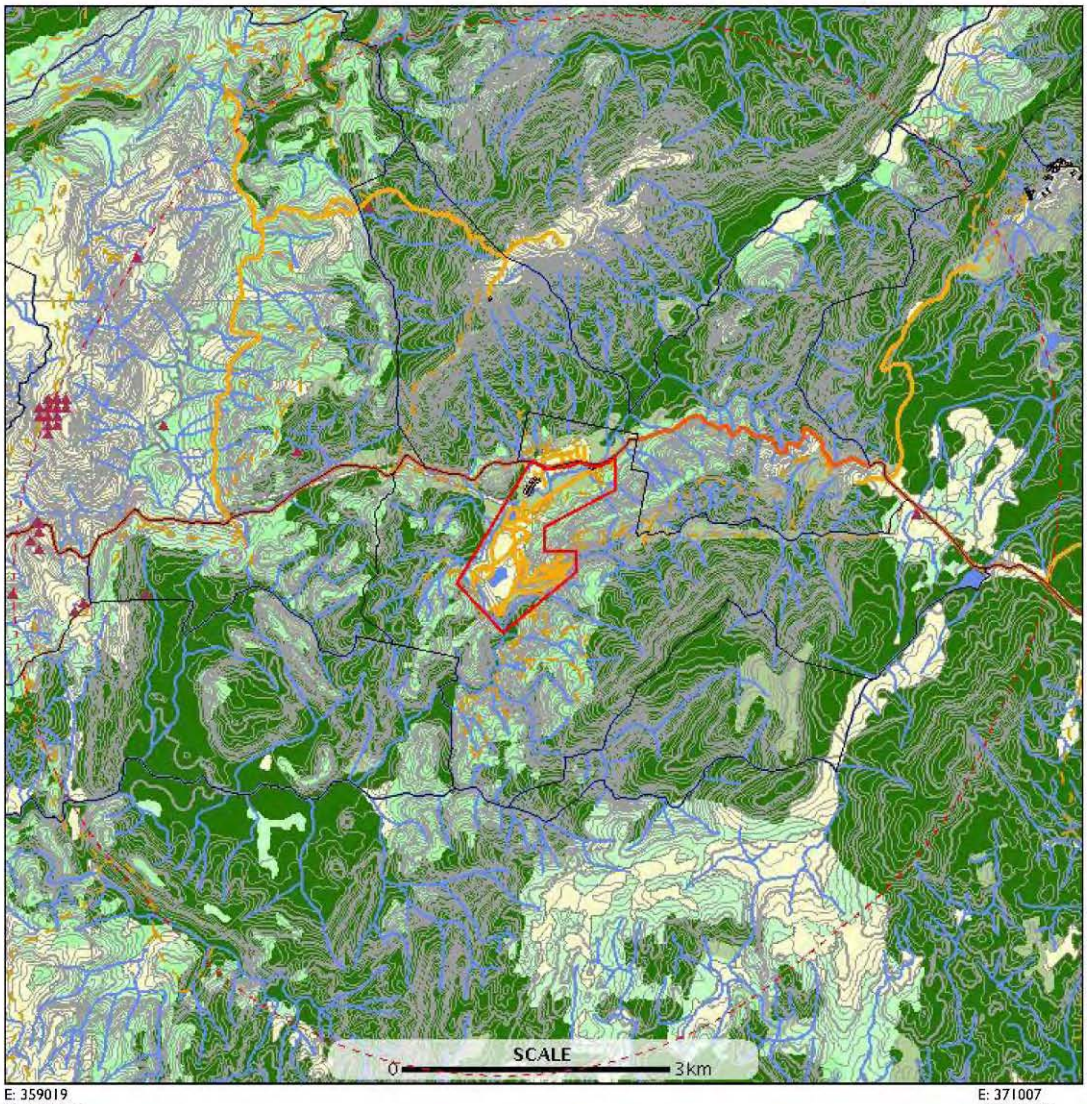
Threatened flora within 500 metres

***** No threatened flora found within 500 metres. *****

Threatened flora within 5000 metres

E: 359019
N: 5413338

E: 371007
N: 5413338



E: 359019
N: 5401167

E: 371007
N: 5401167

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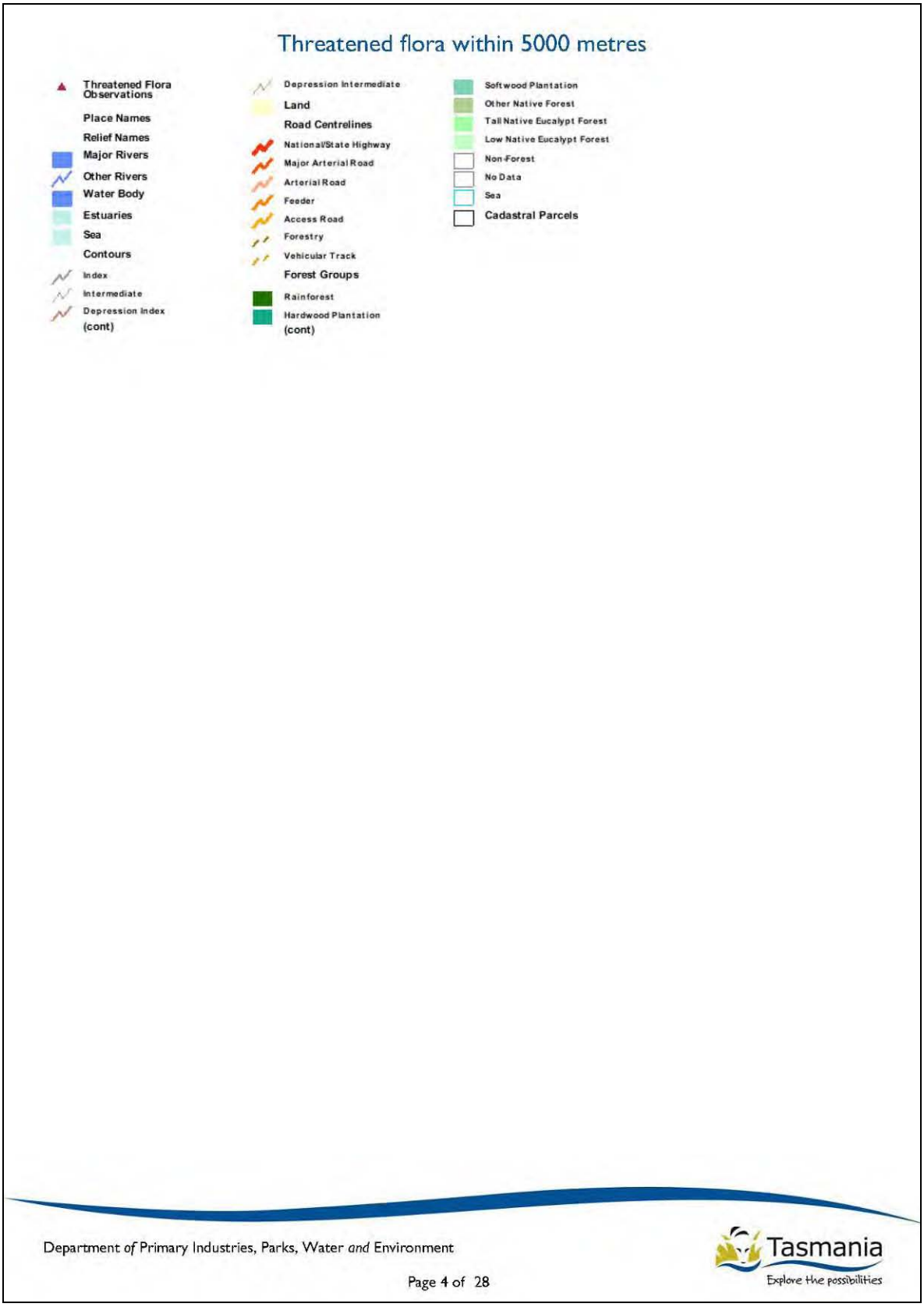
Threatened flora within 5000 metres
Threatened Flora Observations
Place Names
Relief Names
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
Contours
Index
Intermediate
Depression Index
(cont)
Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
Feeder
Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
Hardwood Plantation
(cont)
Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
Cadastral Parcels
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Tasmania
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Threatened flora within 5000 metres

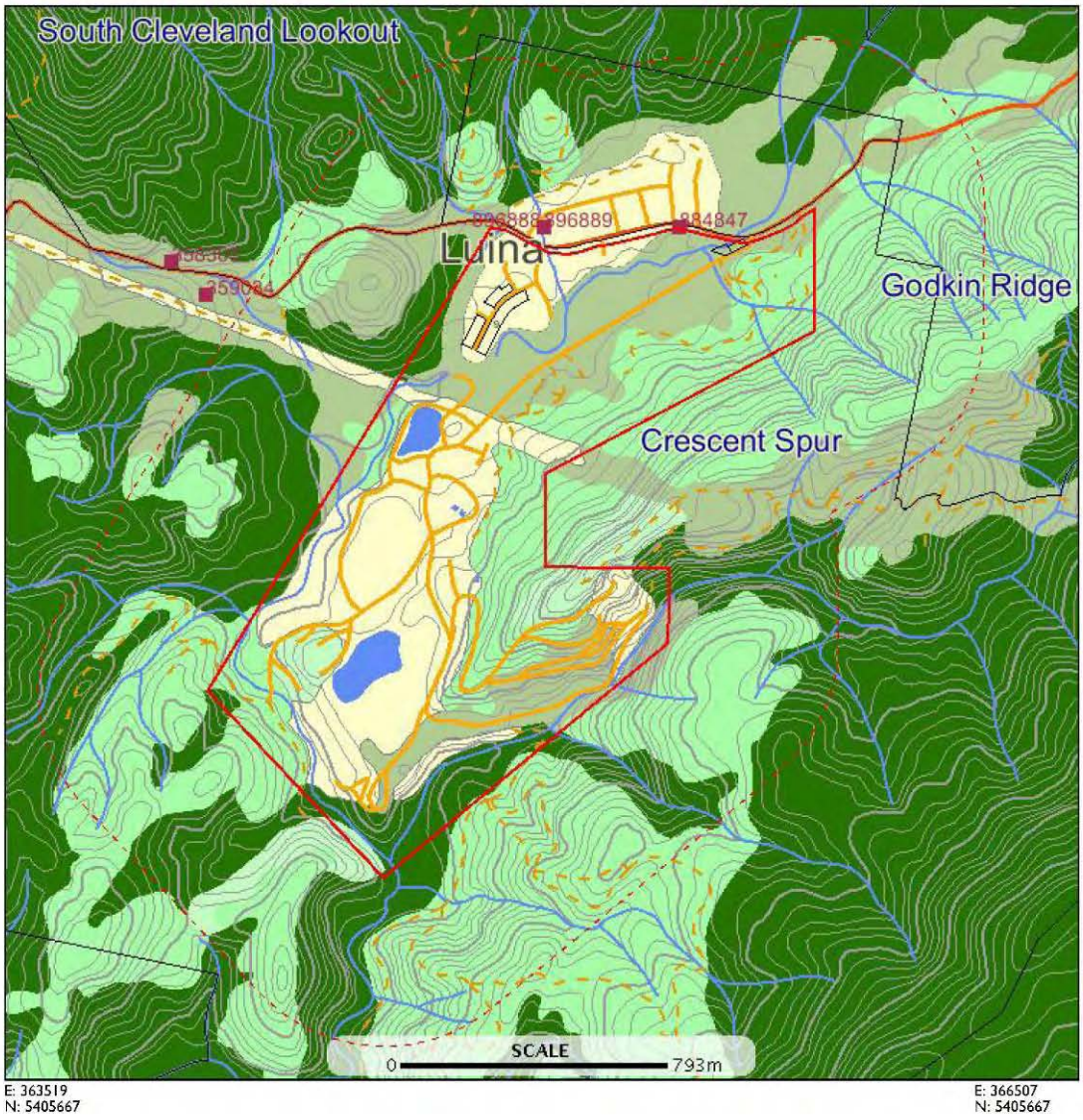
Id	Species	Common name	Ss	Ns	Observers	Date	Obs type	Location (gda94)
228770	Comesperma defoliatum	leafless milkwort	r		H.F. Comber (4408)	Mar-1930	sight	Point (360812,5408583) +/- 12500m.
348562	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359712,5408883) +/- 50m.
349958	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408883) +/- 50m.
349960	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408783) +/- 50m.
348566	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359512,5408583) +/- 50m.
348565	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408683) +/- 50m.
229294	Epacris glabella	smooth heath	e	EN	A.M. Buchanan (3758)	25-Jan-1990	sight	Point (359612,5408783) +/- 100m.
348567	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359512,5408483) +/- 50m.
229441	Epacris glabella	smooth heath	e	EN	A.M. Buchanan (3758)	26-Jan-1990	sight	Point (360512,5410483) +/- 100m.
348564	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359512,5408683) +/- 50m.
349976	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359712,5408783) +/- 50m.
349978	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408583) +/- 50m.
1233190	Hypolepis muelleri	harsh groundfern	r		Nic McCaffrey (22428),Doug Frood (22429),Joy MacDonald (22430)	22-Sep-2010	sight	Point (363135,5411042) +/- 25m.
228574	Micrantheum serpentinum	western tridentbush	r		S.J. Jarman & G. Kantvilas (5583)	23-Nov-1989	sight	Point (359412,5407483) +/- 100m.
169144	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435)	24-May-1995?	sight	Point (359412,5407383) +/- 100m.
168714	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435)	24-May-1995?	sight	Point (359812,5406483) +/- 100m.
228601	Micrantheum serpentinum	western tridentbush	r		A.M. Buchanan (3758)	26-Jan-1990	sight	Point (359612,5408783) +/- 100m.
228672	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435),A North (2500)	24-May-1995	sight	Point (359912,5406583) +/- 100m.
252685	Micrantheum serpentinum	western tridentbush	r		- Unknown (21598)	01-Jan-1600?	sight	Point (360612,5406683) +/- 1000m.
228762	Micrantheum serpentinum	western tridentbush	r		A.M. Buchanan (3758)	26-Jan-1990	sight	Point (360512,5410483) +/- 100m.
169108	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435)	24-May-1995?	sight	Point (359312,5407283) +/- 100m.
946701	Micrantheum serpentinum	western tridentbush	r		H.F. Comber (4408)	03-Mar-1930	sight	Point (362325,5408289) +/- 3500m.
228567	Micrantheum serpentinum	western tridentbush	r		S.J. Jarman & G. Kantvilas (5583)	23-Nov-1989	sight	Point (359412,5407483) +/- 100m.
1100842	Micrantheum serpentinum	western tridentbush	r		Micah Visoiu (5870)	17-Jan-2010	sight	Point (359381,5407495) +/- 100m.
345525	Micrantheum serpentinum	western tridentbush	r		- Unknown (21598)	01-Jan-1600?	sight	Point (359412,5407183) +/- 1000m.
393828	Viola cunninghamii	alpine violet	r		Jamie Kirkpatrick (1315)	1984	sight	Point (369312,5407583) +/- 100m.

For more information about threatened species, please contact the Manager, Threatened Species Section.

Telephone: (03) 6233 8759

Email: ThreatenedSpecies.Enquiries@dpipwe.tas.gov.au

Threatened fauna within 500 metres



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Tasmania
Explore the possibilities

Threatened fauna within 500 metres

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Tasmania
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Threatened fauna within 500 metres

Id	Species	Common name	Ss	Ns	Observers	Date	Obs type	Location (gda94)
884847	Sarcophilus harrisii	tasmanian devil	e	EN	Nick Mooney (16443)	01-Aug-1986?	sight	Point (365512,5408183) +/- 200m.
896888	Thylacinus cynocephalus	thylacine	x	EX	G Modry (7530)	23-Jun-1972?	sight	Point (365112,5408183) +/- 18500m.
896889	Thylacinus cynocephalus	thylacine	x	EX	G Mading (7526)	01-Jan-1970?	sight	Point (365112,5408183) +/- 18500m.

Threatened fauna within 500 metres

(based on Habitat Mapping)

Species	Common name	Ss	Ns	Potential	Known	Core
Aquila audax subsp. fleayi	wedge-tailed eagle	e	EN	1	0	0
Aquila audax	wedge-tailed eagle	pe	PEN	1	0	0
Lathamus discolor	swift parrot	e	EN	1	0	0
Tyto novaehollandiae	masked owl	pe	PVU	1	0	0
Accipiter novaehollandiae	grey goshawk	e		1	0	1

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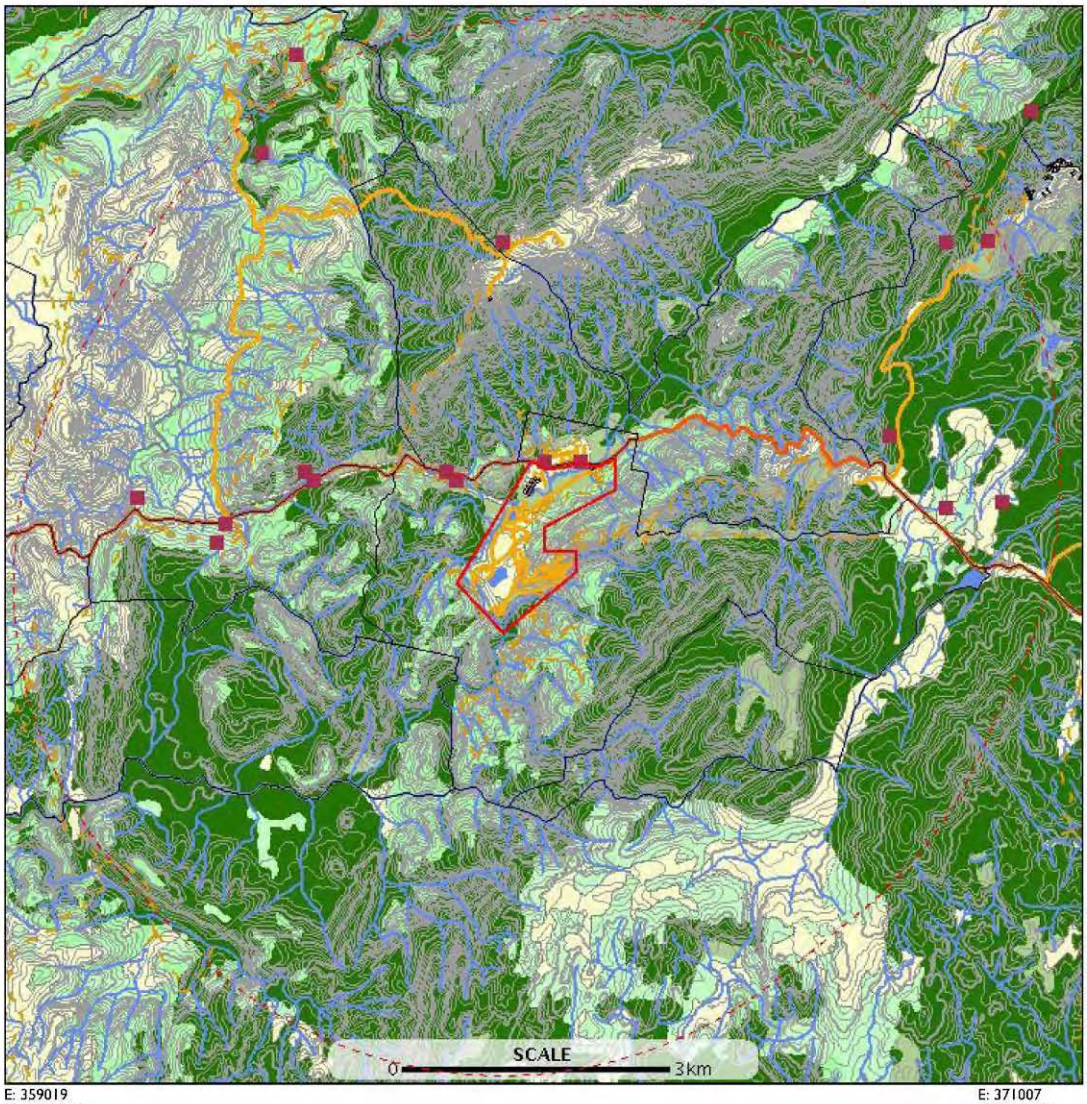
Threatened fauna within 5000 metres

E: 359019
N: 5413338

E: 371007
N: 5413338



E: 359019
N: 5401167

E: 371007
N: 5401167

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Tasmania
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Threatened fauna within 5000 metres

Threatened fauna within 5000 metres

Id	Species	Common name	Ss	Ns	Observers	Date	Obs type	Location (gda94)
856528	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		W Ponder (2524)	24-Jan-1982?	sight	Point (361412,5407283) +/- 200m.
847984	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		W Ponder (2524)	07-Feb-1989?	sight	Point (361412,5407283) +/- 200m.
1200647	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		Shannon Clark (6699)	07-Feb-1989	sight	Point (362512,5407983) +/- 100m.
856529	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		W Ponder (2524)	07-Feb-1989?	sight	Point (362412,5408083) +/- 200m.
1200648	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	24-Jan-1982	sight	Point (361512,5407483) +/- 100m.
532771	Beddomeia hullii	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1982?	sight	Point (361512,5407483) +/- 100m.
998694	Dasyurus maculatus	spotted-tailed quoll	r	VU	Clare Hawkins (8562)	17-Jun-2003	sight	Point (370280,5407740) +/- 10m.
358226	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	21-Jun-1996?	sight	Point (369012,5408483) +/- 25m.
359034	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	21-Jun-1996?	sight	Point (364112,5407983) +/- 25m.
359033	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	21-Jun-1996?	sight	Point (370112,5410683) +/- 25m.
358758	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	01-Apr-1996?	sight	Point (361512,5407483) +/- 25m.
877348	Lathamus discolor	swift parrot	e	EN	R Charles (2101)	27-Dec-1995?	sight	Point (360512,5407783) +/- 50m.
533848	Phrantela annamurrayae	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1982?	sight	Point (361912,5411683) +/- 1000m.
523172	Phrantela marginata	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1982?	sight	Point (361512,5407483) +/- 1000m.
523173	Phrantela marginata	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1989?	sight	Point (362512,5407983) +/- 1000m.
1160312	Sarcophilus harrisii	tasmanian devil	e	EN	Shannon Troy (12201)	Aug-2010	sight	Point (364647,5410671) +/- 5m.
1160313	Sarcophilus harrisii	tasmanian devil	e	EN	Shannon Troy (12201)	Jul-2010	sight	Point (369647,5410671) +/- 5m.
884847	Sarcophilus harrisii	tasmanian devil	e	EN	Nick Mooney (16443)	01-Aug-1986?	sight	Point (365512,5408183) +/- 200m.
358305	Sarcophilus harrisii	tasmanian devil	e	EN	Menna Jones (8901)	21-Jun-1996?	sight	Point (364012,5408083) +/- 100m.
1160306	Sarcophilus harrisii	tasmanian devil	e	EN	Shannon Troy (12201)	Aug-2010	sight	Point (369647,5407671) +/- 5m.
896889	Thylacinus cynocephalus	thylacine	x	EX	G Mading (7526)	01-Jan-1970?	sight	Point (365112,5408183) +/- 18500m.
896888	Thylacinus cynocephalus	thylacine	x	EX	G Modry (7530)	23-Jun-1972?	sight	Point (365112,5408183) +/- 18500m.

Threatened fauna within 5000 metres

(based on Habitat Mapping)

Species	Common name	Ss	Ns	Potential	Known	Core
Aquila audax subsp. fleayi	wedge-tailed eagle	e	EN	3	0	0
Aquila audax	wedge-tailed eagle	pe	PEN	3	0	0
Lathamus discolor	swift parrot	e	EN	3	0	0
Tyto novaehollandiae	masked owl	pe	PVU	3	0	0
Accipiter novaehollandiae	grey goshawk	e		3	0	3

For more information about threatened species, please contact the Manager, Threatened Species Section.

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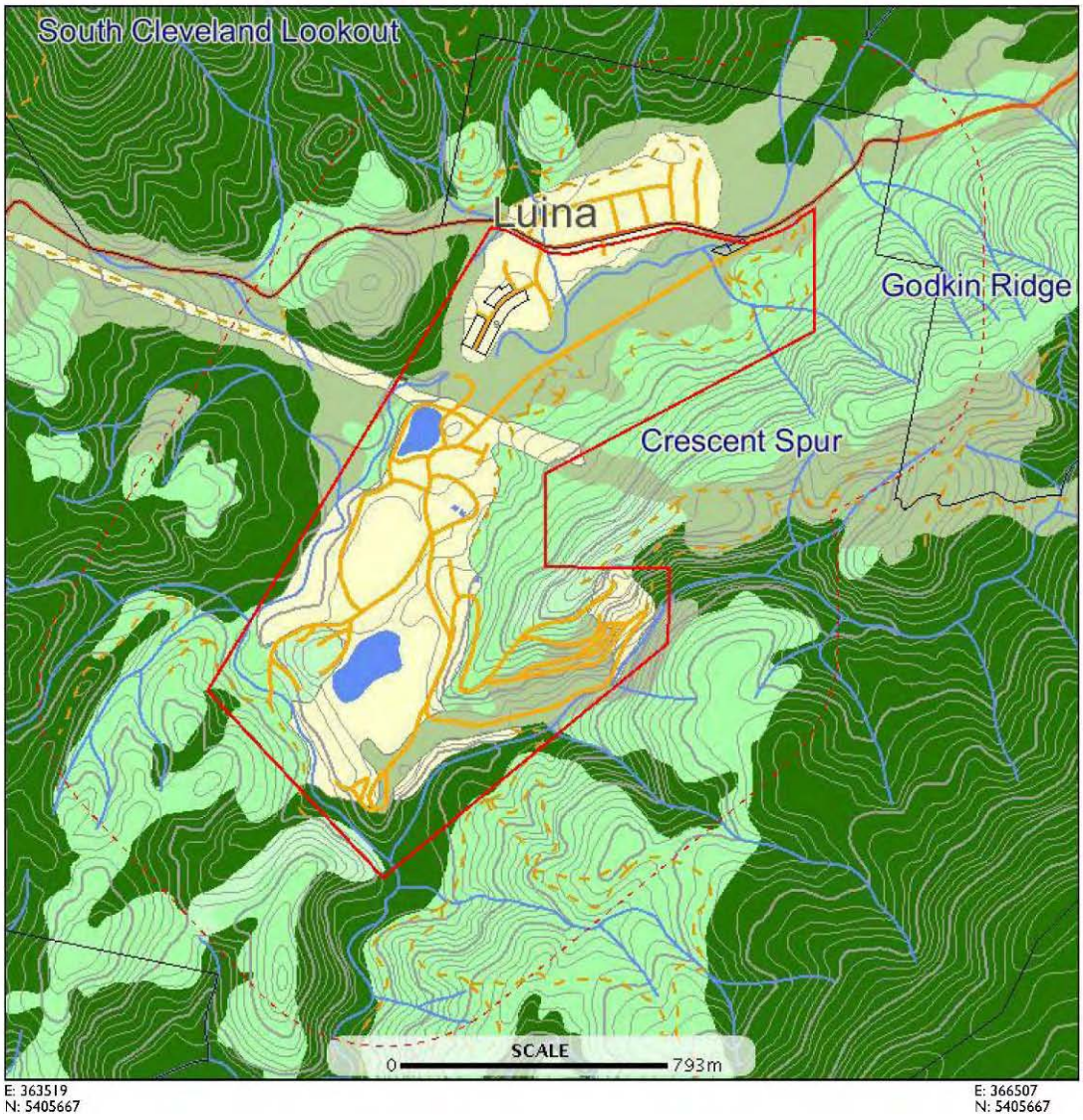

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Tas Management Act Weeds within 500 m

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Tas Management Act Weeds within 500 m

Id	Species	Common name	Observers	Date	Geometry	Location	Obs state	Wma	Wons density	Data source
1226265	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		
1226153	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		

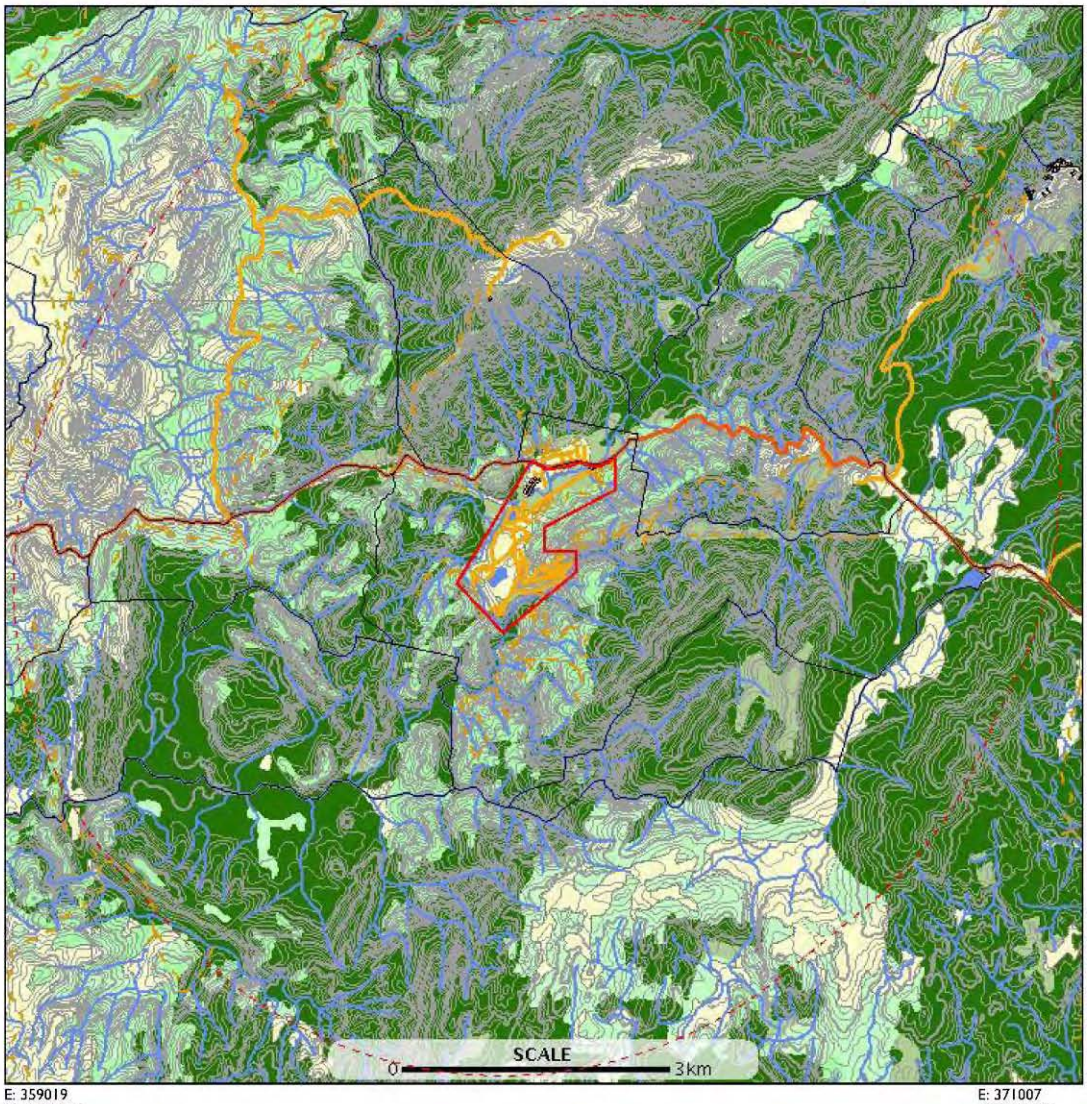
For more information about introduced weed species, please visit the following URL for contact details in your area.

http://www.dpipwe.tas.gov.au/inter.nsf/WebPages/TPRY-52J8Z3?open

Tas Management Act Weeds within 5000 m

E: 359019
N: 5413338

E: 371007
N: 5413338



E: 359019
N: 5401167

E: 371007
N: 5401167

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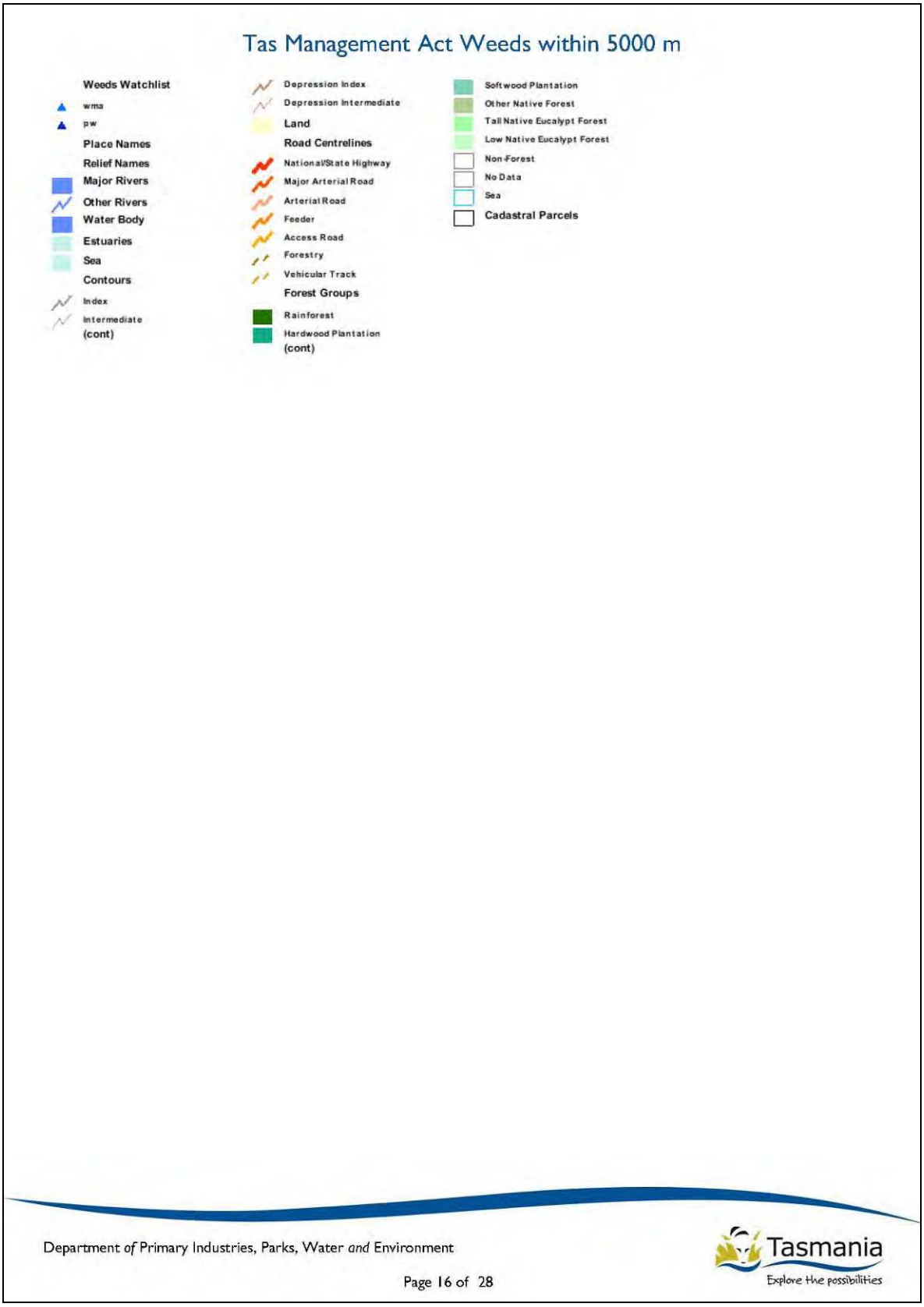
Tas Management Act Weeds within 5000 m
Weeds Watchlist
wma
pw
Place Names
Relief Names
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
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Intermediate
(cont)
Depression Index
Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
Feeder
Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
Hardwood Plantation
(cont)
Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
Cadastral Parcels
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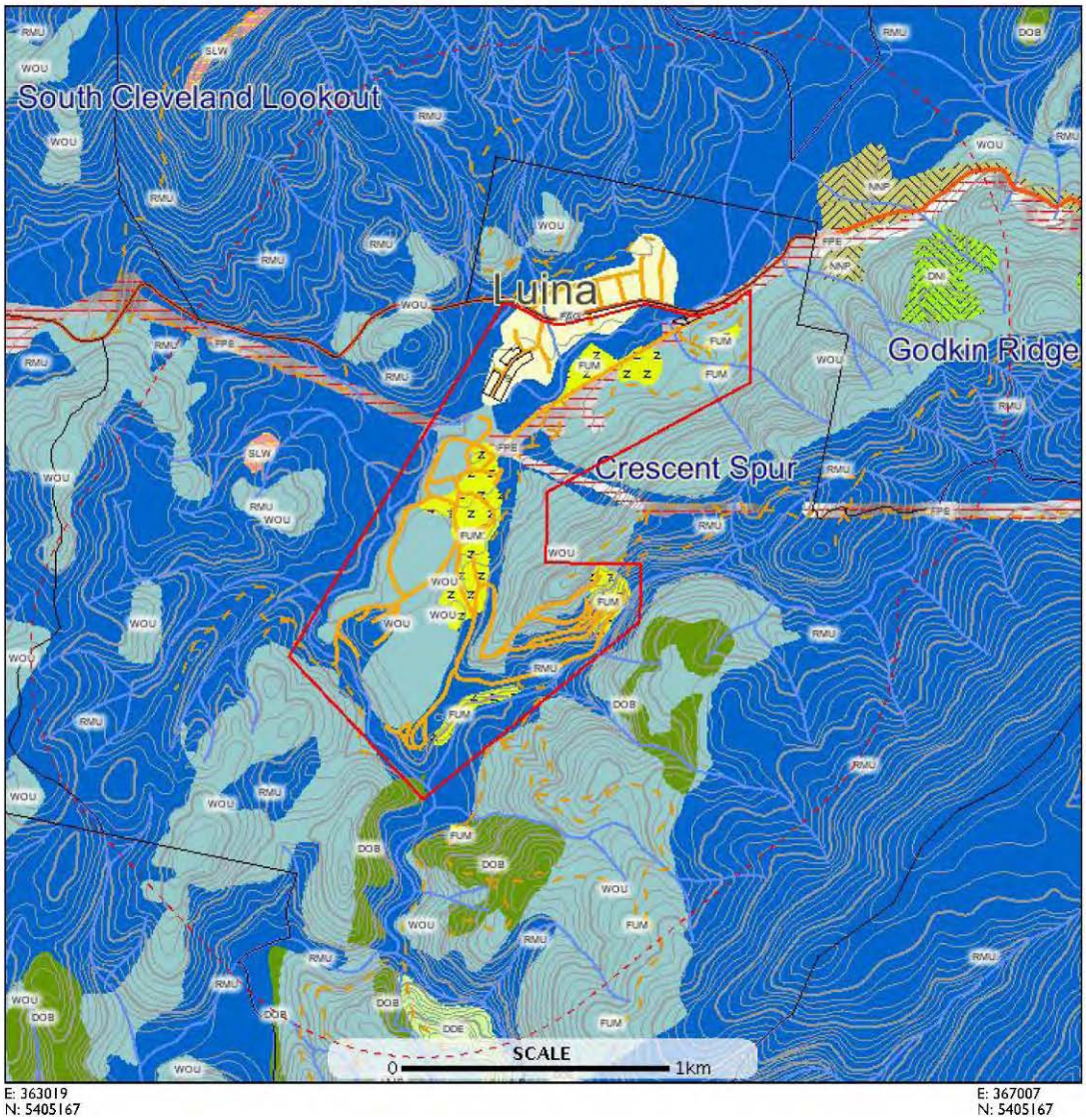
Tas Management Act Weeds within 5000 m

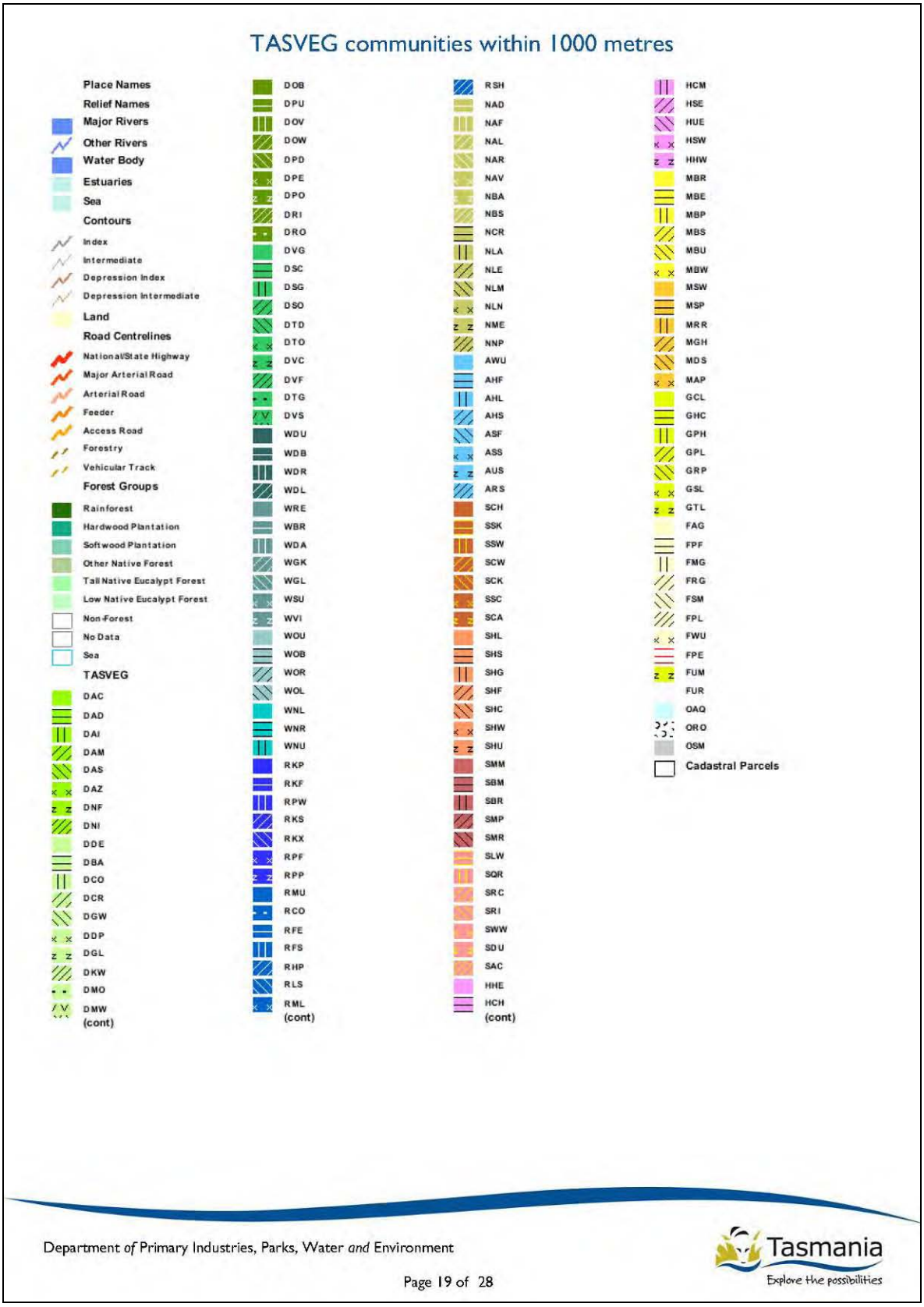
Id	Species	Common name	Observers	Date	Geometry	Location	Obs state	Wma	Wons density	Data source
1226173	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		
1226265	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		
1226153	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		

For more information about introduced weed species, please visit the following URL for contact details in your area.

http://www.dpipwe.tas.gov.au/inter.nsf/WebPages/TPRY-52J8Z3?open

TASVEG communities within 1000 metres




TASVEG communities within 1000 metres
Place Names
Relief Names
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
Contours
Index
Intermediate
Depression Index
Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
Feeder
Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
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Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
TASVEG
DAC
DAD
DAI
DAM
DAS
DAZ
DNF
DNI
DDE
DBA
DCO
DCR
DGW
DDP
DGL
DKW
DMO
DMW
(cont)
DOB
DPU
DOV
DOW
DPD
DPE
DPO
DRI
DRO
DVG
DSC
DSG
DSO
DTD
DTO
DVC
DVF
DTG
DVS
WDU
WDB
WDR
WDL
WRE
WBR
WDA
WGK
WGL
WSU
WVI
WOU
WOB
WOR
WOL
WNL
WNR
WNU
RKP
RKF
RPW
RKS
RKX
RPF
RPP
RMU
RCO
RFE
RFS
RHP
RLS
RML
(cont)
RSH
NAD
NAF
NAL
NAR
NAV
NBA
NBS
NCR
NLA
NLE
NLM
NLN
NME
NNP
AWU
AHF
AHL
AHS
ASF
ASS
AUS
ARS
SCH
SSK
SSW
SCW
SCK
SSC
SCA
SHL
SHS
SHG
SHF
SHC
SHW
SHU
SMM
SBM
SBR
SMP
SMR
SLW
SQR
SRC
SRI
SWW
SDU
SAC
HHE
HCH
(cont)
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HSE
HUE
HSW
HHW
MBR
MBE
MBP
MBS
MBU
MBW
MSW
MSP
MRR
MGH
MDS
MAP
GCL
GHC
GPH
GPL
GRP
GSL
GTL
FAG
FPF
FMG
FRG
FSM
FPL
FWU
FPE
FUM
FUR
OAQ
ORO
OSM
Cadastral Parcels
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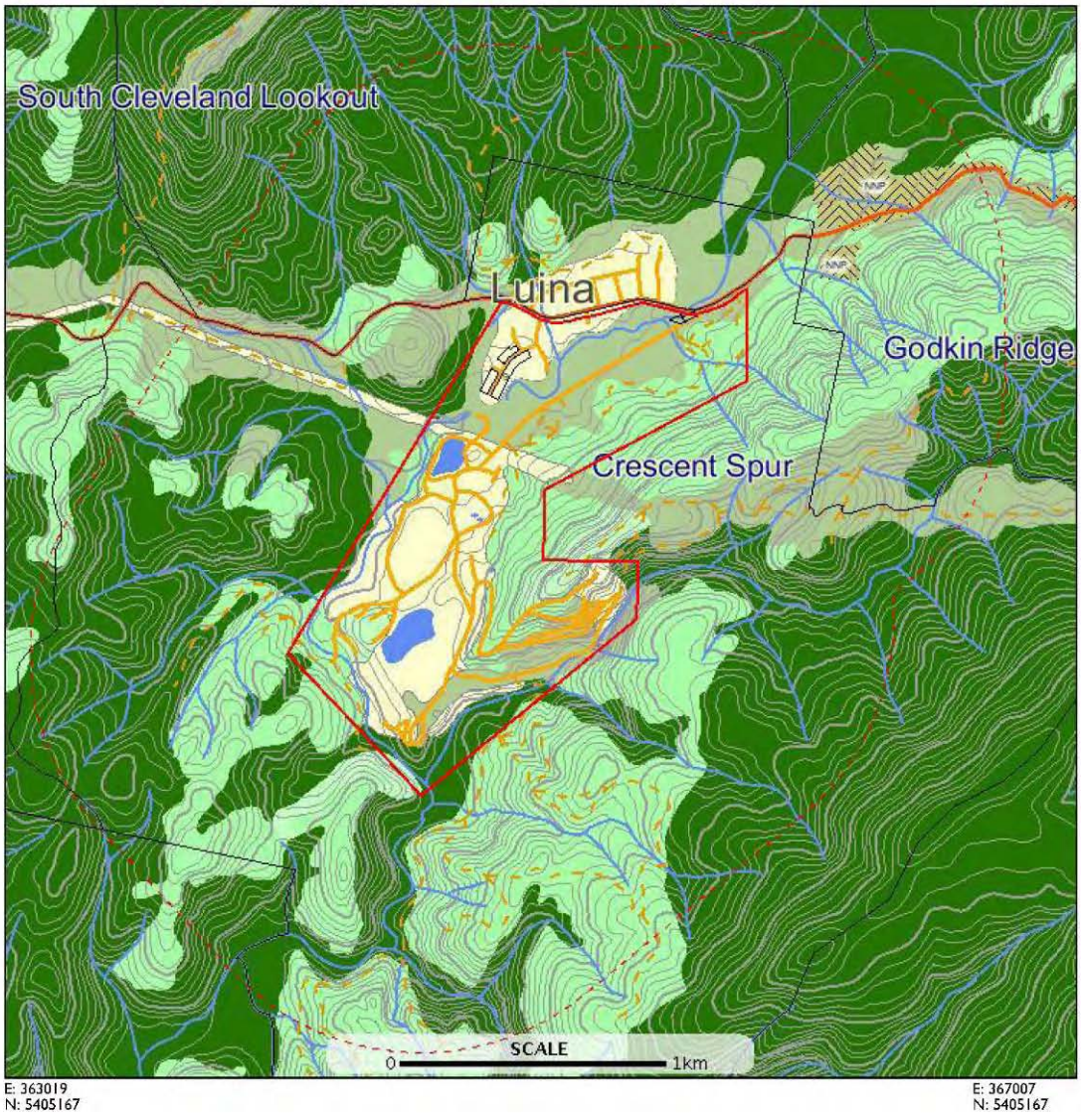
TASVEG communities within 1000 metres

Id	Code	Community	Emergent species
101297396	RMS	Nothofagus / Phyllocladus short rainforest	
101294998	RMT	Nothofagus - Atherosperma rainforest	
101294997	FPE	Permanent easements	
101297407	RMT	Nothofagus - Atherosperma rainforest	
101297409	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297386	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101298613	RMT	Nothofagus - Atherosperma rainforest	
101297444	RMT	Nothofagus - Atherosperma rainforest	
101294996	RMS	Nothofagus / Phyllocladus short rainforest	
101297461	DNI	Eucalyptus nitida dry forest and woodland	
101297459	FUM	Extra-urban miscellaneous	
101297449	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296026	FUM	Extra-urban miscellaneous	
101296618	RMS	Nothofagus / Phyllocladus short rainforest	
101297399	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296028	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296025	FUM	Extra-urban miscellaneous	
101297401	SLW	Leptospermum scrub	
101297417	DOB	Eucalyptus obliqua dry forest and woodland	
101295363	FPE	Permanent easements	
101297424	RMT	Nothofagus - Atherosperma rainforest	
101297458	FPE	Permanent easements	
101296029	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296032	FUM	Extra-urban miscellaneous	
101294994	DOB	Eucalyptus obliqua dry forest and woodland	
101297384	RMS	Nothofagus / Phyllocladus short rainforest	
101296030	FUM	Extra-urban miscellaneous	
101297460	NNP	Notelaea - Pomaderris - Beyeria forest	
101297457	FUM	Extra-urban miscellaneous	
101294995	RMS	Nothofagus / Phyllocladus short rainforest	
101297400	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297447	FAG	Agricultural land	
101297311	FPE	Permanent easements	
101297397	RMT	Nothofagus - Atherosperma rainforest	
101297406	DDE	Eucalyptus delegatensis dry forest and woodland	
101294993	FUM	Extra-urban miscellaneous	
101297446	RMT	Nothofagus - Atherosperma rainforest	
101297448	FUM	Extra-urban miscellaneous	
101297463	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296033	RMS	Nothofagus / Phyllocladus short rainforest	
101296031	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297398	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297445	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297305	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101294992	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296024	RMS	Nothofagus / Phyllocladus short rainforest	
101296027	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297421	RMS	Nothofagus / Phyllocladus short rainforest	
101297395	RMT	Nothofagus - Atherosperma rainforest	
101297387	DOB	Eucalyptus obliqua dry forest and woodland	
101297405	DOB	Eucalyptus obliqua dry forest and woodland	
101296023	DOB	Eucalyptus obliqua dry forest and woodland	
101297462	NNP	Notelaea - Pomaderris - Beyeria forest	
101297408	WOU	Eucalyptus obliqua wet forest (undifferentiated)	

For more information about TASVEG maps, please contact the Coordinator, Tasmanian Vegetation Monitoring and Mapping Program.
Telephone: (03) 6233 4501
Email: TASVEG@dpipwe.tas.gov.au

TASVEG communities within 1000 metres



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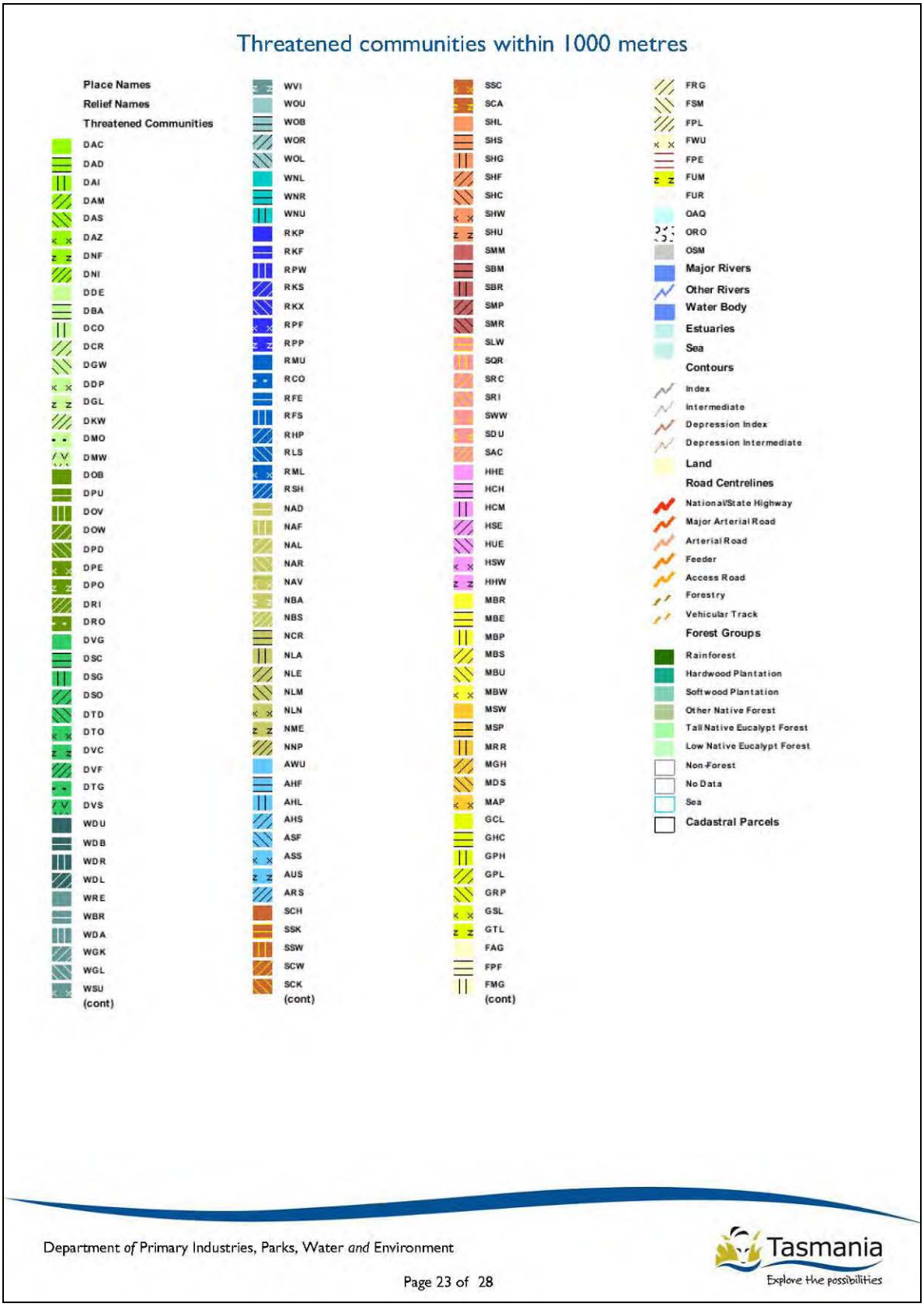
Tasmania
Explore the possibilities


Threatened communities within 1000 metres
Place Names
Relief Names
Threatened Communities
DAC
DAD
DAI
DAM
DAS
DAZ
DNF
DNI
DDE
DBA
DCO
DCR
DGW
DDP
DGL
DKW
DMO
DMW
DOB
DPU
DOV
DOW
DPD
DPE
DPO
DRI
DRO
DVG
DSC
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DSO
DTD
DTO
DVC
DVF
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DVS
WDU
WDB
WDR
WDL
WRE
WBR
WDA
WGK
WGL
WSU
(cont)
WVI
WOU
WOB
WOR
WOL
WNL
WNR
WNU
RKP
RKF
RPW
RKS
RKX
RPF
RPP
RMU
RCO
RFE
RFS
RHP
RLS
RML
RSH
NAD
NAF
NAL
NAR
NAV
NBA
NBS
NCR
NLA
NLE
NLM
NLN
NME
NNP
AWU
AHF
AHL
AHS
ASF
ASS
AUS
ARS
SCH
SSK
SSW
SCW
SCK
(cont)
SSC
SCA
SHL
SHS
SHG
SHF
SHC
SHW
SHU
SMM
SBM
SBR
SMP
SMR
SLW
SQR
SRC
SRI
SWW
SDU
SAC
HHE
HCH
HCM
HSE
HUE
HSW
HHW
MBR
MBE
MBP
MBS
MBU
MBW
MSW
MSP
MRR
MGH
MDS
MAP
GCL
GHC
GPH
GPL
GRP
GSL
GTL
FAG
FPF
FMG
(cont)
FRG
FSM
FPL
FWU
FPE
FUM
FUR
OAQ
ORO
OSM
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
Contours
Index
Intermediate
Depression Index
Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
Feeder
Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
Hardwood Plantation
Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
Cadastral Parcels
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Tasmania
Explore the possibilities

Threatened communities within 1000 metres

Code	Title	Status
NNP	Notelaea - Pomaderris - Beyeria forest	R,E
NNP	Notelaea - Pomaderris - Beyeria forest	R,E

For more information about threatened vegetation communities, please contact Resource Management and Conservation.

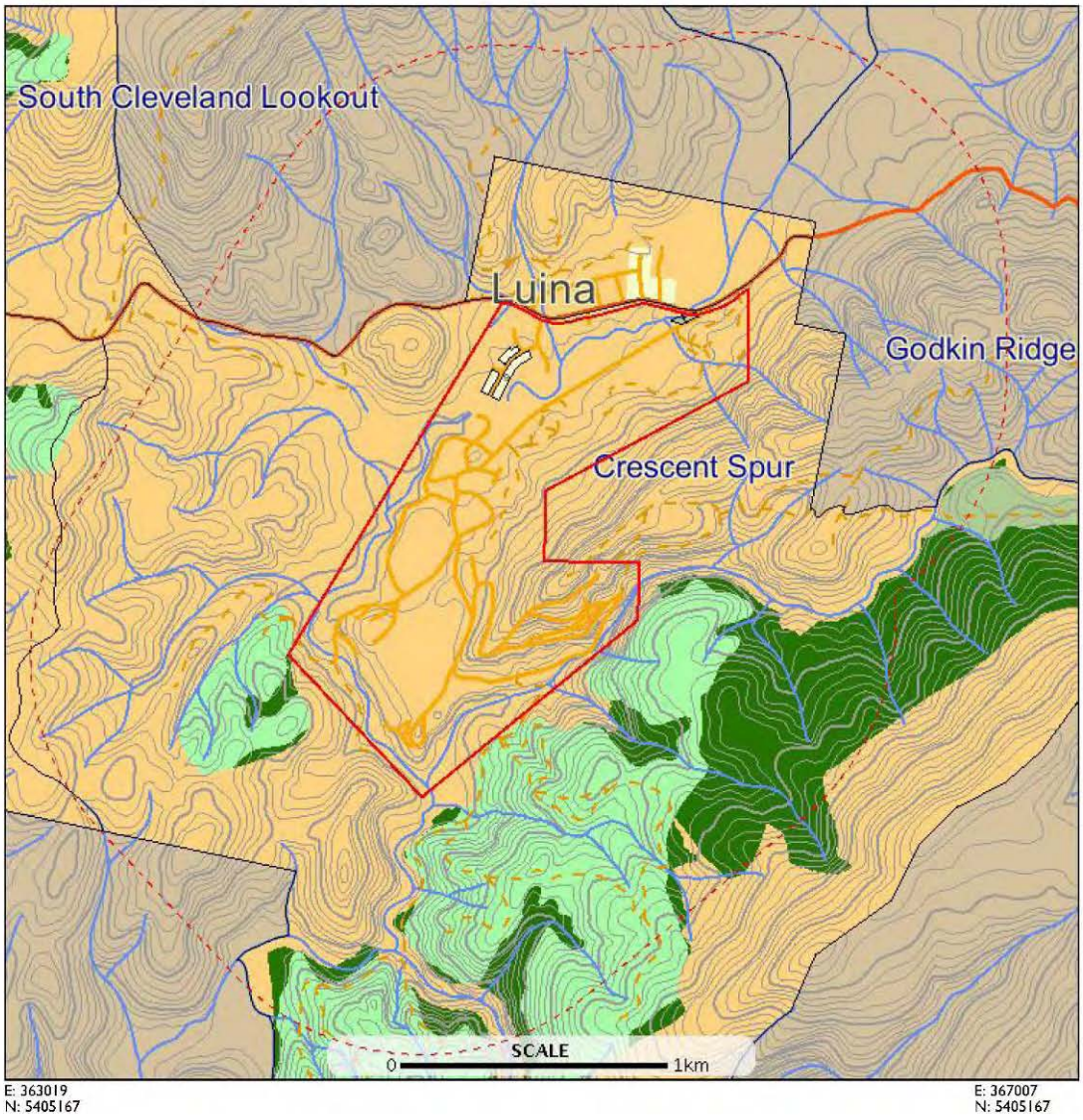
Ph: (03) 6233 4501,

Fax: (03) 6233 3186

Address: GPO Box 44, Hobart TAS 7000 Australia

Geoconservation sites within 1000 metres

***** No Geoconservation sites found within 1000 metres. *****



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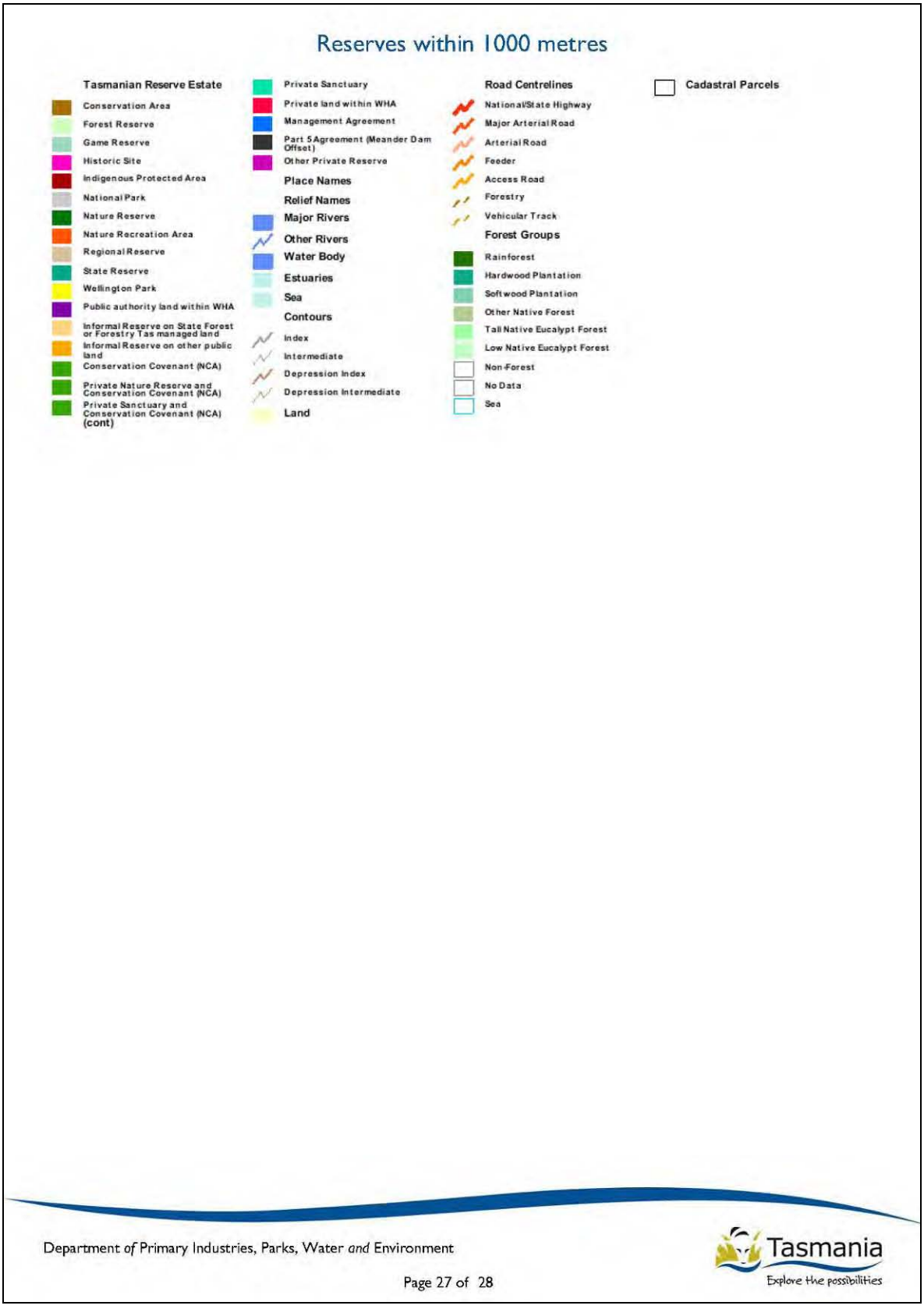
Reserves within 1000 metres
Tasmanian Reserve Estate
Conservation Area
Forest Reserve
Game Reserve
Historic Site
Indigenous Protected Area
National Park
Nature Reserve
Nature Recreation Area
Regional Reserve
State Reserve
Wellington Park
Public authority land within WHA
Informal Reserve on State Forest or Forestry Tas managed land
Informal Reserve on other public land
Conservation Covenant (NCA)
Private Nature Reserve and Conservation Covenant (NCA)
Private Sanctuary and Conservation Covenant (NCA) (cont)
Private Sanctuary
Private land within WHA
Management Agreement
Part 5 Agreement (Meander Dam Offset)
Other Private Reserve
Place Names
Relief Names
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
Contours
Index
Intermediate
Depression Index
Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
Feeder
Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
Hardwood Plantation
Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
Cadastral Parcels
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Reserves within 1000 metres

Name	Classification	Status
Meredith Range Regional Reserve	Regional Reserve	Other Formal Reserve
	Informal Reserve on State Forest or Forestry Tas managed land	Informal Reserve
Savage River Regional Reserve	Regional Reserve	Other Formal Reserve

For more information about the Tasmanian Reserve Estate, please contact the Policy & Conservation Assessment Branch DPIPWE.

Ph: (03) 6216 4457

Fax (03) 6223 8603

Address: GPO Box 44 Hobart TAS 7000

APPENDIX D. Forest Practices Authority's *Fauna Values Database* report for study area

THREATENED FAUNA MAPSHEET DISPLAY

LUINA 3640

Current as at 09/Aug/2011

Please note, coordinates use map datum GDA94

Known localities

Species	Tenure	Locality		Notes
hydrobiid snail (B. bellii)	CL	361512 5407483	Thirteen Mile Creek, junction Mt Cleveland and Corinna Roads	
hydrobiid snail (B. bellii)	CL	362512 5407983	Thirteen Mile Creek 0.8 km u/s Mt Cleveland-Corinna Roads junction	
hydrobiid snail (B. hullii)	CL	361512 5407483	Thirteen Mile Creek, junction Mt Cleveland and Corinna Roads	
hydrobiid snail (P. marginata)	CL	361512 5407483	Thirteen Mile Creek, junction Mt Cleveland and Corinna Roads	
hydrobiid snail (P. marginata)	CL	362512 5407983	Thirteen Mile Creek 0.8 km u/s Mt Cleveland-Corinna Roads junction	
wedge-tailed eagle		374462 5405483	Four Mile Rd, Waratah	nest (#962)
wedge-tailed eagle	SF	376592 5406223	Waratah 3 km S	nest near (#542)
wedge-tailed eagle	SF	376762 5406558	Champion Heath N	nest (#741)

Habitat which may contain threatened species

Species	Habitat
grey goshawk	Wet eucalypt forest with blackwood/myrtle understorey, blackwood swamp, E. brookeriana wet forest, melaleuca and leptospermum forest.
hydrobiid snail	Immediate catchment of the stream in which known locality occurs
ptunarra brown butterfly	Native grasslands or grassy woodlands with tussock grass (*Poa*) cover of more than 15%
quoll (spotted-tailed, eastern)	All wetter forest types, coastal heath and bush-pasture interfaces
Tasmanian devil	Potential habitat includes dry to damp forest, woodlands and grassy woodlands, coastal scrub, and riparian areas.
wedge-tailed eagle	Large tracts (more than 10 ha) of eucalypt or mixed forest

APPENDIX E. DSEWPC's *Protected Matters* report for study area

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

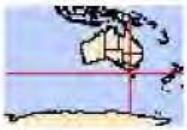
EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Report created: 09/08/11 16:22:49



Summary
Details
Matters of NES
Other matters protected by the EPBC Act
Extra Information
Caveat
Acknowledgements

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 1.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communitites:	1
Threatened Species:	8
Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	7
Whales and Other Cetaceans:	None

Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	2
State and Territory Reserves:	2
Regional Forest Agreements:	1
Invasive Species:	5
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community may occur within area

Threatened Species [Resource Information]

Name	Status	Type of Presence
BIRDS		
Aquila audax fleayi		
Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Species or species habitat may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Ceyx azureus diemenensis		
Tasmanian Azure Kingfisher [25977]	Endangered	Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae castanops		
Masked Owl (Tasmanian) [67051]	Vulnerable	Species or species habitat may occur within area
FISH		
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
MAMMALS		
Dasyurus maculatus maculatus (Tasmanian population)		
Spotted-tail Quoll, Spot-tailed	Vulnerable	Species or species habitat likely to occur within area

Quoll, Tiger Quoll (Tasmanian population) [75183]		
Sarcophilus harrisii		
Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area

Migratory Species		[Resource Information]
Name	Status	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor		

Swift Parrot [744]	Endangered	Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	Status
Natural	
Tarkine TAS	Indicative Place
Tarkine Wilderness Area TAS	Registered

State and Territory Reserves [Resource Information]

Meredith Range, TAS
Savage River, TAS

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.
Tasmania RFA, Tasmania

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Plants		
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtjii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and

marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-41.46649 145.38134,-41.46641 145.38309,-41.46717 145.38476,-41.46717 145.38621,-41.46649 145.38887,-41.46664 145.39002,-41.46695 145.39139,-41.46679 145.39238,-41.46649 145.39352,-41.46557 145.39519,-41.46999 145.39481,-41.47288 145.38507,-41.47502 145.38491,-41.47517 145.38887,-41.47882 145.38895,-41.48461 145.37821,-41.47898 145.37212,-41.46649 145.38149,-41.46649 145.38134

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia

-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Last updated: Thursday, 16-Sep-2010 09:13:25 EST

Department of Sustainability, Environment, Water, Population and Communities
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111 ABN

| Australian Government |

APPENDIX F. DPIPWE's *Conservation of Freshwater Ecosystem Values* report for study area

Conservation of Freshwater Ecosystem Values (CFEV) Database

Corporate Interface Report

https://cfev.dpiw.tas.gov.au

Data in this report should be cited as:

CFEV database, v1.0 (2005), Conservation of Freshwater Ecosystem Values Project, Water Resources Division, Department of Primary Industries and Water, Tasmania

All maps in this report should be cited as:

Base data by CFEV, © State of Tasmania.

Rivers, estuaries and waterbodies - base data by the LIST, © State of Tasmania.

For interpretive information visit:

http://www.dpiw.tas.gov.au/cfev

The CFEV Program is an initiative of the Water Resources Division, Department of Primary Industries and Water.

1 Legend

Karst

Wetlands

River Sections

Waterbodies

Data confidence and CFEV

The strength of the CFEV data lies with its comprehensive coverage of the state, which allows broad scale comparisons, generalised summaries, and the combination of complicated data sets into readily interpreted indices.

It should be acknowledged that CFEV data uses a variety of data sources as input and that some of these are modelled and are not ground-truthed. As a result care should be taken when using specific variables at specific locations.

Disclaimer

This web resource has been developed by the State of Tasmania to provide public access to some State, Commonwealth and local government information, including text, maps and various forms of data and to information obtained from non-government sources.

It also provides on-line access to some government services and transactions. All of the material published on this website is together referred to hereafter as "the information".

In those circumstances, no responsibility is accepted for the accuracy, completeness, or relevance to the user's purpose, of the information and those using it for whatever purpose are advised to verify it with the relevant Commonwealth or State government department, local government body or other source and to obtain any appropriate professional advice.

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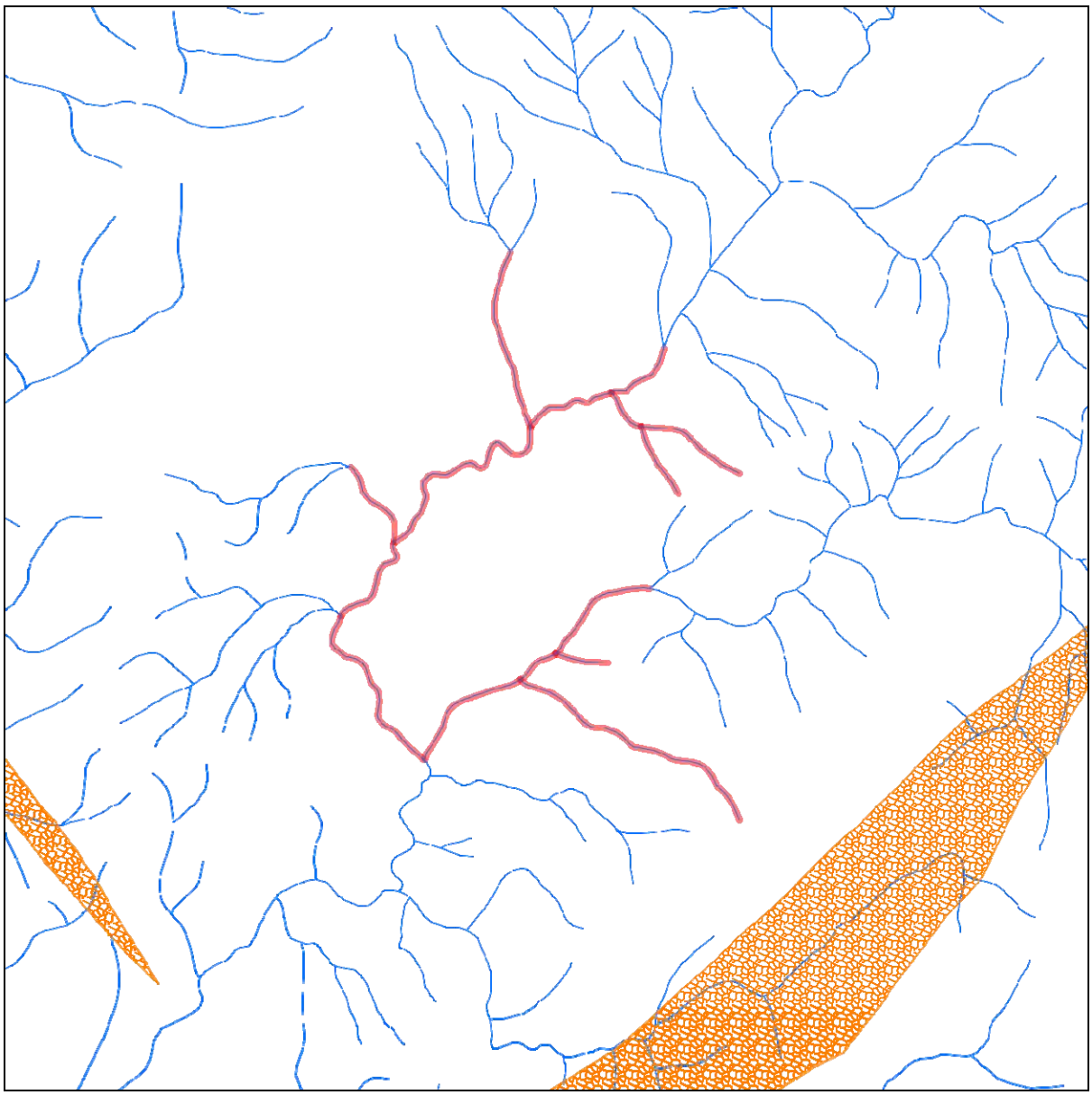
Any results with important management implications should be supported by on-ground surveys

2 River Sections : 143217,143209,143231,143236,143272,143266,143207,143205,143172,143230,143233,143237,143271,143274,143276



Centre point - E: 365260m N: 5407352m Scale (map width): 5332m

GDA94 Zone 55

2.1 Biophysical Classes

2.1.1 Crayfish Class

Code	Description	% Units	Count	Total Units
C6	All first order streams (for rivers) and areas greater than 400 m AHD; Crayfish absent or naturally in low abundance or low probability of occurrence (mainland Tasmania)	28.08%	4	2548.47 m
C1	Areas below 400 m AHD and excluding first order streams (for rivers); Astacopsis gouldi present.	71.92%	11	6525.90 m

2.1.2 Fish Class

Code	Description	% Units	Count	Total Units
F49	Extensive assemblage in river sections and waterbodies covering most of the western part of the state (west of Tyler corridor), including the southern part of King Island and also within a few river sections inland in the east.	64.22%	9	5827.40 m
F0	Fish absent or low probability of occurrence and/or at very low densities (note: headwater streams for rivers). Assemblage a reduced form of that found immediately downstream.	35.78%	6	3246.96 m

2.1.3 Fluvial Geomorphic River Type

Code	Description	% Units	Count	Total Units
G43	Karst in western Savage; Lower catchments dominated by low relief relict surfaces	100.00%	15	9074.36 m

2.1.4 Hydrological Class

Code	Description	% Units	Count	Total Units
H3	The state¿s most perennial, high volume and least variable streams (in annual and monthly flows). High baseflows; High peak runoff with relatively low variability.	100.00%	15	9074.36 m

2.1.5 Macroinvertebrate Class

Code	Description	% Units	Count	Total Units
BC9f	Headwater first order streams, depauperate form of assemblage C9 and located in same areas. Indicator taxa (EPTC groups):	28.08%	4	2548.47 m
BC9	Assemblage of mid to lower altitude (< 800 m AHD) streams throughout much of the inland western region of the state, falling along the western edge of the Tyler line/corridor, encompassing part of	71.92%	11	6525.90 m

Code	Description	% Units	Count	Total Units
	the World Heritage Area, includes upper Franklin and Gordon catchments, middle to lower Huon-Weld-Picton catchments (excluding main-stem Huon and Picton - see R11). Indicator taxa (EPTC groups):			

2.1.6 Macrophyte Class

Code	Description	% Units	Count	Total Units
M1	Low probability of macrophyte assemblage occurrence, absent/very sparse	35.78%	6	3246.96 m
M3	Depauperate macrophyte assemblages characteristic west of Tyler line; Moderate probability of macrophyte assemblage occurrence, Sparse/locally patchy (Depauperate, see Hughes (1987) - Group 5) Dominants:	64.22%	9	5827.40 m

2.1.7 Tree Class

Code	Description	% Units	Count	Total Units
T17	Upland mosaics of moorland, scrub and wet eucalypt forests dominated by E. delegatensis on the eastern side of Lakes Gordon and Pedder and more extensively in inland north-western Tasmania.	45.40%	8	4119.90 m
T50	Lowland scrub and moorland mosaic with implicate rainforest and Huon pine rainforest. Contains communities similar to 21, 38, 43.	54.60%	7	4954.47 m

2.2 Conservation Management Priority

2.2.1 Land Tenure Security

Code	Description	Count	% Count	% Units	Total Units
Medium	This river section lies within a catchment that has predominantly medium security of land tenure. There are some restrictions in place to ensure that the land within this catchment is managed to conserve or protect the landscape from potential negative impacts. This includes informal reserves and State forests.	15	100.00%	100.00%	9074.36 m

2.2.1.1 Land tenure security composition map

Code	Description	Count	% Count	% Units	Total Units
Mixed	The river section lies within a catchment that has mixed security of land tenure. Management restrictions may vary across the	5	33.33%	37.71%	3421.82 m

Code	Description	Count	% Count	% Units	Total Units
	landscape depending on the land tenure.				
Medium	100% of the river section catchment has low moderate tenure security.	10	66.67%	62.29%	5652.54 m

2.2.2 CMPI2

Code	Description	Count	% Count	% Units	Total Units
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the improvement of current conservation management is a lower priority. This CMP was derived by considering both its Integrated Conservation Value and land management security (by tenure).	15	100.00%	100.00%	9074.36 m

2.2.2.1 CMPI1

Code	Description	Count	% Count	% Units	Total Units
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the improvement of current conservation management is a lower priority. This CMP was derived by considering both its Representative Conservation Value and land management security (by tenure).	15	100.00%	100.00%	9074.36 m

2.2.3 CMPP2

Code	Description	Count	% Count	% Units	Total Units
M	Moderate Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a moderate priority when development is proposed or occurs. This applies in the situation where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Integrated Conservation Value and land management security (by tenure).	14	93.33%	97.41%	8839.73 m
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a lower priority when development is proposed or occurs. This applies in the situation	1	6.67%	2.59%	234.63 m

Code	Description	Count	% Count	% Units	Total Units
	where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Integrated Conservation Value and land management security (by tenure).				

2.2.3.1 CMPP1

Code	Description	Count	% Count	% Units	Total Units
M	Moderate Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a moderate priority when development is proposed or occurs. This applies in the situation where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Representative Conservation Value and land management security (by tenure).	14	93.33%	97.41%	8839.73 m
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a lower priority when development is proposed or occurs. This applies in the situation where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Representative Conservation Value and land management security (by tenure).	1	6.67%	2.59%	234.63 m

2.3 Conservation Value

2.3.1 ICV

Code	Description	Count
L	Lower to lowest Integrated Conservation Value (ICV). ICV integrates the Representative Conservation Value with known Special Values (eg. threatened and priority species and communities, and priority sites).	15

2.3.1.1 Special Values

Name	Scientific Name	Status	Type
Platypus	Ornithorynchus anatinus	Non-outstanding	Phylogenetically Distinct Fauna Species

2.3.2 NR class

Code	Description	Count	% Count	% Units	Total Units
C1	C1 class of Representativeness and Naturalness. This river section is within the last group of sites selected for rivers and is in excellent condition. Selection is based on representativeness, rarity of classification units and naturalness score.	9	60.00%	60.61%	5499.65 m
C2	C2 class of Representativeness and Naturalness. This river section is within the last group of sites selected for rivers and is in moderate condition. Selection is based on representativeness, rarity of classification units and naturalness score.	5	33.33%	36.81%	3340.08 m
C3	C3 class of Representativeness and Naturalness. This river section is within the last group of sites selected for rivers and is in poor condition. Selection is based on representativeness, rarity of classification units and naturalness score.	1	6.67%	2.59%	234.63 m

2.3.3 RCV

Code	Description	Count
C	C class Representative Conservation Value (RCV). This river section is within the last group of sites selected for rivers. Selection is based on representativeness, rarity of classification units and naturalness.	15

2.3.3.1 Important biophysical class

Code	Description	% Units	Count	Total Units
T17	Upland mosaics of moorland, scrub and wet eucalypt forests dominated by E. delegatensis on the eastern side of Lakes Gordon and Pedder and more extensively in inland north-western Tasmania.	45.40%	8	4119.90 m
T50	Lowland scrub and moorland mosaic with implicate rainforest and Huon pine rainforest. Contains communities similar to 21, 38, 43.	54.60%	7	4954.47 m

2.4 Location

2.4.1 Easting

Maximum	Minimum	Mean	Count
365982.63 m	364415.82 m	365217.78 m	15

2.4.2 Mapsheet

Description	Count
LUINA	15

2.4.3 Northing

Maximum	Minimum	Mean	Count
5408376.50 m	5406375.33 m	5407408.70 m	15

2.5 Name

Description	Count
Prouse Creek	1
Whyte River	5
Washington Creek	3

2.6 Naturalness

Code	Description	Count	% Count	% Units	Total Units
Low	River section severely altered from natural condition.	1	6.67%	2.59%	234.63 m
High	River section in near-natural condition.	9	60.00%	60.61%	5499.65 m
Medium	River section significantly altered from natural condition.	5	33.33%	36.81%	3340.08 m

2.6.1 Biological Condition Score

Code	Description	Count	% Count	% Units	Total Units
4	Near natural biological condition for the river section.	7	46.67%	51.74%	4695.31 m
3	Significantly impaired biological condition for the river section.	4	26.67%	20.17%	1830.58 m
5	Unimpaired biological condition for the river section.	4	26.67%	28.08%	2548.47 m

2.6.1.1 Exotic Fish Condition

Code	Description	Count	% Count	% Units	Total Units
0	Exotic fish present and abundant; proportion of biomass as native fish approx. 0.	11	73.33%	71.92%	6525.90 m
1	Exotic fish absent or very low probability of occurrence.	4	26.67%	28.08%	2548.47 m

2.6.1.2 Macroinvertebrate Condition

Code	Description	Count	% Count	% Units	Total Units
5	Natural total density levels and natural assemblage composition of benthic macroinvertebrates for the river section.	15	100.00%	100.00%	9074.36 m

2.6.1.2.1 River Abstraction Index

Code	Description	Count	% Count	% Units	Total Units
5	Small to no decreases in long-term mean annual volume of flow, and moderate decreases in summer baseflows in rural areas due to net abstraction (removal out of the channel) of water.	15	100.00%	100.00%	9074.36 m

2.6.1.2.2 Flow Variability Index

Code	Description	Count	% Count	% Units	Total Units
4	The degree of change in flow	15	100.00%	100.00%	9074.36 m

Code	Description	Count	% Count	% Units	Total Units
	regime variability as a result of human flow manipulation (associated with large storages) is zero or very low; no major dam or structure present).				

2.6.1.2.3 Macroinvertebrate Observed/Expected

Code	Description	Count	% Count	% Units	Total Units
1	AUSRIVAS O/E ranked index falls within the A impairment band, O/E rank range approx. 0.8 to 1.3, with mean of approx. 1.0; Equivalent to natural; No impact on presence or relative abundance of approx. dominant families.	4	26.67%	25.07%	2275.10 m
0.8	AUSRIVAS O/E ranked index falls within the AB impairment band region, O/E rank range approx. 0.6 to 1.0, with mean of approx. 0.8; Close to natural or moderately impaired; Minimal to some impact on presence or relative abundance of approx. dominant families.	11	73.33%	74.93%	6799.26 m

2.6.1.3 Fish Condition

Code	Description	Count	% Count	% Units	Total Units
-9	Native fish absent or low probability of occurrence	6	40.00%	35.78%	3246.96 m
0.5	Moderate impact of large dams, changes in flow regime, or acid drainage on native fish populations	1	6.67%	7.34%	666.15 m
1	No impact of large dams, changes in flow regime, or acid drainage on native fish populations	8	53.33%	56.88%	5161.25 m

2.6.1.4 Accumulated Native Riparian Vegetation

Maximum	Minimum	Mean	Count
1.00	0.66	0.87	15

2.6.1.4.1 Native Riparian Vegetation

Code	Description	Count	% Count	% Units	Total Units
3	Moderate to high proportional area of native vegetation occurring within the riparian zone (50m width strip each side of the river section) (20 - 80% of total riparian buffer zone as native vegetation)	6	40.00%	41.73%	3786.93 m
4	Very to extremely high proportional area of native vegetation occurring within the riparian zone (50m width strip each side of river section) (>80% of total riparian buffer zone as native vegetation)	9	60.00%	58.27%	5287.43 m

2.6.1.4.2 Willows

Code	Description	Count	% Count	% Units	Total Units
1	Dense willow infestations (Salix sp.) absent within the riparian zone, willows sparse or absent.	15	100.00%	100.00%	9074.36 m

2.6.1.5 Platypus Condition

Code	Description	Count	% Count	% Units	Total Units
1	Platypus population in essentially natural condition; Not in known Mucor infestation area (in 2004); Riparian vegetation mostly or entirely native.	11	73.33%	78.17%	7093.31 m
0.8	Platypus population in close to natrual condition; Either: a: (Not in known Mucor infestation area in 2004; Mixed native and cultural riparian vegetation; First order stream) or b: (Not in known Mucor infestation area in 2004; Mixed native and cultural riparian vegetation; Stream of order > 1).	4	26.67%	21.83%	1981.05 m

2.6.2 Geomorphic Condition Score

Code	Description	Count	% Count	% Units	Total Units
3	High geomorphic condition score for the river section.	8	53.33%	57.74%	5239.47 m
2	Medium geomorphic condition score for the river section.	7	46.67%	42.26%	3834.89 m

2.6.2.1 Flow change

Code	Description	Count	% Count	% Units	Total Units
5	Minimal to no change to flow regime for the river section.	15	100.00%	100.00%	9074.36 m

2.6.2.1.1 River Abstraction Index

Code	Description	Count	% Count	% Units	Total Units
5	Small to no decreases in long-term mean annual volume of flow, and moderate decreases in summer baseflows in rural areas due to net abstraction (removal out of the channel) of water.	15	100.00%	100.00%	9074.36 m

2.6.2.1.2 Flow Variability Index

Code	Description	Count	% Count	% Units	Total Units
4	The degree of change in flow regime variability as a result of human flow manipulation (associated with large storages) is zero or very low; no major dam or structure present).	15	100.00%	100.00%	9074.36 m

2.6.2.1.3 Regulation Index

Code	Description	Count	% Count	% Units	Total Units
1	The amount of regulation of the	15	100.00%	100.00%	9074.36 m

Code	Description	Count	% Count	% Units	Total Units
	natural flow regime due to cumulative effect of water storage upstream is low. Geomorphic and biological impacts weak or absent.				

2.6.2.2 Geomorphic responsiveness

Code	Description	Count	% Count	% Units	Total Units
0	Responsiveness of channel form to anthropogenic changes in flow and/or sediment regime is low (eg. a bedrock controlled system).	15	100.00%	100.00%	9074.36 m

2.6.2.3 Sediment capture

Code	Description	Count	% Count	% Units	Total Units
3	Low to very low proportion of fluvial sediment captured (stored) in dams upstream of river section.	15	100.00%	100.00%	9074.36 m

2.6.2.4 Sediment Input

Code	Description	Count	% Count	% Units	Total Units
2	Large anthropogenic change to sediment input for the river section.	5	33.33%	32.05%	2908.57 m
1	Very large anthropogenic change to sediment input for the river section.	1	6.67%	7.34%	666.15 m
3	Moderate anthropogenic change to sediment input for the river section.	1	6.67%	2.87%	260.17 m
5	Minimal to no anthropogenic change to sediment input for the river section.	7	46.67%	42.85%	3888.21 m
4	Small anthropogenic change to sediment input for the river section.	1	6.67%	14.89%	1351.26 m

2.6.2.4.1 Catchment Disturbance

Code	Description	Count	% Count	% Units	Total Units
4	Low level of catchment disturbance affecting stream channel and sediments; some disturbance affecting stream channel and sediments with the catchment subject to selective clearance and/or rough grazing.	1	6.67%	14.89%	1351.26 m
5	Minimal level of catchment disturbance affecting stream channel and sediments; minimal or no clearance and/or disturbance.	13	86.67%	82.24%	7462.92 m
2	High level of catchment disturbance affecting stream channel and sediments; catchment heavily cleared and/or used intensively, such as agriculture and urban areas.	1	6.67%	2.87%	260.17 m

2.6.2.4.2 Mining Sedimentation

Code	Description	Count	% Count	% Units	Total Units
1	Absence of major long-term and/or historical mining sedimentation	14	93.33%	92.66%	8408.22 m

Code	Description	Count	% Count	% Units	Total Units
	deposits in channel.				
0	Presence of major long-term and/or historical mining sedimentation deposits in channel; substantial geomorphological and/or biological impacts present or likely.	1	6.67%	7.34%	666.15 m

2.6.2.4.2.1 River Acid Drainage

Code	Description	Count	% Count	% Units	Total Units
0	Significant acid drainage absent	15	100.00%	100.00%	9074.36 m

2.6.2.4.3 Urbanisation

Code	Description	Count	% Count	% Units	Total Units
1	Local channel impacts from urbanisation absent or limited. Fluvial geomorphological impacts absent or not significant.	9	60.00%	60.61%	5499.65 m
0	Local channel impacts from urbanisation present, and significant. Fluvial geomorphological impacts significant.	6	40.00%	39.39%	3574.72 m

2.7 Topographic Variables

2.7.1 Accumulated Mean Annual Runoff

Maximum	Minimum	Mean	Count
40729.08 ML/year	44.37 ML/year	14173.67 ML/year	15

2.7.2 Accumulated Mean Annual Runoff - pre-European

Maximum	Minimum	Mean	Count
40729.08 ML/year	44.37 ML/year	14173.67 ML/year	15

2.7.3 Accumulated Catchment Area

Maximum	Minimum	Mean	Count
28077343.41 m²	30676.56 m²	9729262.42 m²	15

2.7.4 Accumulated Length

Maximum	Minimum	Mean	Count
31725.98 m	3690.77 m	19671.38 m	15

2.7.5 Local Catchment Area

Maximum	Minimum	Mean	Count
1413353.96 m²	30676.56 m²	369624.42 m²	15

2.7.6 Elevation Max

Maximum	Minimum	Mean	Count
569.00 m AHD	293.00 m AHD	371.40 m AHD	15

2.7.7 Elevation Min

Maximum	Minimum	Mean	Count
330.00 m AHD	283.00 m AHD	306.93 m AHD	15

2.7.8 Length

Maximum	Minimum	Mean	Count
1351.26 m	224.69 m	604.96 m	15

2.7.9 Mean Annual Runoff

Maximum	Minimum	Mean	Count
2001.04 ML/year	44.37 ML/year	529.16 ML/year	15

2.7.10 Strahler stream order

Maximum	Minimum	Mean	Count
5.00	1.00	3.20	15

2.7.11 Slope

Maximum	Minimum	Mean	Count
0.461230 rise/run	0.007489 rise/run	0.122111 rise/run	15

Attachment H

Transport Route

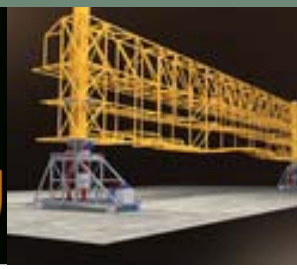
Map Projection:
GDA 1994 MGA Zone 55
Data sources:
Base image by TASMAP (C) State of Tasmania
Map produced by pitt&sherry Date: 7/09/2011
Map ref: HB11225_H009_TransportRoute_12P_RevA

pitt&sherry

Cleveland Luina

Proposed Transport Route

transport infrastructure | community infrastructure | industrial infrastructure | climate change



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Australian Government
Department of Sustainability, Environment, Water, Population and Communities

Mr Chris Dunks
Managing Director
Bright Phase Pty Limited
PO Box 256
HOLLAND PARK QLD 4121

Date: 14 November 2011
EPBC Ref: 2011/6142
EPBC contact: Mark Hall
02 6274 1933
mark.hall@environment.gov.au

Dear Mr Dunks

Decision on referral

The Cleveland Tin Mine, near Luina, North West Tasmania (EPBC 2011/6142)

This proposed action, involving the mining and reprocessing of old tailings and the dewatering and exploration of the old mine workings, has now been considered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

As the delegate of the Minister for Sustainability, Environment, Water, Population and Communities, I have decided that the proposed action is a controlled action and, as such, requires assessment and approval under the EPBC Act before it can proceed.

It appears that the proposed action is likely to have a significant impact on the following matters protected by the EPBC Act:

- Listed threatened species and communities (sections 18 & 18A);

Species of interest include Wedge-Tailed Eagle, Spotted-Tail Quoll, Tasmanian Devil, Masked Owl and Australian Grayling.

Please note that this decision only relates to the potential for significant impact on the specific matters protected under Chapter 2 of the EPBC Act.

The Department has yet to make a decision on assessment approach, and has paused the timeline to make this decision pending confirmation that the project will be assessed under the bilateral agreement with the Tasmanian Government.

Yours sincerely

David Calvert
A/g Assistant Secretary
Environment Assessment Branch

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

Notification of REFERRAL DECISION AND DESIGNATED PROPONENT – controlled action

DECISION ON ASSESSMENT APPROACH

Cleveland Tin Mine (EPBC 2011/6142)

This decision is made under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

proposed action	To mine and reprocess 4 million tonnes of old tailings contained in two large tailings facilities at the closed Cleveland Mine at Luina in Northwest Tasmania including dewatering old mine workings for exploration and geotechnical assessment of resource potential for future hard rock mining, and as described in the referral received under the EPBC Act on 6 October 2011.
decision on proposed action	The proposed action is a controlled action. The project will require assessment and approval under the EPBC Act before it can proceed.
relevant controlling provisions	• Listed threatened species and communities (sections 18 & 18A)
designated proponent	Bright Phase Pty Limited ACN: 127 819 710
assessment approach	To be advised

Decision-maker

Name and position	David Calvert Acting Assistant Secretary Environment Assessment Branch
Signature	
date of decision	14 November 2011

Level 7, 134 Macquarie Street, Hobart TAS
GPO Box 1550, Hobart, TAS 7001 Australia

ENVIRONMENT PROTECTION AUTHORITY

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Web: www.epa.tas.gov.au

Our Ref: 112463:eeo/eas/p/BrightPhase_Cleveland\c/C06_Guidelines

Date 19/3/2012		Recorded BB	
File HB11225/431		Doc H23312	
ATTN	Action	Initial	Date
J.C	A		19-3-12
D.L	I	Rec per	19-3-12
		I	
A. Action		Filed	
I. Information			

15 March 2012

Dr Mike Adams
Bright Phase Pty Ltd
PO Box 374
GUILDFORD WA 6935

Dear Dr Adams

BRIGHT PHASE PTY LTD – CLEVELAND MINE PROJECT
DPEMP GUIDELINES

DPEMP Guidelines

As previously advised, the environmental impact of the above proposal is being assessed by the Board of the Environment Protection Authority (the Board) as a class 2C assessment under the *Environmental Management and Pollution Control Act 1994*.

The assessment cannot proceed further until you have satisfactorily presented the case for assessment in the form of a Development Proposal and Environmental Management Plan (DPEMP) prepared in accordance with the enclosed DPEMP guidelines.

The DPEMP guidelines, prepared based on the Notice of Intent, prescribe the information requirements, as related to the proposal being assessed. Please note that if the project should change from that described in the Notice of Intent the DPEMP guidelines may need to be modified.

Close consultation with the EPA Division, Council, and Commonwealth Department of Sustainability, Environment, Water, Population and the Community (DSEWPaC) during the preparation of the DPEMP is recommended.

A draft of the DPEMP should be submitted to this office for review prior to the submission of a permit application to the local Council. It is recommended that you follow the headings and section numbering outlined in the guidelines to prepare a DPEMP for the above project.

The Assessment Process

Once a satisfactory DPEMP has been received, the application and the DPEMP will be advertised and the public invited to make representations in relation to the project. The application will also be referred to relevant State Government agencies and DSEWPaC for comment.

At the end of the public consultation period, you may be requested to provide the Board with additional supporting information, or to modify the project, in response to the public and agency comments. This will take the form of a supplement to the DPEMP.

On completion of its assessment, the Board will notify you, Council and DSEWPaC of the result of the assessment and of any conditions or restrictions which the Board requires to be contained in any permit granted by Council, or will direct Council to refuse to grant a permit.

Failure to provide a satisfactory case for assessment (DPEMP) within 12 months of your receipt of the attached guidelines may result in rejection of the application or proposal.

Please note that the Board is required to publicly disclose all information relating to the environmental impact of the proposal except where there is a legitimate commercial, national security or environmental reason for confidentiality. Please indicate where you would prefer information to remain confidential, and the basis for the request.

Fees

Also please note that in my letter of 13 January 2012, I provided advice on the likely assessment and annual permit fees for the activity. These figures were based on the activity being classified as a Mine, as per subsection (5)(c) of Schedule 2 of the EMPC Act. After further consideration the activity is now considered to be a Mineral Works (subsection (2)(e) of Schedule 2 of the EMPC Act).

As specified in the *Environmental Management and Pollution Control (General Fees) Regulations 2007*, a Mineral Works with 300,000 tonnes of raw material processed per year, will invoke the following fees: the assessment fee will be determined at an hourly rate of $115.50 per hour spent on the assessment, commencing from the receipt of the Notice of Intent (the assessment fee is capped by law at $57,850). The annual permit fee will be $40,852. An invoice for fees payable will be issued at the conclusion of the Board's assessment. Please note that the above fees are subject to indexation.

If you have any queries regarding the above, please contact the officer nominated at the head of this correspondence.

Yours sincerely

per Alex Schaap
DIRECTOR, ENVIRONMENT PROTECTION AUTHORITY

Encl.

- *Guidelines for the preparation of a Development Proposal and Environmental Management Plan for Bright Phase Pty Ltd, Cleveland Mine Project, Luina, Tasmania.*

cc Mr Greg Winton, General Manager, Waratah-Wynyard Council, PO Box 168, WYNYARD TAS 7325

Mr Jim Lockley, Pitt & Sherry, GPO Box 94, HOBART TAS 7001

Director, Environment Assessment Branch, DSEWPaC, GPO Box 787, CANBERRA ACT 2601

Guidelines for the preparation of a

Development Proposal and Environmental Management Plan

for

Bright Phase Pty Ltd
Cleveland Mine Project
Near Luina, Tasmania.

Board of the Environment Protection Authority
March 2012

ENVIRONMENT PROTECTION AUTHORITY

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GENERAL INFORMATION FOR THE PROPONENT

Commonwealth environmental approval

This proposal has been determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on the grounds that it is likely to have a significant impact on Listed Threatened Species and Communities (sections 18 and 18A), a matter protected by the EPBC Act – the "controlling provision" for assessment. Therefore, in addition to Tasmanian requirements, Australian Government approval is required under the EPBC Act.

The Australian and Tasmanian Governments have signed a bilateral agreement relating to impact assessment under section 45 of the EPBC Act which effectively accredits the State assessment process. This proposal will be assessed in accordance with the bilateral agreement.

Further information on the EPBC Act can be obtained from the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) website at www.environment.gov.au/epbc/ or by calling 1800 704 520.

General

The *Environmental Management and Pollution Control Act 1994* (EMPC Act) requires the Board of the Environment Protection Authority ('the Board') to provide guidance to the proponent about what should be included in the case for assessment.

These guidelines provide general and specific information on preparing a Development Proposal and Environmental Management Plan (DPEMP) for the proposed activity (action) being assessed by the Board under the EMPC Act and the Federal government under the EPBC Act.

Not all issues nominated in these guidelines will have the same degree of relevance to the proposed activity; some of the issues may be more relevant than others, while others will not be applicable at all. The level of detail provided on issues should be appropriate to the level of significance of that issue for the proposal.

These guidelines identify the key issues related to this proposed activity and should not be interpreted as excluding from consideration other matters that emerge as significant from environmental studies, public comments or otherwise during the course of the preparation of the DPEMP.

The DPEMP should specifically describe the implications of the proposal for the relevant matters protected under the EPBC Act in accordance with Schedule 4 of the EPBC Regulations (see Appendix 1).

This document has been prepared based on a Notice of Intent and relates to a tailings reprocessing activity with potential use of water from the underground mine, but does not include exploration or mining of the underground resource.

Objectives and content

The DPEMP should aim to provide:

a) A source of information from which individuals, governments and groups may gain an understanding of the proposed action including: the current status and background of the project, the need for the action, the alternative actions, the consequence of not proceeding with the action, the objective of the action, how the action relates to other actions in the region, the potential or actual impact the action will have on the environment and the safeguards and mitigation measures that will be implemented to minimise any relevant adverse impacts including specific management commitments (see below).

b) A basis for public consultation and informed comment on the proposal.

c) A framework against which decision makers (and in particular the Board, the local Council and federal Government) can consider the proposal and determine the conditions under which any approval would be given.

The DPEMP should provide details of the proposal, describe the existing environment in the vicinity of the proposal site, identify all significant environmental, social, health and economic impacts associated with the proposal, detail proposed measures to avoid or reduce potential adverse impacts and identify opportunities for protection and enhancement of the environment.

While it is recognised that some construction and operational details may not have been finalised at the time the DPEMP is submitted for assessment, the information presented in the document should be as up to date as possible. Where information is unavailable or details have not yet been finalised, estimates and the range of alternative options should be provided. It should be noted, however, that sufficient technical detail must be provided to enable an appropriate level of assessment to be undertaken.

The main text of the DPEMP should be written in a clear and concise style that is easily understood by the general reader. Technical terminology should be avoided as far as possible. The detailed technical data and reports necessary to support the main text should be included in appendices. All sources of information should be referenced. An indication should also be given of the currency of the information used and how the reliability of the information was tested. In particular, the degree of confidence attached to any predictions should be indicated. It is recommended that information be presented on maps, diagrams and site plans to enhance the level of understanding. In accordance with Schedule 4 of the EPBC Regulations 2000 statements must be provided regarding the following: source of information; how recent the information is; how reliability of information was tested; and what uncertainties (if any) are in the information.

Where sensitive information needs to be provided (e.g. information on production processes, areas of conservation, scientific, archaeological, heritage or other special significance) this information should be provided in a separate, confidential appendix. A comment should be provided in the DPEMP to the effect that the information has been so provided.

Specific management commitments must be clearly identified in the text and included in the commitments table referred to in Section 8 of these guidelines.

Where appropriate, refer to information provided in other sections to minimise duplication.

The DPEMP should contain a summary table showing compliance with these guidelines.

Consultation and submission of draft document

Environmental aspects of the proposal will be assessed by the Board; planning aspects of the proposal will be assessed by the Waratah-Wynyard Council (Council); while matters protected under the EPBC Act will be assessed by DSEWPaC. The Board has authorised the EPA Division to undertake the administrative tasks and establish the information base to inform its decision making on its behalf. As such, close consultation with the EPA Division, Council and DSEWPaC during the preparation of the DPEMP is therefore recommended. It is also recommended that the proponent submit a draft DPEMP to Council, the EPA Division, and DSEWPaC for review prior to its finalisation. Please note that draft documents may be rejected without detailed review if they are incomplete, contain significant formatting or typographical errors or do not comply with these guidelines. More than one draft may be necessary before the document is considered suitable for public release.

Following the public consultation phase, the DPEMP or proposal may require amendment as a result of consideration of public and government agency submissions. This generally takes the form of a supplement to the DPEMP.

Submission

The DPEMP is to be submitted in a printed format and in electronic formats suitable for use with a word processor (such as Microsoft Word), and for publishing on the internet (preferably PDF format). The Board will inform the proponent of the number of copies (and format) required.

Copies are to be made available to the public upon request at no charge or for a nominal fee, in either printed or electronic format (CD ROM). Arrangements to display the DPEMP on the internet (whether on the proponent's or the EPA's web site) will also need to be put into place.

Documents should be suitable for download over slower internet connections. Images within the document should be optimised for the internet and font choices should be restricted to those most commonly used. Being judicious about the number of images and/or design elements can avoid unnecessarily adding to the file size. Large files should be broken into multiple documents.

Structure and content

The following sections have been set out in a manner which may be adopted as the structure for the DPEMP. The proposed structure of the DPEMP must focus on the key issues for the proposal as outlined in section 4.0.

Any significant departure from the requirements and intent of the relevant sections of these general guidelines must be approved by the assessing agencies.

CONTENTS OF THE DPEMP

FOREWORD

This section should briefly outline the assessment and approvals process and explain the function of the DPEMP in this process.

TABLE OF CONTENTS

This section should contain a table of the contents of the report with reference to the relevant page numbers. It should also contain a list of figures and tables.

EXECUTIVE SUMMARY

This section should provide an executive summary of the DPEMP to give a clear and concise overview of the proposal and its environmental implications. It should contain headings corresponding to the main section headings of the DPEMP.

For larger DPEMPs, it is recommended that the executive summary be written as a stand-a-lone document, able to be provided on request to interested parties who may not wish to read or purchase the full DPEMP.

1. INTRODUCTION

This section should provide information on the following:

- Title of the proposal.
- Name and address of the proponent and general background, such as relevant development or operational experience. Where the proponent is a registered company, its Australian Company Number and Registered Office address should be included.
- Relevant background information on the proposal, including a history of the site use, the current status of the proposal, a general overview of the principal components of the proposal and the proposal location, the rationale and need for the proposal, anticipated establishment costs, likely markets for the product, and the possibilities for future expansion.
- An examination of how the proposal relates to any other proposals that have been, or are being, developed or that have been approved in the region affected by the proposal.
- Environmental legislation, standards and guidelines that will be applicable (such as policies, regulations and industry codes of practice).
- Other relevant Commonwealth, State and Local Government policies, strategies and management plans with which the proposal would be expected to comply (using separate headings for each jurisdiction).
- A description of any approval that has already been obtained from a State, Territory or Commonwealth agency or authority. If appropriate any additional approvals that may be required should be identified.

- Details of the nature and results of public consultation undertaken (if any) by the proponent during project planning and preparation of the DPEMP, as well as any proposals for further public consultation during and beyond project implementation. This should include the identification of affected parties and their views on the proposal.

2. PROPOSAL DESCRIPTION

This section should provide a full description of the proposal, including the construction, commissioning, operational and decommissioning phases, as well as any infrastructure and off-site ancillary facilities required for the proposal.

2.1 Proposal outline

This section should provide a detailed description (including precise locations) of key physical components of the proposal, including their function, composition, size, capacity, operational life, technical and performance requirements, inter-relationships and method of construction, operation and maintenance.

As a minimum the following information should be provided.

2.1.1 General

- The proposed area of the action - historically disturbed areas which are not to be included in 'the Land' should be clearly defined.
- The major items of equipment (including pollution control equipment) and on-site facilities including sanitary and sewage treatment facilities should be described. Detailed technical information on major items of equipment may be included in appendices.
- A description of any existing or proposed dams, tailings storage/water treatment facilities.
- The process should be described in a step-by-step manner using explanatory diagrams and flow charts where appropriate to augment text.
- The raw materials required for the proposal (including water and energy) should be specified. Quantities, characteristics and supply options should be listed.
- Details of production capacity and production rates for relevant processes including both peak rates and daily average rates. Include proposed annual production rates.
- The hours of operation for the proposal (hours per day and specific days per week) including any seasonal variations.
- The volume, composition, origin, destination and route for vehicle movements (including road, rail, shipping and air) likely to be generated during the operational phase, including a break-down for over-dimension and heavy road vehicles.
- A description of the mineral resource as currently understood including a brief description of historical and proposed drilling and exploration work undertaken to date to identify and characterise the resource, including metallurgical test results, particle size and saturation levels, interstitial water depth and quality, and the expected long-term prospects (eg 10 years).

- A mine plan including direction of works, transport and storage of material, mining rate, processing rate and mine life and the design parameters for aspects of the structures or elements of the action that may have relevant impacts.
- A description of drilling and blasting requirements, including compliance with relevant safety procedures including any requirement for blast monitoring: (eg. air blast overpressure and ground vibration).
- A description of underground ventilation requirements, including surface infrastructure to be installed in respect of dewatering.
- An estimation of the area of disturbance associated with all aspects of the proposal including any ventilation shaft surface infrastructure required.
- Proposed timetable for decision points and for each stage of the project including construction, tailings extraction, processing, mine dewatering, potential underground exploration and progressive rehabilitation.
- Planned land use of the site when operations are completed.

2.1.2 Construction

- A step-by-step description and timetable for significant activities during the construction phase of the proposal. Indicative timeframes for the completion of major steps, and the likely sequencing of steps.
- Estimates of the quantities of major raw materials required for construction and how these will be sourced.
- Nature, capacity and location of temporary construction equipment required on-site (such as cranes, concrete batch plants, rock crushers, construction camps);Proposed hours per day and days per week of construction activities; and
- Volume, composition, origin, destination and route for vehicle movements likely to be generated during the construction phase, including a breakdown for over-dimension and heavy vehicles.

2.1.3 Commissioning

- A step-by-step description of major commissioning activities (if any) following installation of equipment. Indicative timeframes for the completion of major steps, the likely sequencing of steps and the defining points by which commissioning will be determined to be completed.

2.2 Site plan

Site plans are required which identify the proposal site and which show the following[1] (where relevant).

- The Mining Lease(s).
- The boundary of the proposal site.

[1] When providing maps or referring to spatial databases, the coordinate reference system being used should be specified.

- The location of all major items of equipment and facilities including: site office; change rooms; workshop; crushing machinery; processing plant; borrow pits; wetlands; tailings storage/water treatment facilities (short and long term); haul roads and access tracks; portal entrance; pipelines/conveyors or similar means of transporting on-site materials; electricity transmission lines, energy and water supply; temporary and permanent storage areas for raw materials, waste rock/overburden, product, topsoil, fuels, oils, explosives and other dangerous goods or chemicals (including products, by products and wastes); and stormwater collection systems.
- Plans and description of any proposed stream diversions. Details of any screening vegetation or bund walls.
- Existing vegetation and type including locations of known listed threatened species and communities (TSPA and EPBCA) overlaid with development plans.
- The location of all point sources of atmospheric emissions and liquid emissions (including stormwater).
- The location of all major sources of noise.
- The location of all current and proposed monitoring sites.
- Plans or diagrams depicting the proposed means of access to and from the Waratah Road.
- Location of historical workings and existing infrastructure, such as transmission lines, access/cartage routes, adits or excavations, drill holes and ventilation shaft surface infrastructure locations.

2.3 General location map

A general location map (*e.g.* 1:25,000 scale) which identifies the following is required:

- The location of the proposal site.
- Topographical features, aspect and direction of drainage.
- Road access to and from the site.
- Location of waterways and drains (including ephemeral).
- The distance(s) to any nearby sensitive uses (such as residences).
- Electricity transmission lines.
- Boundaries of the property on which the proposal is located.
- Surrounding land tenure.
- Surrounding land use (identify areas of conservation or recreational significance).

2.4 Off-site infrastructure

Any new infrastructure or off-site ancillary facilities (such as pipelines, power lines etc) required to allow the proposal to proceed should be described (for example water supply, electricity supply, roads or other transport infrastructure).

2.5 Technical and management alternatives

For any part of the proposal where alternative technologies, design options or management practices with different environmental consequences may exist, the alternatives should be identified, their environmental performance evaluated and the reason for the proposed choice justified.

3. THE EXISTING ENVIRONMENT

This section should describe the proposal site location and provide an overview of the existing environment which may be affected by the construction and operation of the proposal, including areas associated with any ancillary activities and off-site infrastructure.

It should include details of salient features of the existing environment and, where appropriate, include maps, plans, photographs, diagrams or other descriptive detail.

The following details should be included.

3.1 Planning aspects

- Information on land tenure and property boundaries of the proposal site, with title details.
- Land zonings for the proposal site and surrounding areas, and any by-laws or special planning controls that may apply to the site and surrounding areas.
- Any rights of way, easements and covenants affecting the proposal site.
- Land use and planning history of the proposal site, including the potential for site contamination[2], the present use of the site and any existing buildings and significant structures.
- A description of land use and ownership in the vicinity of the proposal site and those areas which may be affected by the proposal. The location and nature of industrial facilities, the location of individual residences, schools, hospitals, caravan parks and similar sensitive uses, and the location of any tourist or recreation facilities or routes (such as camping areas, picnic areas, walking tracks, historic routes) within 1000 metres of the proposal site should be included. Any proposed or potential sensitive users within this distance of the proposal site, which have been or are likely to be granted approval under the local planning scheme, should also be considered.

3.2 Environmental aspects

- A description of the general physical characteristics of the proposal site and surrounding area, including topography (eg. as relevant to flooding, dispersion of site discharges/emissions and disturbance of particulates), geology, geomorphology, soils (including erodibility), vegetation, fauna, groundwater and surface drainage (including waterways, lakes, wetlands, coastal areas etc.).
- A description of natural processes of particular importance for the maintenance of the existing environment (e.g. fire, flooding, etc).
- Any existing conservation reserves located on or within 500 metres of the proposal site

[2] Information on potentially contaminating activities and contaminated site assessment can be found online at www.epa.tas.gov.au under 'Land Contamination'.

- Any high quality wilderness areas identified in the *Tasmanian Regional Forest Agreement* located on or within twenty kilometres of the proposal site.
- A brief description of the local climatology (eg. temperature, rainfall, wind speed and direction) and an assessment of the vulnerability of the site to natural hazards (e.g. flooding, seismic activity, fire, landslips or strong winds).
- Location of nearest residences or sensitive uses.

3.4 Alternative sites

This section should describe the site selection process, including site selection criteria, alternative sites considered and an assessment of those alternatives. The assessment should compare alternatives according to clearly defined environmental, social, economic and technical criteria, and provide a justification for the preferred site. Any community consultation undertaken and the impact it had on the selection process should be detailed. Include a discussion of the impacts of each alternative on the matters protected by the EPBC Act.

4. POTENTIAL IMPACTS AND THEIR MANAGEMENT

The key issues that have been identified for consideration in relation to the project, and which should be the principal focus of the DPEMP, are as follows:

- Impacts on surface and ground waters including from discharge of wastewater and exposure of tailings and underground materials to the atmosphere.
- Waste management including measures to prevent or mitigate the formation of acidic and metalliferous drainage (AMD).
- Impacts on natural values.
- Mine closure and rehabilitation.

Survey and study requirements in relation to key issues

The following surveys and studies will be required as part of the DPEMP in relation to the key issues identified above. It is strongly recommended that relevant EPBC Act policy guidelines are consulted and the advice of the EPA Division is sought on the acceptability of survey techniques prior to the work being undertaken.

Where previous surveys have been undertaken these may be used if it can be demonstrated that the results are still relevant.

Key Issue	Survey requirements for DPEMP	Other studies for DPEMP	Relevant section of DPEMP Guidelines
1. Water Quality	Ambient surface water quality survey of the pre-existing receiving environment (evaluation of historical sources of pollution including mass loadings at various flows). Water quality survey of water to be extracted from underground workings at various depths. Tailings (resource) geotechnical survey (acid base accounting) and assessment of interstitial water depth and quality.	Provide an assessment of the potential impact of aqueous emissions from the operation upon the receiving environment including new point source emissions and impacts on diffuse emissions eg by exposing tailings and underground materials to the atmosphere.	3.2/4.2
2. Groundwater	Ambient groundwater quality survey of the pre-existing receiving environment (evaluation of historical sources of pollution).	Provide an assessment of the potential impact on groundwater quality and quantity including intended quantities of groundwater to be used for the activity.	4.3
3. Waste Management	A geotechnical survey of the location of any new dams.	Through geochemical test work (Acid Base Accounting) and modelling - quantify the potential acid forming nature and distribution of materials within areas to be disturbed by the activity. Identify the timing and quantity of exposure of potentially acid forming materials and elements and concentrations that may be of environmental concern based on background levels.	4.2/4.5
4. Natural Values	A terrestrial and aquatic ecological survey including a targeted survey for *Beddomeia beli* (hydrobiid snail – Rapid River) in any potential habitat that will be directly or indirectly impacted by the proposal.	An assessment of the potential impacts of water extraction (if relevant) on the environmental flows and natural values of waterways. An assessment of the impact of wastewater discharge on the aquatic health of the receiving environment.	4.7
5. Mine Closure		Assess the long term acid generating potential of the activity including in the case of unexpected closure.	7

4.0 Guidance for preparation of this section

This section should identify for each of the impacts below:

a) **Existing conditions** – an outline of the existing conditions relevant to that impact (with cross referencing where appropriate to other sections).

b) **Performance requirements** – performance requirements to be achieved should be identified and evidence provided to demonstrate that these can be complied with. These may be standards or requirements specified in legislation, codes of practice, state policies, national guidelines or as determined by agreement with the assessing agencies. Industry best practice standards should be referred to where appropriate. **Unsupported assertions that performance requirements will be achieved will not be considered adequate**.

c) **Potential impacts** – potential environmental impacts of the proposal (positive and negative) should be described for all stages, including construction, operation and closure, in the absence of special control measures. Short and long term impacts plausible worst case consequences and cumulative impacts need to be addressed, in relation to the vulnerability of the affected environment, and the reversibility of the impacts. Interactions between biophysical, socio-economic and cultural impacts should be identified. The representation of the above information on maps, diagrams, site plans and photographs is recommended. Predictions and evaluations of impacts should be based on scientifically supportable data. The methodologies used or relied on should be referenced, together with the relevant research and investigations supporting them. Assumptions, simplifications and scientific judgements should be stated clearly, and the nature and magnitude of uncertainties should be clearly defined. Where relevant, the choice of a particular methodology over alternative methodologies should be explained. Where impacts are unknown, unpredictable, irreversible or not quantifiable, this should be identified and the potential impacts adequately described.

d) **Avoidance and mitigation measures** – a description and list of the measures proposed to avoid or reduce potential adverse impacts in order to achieve the environmental performance requirements. Where adverse environmental impacts are unavoidable, the proposed measures to mitigate the impacts (e.g. pollution control equipment, treatment processes, management practices) should be described in detail. The extent to which they will overcome the anticipated impacts should be specified. Where pollution control equipment and/or treatment processes are key factors in achieving satisfactory environmental performance, contingencies in the event of breakdown or malfunction of the equipment or processes should be discussed. It should be demonstrated that the maintenance of pollution control equipment can be provided for without causing performance requirements to be exceeded. Where measures to control environmental impacts are necessary, but will not be undertaken by the proponent, the means by which the proponent will ensure that the necessary measures are implemented should be identified (*e.g.* lease conditions, trade waste agreement, contractual arrangement or other binding third party commitment). In relation to controlling measures under the EPBC Act information should be provided on whether the mitigation measures suggested have any statutory or policy basis and an indication of how much they are expected to cost.

An outline of an environmental plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing must be

provided, and must note which agency will be responsible for endorsing/approving each mitigation measure or monitoring program. (Note: this could also be provided in section 8 – Commitments). **Mitigation measures over which the proponent has no control will generally not be considered adequate.**

e) **Offsetting unavoidable adverse impacts** - if adverse residual environmental impacts are considered unavoidable despite the adoption of best practice environmental management avoidance and mitigation measures, then proposals to offset such impacts should be detailed. For example, if the loss of conservation values, community assets or amenities is considered unavoidable, measures to compensate for those losses should be proposed in proportion to the loss. Any offset actions proposed must be demonstrated to be 'real' actions. All proposed offsets must comply with State and Commonwealth offset policies such as DSEWPaC's *Environmental Offsets Policy – Consultation Draft August 2011* found at *http://www.environment.gov.au/epbc/publications/consultation-draft-environmental-offsets-policy.html.*

That is, **the offset actions must have a measurable and relevant benefit which would otherwise not have occurred.**

f) **Assessment of impacts** – an assessment of the overall impacts of the development on the environment after allowing for the implementation of proposed avoidance and mitigation measures. This should include an evaluation of the significance of impacts and comparison with state, national and international regulations and standards. Any net benefits likely to result from the proposal should be identified.

g) **Consideration of alternatives-** Where there are clear, alternative avoidance or mitigation measures for a particular adverse environmental impact, the alternatives should be reviewed and the preferred option justified.

4.0.1 Sustainable development objectives

Attention should be paid to demonstrating that the proposal is consistent with objectives as required by the relevant Commonwealth and Tasmanian statutes and policies, including the National Strategy for Ecologically Sustainable Development, the Tasmanian Resource Management and Planning System, the Environmental Management and Pollution Control System and the principles of ecologically sustainable development as described in the EPBC Act.

4.1 Air emissions

This section should identify existing conditions, identify performance requirements to be achieved, identify any potential impacts of the proposal on the local, regional and global air environment, identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts on the air environment following implementation of the proposed avoidance and mitigation measures.

4.1.1 Legislative and policy requirements

Consideration should be given to the requirements of the Tasmanian *Environment Protection Policy (Air Quality)* (see www.environment.tas.gov.au/AirQualityPolicy).

4.1.2 Other issues

The following issues should be addressed (where relevant).

- The location of all emission points should be specified and mapped.
- Potential sources of fugitive emissions (including odour, dust, dry tailings and asbestos that may arise from loading, unloading and transport) should be described.
- The potential for emissions to cause environmental and health impacts should be evaluated and proposed mitigation measures should be described.

4.2 Liquid waste

This section should identify existing conditions, detail the performance requirements to be achieved, identify potential impacts of the proposal on the receiving environment (including surface water, groundwater and soil), identify measures to avoid and mitigate potential adverse impacts and assess the overall impacts on the receiving environment following the implementation of the proposed avoidance and mitigation measures.

This section should demonstrate that all reasonable and practicable measures have been taken (having regard to best practice environmental management as defined in the EMPC Act) to avoid producing liquid waste, and to reduce the amount of liquid waste to be discharged having regard to best practice environmental management. The measures must be in accordance with the following hierarchy of waste management, arranged in decreasing order of desirability:

a) waste avoidance;

b) waste recycling/reclamation;

c) waste re-use;

d) waste treatment to reduce potentially adverse impacts; and waste disposal.

4.2.1 Legislative and policy requirements

It must be demonstrated that the proposal is consistent with the objectives and requirements of relevant water management policies and legislation, including the *Water Management Act* 1999, *State Policy on Water Quality Management 1997* (Water Policy), the *Inland Fisheries Act 1995,* the *Living Marine Resources Management Act 1995* and the *Tasmanian State Coastal Policy 1996.*

In particular, it must be demonstrated that the proposal will not prejudice the achievement of any water quality objectives set for water bodies under the *State Policy on Water Quality*

Management (see http://epa.tas.gov.au/epa/water). Where water quality objectives have not yet been set, the EPA Division should be consulted to identify the baseline water quality data required to enable the water quality objectives to be determined.

4.2.2 Discharge of wastewater to the environment

If the proposal includes any discharge of wastewater to the environment, then a detailed consideration of the nature of the discharge and of the receiving environment must be presented. Any proposed treatment processes should be described and the potential impacts upon the receiving environment must be assessed under typical and plausible worst case conditions. Note: wastewater means water used during carrying out the activity, and does not include stormwater arising from rainfall on the proposal site (see below).

- Results of any ambient surface water quality survey(s). Wherever possible mass loading of pollutants from historical sources should be quantified across a range of flow conditions. Provide a summary of all available water monitoring data (including all baseline monitoring to date).
- Monitoring results for mine water at various depths, (including pH, redox, DO, H2S, metal contents, alkalinity, acidity, Ca, Mg).
- A description, including map, and quantitative analysis of the water balance. The analysis should consider all aspects of the activity including proposed water licenses, mine dewatering and variations in precipitation and natural flow, accounting for extended dry periods and periods of excessive rainfall;
- Identify principle discharge points from the activity to the receiving environment including seepage and decant.
- Describe the sources, volume and quality of contaminated water. All potential pollutants of interest should be identified and the proposed discharge should be discussed with regard to expected annual mass loadings and discharge rate versus the flow rate and existing water quality the receiving environment.
- Best Practice Environmental Management measures to prevent or mitigate the formation of AMD, particularly from: underground acid-generating rock exposed to oxygen by dewatering; the movement of the existing tails; the exposure of tailings to the atmosphere; and the grinding of tailings to a finer size.
    - The current situation should be outlined with regard to AMD. The DPEMP should demonstrate an understanding of how and why AMD is leaving the existing TSFs.
    - Review the potential for acidic/alkaline generation; potential sources, pathways off site, and volumes.
    - Acid-base accounting for the tailings and their geochemical-kinetics properties. Testing must include a significant number of samples and as a minimum should consider the following parameters: metal contents; alkalinity; acidity; mineralogy of potential neutralising minerals; mineralogy of sulphides; and total sulphur. Static and kinetic testing will be required in order to determine appropriate handling methods.
    - Risks of AMD from mine dewatering, including sitting water and future recharge, through exposure of sulphidic geology or waste material that has

been deposited in the underground workings. Acid base accounting for the mine minerals and geochemical-kinetics properties (undertaken or proposed).

- Best Practice Environmental Management measures for ongoing collection and treatment of AMD which cannot be prevented from occurring to remove pollutants prior to discharge. This should include measures to ensure that any AMD is restricted to particular areas: management measures for spillages and contingency measures for pipe blockages should be discussed.

- Mitigation measures (for all pollutants of water) during periods when pollution control equipment may fail or be shut-down must be described and options for the storage of the treated tailings. Contingency/redundancy measures should be including for the event that water quality is poorer or volumes greater than predicted.
- The potential for the effluent to cause environmental and health effects should be evaluated through dilution modelling. This should include consideration of typical and plausible worst case situations.
- Demonstrate that the proposed discharge(s) will satisfy the requirements of the *State Policy on Water Quality Management 1997* including compliance with any relevant emission limit guidelines. Attention should be given to the Protected Environmental Values (PEV's) in the Whyte River, any threatened species and communities listed under the TSPA and/or EPBC Act, potability of downstream water that is, or is likely to be, used for human consumption, the levels of metals or other residues in fish or other downstream resident aquatic species that may affect safe human consumption and potential downstream recreational water usage;

4.2.3 Other issues

The following issues should be addressed (where relevant).

- An assessment of the potential for sediment to enter and impact on natural drainage lines and water courses through storm water run-off during both the construction and operational phases of the mine. Include details of mitigation measures and management strategies to prevent the sourcing and mobilisation of sediment (e.g. erosion control measures), and transport of sediment off-site;
- Details of stormwater management on the proposal site should be provided. The potential for pollutants to become entrained in stormwater should be assessed and measures to prevent transport of sediment off-site. An estimation of runoff volume and available detention capacity/time and of contingencies for failure of control measures, such as during heavy rainfall or flooding should be provided.
- If the proposal anticipates a discharge to a municipal sewerage system (including tankered waste), then a suitably detailed agreement with the operator of the municipal sewerage system should be negotiated.
- Details of any additional liquid wastes should be included.

4.3 Groundwater

This section should identify existing conditions, identify performance requirements to be achieved, identify any potential impacts of the proposal on groundwater quality or quantity, identify measures to avoid and mitigate any possible adverse impacts, and assess the overall impacts on groundwater following implementation of the proposed avoidance and mitigation measures.

It must be demonstrated that the proposal is consistent with the objectives and requirements of all relevant water management policies and legislation, including the *Water Management Act 1999* and the *State Policy on Water Quality Management 1997*.

- Measures to ensure protection of the quality and quantity of the region's groundwater resources including maintenance of any existing beneficial use of groundwater such as ecosystem maintenance and extraction for irrigation/consumption.
- The results of any groundwater monitoring that has been undertaken and details of a proposed groundwater monitoring and reporting program developed by a suitably qualified and experienced person must be provided (see section 6). The groundwater assessment should include major Cations and Anions results together with targeted potential pollutants such as metals, pH etc and a discussion of the potential impact of dewatering on groundwater levels/recharge.

4.4 Noise emissions

This section should identify existing conditions, identify performance requirements to be achieved, identify any potential impacts of the proposal on ambient (surrounding) noise levels (during both the construction and operational phases), identify measures to avoid and mitigate any possible adverse impacts, and assess the overall impacts on ambient noise levels following implementation of the proposed avoidance and mitigation measures.

The following issues should be addressed:

- All major sources of noise must be identified and described.
- The potential for noise emissions (during both the construction and operational phases) to cause nuisance for nearby land users should be considered and any proposed measures to mitigate noise impacts should be described.
- The potential for noise emissions to affect terrestrial, marine and freshwater wildlife and livestock.

4.5 Solid and controlled waste management

This section should demonstrate that all reasonable and practicable measures have been taken to avoid producing each type of solid waste, or controlled waste and in particular to reduce the amount of waste requiring disposal, having regard to best practice environmental management. The measures must be in accordance with the hierarchy of waste management.

Controlled waste is defined in the EMPC Act and associated regulations. A non-exhaustive listing of categories of Controlled waste can be found on the internet at: http://epa.tas.gov.au/regulation/controlled-waste-category-codes.

The following issues should be addressed:

- The source, nature and quantities of all solid (sulphidic and non-sulphidic) and/or controlled wastes likely to be generated should be identified, including general refuse, waste rock types, tailings and sulphides and their mineralogy, grain sizes and geochemical characteristics.
- Any foreseeable variations in waste generated during the start-up and operational phases should be identified and any temporary storage requirements specified.
- Facilities and methods proposed to collect, store, reuse, treat or dispose of each solid waste stream should be described in detail eg segregation, blending, capping, backfilling and reuse. Any materials with special storage or handling requirements (including hazardous or putrescible materials) should be clearly identified. The resultant concentrations and mass loads of pollutants, including estimates of performance ranges, to be emitted after treatment should be provided. Maintenance requirements should be included.
- A description of any existing or proposed dams, tailings storage/water treatment facilities including their, design, use, capacity, location and the results of any geotechnical surveys undertaken. Sufficient detail should be provided to allow a decision to be made whether referral to the Assessment Committee for Dam Construction (ACDC) is required. It is likely that a pre-construction dam report will be required, advice regarding the information requirements for such a report is available from the ACDC.
- Measures to ensure long term geotechnical stability of any dump slopes should be described.

4.6 Dangerous goods and environmentally hazardous materials

This section should identify any potential impacts from the transport, storage and usage of dangerous goods and environmentally hazardous materials associated with the proposal, identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts following implementation of the proposed avoidance and mitigation measures.

The following issues should be addressed (where relevant).

- The nature, quantity and storage location of all environmentally hazardous materials including fuels, oils, products, by-products, wastes and chemical reagents and Dangerous Goods (as defined in the *Australian Code for the Transport of Dangerous Goods by Road and Rail)* that will be used during the construction and operation of the proposal.
- The measures (such as storage of such materials within bunded areas or spill trays) to be adopted to prevent or control any accidental releases of dangerous goods and environmentally hazardous materials.
- Contingency plans for when control measures/equipment breakdowns or accidental releases to the environment occur, including proposed emergency and clean-up measures and notification procedures.

- Identify any safety management requirements for the protection of human health and safety affecting the community.
- Particular reference should be made to the management of fuels and lubricants required for equipment during construction, operational and maintenance activities.

4.7 Biodiversity and natural values

This section should identify existing conditions, identify performance requirements to be achieved, identify any potential impacts of the proposal, including the development of infrastructure directly related to the proposal, on biodiversity and nature conservation values. It should identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts on biodiversity and nature conservation values following implementation of the proposed avoidance and mitigation measures. It should address these issues in the context of the terrestrial and aquatic environment as appropriate.

4.7.1 Key legislative and policy requirements

Regard should be given to the *National Strategy for the Conservation of Australia's Biological Diversity*, the draft *Tasmania's Nature Conservation Strategy* and the *Threatened Species Strategy for Tasmania.*

4.7.2 Other biodiversity and natural values issues

The following should be addressed (where relevant).

- Information on sites or areas of landscape, aesthetic, wilderness, scientific or otherwise special conservation significance which may be affected by the proposal. Relevant information resources include the LIST (www.thelist.tas.gov.au) and the Natural Values Atlas (www.naturalvaluesatlas.dpiw.tas.gov.au).
- Impacts on terrestrial flora and fauna species, communities and habitat, with particular reference to rare and threatened species, communities and habitats, including those listed under the EPBC Act and the *Tasmanian Threatened Species Protection Act 1995* (TSP Act) including results of a survey for terrestrial threatened flora, fauna and communities. Details of proposed mitigation measures to avoid or minimise potential impacts including the minimisation of native vegetation clearance particularly of any mature and/or hollow bearing trees and management measures that will be undertaken should the dens of *Sarcophilus harrisii* or *Dasyurus maculatus maculatus* be detected.
- Identify any freshwater ecosystems of high conservation management priority using the Conservation of Freshwater Ecosystem Values (CFEV) database (accessible on the internet under water.dpiw.tas.gov.au/wist/). The scope of investigation should encompass the vicinity of the proposed development where there is likelihood of alteration to the existing environment. The specific CFEV information used for DPEMPs should be Conservation Management Priority_Potential which is appropriate for Development Proposals.
- The results of an aquatic ecological survey in any waters potentially impacted by the proposal. The NOI indicates that the study/proposal area s within a catchment supporting or likely to support the threatened *Beddomeia beli* (hydrobiid snail – Rapid River) based on predictive range mapping provided by the FPA. A targeted survey must be completed (by a suitably qualified person(s)) for this species in any potential habitat that will be

directly or indirectly impacted by the proposal. The results (and mitigation if required) should be described in the DPEMP.

- An assessment of the potential impact of the proposal on the aquatic health of the Whyte or Washington River including by water extraction and wastewater discharge. Provide details of mitigation measures to avoid or minimise any impacts.
- Impacts on identified areas or habitats of conservation significance, including designated conservation areas, areas relating to the requirements of international treaties (e.g. Japan-Australia and China-Australia Migratory Bird Agreements (JAMBA/CAMBA) and Ramsar (wetlands) Convention), or wetlands listed in *A Directory of Important Wetlands in Australia.*
- Impacts on sites of geoconservation significance or natural processes (such as fluvial or coastal features), including sites of geoconservation significance listed on the Tasmanian Geoconservation Database.
- Impacts on existing conservation reserves which may be affected by the proposal, with reference to the management objectives of the reserve(s) and the reserve management plan(s) (if any).
- Impacts on any high quality wilderness areas identified in the *Tasmanian Regional Forest Agreement* (Tasmanian RFA) which may be affected by the proposal.
- Impacts on other species, sites or areas of landscape, aesthetic, wilderness, scientific, geodiversity or otherwise special conservation significance.
- A consideration of indirect impacts in relation to matters under the EPBC Act with regard to definitions of indirect impacts provided in *Significant Impact Guidelines 1.1: Matters of National Environmental Significance (2009).* http://www.environment.gov.au/epbc/publications/pubs/nes-guidelines.pdf
- The potential for migration and/or introduction of pests, weeds and plant and animal diseases as a result of the proposal and details of a conceptual Weed and Disease Management Plan, which is in adherence to the *Tasmanian Washdown Guidelines for Weed and Disease Control: Machinery, Vehicles and Equipment Edition 1 (2004).* The plan should include actions that will be undertaken prior to, during and post construction and include a long term monitoring and control program to ensure declared and environmental weeds are not introduced, spread or taken offsite. The weed and disease management plan should be finalised prior to any works commencing on the site.

4.7.3 Requirements for surveys

Any flora and fauna surveys must, as a minimum, comply with the requirements of the document *Guidelines for Natural Values Assessment* published by the Development and Conservation Assessment Branch, Resource Management and Conservation Division of the Department of Primary Industries, Parks, Water and the Environment (DPIPWE). The methodology for surveys should be developed in consultation with DPIPWE. The DPEMP must also demonstrate how surveys are consistent with relevant DSEWPaC survey guidelines found at http://www.environment.gov.au/epbc/guidelines-policies.html.

4.8 Marine and coastal

Where relevant, this section should identify any potential impacts of the proposal on marine and coastal areas not addressed in other sections. It should identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts on marine and coastal

areas following implementation of the proposed avoidance and mitigation measures. Cross referencing should be made to other relevant sections dealing with conservation values (marine flora and fauna, geoconservation) and coastal impacts.

4.8.1 Legislative and policy requirements

It must be demonstrated that the proposal is consistent with the objectives and requirements of all relevant marine and coastal policies and legislation, including the *Living Marine Resources Management Act 1995, State Policy on Water Quality Management 1997* and the *Tasmanian State Coastal Policy 1996.*

4.9 Greenhouse gases and ozone depleting substances

This section should contain an assessment of the proposal in terms of the evolving national response to climate change and greenhouse gas emissions[3] and the Tasmanian Framework for Action on Climate Change 2008 (available at www.climatechange.tas.gov.au). The direct and indirect impacts of the proposal on greenhouse gas production and ozone depleting substances should be described.

Proponents will need to determine whether they are required to report to the Commonwealth under the *National Greenhouse and Energy Reporting Act 2007.*

4.9.1 Estimate of greenhouse gas emissions

An estimate of annual emissions of greenhouse gases generated on site should be presented in terms of carbon dioxide mass equivalents

4.9.2 Implementing greenhouse best practice

It should be demonstrated that the development will implement cost-impactive greenhouse best practice measures to achieve ongoing minimising of greenhouse gas emissions. Reference should be made to the Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2006 (refer to www.climatechange.gov.au).

Details of any feasible alternative ways of providing energy for the proposal, transporting materials to and from the proposal, design and construction of components or otherwise implementing the proposal so as to have a lesser impact on the enhanced greenhouse impact, and the justification for not adopting these alternatives should be included.

4.9.3 Ozone depleting substances

Any generation or use of ozone depleting substances in the proposal (such as in refrigeration or fire fighting) must be identified and justified.

4.10 Heritage

This section should identify potential impacts of the proposal, including the development of infrastructure directly related to the proposal, on Aboriginal and non-Aboriginal cultural heritage sites and areas. It should identify recommended measures to avoid or mitigate any potential adverse impacts on cultural heritage sites and assess the overall impacts of the proposal on cultural heritage sites following implementation of the proposed avoidance and mitigation measures.

[3] Information about the national approach to greenhouse gas emissions is available on the internet at: www.climatechange.gov.au

4.10.1 General

Potential impacts on the following should be addressed (where relevant).

- Declared World Heritage Area properties and values.
- Any places listed on the National Heritage List and values.
- Any places listed or interim listed on the Register of the National Estate and values.
- Any places listed on the Tasmanian Heritage Register (maintained by Heritage Tasmania), including consideration of cultural landscapes.
- Any places on the Tasmanian Historic Places Inventory (maintained by Heritage Tasmania).
- Any places on the Tasmanian Aboriginal Site Index (maintained by Heritage Tasmania), including consideration of cultural landscapes.
- Local government planning scheme heritage schedules.
- Any other places of heritage significance.

4.10.2 Aboriginal heritage

Aboriginal Heritage Tasmania (AHT) has advised that no Aboriginal heritage survey is required. However; the DPEMP should demonstrate awareness that any Aboriginal heritage material identified must be dealt with in accordance with the *Aboriginal Relics Act 1975.*

4.10.3 Historic heritage

The advice of Heritage Tasmania should be sought with regard to impacts on places listed on the Tasmanian Heritage Register and to establish regulatory requirements for heritage values, places and landscapes. Any approvals required under the *Historic Cultural Heritage Act 1995* should be identified.

Any Cultural Heritage survey undertaken should follow the methodology outlined in Heritage Tasmania's *Pre-development Assessment Guidelines* available at:

http://www.heritage.tas.gov.au/guidelines.html

4.10.4 Consultation

Consultation with the Tasmanian Aboriginal Lands Council, Tasmanian Office of Aboriginal Affairs, Aboriginal Heritage Tasmania, as well as with Aboriginal communities, should occur prior to any survey of potential sites to establish regulatory requirements for heritage values, places and landscapes.

4.10.5 Commonwealth Government requirements

The requirements of the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* should also be considered where there is a threat of injury or desecration to an area which is significant as part of Aboriginal tradition, and potential impacts identified, assessed and managed in consultation with the traditional owners, Native Title claimants and any other indigenous people with rights and interests in the area.

The Australian Heritage Office can provide advice on places listed in the National Heritage List and Register of the National Estate.

4.11 Land use and development

This section should identify any potential impacts of the proposal in terms of constraints or benefits it may place on the current or future use of land within the proposal site and surrounding area. It should identify measures to avoid, mitigate and compensate for any possible adverse impacts.

The following issues should be addressed (where relevant).

- Impacts on existing or proposed tourist or recreation activities, such as camping areas, picnic areas, walking tracks, horse riding tracks, heritage trails etc.
- Impacts on residential activities.
- Impacts on industrial activities.
- Impacts on agricultural activities, including any requirement of the *State Policy for the Protection of Agricultural Land (2009)* – (see http://www.dpac.tas.gov.au/divisions/policy/state_policies)
- Impacts on local and regional tourism.
- Impacts on other commercial activities.

4.12 Visual impacts

This section should outline the existing visual setting within which the proposal infrastructure will be located and assess the capacity of the landscape to absorb any visual changes to the landscape as a result of the proposal. The assessment should also take account of the appearance of the proposal from significant vantage points. These should include points both inside and outside the site and should include viewpoints likely to be visited by tourists or recreational users. Presentation of 'artists impressions', photomontages or visual modelling is recommended. The methodology used and assumptions made in the assessment should be clearly identified.

Measures to avoid and mitigate potential adverse visual impacts should be identified, such as minimising vegetation clearance, facility height, size, design, colour, separation and post-construction revegetation.

4.13 Socio-economic issues

This section should contain information on the existing social and economic environment that may be affected by the proposal and the social and economic impacts of the proposal during the construction, operation and decommissioning phases.

The following issues should be addressed (where relevant):

- A summary of the social/demographic characteristics of the population living in the vicinity of the proposal site, identifying any special characteristics which may make people more sensitive to impacts from the proposal than might otherwise be expected.
- A summary of the characteristics of the local and regional economy (e.g. existing employment trends, land values).
- An estimate of total capital investment for the proposal.
- The impacts on local and State labour markets for both the construction and operational phases of the proposal. Skills and training opportunities should also be discussed.

- The impacts on upstream/downstream industries, both locally and for the State.
- The extent to which raw materials and services will be sourced locally.
- A qualitative assessment of community infrastructure impacts, including recreational, cultural, health and sporting facilities and services. Any proposals to enhance or provide additional community services or facilities should be described.
- Community demographic impacts (changes to cultural background, occupation, incomes).
- Impacts on land values, and demand for land and housing.
- Impacts on the local, regional, state and national economies.

4.14 Health and safety issues

This section should review any health and safety issues relating to employees, site visitors and the public which have not been addressed in other sections.

It must be demonstrated that occupational health and safety issues have been taken into account during the planning of the proposal, including an analysis of alternatives. It should be demonstrated that compliance with the *Workplace Health and Safety Act 1995* and the *Workplace Health and Safety Regulations 1998* will be achieved. Safety management systems to be used during construction and operational phases should be described.

The following issues should be addressed.

- Construction phase safety issues.
- Security arrangements to prevent unauthorised access to the proposal site during construction.
- Operations, maintenance and inspection safety issues.

4.15 Hazard analysis and risk assessment

This section should contain a preliminary analysis (appropriate to the scale of the project) of the potential for a major hazard event (such as an explosion) to occur and proposed safeguards to prevent such an occurrence. The preliminary analysis should systematically identify all potential major hazards (internal and external) to people and the environment associated with the construction, operation, maintenance and decommissioning of the proposal.

- A risk assessment incorporating the requirements of Australian/New Zealand Standard AS/NZS 4360:1995 *Risk Management*, or equivalent, should be conducted, to identify all credible risks associated with specific major hazard events identified through hazard analysis. The risk assessment should identify measures to avoid and mitigate potential adverse effects.

The following issues should be addressed by the risk assessment (where relevant):

- Identify hazard events with the potential to cause a major accident or significant impact on people or the environment. This should include consideration of the risks associated with malfunctions, accidents or fires, in addition to those posed by natural disasters such as such as storms, bushfires, seismic events and floods, including the impact of extreme

rainfall events or flooding on the AMD management system. For each hazard event, estimate the frequency and consequence of such an event occurring;

- Identify high risk locations and facilities;
- Describe technical and management safeguards to be employed to assess and minimise the likelihood of occurrence and the consequences of identified hazard events; and
- Define the objectives and management principles to be adopted for the preparation of a detailed emergency plan (including emergency response, recovery/cleanup procedures and consultation with relevant emergency services).

4.16 Fire risk

This section should identify the potential fire risk associated with the proposal. This should include consideration of fire within the site, fire escaping from the site and the impact of wildfire originating outside the development. Measures to avoid and mitigate potential adverse impacts should be outlined, including the objectives and management principles to be adopted for the preparation of a fire response plan. The proponent should demonstrate compliance with the relevant requirements of the *Fire Services Act 1979* and the *Workplace Health and Safety Act 1995.*

4.17 Infrastructure and off-site ancillary facilities

This section should identify potential impacts on any significant off-site or infrastructure facilities (including increased use of existing infrastructure, such as roads, ports and quarries), identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts following implementation of the proposed avoidance and mitigation measures. For example, upgrading or re-routing of roads, rail or other services required as a result of the proposal, should be detailed.

This Section should identify roads and other infrastructure to be used by vehicles for the proposal (during both construction and operation). Potential environmental impacts associated with construction and use of such infrastructure should be assessed.

4.18 Environmental management systems

This section should provide information on strategic matters relating to environmental management of the proposal, including a description of the following.

- Any environmental management systems or environmental policies implemented or proposed by the proponent, which are relevant to the environmental management of the proposal.
- Organisational structure and environmental responsibility within that structure for the proposal.
- Procedures and instructions to employees (including contractors) on minimising adverse environmental impacts of activities, as well as employee induction and education programs to ensure an appropriate response to operational environmental concerns should be included in relevant sections.

4.19 Cumulative and interactive impacts

Where relevant, this section should contain an assessment of the potential cumulative impacts of the proposal, based on existing and other formally proposed developments in the region, which have not been addressed in previous sections. Interactions between biophysical, socio-economic and cultural impacts of the proposal should be discussed.

4.20 Traffic impacts

This Section should identify roads to be used by vehicles associated with the proposal (both during construction and operation) and the likely volume and nature of traffic and timing of traffic flows, including details of the current usage of these roads. Impacts associated with altered traffic flows should be discussed (such as impacts on other roads users and residences adjacent to roads).

5. EPBC ACT REQUIREMENTS

This chapter is required for the final approval of the proposal under the EPBC Act and must address matters described in Schedule 4 of the Commonwealth *Environment Protection and Biodiversity Conservation Regulations 2000* (see Appendix 1).

To the extent that elements of parts 2, 5, 6 and 7 repeat information that will be covered elsewhere in the DPEMP, a cross reference will be sufficient. Parts 3 and 4, however, require particular attention with explicit reference to listed threatened species in this chapter.

As a minimum the following matters under the EPBC Act must be addressed:

Listed communities:

- Alpine Sphagnum Bogs and Fens (Endangered).

Listed threatened species:

- Wedge-tailed Eagles (*Aquila audax fleayi*) (Engangered).
- Spotted-tailed Quoll (*Dasyrus maculatus maculatus)* (Vulnerable).
- Tasmanian Devil (Sarcophilus harrisii) (Endangered).
- Australian Grayling (Prototroctes maraena) (Vulnerable).
- Tasmanian Azure Kingfisher (Ceyx azureus diemensis) (Endangered).
- Tasmanian Masked Owl (*Tyto novaehollandiae castnops*) (Vulnerable).

The information provided on these matters should be consistent with any relevant publicly available policy guidance or listing advice provided by DSEWPaC.

This section of the DPEMP must provide enough information about the project and its relevant impacts (including quantification of impacts and consideration of direct and indirect impacts) to allow the Commonwealth Minister to make an informed decision whether to approve the project under the EPBC Act.

In addition to consideration of matters of national environmental significance the following information must be provided:

- Details of any proceedings under a Commonwealth, State or Territory Law for the protection of the environment or the conservation and sustainable use of natural resources against:

  - The person proposing to take the action; and/or
  - For an action for which a person has applied for a permit, the person making the application.
- Details of the corporation's environmental policy and planning framework which must be provided if the person proposing to take the action is a corporation.

6. MONITORING AND REVIEW

This section should provide an outline of a monitoring, review and reporting programme for each sector of the proposal which should include the sites to be sampled, sampling procedures, parameters to be analysed, the frequency of sampling and format and frequency of reporting. The rationale and frequency of sampling for sampling specific points should be clearly detailed

The programme should be designed to meet the following objectives:

- Monitoring of compliance with emission standards and other performance requirements identified in the DPEMP.
- Assessing the effectiveness of the performance requirements and environmental safeguards in achieving environmental quality objectives.
- Assessing the extent to which the predictions of environmental impacts in the DPEMP have eventuated.
- Assessing compliance with commitments made in the DPEMP.

7. DECOMMISSIONING AND REHABILITATION

Due to the finite nature of mining operations and their susceptibility to external economic influences, mine closure planning should commence before the operation commences. The DPEMP should describe an on-going, staged approach to site decommissioning and rehabilitation throughout the proposal life and should contain sufficient detail to enable a bond to be established to protect the Crown from future liabilities in the event of unforeseen mine closure or company failure.

The DPEMP should include a conceptual mine closure plan for end-of-mine life and/or premature mine closure with a framework for regular review/development of these concepts as development of the mine occurs. This should consider, as a minimum, the following:

- Consideration of long term stability (ie post-mine closure) of all areas of the site including tailings dams and mine pit closure plans partly or fully dewatered mine. Including the potential for AMD, including sources, long term volumes and pathways to the environment.
- Any ongoing maintenance requirements for collection and treatment facilities.
- The conceptual proposed method of rehabilitation of disturbed areas, including the replacement of stockpiled topsoil and revegetation techniques (using local provenance species) to be applied and contingencies to achieve satisfactory rehabilitation, should the operation cease during the life of the DPEMP.
- Description of the concepts for any necessary decontamination of the site.
- Post closure monitoring programs.

Determination of the cost estimate should be based on the closure (decommissioning and rehabilitation) concepts correlated to the proposed level of development/disturbance associated with the project. It is envisaged that with future revisions of the closure plan, revision of the closure cost estimate will also be undertaken to more accurately reflect the true cost of decommissioning and rehabilitation of the site.

8. COMMITMENTS

This section should contain a consolidated commitments table listing all of the commitments made throughout the DPEMP. Commitments must be sequentially numbered, unambiguous statements of intent. For each commitment, the table must specify when the commitment is to be implemented, specify who is responsible for the undertaking of the commitment, and refer to the section of the DPEMP where the commitment is detailed.

The commitments will provide a basis for the preparation of conditions of approval, should approval be granted.

9. CONCLUSION

This section should briefly describe the proposal and draw together the critical environmental impacts of the proposal, both positive and negative, including impacts on listed threatened species and communities under the EPBC Act. It should present a balanced overview of the net environmental impacts of the proposal, and the extent to which any adverse impacts on the environment can be satisfactorily avoided, mitigated, remediated or compensated. The conclusion should also describe how the proposal meets the objectives of relevant Commonwealth and State assessment and planning policies and legislation.

10. REFERENCES

This section should provide details of authorities consulted, reference documents etc.

11. APPENDICES

As a means of improving readability of the DPEMP document, detailed technical information which supports the DPEMP should be included in appendices. The salient features of the appendices should be included in the main body of the DPEMP. Care should be taken to avoid inconsistencies between technical content of Appendices and the DPEMP itself, unless carefully explained.

GLOSSARY

AMD – Acid and metalliferous drainage

DPEMP – Development Proposal and Environmental Management Plan

DPIPWE - Department of Primary Industries, Parks, Water and the Environment

DSEWPAC - Department of Sustainability, Environment, Water, Population and Communities (Cth).

EMPC Act – Environmental Management and Pollution Control Act 1994

EPBC Act - Environment Protection and Biodiversity Conservation Act 1999 (Cth)

JAMBA/CAMBA - Japan-Australia and China-Australia Migratory Bird Agreements

Tasmanian RFA - Tasmanian Regional Forest Agreement

TSP Act - *Threatened Species Protection Act 1995*

ROM - Run of Mill

Appendix 3 – ASX JORC Waiver - Draft

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MEMORANDUM

To:	**Chris Dunks**	**Phone:**	**0439 998 808**
Company:	**Bright Phase Resources Limited**	**Fax No:**	
Cc:			
From:	**Mick McKeown**	**Email:**	**mmckeown@miningone.com**
Date	**2 June 2012**		
Project:	**Cleveland Tin**		
Subject:	**ASX Waiver – Draft ~~v1~~**		

DRAFT

This memorandum is not a report of Mineral Resources or Ore Reserves in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, 2004 edition ("JORC Code").

This memorandum has been prepared for Bright Phase Resources Limited in accordance with ASX Companies Update~~s~~ 05/04 and 11/07, in particular, this memorandum applies to previously prepared reports which include statements of historical estimates not reported in accordance with the JORC Code. ~~.~~ This memorandum has been prepared to accompany an application by Bright Phase Resources Limited for a waiver to enable non-JORC Compliant reporting of historical resource estimates and this memorandum must not be used for any other purpose.

Introduction

The Cleveland Mine ("Cleveland") at Luina on the West Coast of Tasmania operated from 1968 to 1986. Cleveland produced about 36,000 tonnes of tin in concentrate and about 15,000 tonnes of copper in concentrate~~s~~ and ranks as the third largest tin producer in Tasmania behind Renison Bell which has produced over 200,000 tonnes of tin in concentrate and Mt Bischoff which has produced about 60,000 tonnes of tin in concentrate.

Cleveland was operated by Cleveland Tin N.L., Aberfoyle Limited and other Aberfoyle group companies (collectively referred to here as "Aberfoyle"). Cleveland closed in 1986. The tin price fell significantly in 1985 following the collapse of price support from the

International Tin Council. In addition, Aberfoyle had turned its attention to lead, zinc and copper following the discovery of the Que River deposit in 1974 and the Hellyer deposit in 1983. It is, perhaps, no coincidence that Cleveland was closed in June 1986, the same month that the Hellyer orebody was exposed in the Hellyer Decline.

The historic data remaining from Aberfoyle's Cleveland operation is comprehensive and was developed during~~in~~ operation of a successful underground mine and mill.

When Cleveland closed, three known resources remained:

- a tin and copper resource in the Cleveland mine.
- a tungsten resource in the Cleveland mine, and
- a tin resource in Cleveland Tailings Dams No 1 and No 2.

Each of these resources is dealt with separately in this memorandum. The numbering of the sections in each description follows the numbering of the Requirements for non-JORC Code Compliant Historical and Foreign Reporting in ASX Companies Update No 11/07.

The Cleveland tin and copper mineralisation is of the sulphide-cassiterite style which also occurs at Renison Bell, Mt Bischoff and Queen Hill, all of which also occur on Tasmania's West Coast. Tin occurs as cassiterite and lesser stannite and copper occurs as chalcopyrite and lesser stannite in semi-massive to massive iron sulphides.

The Cleveland tungsten mineralisation occurs in quartz vein stockwork associated with a quartz porphyry intrusive. Tungsten occurs principally as wolframite with trace amounts of scheelite.

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Tin and Copper Resource in the Cleveland Mine

Tin at Cleveland occurs principally as cassiterite, a tin oxide with the formula SnO_2 and less commonly as stannite, a tin-copper-iron sulphide with the formula (Sn,Cu,Fe)S. For deposits where both tin minerals are present, Sn assays are usually reported as total Sn, representing all the Sn in a sample, and~~or~~ as soluble Sn, representing the Sn which occurs as stannite. Copper at Cleveland occurs principally as chalcopyrite, a copper sulphide with the formula $CuFeS_2$.

The ~~The~~ paragraph numbers in this section coincide with the paragraph numbers under Requirements for non-JORC Compliant Historical and Foreign Reporting in the ASX Companies Update 11/07.

1. The historical resource referred to here is not reported in compliance with the JORC Code and it is uncertain that following evaluation and/or further exploration that the resource will ever be able to be reported in accordance with the JORC Code.

All reports available on the hard rock resource were reported pre-JORC and not completed within JORC specifications. All efforts will be made by Bright Phase Resources to upgrade the historic estimates to comply with the JORC code; however, evaluation has not yet been completed and the results of this evaluation remain uncertain.

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Table 1 Cleveland Mine – Tin and Copper Mineral Resources

Cleveland Mine – Tin and Copper – Mineral Resources			
Indicated Mineral Resources			
0.35% Sn (total) Cut-off Grade			
Lens	**tonnes**	**% Sn (total)**	**% Cu**
Hall's	3,400,000	0.71	0.33
Henry's	450,000	0.81	0.47
Khaki and Lucks	680,000	0.70	0.22
B South and Battery	620,000	0.57	0.22
Total	**5,200,000**	**0.70**	**0.31**
Inferred Mineral Resources			

0.35% Sn (total) Cut-off Grade			
Lens	**tonnes**	**% Sn (total)**	**% Cu**
Hall's	1,100,000	0.69	0.2
Khaki and Lucks	40,000	0.73	0.15
B South and Battery	190,000	0.86	0.35
Total	**1,330,000**	**0.72**	**0.22**

2. The source of the historical resource estimate is:

- **Dronseika, E.V., 1986.** Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Unpublished report for Aberfoyle Resources Limited, Cleveland Division by E.V. Dronseika, Senior Mine Geologist.

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In addition, there are several other documents which support or explain aspects of the historical resource estimate and these are listed at the bottom of Table 3.

3. Dronseika's 1986 resource estimate of the tin-bearing sulphide cassiterite lodes is relevant. It was prepared when the mine closed and there has been no work in the mine since then. McArthur's 1983 report is also relevant. It clearly sets out the procedure for estimating resources at Cleveland.

At the time of closure, in 1986, the mine was allowed to flood and has remained flooded through the subsequent period with no ~~for~~ mining. All historic resource estimates can therefore be considered to be unchanged since the mine closure. There have been no applications for mining rights submitted to Mineral Resources Tasmania in the time since closure and all records of exploration have focused on the tailings ~~material~~ stored in dams on the site.

4. The historical resource estimate is reliable. The data used for the Aberfoyle resource estimate was compiled during Aberfoyle's ownership of Cleveland from 1961 to 1986. During that time, Aberfoyle drilled over 2000 diamond drill holes into the Cleveland deposit and mined about 7 million tonnes of ore over a period of 18 years, from 1968 to 1986. In the 1970s, Aberfoyle was one of the leading tin producers in Australia with four operating tin mines: Cleveland, the Storeys Creek and Aberfoyle mines in North-East Tasmania, and the Ardlethan mine in southern New South Wales. The author worked for Aberfoyle from 1970 to 1973 and was acquainted with many of the Aberfoyle staff who worked at Cleveland. He knows of no reason to doubt the competence of the geologists who worked

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at Cleveland, in fact, Aberfoyle personnel were recognised as efficient operators with good record keeping and reporting practices.

When the mine closed, the mine plans showing the locations of the workings, geological plans, sections and longitudinal projections, and the drill logs for the diamond drill holes were placed in storage in Burnie and are available for use. In addition, the drill core from 87 diamond drill holes is stored in the Core Store of Mineral Resources Tasmania at Mornington in Tasmania.

Some of the existing data ~~could be~~has been verified by Bright Phase Resources ~~duplicate testing or by other means, for example, sampling and assay could be verified~~ by re-splitting and assaying the existing drill core (McKeown, 2011). S~~, or s~~urveying could be verified by re-surveying, however, this has not yet been done.

The nature of defects in the assessment and reporting criteria noted for the historical resource estimate and their likely impacts on the quality of the resource report are listed in Table 2. The Assessment and Resource Reporting Criteria listed in Table 3 have been categorised using the terms listed under Nature of Defects.

Table 2 Nature of Defects - Likely Impact on Resource Report Quality and Likely Impact on Subsequent Use of the Resource Report

Nature of Defects	Likely Impact on Resource Report Quality	Likely Impact on Subsequent Use of Resource Report
Acceptable: no defects	None	None
Defects tolerable	Low	No material impact
Defects not acceptable	Quality severely compromised	Severely compromised

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Table 3 Cleveland Sn and Cu Resource Estimate – Assessment and Reporting Criteria

Cleveland Sn and Cu Resource Estimate	
Sampling Techniques and Data	
Sample recovery.	Acceptable. A sampling of drill logs by the author did not reveal that core loss was a problem during diamond drilling. The reliability of core recovery was confirmed in discussions with a contemporary Aberfoyle geologist. Aberfoyle reported that core recovery at Cleveland was consistently good (Cox, 1967). This is in accordance with the reported ground conditions in the Cleveland mine which have been reported as competent to highly competent (Everett, 1977) and Buckland, 1980).
Logging.	Acceptable to tolerable. A sampling of drill logs by the author indicated that the logs contained adequate locational, sampling and assay data. Lithological logging was not always carried out but, given the nature of the mineralisation, even though not ideal, this lack is tolerable.
Sub-sampling techniques and sample preparation.	Acceptable. Drill core was split longitudinally and crushing and pulverising were subject to specific and definite protocols. Aberfoyle paid particular attention to sampling technique and sample preparation (Cox, 1967). The reliability of sub-sampling techniques and sample preparation has been confirmed by re-sampling and re-assaying

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	of existing drill core by Bright Phase Resources (McKeown, 2011).
Quality of assay data and laboratory tests.	Acceptable. Assays were conducted at the Tasmanian Mines Department Laboratory at Launceston and at Cleveland and check samples, although not recorded in the drill logs, were in use (Cox, 1967). The reliability of the assays is also partly confirmed by reconciliations of resources to production (Dronseika, 1986). The reliability of Sn assays has been confirmed by re-sampling and re-assaying of existing drill core by Bright Phase Resources (McKeown, 2011).
Verification of sampling and assaying.	Tolerable. Some verification of assay data was carried out routinely. Check samples, although not recorded in the drill logs, were in use (Cox, 1967). The reliability of the assays is also partly confirmed by reconciliations of resources to production (Dronseika, 1986).
Location of data points.	Acceptable. Locations of drill hole collars, channel samples and mine workings were established by Surveyors.
Data spacing and Distribution.	Acceptable. Data spacing was sufficient for creation of useable Sn and Cu variograms (Dronseika, 1986). Generally, geological interpretation did not extend more than 10m beyond diamond drill hole intercepts or mine development (Dronseika, 1986).
Orientation of data in relation to geological structure	Acceptable. The strike and dip of the host geological formation and of the sulphide cassiterite mineralisation was well known from the beginning of systematic evaluation by Aberfoyle in 1961 and the drill holes and channel samples were oriented

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	accordingly.
Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle. However, there was a culture of internal reviewing of the methods used for resource estimates including reconciliation of resources to production (Dronseika, 1986, and McArthur, 1983) and a review of sampling methods (Cox, 1967).
Estimation and Reporting of Mineral Resources	
Database integrity.	Tolerable. The specific measures to ensure database integrity are not known. However, every sample in the data used for the resource estimate is listed in the Appendix to the resource report, including the three dimensional coordinates of the sample, the total Sn assay, the soluble Sn assay and the Cu assay.
Geological interpretation.	Tolerable. The geological interpretation was devised by the Cleveland Senior Mine Geologist on 1:200 and 1:500 cross-sections and longitudinal projections (Dronseika, 1986). The mineralisation was interpreted as at least 10 lenses within a specific geological formation and lens terminations were interpreted by a geologist (Dronseika, 1986 and McArthur, 1983). Halls Formation, the geological formation which contains the lenses of mineralisation, dips nearly vertically and is known over a strike length of 700m, an across strike width of about 200m, and a down-dip extent of over 800m (Ransom and Hunt, 1975 and Dronseika, 1986). Halls Formation and the lenses of mineralisation are interpreted as being offset by flat lying faults (Ransom and Hunt, 1975 and Everett, 1977).
Dimensions.	Acceptable.

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	Halls Formation, the geological formation which contains the lenses of mineralisation, dips nearly vertically and is known over a strike length of 700m, an across strike width of about 200m, and a down-dip extent of over 800m (Ransom and Hunt, 1975 and Dronseika, 1986). The spatial dimensions for each lens were quoted in the resource report (Dronseika, 1986).
Estimation and modelling techniques.	Tolerable. Mineralisation was modelled as two dimensional 10m X 10m blocks, grade estimates of total Sn, acid soluble Sn and Cu were made by ordinary kriging and depletion was made for mineralisation which had been mined (Dronseika, 1986). These were appropriate techniques. No check estimates were reported but resource reporting included annual reconciliation of resources to production (Dronseika, 1986) No assumptions were made about the recovery of by-products. No estimates of S grade were made.
Moisture.	Acceptable. All assays were reported on a dry basis.
Cut-off parameters.	Tolerable. The resources were reported using a cut-off grade of 0.35% total Sn which was estimated as "the absolute minimum value whereby in situ materials of that grade, once diluted by mining process, could never be mined and treated at a profit" (Dronseika, 1986). It is not clear what costs were taken into account for this definition but, given cut-off grades at similar mines, this is not an unreasonable estimate.
Mining factors or assumptions.	Acceptable. Resources were estimated, not reserves, and no

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	mining factors were used.
Metallurgical factors or assumptions.	Acceptable. Varying metallurgical recoveries were applied to each lens or part of a lens and the effects of the varying recoveries were taken into account in the calculations. This approach wais reasonable and important. Not all the Sn at Cleveland occurs as cassiterite, for example, the soluble Sn occurs as stannite, and only the Sn which occurs as cassiterite is potentially recoverable by gravity or tin flotation.
Bulk density.	Tolerable. Bulk densities of 3.05 and 3.08 tonnes per cubic metre were used (Dronseika, 1986). These were the same as had been used in earlier estimates. The sources of the bulk densities are not known but given the style of the mineralisation the bulk densities are reasonable.
Classification.	Tolerable. The resources were classified as Measured, Indicated and Inferred using these definitions: Measured: “Materials for which estimates of the quality and quantity have been computed from sample analyses and measurements from closely spaced and geologically well known sample sites such that: (a) the pattern of ore continuity is well understood; (b) the actual metal content will have a high probability of being in the range 90% to 110% of the prediction.” (Dronseika, 1986) Indicated: “Materials for which estimates of the quality and quantity have been computed partly from sample analyses and measurements, and partly from reasonable geologic projections such that: (a) the pattern of ore continuity is understood though surprises are still possible; (b) the actual metal content will have a high probability of being in the range 70% to 130% of

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	the prediction." (Dronseika, 1986) Inferred: "Quantitative estimates are based largely on broad knowledge of the geological character of the deposit and for which there are few sample measurements. The estimates are based on an assumed continuity or repetition of which there is geologic evidence." (Dronseika, 1986). These categories were reasonable and were reasonably defined.
Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle. However, there was a culture of internal reviewing of the methods used for resource estimates including reconciliation of resources to production (Dronseika, 1986, and McArthur, 1983) and a review of sampling methods (Cox, 1967).
Discussion of relative accuracy/confidence	Tolerable. See Classification above. Reconciliation of mill feed and resources removed were made 18 times between 1970 and 1986. The reconciliation from May 1985 to June 1986 indicated a tonnage increase of 37% and a grade decrease of 10%.

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References quoted in the table above:

Buckland, K.R., 1980. Tin-copper ore mining at Cleveland Tin Limited, Luina, Tas. *in* Woodcock, J.T., 1980, Mining and Metallurgical Practices in Australasia, Monograph Series No. 10, The Australasian Institute of Mining and Metallurgy.

Cox, R., 1967. The use of comparative sampling methods at Cleveland mine, Tasmania, March 1967. Unpublished report, Aberfoyle Tin Development Partnership, Cleveland Development Project.

Dronseika, E.V., 1986. Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Unpublished report for Aberfoyle Resources Limited, Cleveland Division by E.V. Dronseika, Senior Mine Geologist.

Everett, H.R., 1977. Current mining practice at Cleveland mine of Abminco N.L.. in Underground Operators' Conference, October 1977, The AusIMM Broken Hill Branch.

McArthur, G.A., 1983. Schematic 1983 Ore Reserve Procedure, 31 May 1983. Unpublished report for Cleveland Tin Ltd.

McKeown, M.V., 2011. Re-sampling and re-assaying of Cleveland drill core. Memorandum from Mick McKeown to Mike Adams, 12 December, 2011. Mining One Pty Ltd.

Ransom, D.M. and Hunt, F.L., 1975. Cleveland tin mine *in* Knight, C.L. (editor), 1975, Economic Geology of Australia and Papua New Guinea, Monograph Series No. 5, The Australasian Institute of Mining and Metallurgy.

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5 a. The historical resource estimate is material because it deals explicitly and directly with the tin and copper resources remaining at Cleveland. The estimate was reported to have been made using the relevant geological and mining data available at the operating mine at the time. (Refer to section 4 above).

5 b. Bright Phase Resources intends to de-water the flooded Cleveland mine and, if required, conduct diamond drilling of the mineralisation to acquire new data and to confirm historical data. Bright Phase Resources primarily intends to confirm the reliability of historical drill hole data by re-splitting and re-assaying existing drill core held at the Mineral Resources Tasmania Core Store at Mornington, Tasmania.

The creation of a~~A~~ digital drill hole database ~~will be made~~ using the existing hard copy drill logs held in Burnie, Tasmania has commenced.~~.~~

The existing mine workings will be digitised using the existing hard copy plans held at Burnie, Tasmania and Mineral Resources Tasmania, Rosny Park, Tasmania.~~.~~

The Aberfoyle geological interpretation will be digitised using the existing hard copy plans, cross-sections and longitudinal projections held at Burnie, Tasmania.

5 c. The work proposed by Bright Phase Resources will be funded by a public float of the Company.

5 d. The Cleveland leases are the only targets for Bright Phase Resources.

6. The historical estimates are listed above and the resource categories compare reasonably with current JORC Code definitions.

7. No additional work on hard rock resource definition has been completed since mine closure. The mine was allowed to flood after closure and no access has been possible

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since that time. No records of surface drilling activity on EL7/2005 since mine closure have been lodged with Mineral Resources Tasmania (MRT).

8. . Bright Phase Resources plans to undertake a program to validate the historic resource estimates detailed by Aberfoyle and upgrade these estimates to current JORC code requirements. The program will be developed under the guidance of a competent geologist and is anticipated to include the following aspects:

- A thorough search of available Aberfoyle mine exploration and production data for the Cleveland operation. This will target the determination of what records of sampling, auditing and general data validation practices are available for JORC compliant reporting of the estimates.
- Where inadequate records are available, or indications that the methodologies used were not in compliance with JORC reporting standards, work will be implemented to drill the ore body using appropriate methods. The extent of this drilling program will be determined by a competent geologist to provide sufficient information to support historical estimates.
- Existing data will be digitised and used to develop a 3D model of the mineralisation and the mine.

9. This report is consistent with the guidance contained in the ASX Companies Updates No 11/07 and 05/04.

10. The information in this report that relates to Mineral Resources is based on information compiled by Michael McKeown who is a Fellow of the Australasian Institute of Mining and Metallurgy. Michael McKeown is employed by Mining One Pty Ltd and he has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Michael McKeown consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.

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Tungsten Resource in the Cleveland Mine

Tungsten at Cleveland occurs as wolframite, an iron and manganese tungsten oxide with the formula $(Fe,Mn)WO_4$. In the mining industry, tungsten assays are usually expressed as $\%WO_3$ and this was the practice at Cleveland.

The paragraph numbers in this section coincide with the paragraph numbers under Requirements for non-JORC Compliant Historical and Foreign Reporting in the ASX Companies Update 11/07.

1. The historical resource referred to here is not reported in compliance with the JORC Code and it is uncertain that following evaluation and/or further exploration that the resource will ever be able to be reported in accordance with the JORC Code.

Table 4 Cleveland Mine – Tungsten Mineral Resources

Cleveland Mine – Tungsten - Mineral Resources		
Inferred Mineral Resources		
Cut-off Grade % WO_3	**tonnes**	**% WO_3**
0.20	3,800,000	0.28
0.30	1,230,000	0.35
0.40	140,000	0.43

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2. The source of the historical resource estimate is:

- **Dronseika, E.V., 1983**. Geological assessment of the Foley zone mineralisation at Cleveland mine Tasmania, May 1983. Unpublished report for Cleveland Tin Ltd.

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In addition, there are several other documents which support or explain aspects of the historical resource estimate and these are listed at the bottom of Table 6.

3. The wolframite bearing quartz vein stockwork is known as Foleys Lode. Dronseika's 1983 resource estimate for Foleys Lode is relevant. It was prepared by the geologist who was most familiar with the geology of Foleys lode and clearly describes how the resource estimate was made.

At the time of closure, in 1986, the mine was allowed to flood and has remained flooded through the subsequent period with no ~~for~~ mining. All historic resource estimates can therefore be considered to be unchanged since the mine closure. There have been no applications for mining rights submitted to Mineral Resources Tasmania in the time since closure and all records of exploration have focused on the tailings ~~material~~ stored in dams on the site.

4. The historical resource estimate is reliable. The data used for the resource estimate was compiled during Aberfoyle's ownership of Cleveland from 1961 to 1986. During that time, Aberfoyle drilled over 2000 diamond drill holes into the Cleveland deposit, including 24 which tested the Foley Zone, and mined about 7 million tonnes of ore over a period of 18 years, from 1968 to 1986. In the 1970s, Aberfoyle was one of the leading tungsten~~in~~ producers in Australia with ~~four~~ two operating ttungsten~~in~~ mines: ~~: Cleveland,~~ the Storeys Creek and Aberfoyle mines in North-East Tasmania~~, and the Ardlethan mine in southern New South Wales~~. The author worked for Aberfoyle from 1970 to 1973 and was acquainted with many of the Aberfoyle staff who worked at Cleveland. He knows of no reason to doubt the competence of the geologists who worked at Cleveland, in fact, Aberfoyle personnel were recognised as efficient operators with good record keeping and reporting practices.

When the mine closed, the mine plans showing the locations of the workings, geological plans, sections and longitudinal projections, and the drill logs for the diamond drill holes were placed in storage in Burnie and are available for use. In addition, the drill core from 87 diamond drill holes, including at least seven drilled into Foleys Lode, is stored in the Core Store of Mineral Resources Tasmania at Mornington in Tasmania.

Some of the existing data could be verified by duplicate testing or by other means, for example, sampling and assay could be verified by re-splitting and assaying the existing drill core, or surveying could be verified by re-surveying, however, this has not yet been done.

The nature of defects in the assessment and reporting criteria noted for the historical resource estimate and their likely impacts on the quality of the resource report are listed in Table 5. The Assessment and Resource Reporting Criteria listed in Table 6 have been categorised using the terms listed under Nature of Defects.

Table 5 Nature of Defects - Likely Impact on Resource Report Quality and Likely Impact on Subsequent Use of the Resource Report

Nature of Defects	Likely Impact on Resource Report Quality	Likely Impact on Subsequent Use of Resource Report

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Acceptable: no defects	None	None
Defects tolerable	Low	No material impact
Defects not acceptable	Quality severely compromised	Severely compromised

Table 6 Cleveland WO_3 Resource Estimate – Assessment and Reporting Criteria

Cleveland WO_3 Resource Estimate	
Sampling Techniques and Data	
Sample recovery.	Acceptable. A sampling of drill logs by the author did not reveal that core loss was a problem during diamond drilling. The reliability of core recovery was confirmed in discussions with a contemporary Aberfoyle geologist. Aberfoyle reported that core recovery at Cleveland was consistently good (Cox, 1967). This is in accordance with the reported ground conditions in the Cleveland mine which have been reported as competent to highly competent (Everett, 1977) and Buckland, 1980) and, in the quartz porphyry host rock, as excellent (Dronseika, 1983). Core recovery in the WO_3 mineralisation was in excess of 95% (Dronseika, 1983).
Logging.	Acceptable. 5500m of core was logged in detail noting country rock, wall-rock alteration, structures, mineralogy, vein thickness and vein to core angle (Dronseika, 1983). A sampling of drill logs by the author indicated that the logs contained adequate locational, geological, sampling and assay data. In addition, there are 64 petrological and mineralogical descriptions made under the microscope by AMDEL and Latrobe University

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	(included in Dronseika, 1983).
Sub-sampling techniques and sample preparation.	Acceptable. Drill core was split longitudinally and crushing and pulverising were subject to specific and definite protocols. Aberfoyle paid particular attention to sampling technique and sample preparation (Cox, 1967).
Quality of assay data and laboratory tests.	Tolerable. Samples were routinely assayed in the laboratory at Cleveland. Thirty samples were re-split and re-assayed by AMDEL Laboratories. Some samples were re-assayed by AMDEL Laboratories. The correlation of assay results for WO_3 was acceptable (Hample and Waters, 1983).
Verification of sampling and assaying.	Tolerable. Samples were routinely assayed in the laboratory at Cleveland. Thirty samples were re-split and re-assayed by AMDEL Laboratories. Some samples were re-assayed by AMDEL Laboratories. The correlation of assay results for WO_3 was acceptable (Hample and Waters, 1983).
Location of data points.	Acceptable. Locations of drill hole collars, channel samples and mine workings were established by Surveyors.
Data spacing and Distribution.	Acceptable. Data spacing was sufficient for creation of useable WO_3 variograms with relatively low nugget effect and ranges for spherical models of up to 150m (McArthur, 1983 in Dronseika, 1983).
Orientation of data in relation to geological structure	Acceptable. The strike and dip of the quartz porphyry intrusion and the quartz vein stockwork mineralisation was well known from the beginning of systematic evaluation by Aberfoyle in 1970 and the drill holes were oriented accordingly.

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Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle. However, there was cooperation during the resource estimate between the Project Geologist (E. V. Dronseika) and the Senior Mine Geologist (G.A. McArthur)
Estimation and Reporting of Mineral Resources	
Database integrity.	Tolerable. The specific measures to ensure database integrity are not known but the descriptions of the work carried out by Dronseika (Dronseika, 1983) and McArthur (McArthur, 1983) imply a systematic and thorough approach.
Geological interpretation.	Tolerable. The geological interpretation was devised by the Cleveland Project Geologist using 1:500 mine plans, cross-sections and longitudinal projections. The interpretation was based on detailed logging of 5500m of drill core and underground mapping. (Dronseika, 1983) The mineralisation was interpreted as a stockwork of quartz veins surrounding an intrusion of quartz porphyry in the form of a steeply dipping stock. The quartz porphyry stock is known from near sea level to 600m below sea level. The wolframite bearing quartz vein stockwork is known from 300m above sea level to 600m below sea level. The maximum extents of the quartz vein stockwork extends are 900m vertically, 300m along strike and 300m across strike. (Dronseika, 1983)
Dimensions.	Acceptable. The wolframite bearing quartz vein stockwork is known from 300m above sea level to 600m below sea level. The maximum extents of the quartz vein stockwork extends are 900m vertically, 300m along strike and 300m across strike.

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	(Dronseika, 1983)
Estimation and modelling techniques.	Tolerable. Mineralisation was modelled as three dimensional blocks, grade estimates of WO_3 were made by ordinary kriging (Dronseika, 1983). These were appropriate techniques. No check estimates were reported. No assumptions were made about the recovery of by-products. No estimates of S grade were made.
Moisture.	Acceptable. All assays were reported on a dry basis.
Cut-off parameters.	Tolerable. The resources were reported using cut-off grades of 0.2%, 0.3% and 0.4% WO3. Given the existence of underground access to Foleys Lode, current tungsten prices and the author's understanding of likely mining and processing costs, a marginal cut-off grade of 0.2% WO_3 waswould be reasonable.
Mining factors or assumptions.	Acceptable. Resources were estimated, not reserves, and no mining factors were used.
Metallurgical factors or assumptions.	Tolerable for Inferred Category Not acceptable for Indicated Category Metallurgical test work to estimate the flotation response for wolframite was undertaken by Aberfoyle Central Metallurgical Services; the note which refers to the test work reports concentrate grades which were achieved but not mill recoveries (Thomas, 1983). However, in the author's experience, given the size of the wolframite grains reported in drill logs and in thin and polished sections and the

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	generally magnetic nature of wolframite, mill recoveries of the order of 60% to 80% could be expected. Metallurgical test work was carried out to determine whether photometric ore sorting would be practically useful to beneficiate the wolframite bearing quartz stockwork mineralisation. Results were not encouraging (Hamill, 1981).
Bulk density.	Tolerable. Bulk density of 2.87 tonnes per cubic metre was used (Dronseika, 1983). The source of the bulk density is not known but given the style of the mineralisation the bulk density is reasonable.
Classification.	Tolerable for Inferred Category. Unacceptable for Indicated Category. The resources were classified as Indicated but no definition of the category was given (Dronseika, 1983). However, in another almost contemporaneous Aberfoyle Report written by the same author, categories were defined as: Measured: "Materials for which estimates of the quality and quantity have been computed from sample analyses and measurements from closely spaced and geologically well known sample sites such that: (a) the pattern of ore continuity is well understood; (b) the actual metal content will have a high probability of being in the range 90% to 110% of the prediction." (Dronseika, 1986) Indicated: "Materials for which estimates of the quality and quantity have been computed partly from sample analyses and measurements, and partly from reasonable geologic projections such that: (a) the pattern of ore continuity is understood though surprises are still possible; (b) the actual metal content will have a high probability of being in the range 70% to 130% of the prediction." (Dronseika, 1986)

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	Inferred: "Quantitative estimates are based largely on broad knowledge of the geological character of the deposit and for which there are few sample measurements. The estimates are based on an assumed continuity or repetition of which there is geologic evidence." (Dronseika, 1986). These categories were reasonable and were reasonably defined. Given the lack of metallurgical test work to estimate mill recoveries, the resources should be classified as Inferred rather than Indicated.
Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle. However, there was a culture of internal reviewing of the methods used for resource estimates including reconciliation of resources to production (Dronseika, 1986, and McArthur, 1983) and a review of sampling methods (Cox, 1967).
Discussion of relative accuracy/confidence	Tolerable. See Classification above.

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References quoted in the table above:

Buckland, K.R., 1980. Tin-copper ore mining at Cleveland Tin Limited, Luina, Tas. *in* Woodcock, J.T., 1980, Mining and Metallurgical Practices in Australasia, Monograph Series No. 10, The Australasian Institute of Mining and Metallurgy.

Cox, R., 1967. The use of comparative sampling methods at Cleveland mine, Tasmania, March 1967. Unpublished report, Aberfoyle Tin Development Partnership, Cleveland Development Project.

Dronseika, E.V., 1983. Geological assessment of the Foley zone mineralisation at Cleveland mine Tasmania, May 1983. Unpublished report for Cleveland Tin Ltd.

Dronseika, E.V., 1986. Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Unpublished report for Aberfoyle Resources Limited, Cleveland Division.

Everett, H.R., 1977. Current mining practice at Cleveland mine of Abminco N.L.. *in* Underground Operators' Conference, October 1977, The AusIMM Broken Hill Branch.

Hamill, J.P., 1981. Ore sorting of Foley's zone. Internal Memorandum to G.A. McArthur, 27th October 1981, Cleveland Tin Limited.

Hample, B.W. and Waters, M.T., 1981. Accuracy of Foley's mine assays in comparison to outside assay services. Internal Memorandum to G.A. McArthur, 16th July 1981, Cleveland Tin Limited.

Thomas, I., 1983. Analysis of metallurgical products from Foley Zone Upper Stockwork. Internal Memorandum to G.J. McArthur, 22nd March 1983, Aberfoyle Central metallurgical Services.

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5 a. The historical resource estimate is material because it deals explicitly and directly with the tungsten Resources at Cleveland. The estimate was reported to have been made using the relevant geological and mining data available at the time. (Refer to section 4 above).

5 b. Bright Phase Resources intends to de-water the flooded Cleveland mine and, if required, conduct diamond drilling of the mineralisation to acquire knew data and to confirm historical data. Bright Phase also intends to confirm the reliability of historical drill hole data by re-splitting and re-assaying existing drill core held at the Mineral Resources Tasmania Core Store at Mornington, Tasmania.

Creation of a~~A~~ digital drill hole database ~~will be made~~ using the existing hard copy drill logs held in Burnie, Tasmania has commenced.~~.~~

The existing mine workings will be digitised using the existing hard copy plans held at Burnie, Tasmania and at Mineral Resources Tasmania, Rosny Park, Tasmania.~~.~~

The Aberfoyle geological interpretation will be digitised using the existing hard copy plans, cross-sections and longitudinal projections held at Burnie, Tasmania.

5 c. The work proposed by Bright Phase Resources will be funded by a public float of the Company.

5 d. The Cleveland leases are the only targets for Bright Phase Resources.

6. The historical estimates are listed above and the resource category compares well with current JORC Code definitions.

7. No additional work on hard rock resource definition has been completed since mine closure. The mine was allowed to flood after closure and no access has been possible

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since that time. No records of surface drilling activity on EL7/2005 since mine closure have been lodged with Mineral Resources Tasmania (MRT).

8. Bright Phase Resources plans to undertake a program to validate the historic resource estimates detailed by Aberfoyle and upgrade these estimates to current JORC code requirements. The program will be developed under the guidance of a competent geologist and is anticipated to include the following aspects:

- A thorough search of available Aberfoyle mine exploration and production data for the Cleveland operation. This will target the determination of what records of sampling, auditing and general data validation practices are available for JORC compliant reporting of the estimates.
- Where inadequate records are available, or indications that the methodologies used were not in compliance with JORC reporting standards, work will be implemented to drill the ore body using appropriate methods. The extent of this drilling program will be determined by a competent geologist to provide sufficient information to support historical estimates.
- Existing data will be digitised and used to develop a 3D model of the mineralisation and the mine.

9. This report is consistent with the guidance contained in the ASX Companies Updates No 11/07 and 05/04.

10. The information in this report that relates to Mineral Resources is based on information compiled by Michael McKeown who is a Fellow of the Australasian Institute of Mining and Metallurgy. Michael McKeown is employed by Mining One Pty Ltd and he has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Michael McKeown consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.

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Tin Resource in the Cleveland Tailings Dams

Tin at Cleveland occurs principally as cassiterite, a tin oxide with the formula SnO_2 and less commonly as stannite, a tin-copper-iron sulphide with the formula (Sn,Cu,Fe)S. For deposits where both tin minerals are present, Sn assays are usually reported as total Sn, representing all the Sn in a sample, or as soluble Sn, representing the Sn which occurs as stannite.

The paragraph numbers in this section coincide with the paragraph numbers under Requirements for non-JORC Compliant Historical and Foreign Reporting in the ASX Companies Update 11/07.

~~1.~~1. The historical resource referred to here (see Table 7) is not reported in compliance with the JORC Code and it is uncertain that following evaluation and/or further exploration that the resource will ever be able to be reported in accordance with the JORC Code.

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Table 7 Cleveland Tailings Dams – Mineral Resources

Cleveland Tailings Dams – Tin - Mineral Resources		
Inferred Mineral Resources		
0.0% Sn Cut-off Grade		
	tonnes	**% Sn**
Tailings Dam 1	910,000	0.4
Tailings Dam 2	2,700,000	0.3
Total	3,600,000	0.3

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2. The source of the historical resource estimate is the milling records for the Cleveland mill as reported in:

- **Foo, K.A., 1981.** Performance of concentrators within Aberfoyle, past present and future, March 1981. Unpublished report, Aberfoyle Limited.

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This resource estimate was made in 1981, five years before Cleveland closed in 1986. The estimates have been updated by reference to:

- **Moony, N., 2008.** Review of Cleveland tin tailings deposits in Tasmania. Unpublished report by Esker Milling and Processing Pty Ltd for The Lynch Group.

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In addition, there are several other documents which support or explain aspects of the historical resource estimate and these are listed at the bottom of Table 9.

3. All the tailings from the treatment of ore from the Cleveland Mine are stored in two tailings dams at Cleveland: Tailings Dam 1 (TD1) and Tailings Dam 2 (TD2). The tailings dams contain tin in the form of cassiterite. The tin recovery in the Cleveland Mill was such that the dams now contain significant tonnages of tin, some of which should be recoverable with modern metallurgical methods. Aberfoyle metallurgists investigated the re-treatment of the stored tailings from 1979 to 1984.

4. The historical resource estimate is reliable. The data used for the resource estimate was compiled during Aberfoyle's ownership of Cleveland from 1961 to 1986. During that time, about 7 million tonnes of ore were treated over a period of 18 years, from 1968 to 1986. In the 1970s, Aberfoyle was one of the leading tin producers in Australia with four operating tin mines: Cleveland, the Storeys Creek and Aberfoyle mines in North-East Tasmania, and the Ardlethan mine in southern New South Wales. The author worked for Aberfoyle from 1970 to 1973 and was acquainted with many of the Aberfoyle staff who worked at Cleveland. He knows of no reason to doubt the competence of the geologists who worked at Cleveland.

The resource estimate is based on the metallurgical records of the Cleveland Mill from 1969 to 1986 (Foo, 1981 and ~~Enraght-~~Moony, 2008).

The existing data has been partly verified by test drilling of the tailings dams in 2008 (Brewer, 2008).

The nature of defects in the assessment and reporting criteria noted for the historical resource estimate and their likely impacts on the quality of the resource report are listed in Table 8. The Assessment and Resource Reporting Criteria listed in Table 9 have been categorised using the terms listed under Nature of Defects.

Table 8 Nature of Defects - Likely Impact on Resource Report Quality and Likely Impact on Subsequent Use of the Resource Report

Nature of Defects	Likely Impact on Resource Report Quality	Likely Impact on Subsequent Use of Resource Report
Acceptable: no defects	None	None
Defects tolerable	Low	No material impact
Defects not acceptable	Quality severely compromised	Severely compromised

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Table 9 Cleveland Tailings Resource Estimate – Assessment and Reporting Criteria

Cleveland Tailings Resource Estimate	
Sampling Techniques and Data	
Sample recovery.	Acceptable. The tailings grade is based on sampling in the Cleveland Mill and subsequent metallurgical mass balances from 1968 to 1986.
Logging.	Not applicable.
Sub-sampling techniques and sample preparation.	Acceptable. Sampling in the Cleveland Mill was subject to metallurgical mass balances from 1968 to 1986.
Quality of assay data and laboratory tests.	Acceptable. Samples were taken routinely in the Cleveland Mill and routinely assayed in the laboratory at Cleveland. Assaying in the Cleveland Mill was subject to metallurgical mass balances from 1968 to 1986.
Verification of sampling and assaying.	Acceptable. Samples were taken routinely in the Cleveland Mill and routinely assayed in the laboratory at Cleveland. Assaying in the Cleveland Mill was subject to metallurgical mass balances from 1968 to 1986. Drilling of the tailings dams in 2008 confirmed the grade of the tailings (Brewer, 2008).
Location of data points.	Not applicable.
Data spacing and Distribution.	Acceptable. Sampling in the Cleveland Mill was routine and subject to metallurgical mass balances from 1968 to 1986. A very large number of tailings samples were taken during that time, probably at least one

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	per day from 1968 to 1986.
Orientation of data in relation to geological structure	Not applicable. However, the drilling in 2008 suggested that there is layering in the dams.
Audits or reviews.	Acceptable. The Aberfoyle estimates of tonnage and grade of tailings made in 1981 (Foo, 1981) were confirmed in 2008 (Moony, 2008) and by Goodall, 2011.~~,~~
Estimation and Reporting of Mineral Resources	
Database integrity.	Tolerable. The specific measures to ensure the integrity of the Aberfoyle metallurgical data are not known but, given that the data was collected at a large operating mill, it is reasonable to assume that the data is sound.
Geological interpretation.	Not applicable.
Dimensions.	Acceptable. TD1 is 300m long, 100m wide and a maximum depth of about 20m. TD2 is 400m long, 0m to 200m wide and has a maximum depth of about 35m.
Estimation and modelling techniques.	Tolerable. There is no model of the tailings deposits. The tonnages and grades were estimated directly from records of tailings discharge from the Cleveland Mill.
Moisture.	Acceptable. All assays were reported on a dry basis.
Cut-off parameters.	Acceptable. The resource is quoted at 0.0% Sn (total) cut-off grade. Given that all the tailings will probably need re-treatment without selectivity, this is

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	reasonable.
Mining factors or assumptions.	Not applicable. All the tailings will probably need re-treatment without selectivity, this is reasonable.
Metallurgical factors or assumptions.	Tolerable for Inferred Category. Foo (1981) considered that mill recoveries from treatment of run of mine ore of 65% for Sn could be maintained under best operating conditions at the time. This is considerably better than the mill recoveries during the routine operation of the mill up until that time. This implies that some, at least, of the tin in the tailings dams should be recoverable. Stribley et al. (1984) reported that mill recoveries from treatment of tailings of between 33% and 45% for Sn were attainable using conventional gravity and flotation processing.
Bulk density.	Not applicable. Tailings discharge from the Cleveland Mill was measured in tonnes.
Classification.	Acceptable for Inferred Category. The resources were not classified in the historical estimates. However, given they would be classified as Inferred Mineral Resources today.
Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle.
Discussion of relative accuracy/confidence	Acceptable. A Mineral Resource is a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such from, quality and quantity that there are reasonable prospects for eventual economic extraction (JORC, 1984). By this measure, the tailings are a Mineral Resource. An Inferred Mineral Resource is that part of a Mineral Resource for which tonnage, grade and

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	mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability (JORC, 1984). By this measure, the tailings for which the tonnage and grade have been determined from the sampling and assaying techniques used in the Cleveland Mill and confirmed in part by drilling of the dams, may be classified as Inferred.

References quoted in the table above:

Brewer, A., 2008. Cleveland tailings drilling, 17/3/2008. Memorandum from Adrian Brewer, Brewer Geological Services to John Lynch.

Foo, K.A., 1981. Performance of concentrators within Aberfoyle, past present and future, March 1981. Unpublished report, Aberfoyle Limited.

Goodall, W., 2011. 110711 Cleveland tailings reserve calc – annual report basis.xlsx. Spreadsheet prepared from Aberfoyle Public Annual Reports. Bright Phase Resources Ltd, 11 July 2011; McKeown, M., 2011. Cleveland Historical Production 3 Aug MM.xls. Validation and extension of this spreadsheet, 3 August 2011.

~~**Goodall, W., 2011**. 110711 Cleveland tailings reserve calc – annual report basis.xlsx. Spreadsheet prepared from Aberfoyle Public Annual Reports. Bright Phase Resources Ltd, 11 July 2011.~~

Moony, N., 2008. Report on the Cleveland tailings deposit, 2008. Unpublished report by Esker Milling and Processing Pty Ltd for The Lynch Group.

Stribley, D.J., Tapp, G.C. and Meik, S.S, 1984. Cleveland tailings re-treatment, pilot plant and laboratory flotation results, February 1984. Unpublished report by Aberfoyle Central Metallurgical Services

5 a. The historical resource estimate is material because it deals explicitly and directly with the tin resources in the Cleveland tailings dams.

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5 b. Bright Phase Resources intends to perform a grid-based drilling and sampling programme across tailings dams No 1 and No 2. The drill spacing will be selecte-d in consultation with a competent geologist or mining engineer.

5 c. The work proposed by Bright Phase Resources will be funded by a public float of the Company.

5 d. The Cleveland leases are the only targets for Bright Phase Resources.

6. The historical estimate made in 1981 was not classified into any category.

7. As noted in Section 2 above, the historical estimate included in Foo (1981) has been updated by the 2008 estimate included in Moony (2008).

8. Bright Phase Resources intends to undertake a comprehensive programme of drilling of tailings dams No 1 and No 2 and representative metallurgical composites will be collected during this programme. The drill spacing will be selecte-d in consultation with a competent geologist or mining engineer. In conjunction with the drilling programme, a detailed survey of the tailings dams will be undertaken as warranted by a review of existing data to confirm the volume and tonnage of tailings in the dams.

A metallurgical evaluation programme will be performed including:

- Bench-scale evaluation of optimum metallurgical parameters for each stage of- the proposed flowsheet.
- Mineralogical evaluation of key products from bench scale testwork using QEMSCAN (Quantitative Evaluation of Minerals by Scanning Electron Microscope) to define the fine scale mode of occurrence of valuable minerals and key gangue minerals.
- Laboratory pilot-scale or locked-cycle evaluation of process ~~flow~~.
- Vendor evaluation where required for optimum unit operations in fine-particle gravity and flotation.

9. This report is consistent with the guidance contained in the ASX Companies Updates No 11/07 and 05/04.

10. The information in this report that relates to Mineral Resources is based on information compiled by Michael McKeown who is a Fellow of the Australasian Institute of Mining and

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Metallurgy. Michael McKeown is employed by Mining One Pty Ltd and he has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Michael McKeown consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.

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CLEVELAND MINE, LUINA, TASMANIA
PROGRESS REPORT ON DEVELOPMENT OF A RESOURCE BLOCK MODEL

for

BRIGHT PHASE RESOURCES LIMITED

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Job No.	1606_M	Mining One Pty Ltd
Doc No.	Document1	Level 9, 50 Market Street
Date:	June 2012~~December 2011~~	Melbourne VIC 3000
Prepared by:	M V McKeown	Ph: 03 9600 3588 Fax: 03 9600 3944

State Grid used in this report

Unless otherwise stated, any reference to a State Grid in this report is the Australian Geodetic Datum 1966 known as AGD66. This is the older datum which was generally in use prior to 31 March 2003. Tasmania now operates on a new State Grid known as GDA94 and coordinates in the two systems are significantly different.

This is not a report of Resources or Ore Reserves in Accordance with the JORC Code

This is not a report of Mineral Resources or Ore Reserves in Accordance with the JORC Code.

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Textual abbreviations used in this report

Aberfoyle	Any of the Aberfoyle and Cominco group of companies including, for example, Aberfoyle Ltd, Cleveland Tin N.L., Aberfoyle Exploration Pty Ltd and Cominco Exploration Pty Ltd.
asl	above sea level
BCA	Bedding to Core Angle: the maximum angle between a trace of bedding and the long axis of core: bedding parallel to the core axis has a BCA of 0^{O}.
Bright Phase Resources	Bright Phase Resources Limited.
DTM	Digital Terrain Model, a Surpac name for a wireframe.
EL	Exploration Licence.
HMS	Heavy Media Separation.
JORC	Joint Ore Reserve Committee (of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geosciences and Minerals Council of Australia).
Mining One	Mining One Pty Ltd
MRT	Mineral Resources Tasmania (a State Government Department).
RL	Reduced Level, a measure of elevation in height
Western Metals	Western Metals Limited.

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Figure 16 Part of working cross-section K; the heights of the development are about 5 metres; a volcanic layer shaded in green on the drill holes appears to be unaffected by the faults marked R and N; the pencilled boundaries to the layer of volcanics are the author's.

Figure 17 Part of working section G: the heights of the development which is shown are about 5 metres; a suggested interpretation by the author is shown as synclinal fold closure pencilled in near the bottom of the figure; this interpretaion would dispense with the requirement for the fault marked W on this section and to be fair this is the interpretation shown on working cross-section I.

Figure 18 Part of working cross-section N; it would be reasonable to connect the two podes of Henry's lode marked 1 to the pod marked 6.

Figure 19 Plan showing the quartz porphyry dyke and accompanying quartz vein halo and Hall's B lens.

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1 INTRODUCTION

The Cleveland Mine is located at Luina about 80km from Burnie (See Figure 1).

Bright Phase Resources Limited ("Bright Phase Resources") is an Australian public unlisted company based in Queensland. Bright Phase Resources is investigating the mineral deposits and tailings at the Cleveland Mine at Luina on the West Coast of Tasmania. The Cleveland Mine is an underground tin and copper mine which closed in 1986 after which the surface area of the mine site was rehabilitated.

The Cleveland mine occurs within Exploration Licence 7/2005 ("EL7/2005") which is held by Lynch Mining Pty Ltd ("Lynch Mining") (See Figure 2).

Exploration by the Tasmania Mines Department and the Australian Bureau of Mineral Resources in the 1950s identified the potential for relatively large cassiterite bearing sulphide ore bodies (Hughes, 1952, 1953a, 1953b, 1954 and Keunecke, O. and Tate, K.H., 1954). Consequently, in 1961, the Aberfoyle Tin Development Partnership acquired the leases at Cleveland and commenced systematic exploration based on geological mapping and using diamond drilling (Mason et al., 1963). Since then, over 2000 diamond drill holes have been drilled into the deposit and its known depth has been demonstrated to about 700 metres below the surface (Barth, 1986).

In the 1960s and early 1970s, the mines of the Aberfoyle group of companies ("Aberfoyle") were Australia's chief producers of tin and tungsten. The group operated Cleveland tin and copper mine, the Storeys Creek and Aberfoyle tin and tungsten mines in North-East Tasmania, and the Ardlethan tin mine in southern New South Wales.

Mining of ore at Cleveland commenced in 1968 using trackless mining for mining and ore haulage to the surface. The Cleveland Mine was among the first in the world to use trackless mining and the mine now extends to a depth of over 500 metres below surface (See Figure 4).

Production from the mine during the Aberfoyle operation was 5,645,000 tonnes at a grade of 0.68% Sn and 0.29% Cu (See Table 1). The mine closed in 1986 following the collapse of the tin price after 1980 (See Figure 3).

There are large remaining resources of tin and tungsten at Cleveland in the form of semi-massive sulphide, quartz stockworks and greisen, and tailings.

Bright Phase has retained Mining One Pty Ltd ("Mining One") to develop a digital database of the existing geological data and to create a resource block model which can be used in future mining studies. This report describes the progress made in these tasks.

In particular, this report records:

- information regarding the grid system and reference planes which were used by Aberfoyle;
- a summary description of the geology;
- comments regarding the current geological interpretation;
- details of the existing data and progress made on creating a digital database;
- modelling of the mineralisation, including a preliminary resource estimate;
- a brief assessment of the exploration potential in the mine.

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Figure 1 Location of the Cleveland Mine

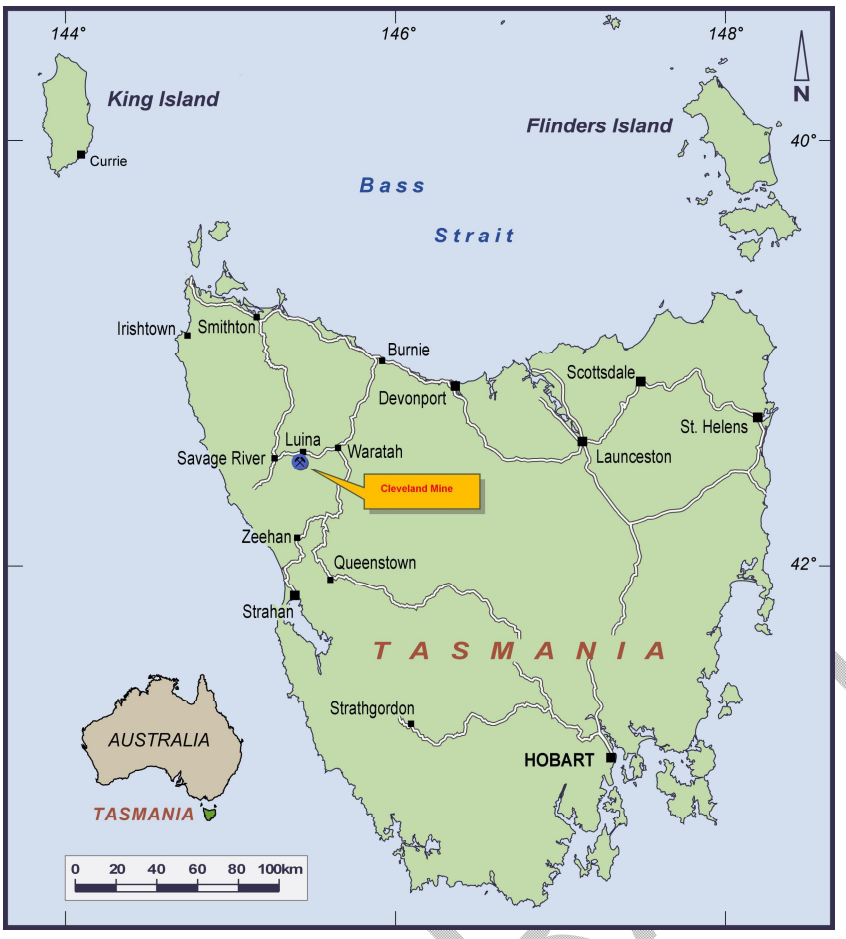

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Figure 2 **Location of Exploration Licence 7/2005 (Coordinates are based on Australian Geodetic Datum 1966).**

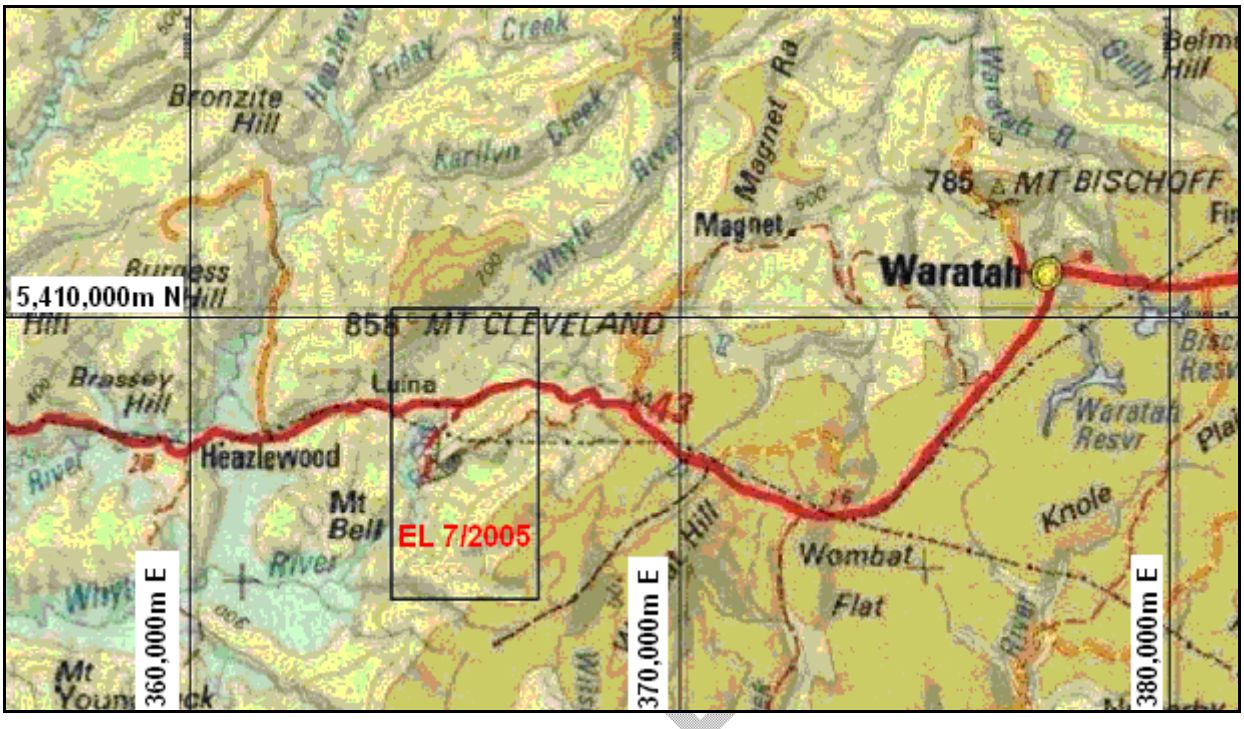

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Table 1 Cleveland Mine – Mine Production During Aberfoyle Operations.
(Compiled from Aberfoyle Ltd and Cleveland Tin N.L. annual reports.)

Year	Ore Treated tonnes	Ore Treated	
		% Sn as cassiterite	% Cu
1968	?	?	?
1969	256,865	0.85	0.40
1970	281,875	0.79	0.37
1971	305,726	0.73	0.42
1972	357,498	0.78	0.40
1973	505,806	0.76	0.32
1974	314,210	0.75	0.25
1975	289,018	0.78	0.32
1976	363,036	0.73	0.27
1977	393,275	0.66	0.22
1978	388,579	0.53	0.18
1979	352,977	0.52	0.24
1980	367,866	0.47	0.21
1981	439,304	0.51	0.22
1982	350,300	0.64	0.28
1983	277,700	0.71	0.25
1984	180,300	0.71	0.26
1985	137,000	0.80	0.25
1986	83,700	0.92	0.41
Total	**5,645,035**	**0.68**	**0.28**

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Figure 3 Tin Price 1960 to 2010 – US$ per Tonne

(Compiled from Minerals Year Books of the Bureau of mines of the United States Geological Survey.)

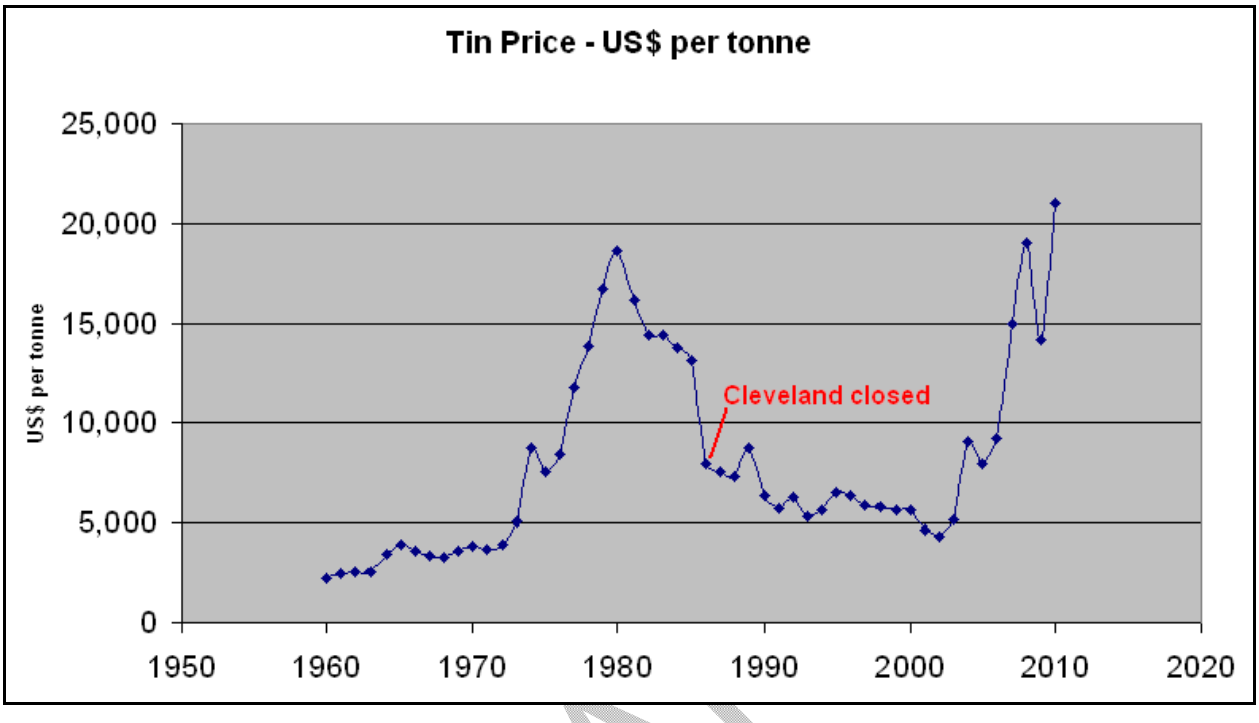

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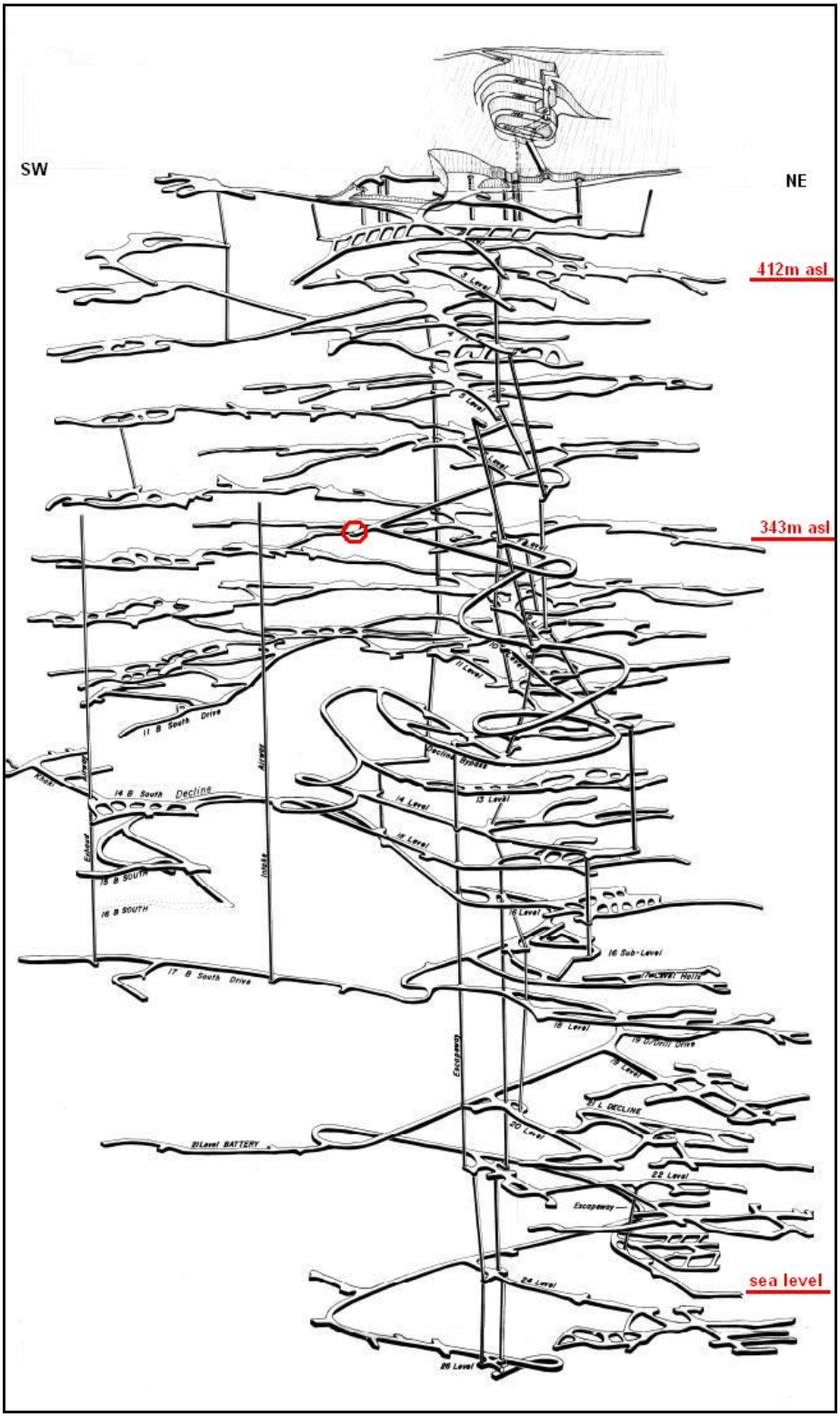
Figure 4 **Cleveland Mine: the entrance to the Cleveland Decline is circled; the mine was over 500m deep: the heights above sea level (asl) are shown on the right.**

(Taken from Aberfoyle records.)



2 GRID CONVENTION AND REFERENCE PLANES IN THE CLEVELAND MINE

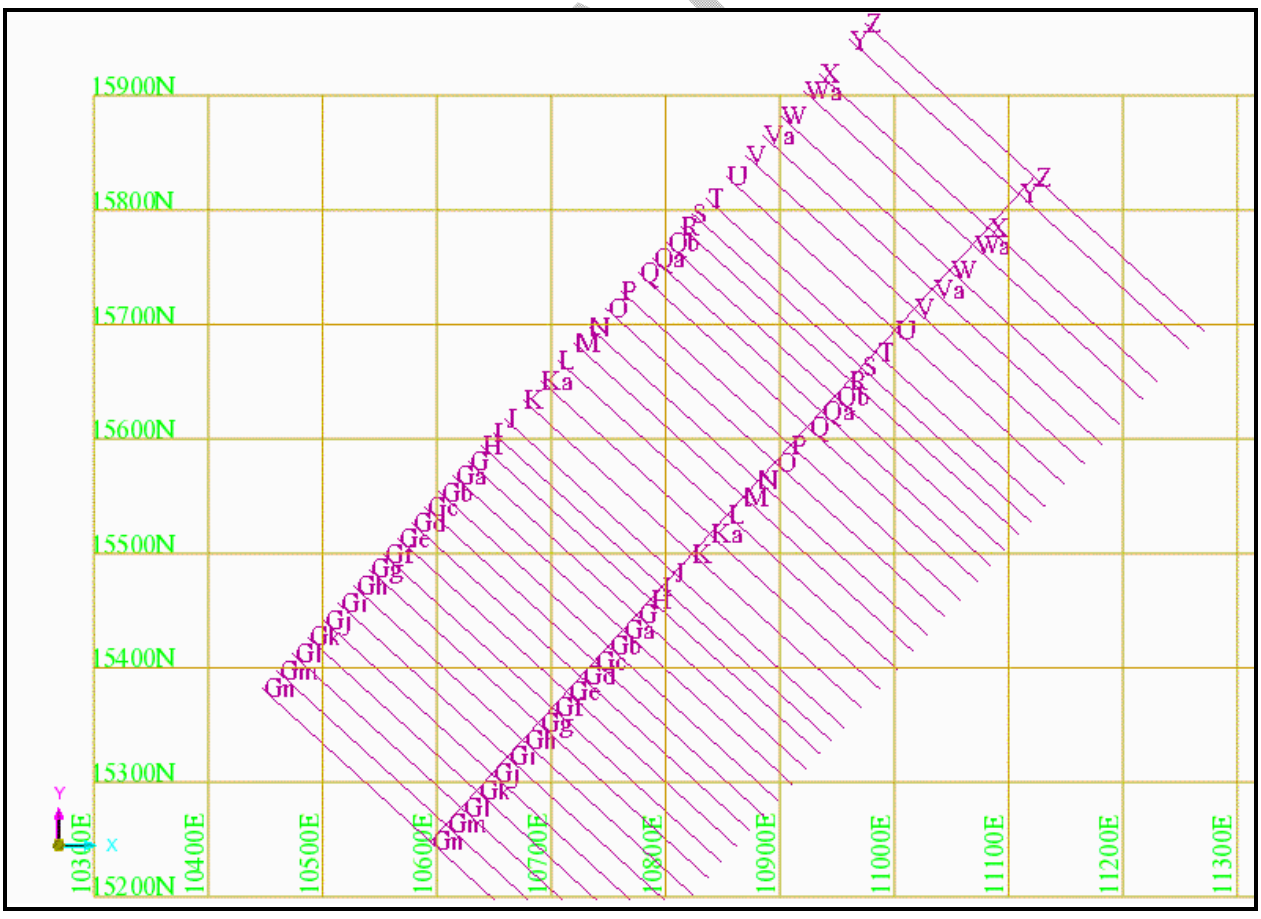
The Cleveland Mine Grid was established in the 1950s during the early geophysical investigations of the field and was used by Aberfoyle during its tenure of the mine. Unfortunately none of the principal compass directions of the Cleveland Mine Grid is parallel to the strike of the mineralisation. Consequently, Aberfoyle established two reference planes which were parallel to the strike of the mineralisation; the principal and most used reference plane was parallel to the strike of the Hall's, Henry's and Khaki lodes (See Figure 7) and was known as Hall's Reference Plane (See Figure 5).

Relative Levels (RL) used in the mine were heights above sea level + 1000m. Note that some older plans and reports refer to the heights above sea level without the addition of the 1000m.

Aberfoyle used a series of cross-sections, perpendicular in strike to Hall's Reference Plane. The locations and ad hoc numbering of these cross-sections date back to the start of exploration drilling on cut grids in the 1960s (See Figure 5).

Further details of the location of the Cleveland Mine Grid, Hall's Reference Plane, mine levels and section locations are attached (See Appendix 1 to Appendix 3).

Figure 5 Hall's Reference Plane and the Cleveland Mine Grid (halls_grid2.str)



3 GEOLOGY

3.1 Ore Minerals in the Cleveland Mine

Worldwide, tin is won from cassiterite, copper from chalcopyrite and tungsten from wolframite or scheelite (See Table 2). Tin and copper grades are usually expressed as % Sn and % Cu respectively; tungsten grades are usually expressed as % WO_3.

Tin, copper and tungsten occur at Cleveland: tin occurs principally as cassiterite and in minor amounts as stannite; copper occurs principally as chalcopyrite and also in minor amounts as stannite; tungsten occurs as wolframite.

Table 2 Tin, copper and tungsten ore minerals

Ore Mineral	Formula	Metal Content	Occurrence at Cleveland
cassiterite	SnO_2	78.6% Sn	Yes
stannite	$Cu_2S.FeS.SnS_2$	27.5%Sn, 29.5%Cu	Yes
wolframite	$(Fe,Mn)WO_4$	76.4% WO_3	Yes
scheelite	$CaWO_4$	80.5% WO_3	No

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Traditional processing of tin bearing ore recovers only cassiterite. Consequently, it is important to know how much of the tin in a deposit occurs as cassiterite. Stannite is soluble in nitric acid whereas cassiterite is not and soluble tin assays are assays of tin occurring in stannite and the determination of the grade of tin as cassiterite is calculated by determining the total tin and the soluble tin grade and then subtracting one from the other:

grade of tin as cassiterite = total tin grade – soluble tin grade

This was the practice by Aberfoyle at Cleveland.

Cassiterite is relatively heavy with a specific gravity of about 7gm per cubic centimeter.

Traditionally, cassiterite bearing ore from hard rock deposits, such as those at Cleveland, is reduced in size by crushing and the crushed material is passed through a Heavy media separation (HMS) process where some less dense, tin poor material is floated off and discarded. The remaining ore then passes to grinding so that the cassiterite grains are mostly liberated from the other minerals present. Then, coarser cassiterite is concentrated by gravity methods using jigs, spirals and shaking tables. Sulphide minerals present are then removed by sulphide flotation and finer cassiterite is concentrated by cassiterite flotation into a cassiterite concentrate usually assaying over 60% Sn. The processing recovery of tin is commonly in the range of 55% to 75%. The cassiterite concentrate is then smelted to recover the tin in a traditional tin smelter.

An alternative method of tin concentration, known as fuming, was first suggested in the 1970s but, to date, this process has not been used anywhere. This process mirrors that just described but a cassiterite concentrate assaying only about 10% Sn is produced. The processing recovery of tin is hoped to be as high as 85% to 90%. The cassiterite concentrate is then smelted to recover the tin in a ~~special~~ tin smelter ~~which employs a smelting process known as fuming~~.

The principal aim of processing at Cleveland was the recovery of tin rather than copper. This was because the tin price was then, as now, significantly greater than the copper price and the tin grade of the ore was greater than the copper grade (See Table 3).

The cassiterite in the semi-massive sulphide mineralisation is fine grained with grains generally being in the range 0.02mm to 0.07mm across. The fine grain size dictates the extent to which the ore must be ground to release the cassiterite from the other minerals present so that it can then be recovered. As the grind size becomes finer, the cassiterite becomes more difficult to recover in a traditional processing plant which uses gravity and flotation methods to recover the cassiterite. During the Aberfoyle operations at Cleveland, tin and copper recovery both averaged about 60% (See Table 3 – the final years reflect the mining of remnant ore in the upper levels).

Table 3 Cleveland Mine – mill performance during Aberfoyle operations.

Year	Ore Treated	Feed Grade		Sn Recovered from Cassiterite		Cu Recovered	
	tonnes	% Sn as cassiterite	% Cu	tonnes	recovery	tonnes	recovery
1969	256,865	0.85	0.40	1,136	52%	378	37%
1970	281,875	0.79	0.37	1,472	66%	717	69%
1971	305,726	0.73	0.42	1,557	69%	823	65%
1972	357,498	0.78	0.40	1,874	67%	969	69%
1973	505,806	0.76	0.32	2,668	69%	1216	76%
1974	314,210	0.75	0.25	1,513	65%	529	69%
1975	289,018	0.78	0.32	1,370	60%	565	61%
1976	363,036	0.73	0.27	1,519	60%	617	62%
1977	393,275	0.66	0.22	1,386	54%	420	49%
1978	388,579	0.53	0.18	1,236	60%	458	65%
1979	352,977	0.52	0.24	1,106	60%	422	49%
1980	367,866	0.47	0.21	1,080	63%	414	53%
1981	439,304	0.51	0.22	1,337	60%	518	55%
1982	350,300	0.64	0.28	1,457	65%	602	60%
1983	277,700	0.71	0.25	1,182	60%	405	59%
1984	180,300	0.71	0.26	668	53%	300	64%
1985	137,000	0.80	0.25	525	48%	198	59%
1986	83,700	0.92	0.41	434	56%	140	41%
Total	**5,645,035**	**0.68**	**0.28**	**23,519**	**61%**	**9,691**	**60%**

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3.2 Local Geology

The Cleveland and Mt Bischoff tin mines both occur to the north of the outcrop of the Meredith granite (See Figure 6).

Two other mines occur in the area: the Magnet silver lead mine between Cleveland and Mt Bischoff and the Godkin Mine to the south of Cleveland (See Figure 6). The more significant of these was the Magnet Mine which operated from 1895 to 1940 and produced 630,000 tonnes of ore containing 38,000 tonnes of lead and 8,000,000 ounces of silver (Cottle, 1953).

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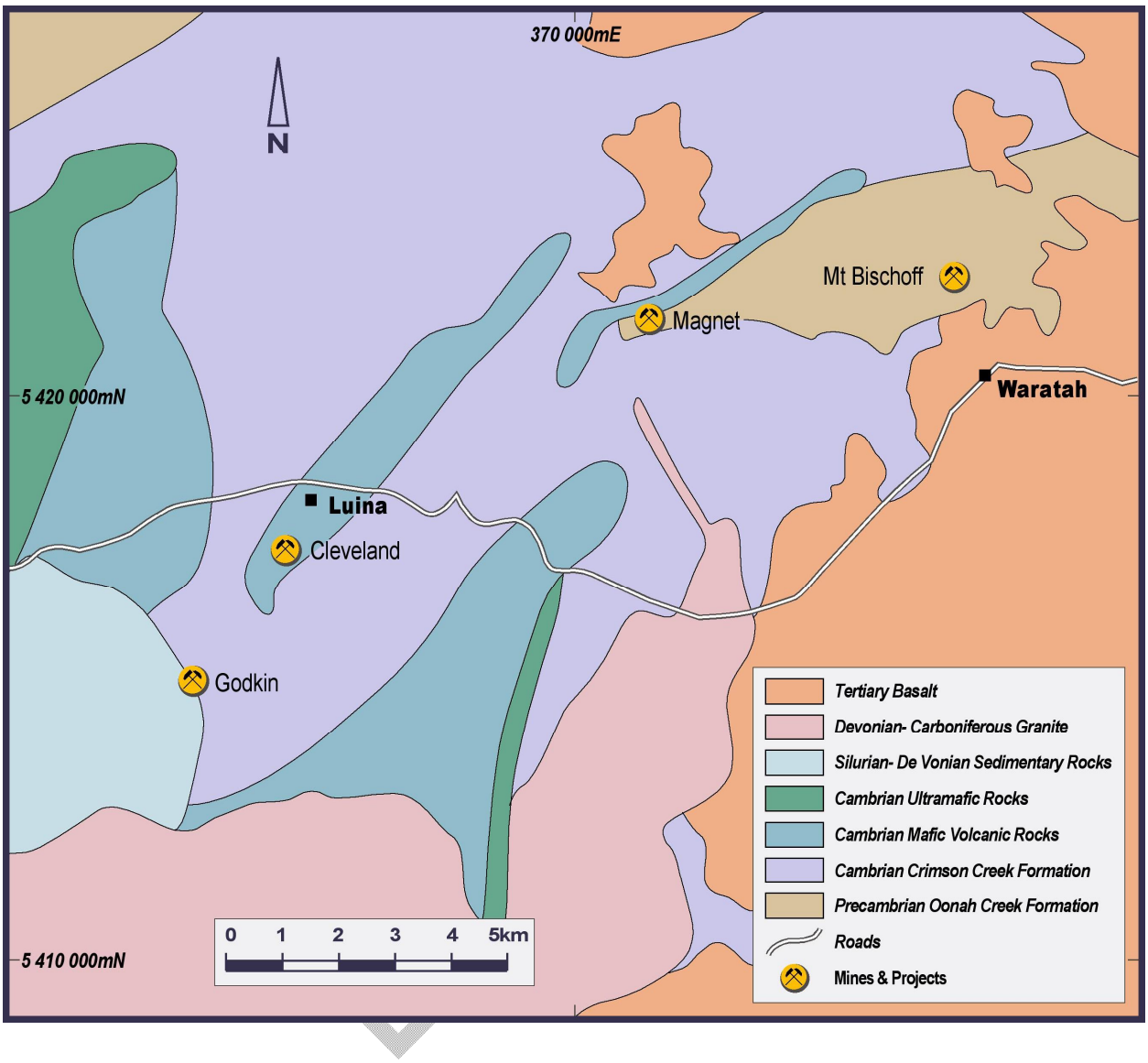
Figure 6 Local geology around Cleveland.



3.3 Mine Geology

At Cleveland, the known tin, copper and tungsten mineralisation occurs within a series of sedimentary rocks belonging to Hall's Formation (See Figure 7~~Figures 7~~ and 8). Hall's Formation is underlain by the sandstone and overlain by volcanics. All these sedimentary rocks are of Cambrian age and, while they were originally deposited horizontally, they have been tilted and are now more or less vertical.

The sedimentary rocks were intruded by the Devonian-Carboniferous Meredith granite. A quartz porphyry dyke occurs in the bottom of the mine below 350m from the surface.

The mineralisation at Cleveland is of three styles:

- Tin and copper bearing semi-massive sulphide consisting of pyrrhotite and pyrite with cassiterite and lesser chalcopyrite and stannite, and quartz, fluorite and carbonates. Sulphide minerals make up 20% to 30% of the mineralisation.
- Tungsten bearing greisen with wolframite in quartz and mica.
- Tungsten bearing quartz stock work with wolframite in quartz.

The semi-massive sulphide has formed by the replacement of limestone and is geologically similar to the tin bearing semi-massive and massive sulphide mineralisation at Renison.

The known tin and copper bearing semi-massive sulphide mineralisation occurs entirely within Hall's Formation, as faulted, more or less vertically dipping, lenticular deposits with strike lengths of up to 550 metres, across strike thicknesses of up to 30 metres and down-dip extents of up to 800 metres (See **Error! Reference source not found.**~~Figure 8~~). The deposits are referred to as lodes, and from east to west, these are:

- Battery, Smithy and Luck's Lodes,
- Khaki Lode
- Hall's Lodes,
- Henry's Lode,

The tungsten bearing greisen formed by the hydrothermal alteration of the quartz porphyry dyke. The dyke dips vertically and has a known strike length of 100m, an across strike thickness of up to 60m and a down-dip extent of 800 metres (Jackson et al., 2000).

The tungsten bearing quartz stock work formed by the intense quartz veining which forms a halo around the quartz porphyry dyke.

The tungsten bearing greisen and quartz stock work is known as Foley's Zone (See Figure 9). Foley's Zone dips vertically and has a known strike length of 300 metres, an across strike width of up to 300 metres and a down-dip extent of over 900 metres (Dronseika, 1983).

The quartz stock work and the semi-massive sulphide mineralisation overlap in part.

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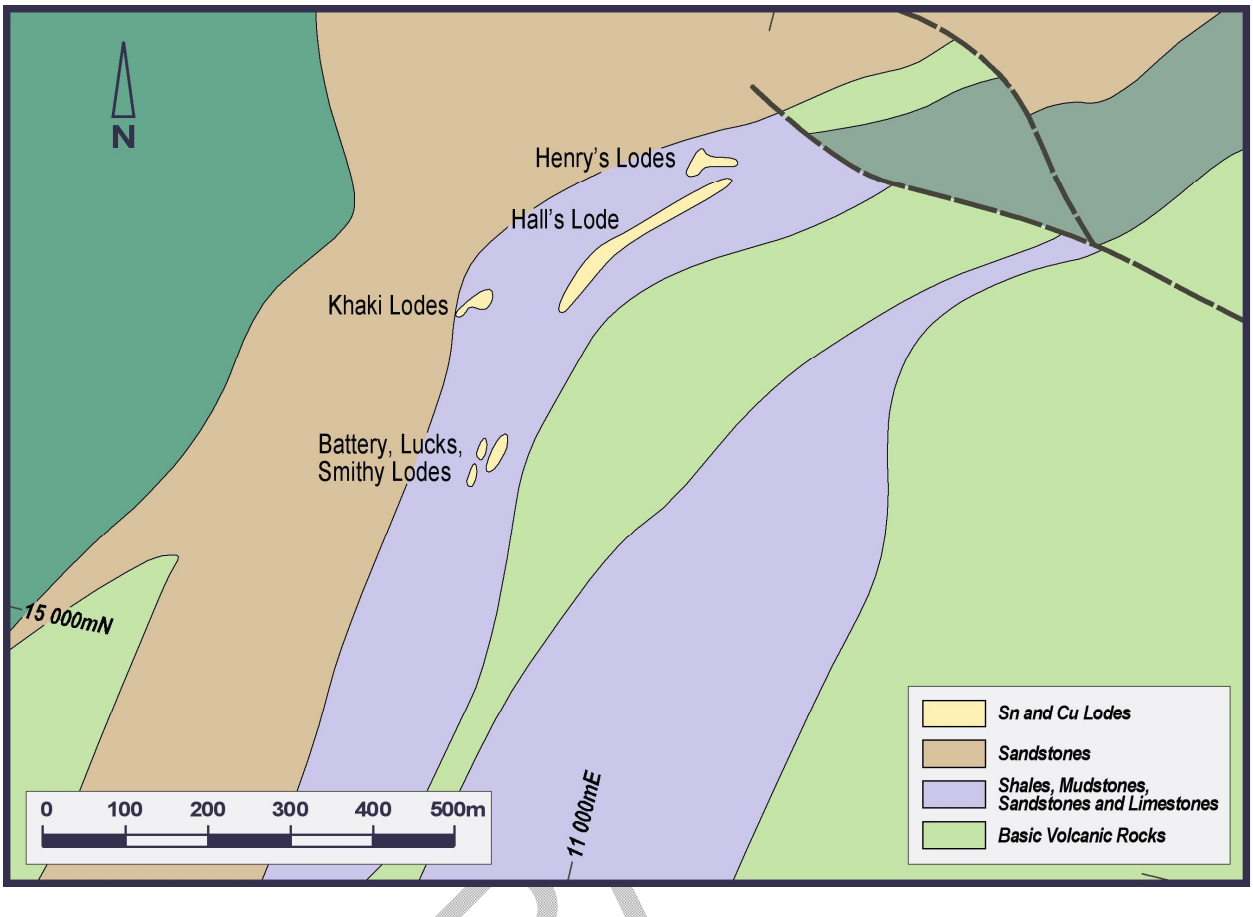
Figure 7 Geology near the Cleveland Mine.



Modelling of the granite, based on geophysical gravity survey, indicates that the top of the granite is nearly 4 kilometres deep at Cleveland (Leaman and Richardson, 1989 and 2003) (See Figure 10). This is important because:

- at Renison, the tin mineralisation continues at least to the granite,
- in Cornwall, tin mineralisation continues into the granite, and
- the granite is deeper than thought by explorers from the 1960s to the 1980s.

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Figure 8 **Tin copper bearing semi-massive sulphide mineralisation on cross-section number "N".**

(Updated after Collins et al., 1989)

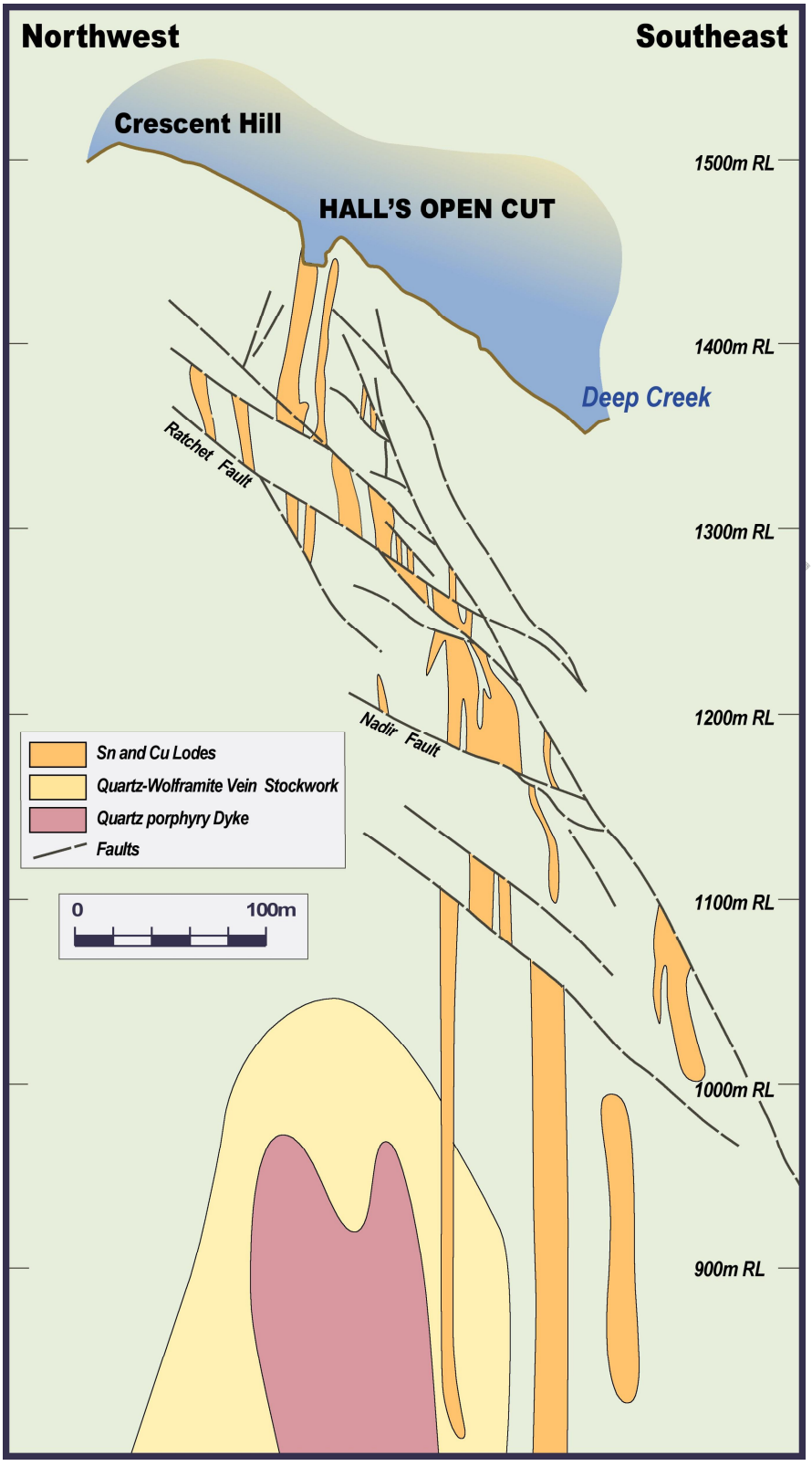


Figure 9 Schematic representation of Foley's Zone – cross section. (After Jackson et al, 2000.)

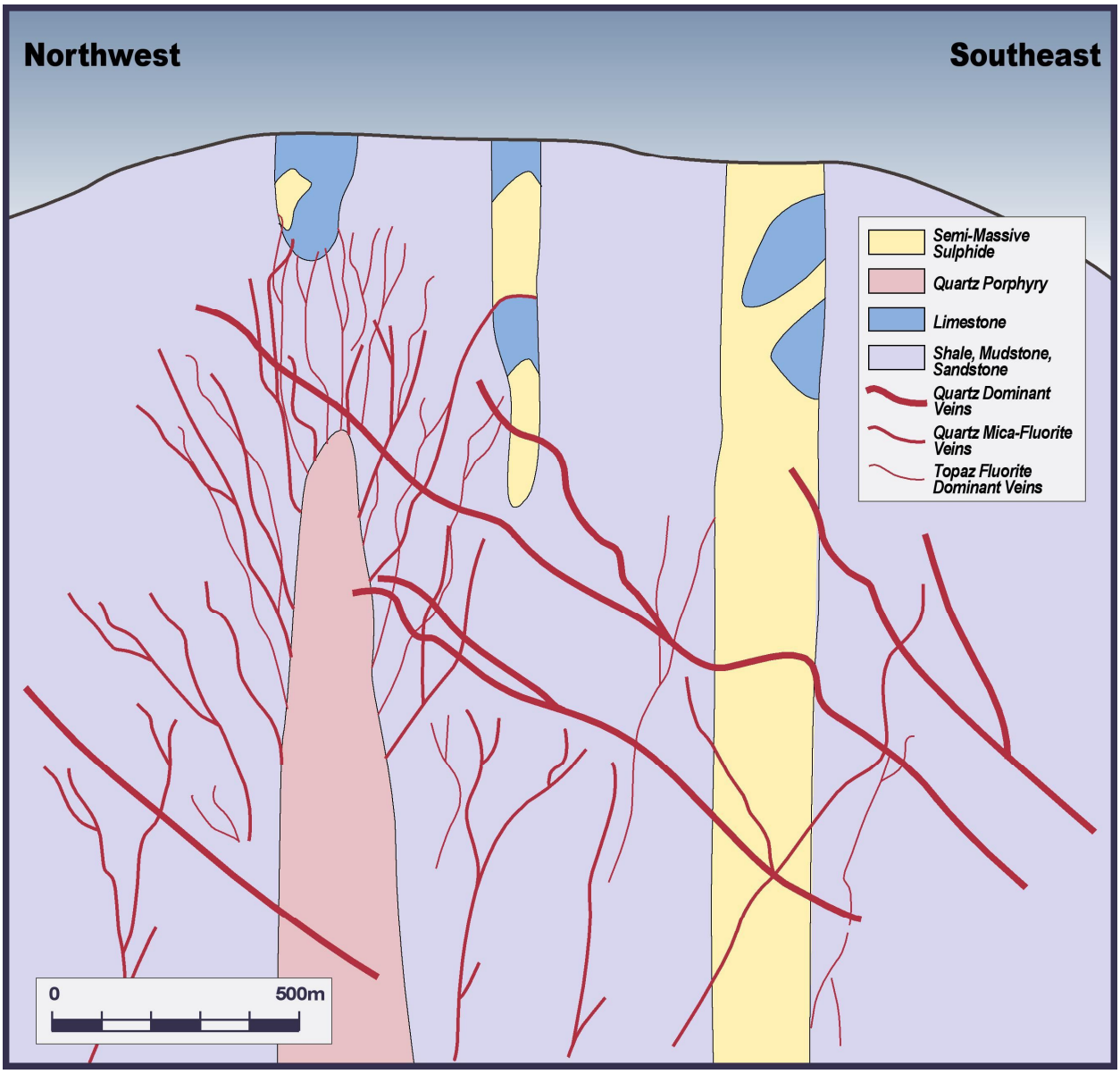
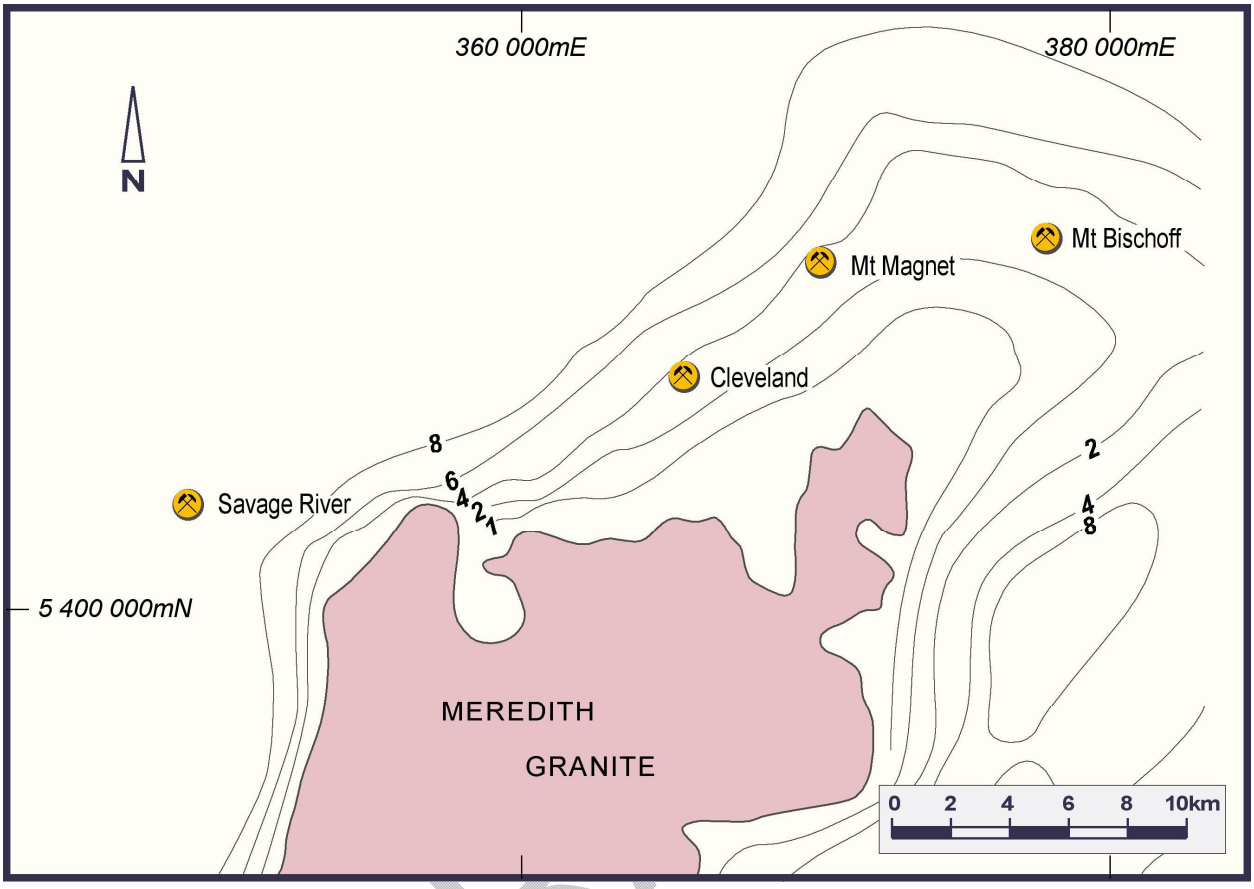


Figure 10 Depth to the Granite
(After Leaman and Richardson, 1989)



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4 INTERPRETATION OF THE MINERALISATION IN THE MINE

The geological interpretation of the mineralisation at Cleveland has changed several times.

The replacement style of the tin and copper bearing massive sulphide mineralisation was first recorded in Reid (1923). The mineralisation appears to have replaced limestone beds within Hall's Formation (See 3.3 Mine Geology). However, the interpretation of the boundaries of the lodes has changed several times depending on whether the structure was thought to be controlled by folds or reverse faults and whether the faults were steep or flat:

- **Folding:** Carey (1945) considered that "the orebodies are replacement deposits, which conform to the folded structures of the sedimentary rocks, not to fractures or fissures… the lodes of Henry's cut, Hall's cut, no. 12 workings, and all of Luck's lodes (No. 8, 10 and 16 workings) are all developed on the troughs and adjacent limbs of synclines."
- **Folding**: Mason (1965) claimed that "complex folding and multiple plications of the mineralized lode bed often cause several parallel repetitions of it interspersed with bands of barren chert thus giving the effect of successive sulphide and chert bands".
- **Steep reverse faults**: Cox and Glasson (1967) suggested that the structure of the mineralisation was controlled by steeply dipping faults which caused multiple repetitions of the lodes in cross-section (See Figure 11).
- **Flat reverse faults**: Ransom and Hunt (1975) postulated that the structure of the mineralisation was controlled by a small number of relatively flat reverse faults cutting across gently undulating lodes (See Figure 12).
- **Flat reverse faults**: Collins (1981) re-interpreted the structure and increased the number of postulated flat reverse faults significantly (See Figure 13).
- **Flat reverse faults**: Barth (1986) perpetuated the interpretation of Collins (1981) (See Figure 14).

The interpretation based on flat faults off-setting the lodes was in use when the mine closed in 1986, for example, see **Error! Reference source not found.**~~Figure 8~~. However, there are several reasons why this interpretation may be in error:

1. The actual appearance of the flat faults has not been described, for example, not in Collins (1981) nor in Collins et al. (1989) nor in Barth (1986).
2. The underground mapping shown on the working cross-sections was not always taken into account when interpreting the positions of the flat reverse faults, for example, on cross-section Ka the traces of two faults defy the observed geology (See Figure 15).
3. Similarly, the interpreted positions of the flat reverse faults do not always take into account the lithologies logged in diamond drill holes, for example, on working cross-section K, the traces of two faults ignore the apparent continuity of a lens of volcanics on the cross-section (See Figure 16).
4. There are many places where lenses which are close to each other could be interpreted as the limbs of synclines, for example, on cross-section G Hall's A and Hall's B lenses could be interpreted in this way (See Figure 17).
5. There are also places where lenses which have been interpreted on either side of a flat reverse fault could be joined together sensibly, for example, see the pods of Henry's lode on working cross-section N (See Figure 18).

The current geological interpretation is based on the working cross-sections. These paper cross-sections are at 1:500 scale and show locations and geological mapping of underground

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development, and traces of diamond drill holes annotated with logged rock types (See Figure 15 to Figure 18). There are no tin assays shown on the cross-sections. Also, note that in the drill logs there are no records of bedding to core angles (BCA), sometimes known as α angles and so these are also not shown on the cross-sections. Despite these short-comings the working cross-sections are an invaluable source of geological information (See 5.1 Existing Data).

There seems to have been an attempt made to interpret the structure taking into account rock types only. This was a relatively puristic geological approach but it ignored all other existing and available data such as:

- mapped exposures of geology in underground development,
- assays of diamond drill core, and
- BCAs.

In addition, there appears to have been a reluctance to interpret dips of lodes which were anything but vertical to sub-vertical.

The interpretation of the boundaries to tin lodes without reference to Sn assays is particularly odd and a record of BCAs would have helped to determine the dip of the lithological units and lodes on cross-section.

Lode boundaries should be re-interpreted taking into account all the available data. This will require the logging of BCAs in selected holes amongst those stored in the Mineral Resources Tasmania ("MRT") Core Store at Mornington, Tasmania.

An inadequate geological interpretation could have an adverse impact on the classification of resources according to the JORC code.

Another important consequence of the current interpretation is that the lode mineralisation has been interpreted as 42 separate lenses or pods (See Table 5) which are disconnected and some of which are quite small. This interpretation has negative implications for mine planning, particularly stope design, and a simpler interpretation, if valid, would help to improve the potential productivity of the mine.

For the record, Barth (1986) noted that the quartz porphyry "dike is surrounded by a vein halo, which in one place, cuts across the near vertical dipping marginal part of lower Hall's B lens" (see Figure 19). This implies that the quartz porphyry dyke is younger than the tin lode mineralisation and probably over-prints the lode mineralisation.

Also, for the record the rock type codes, as assumed by the author, shown on the working cross-sections are listed in Table 4.

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Table 4 Rock type codes as used on working cross-sections, as assumed by the author.

Code	Rock Type
vb	basic volcanic
vf	
dol	dolomite
ch	chert
sh	shale
ss	sandstone
lm	limestone
L	lode
min	mineralised

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Figure 11 Cross-section interpreted by Cox and Glasson (1971); this is cross-section Qa.

(Cox and Glasson, 1971)

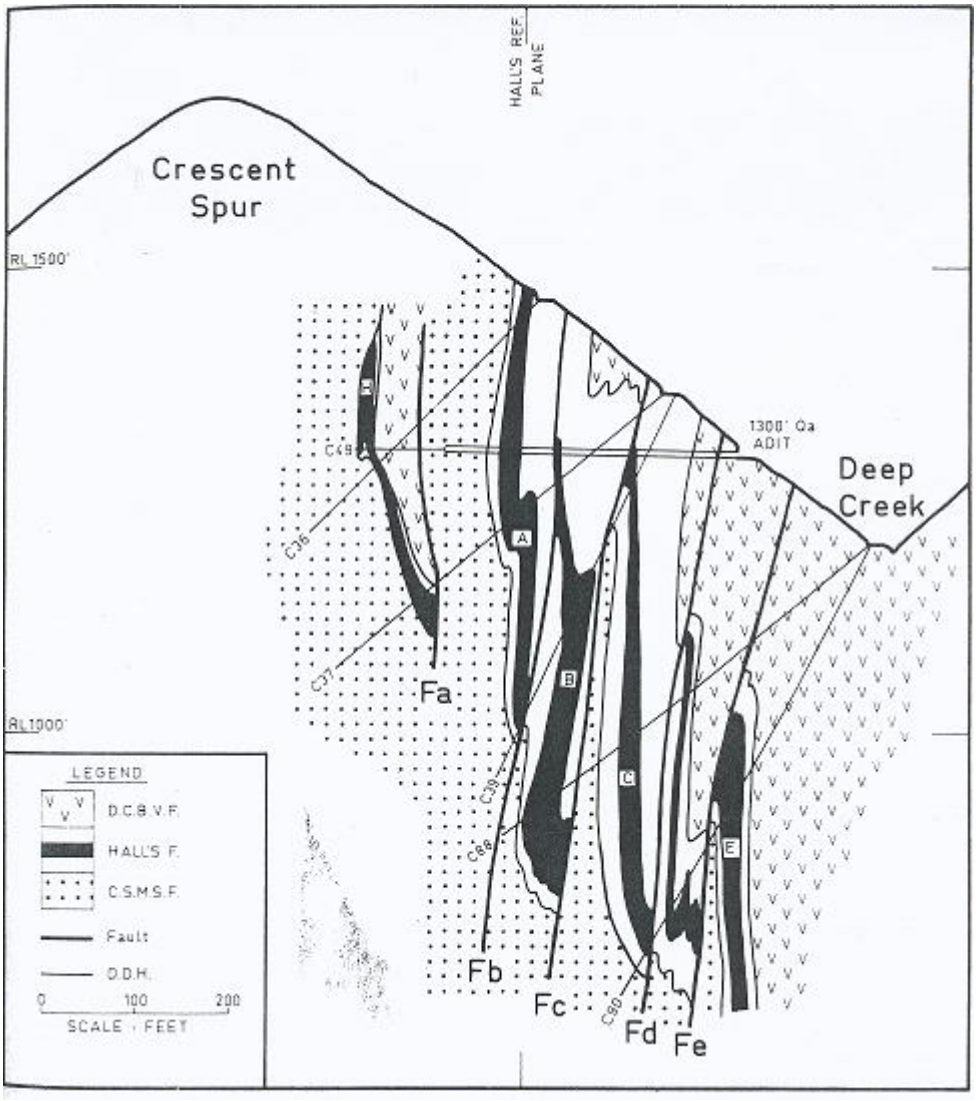


Figure 12 Cross-section interpreted by Ransom and Hunt (1975); this is cross-section Qa, the same cross-section as shown in Figure 11.

(Ransom and Hunt, 1975)

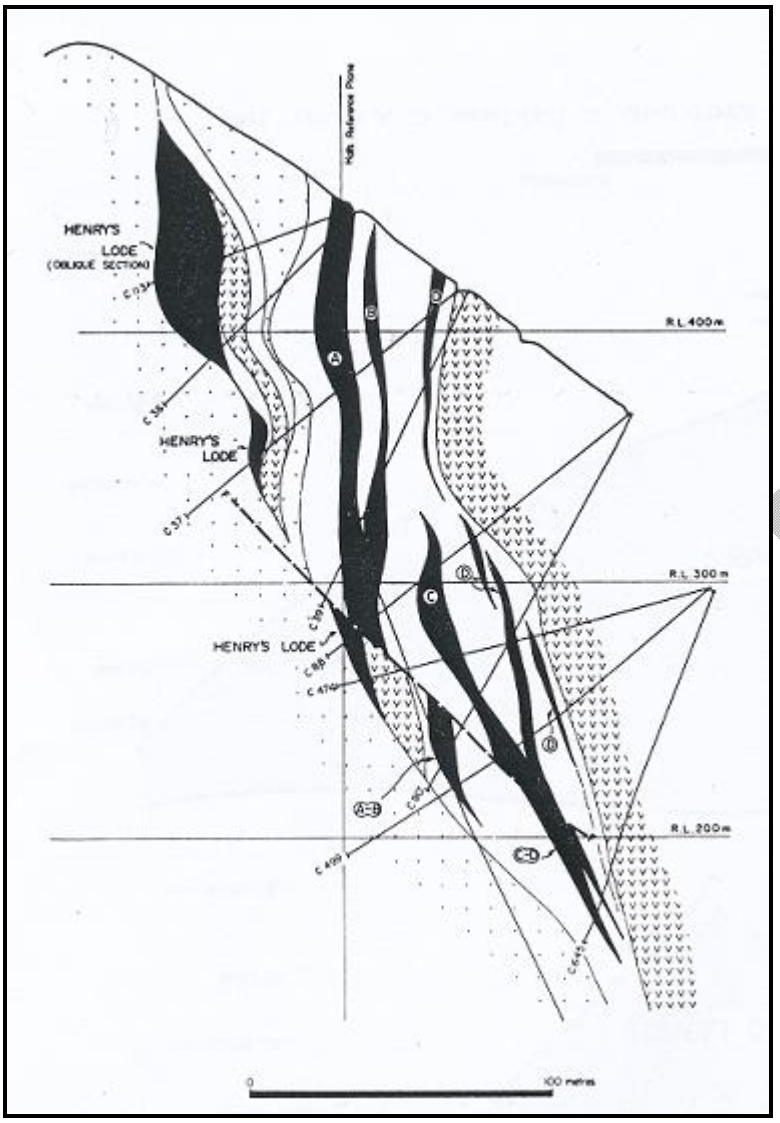


Figure 13 Cross-section interpreted by Collins (1981); this is cross-section Qa, the same cross-section as shown in Figure 11 and Figure 12.

(Collins, 1981)

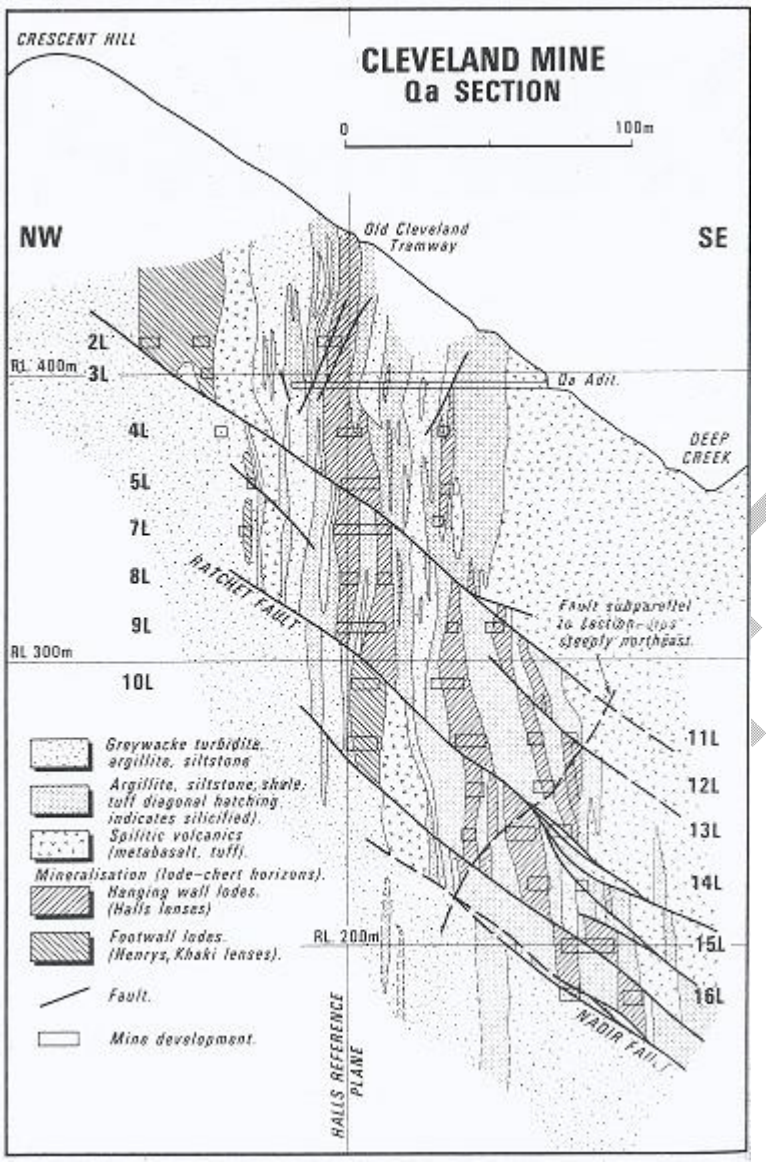


Figure 14 Diagrammatic cross-sections from Barth (1986).

(Barth, 1986)

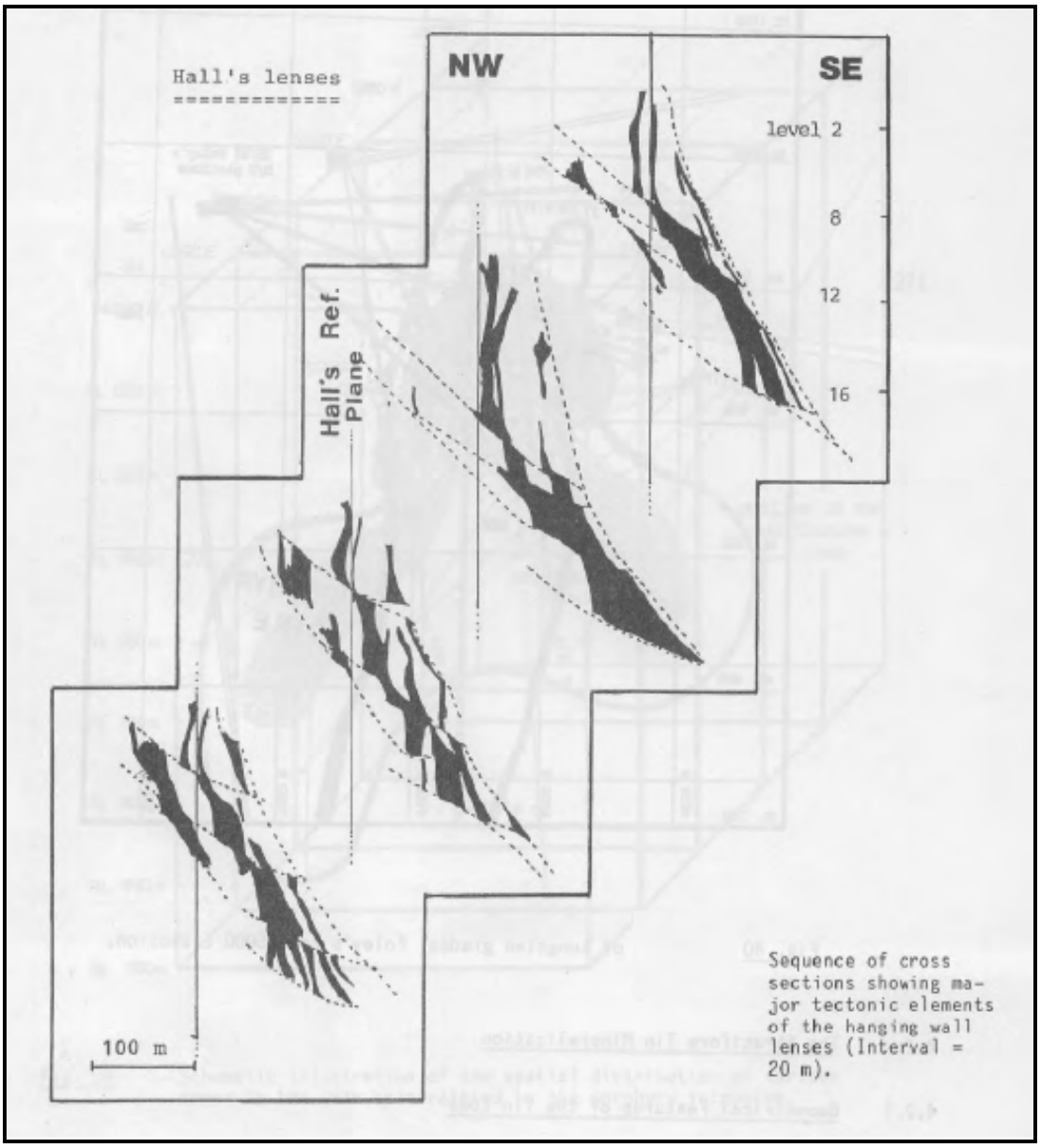


Figure 15 **Part of working section Ka: the heights of the development which is shown are about 5 metres; note that the traces of the faults marked W and J defy the observed geology.**

(Aberfoyle 1:500 working cross-sections)

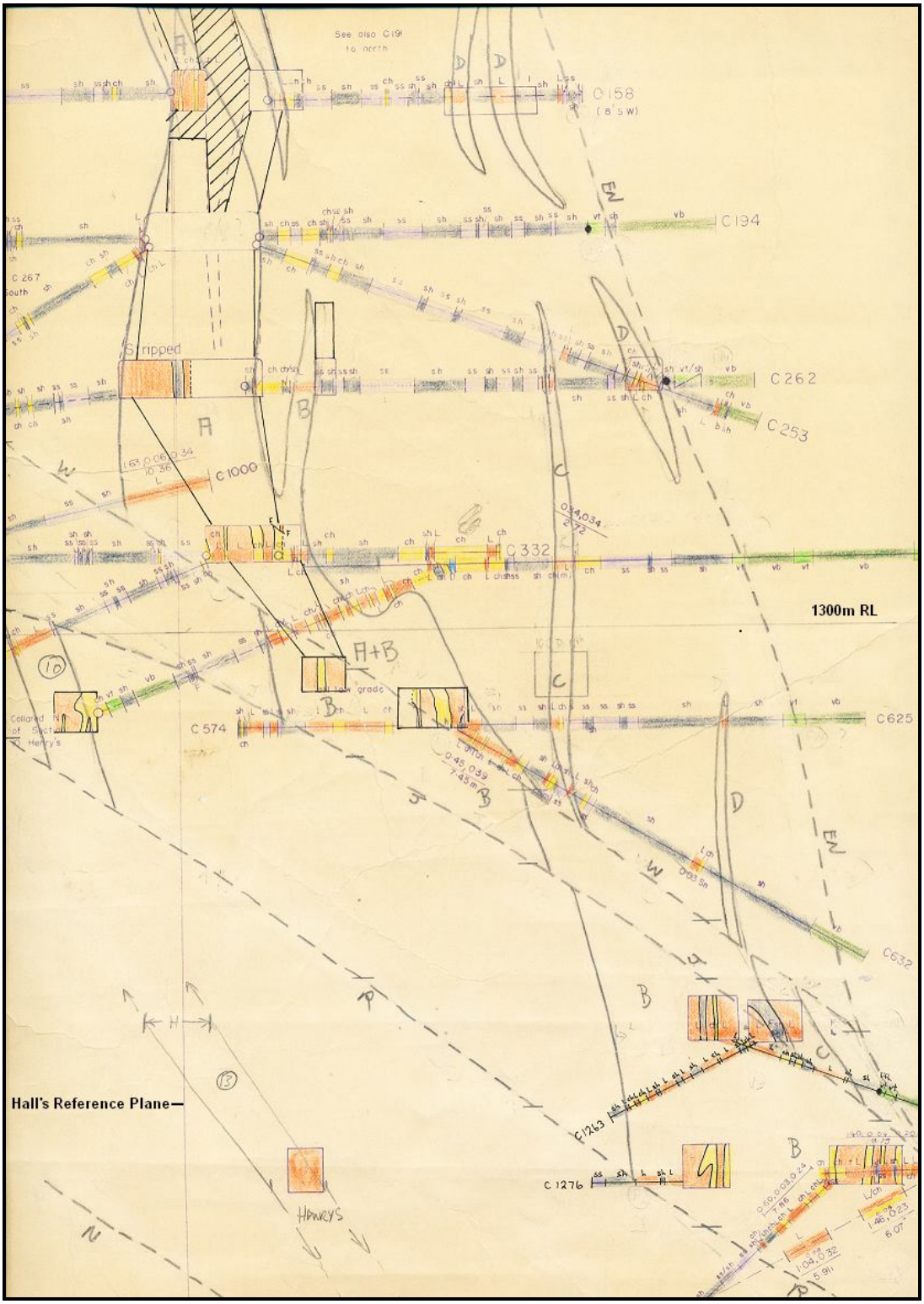


Figure 16 **Part of working cross-section K; the heights of the development are about 5 metres; a volcanic layer shaded in green on the drill holes appears to be unaffected by the faults marked R and N; the pencilled boundaries to the layer of volcanics are the author's.**

(Aberfoyle 1:500 working cross-sections)

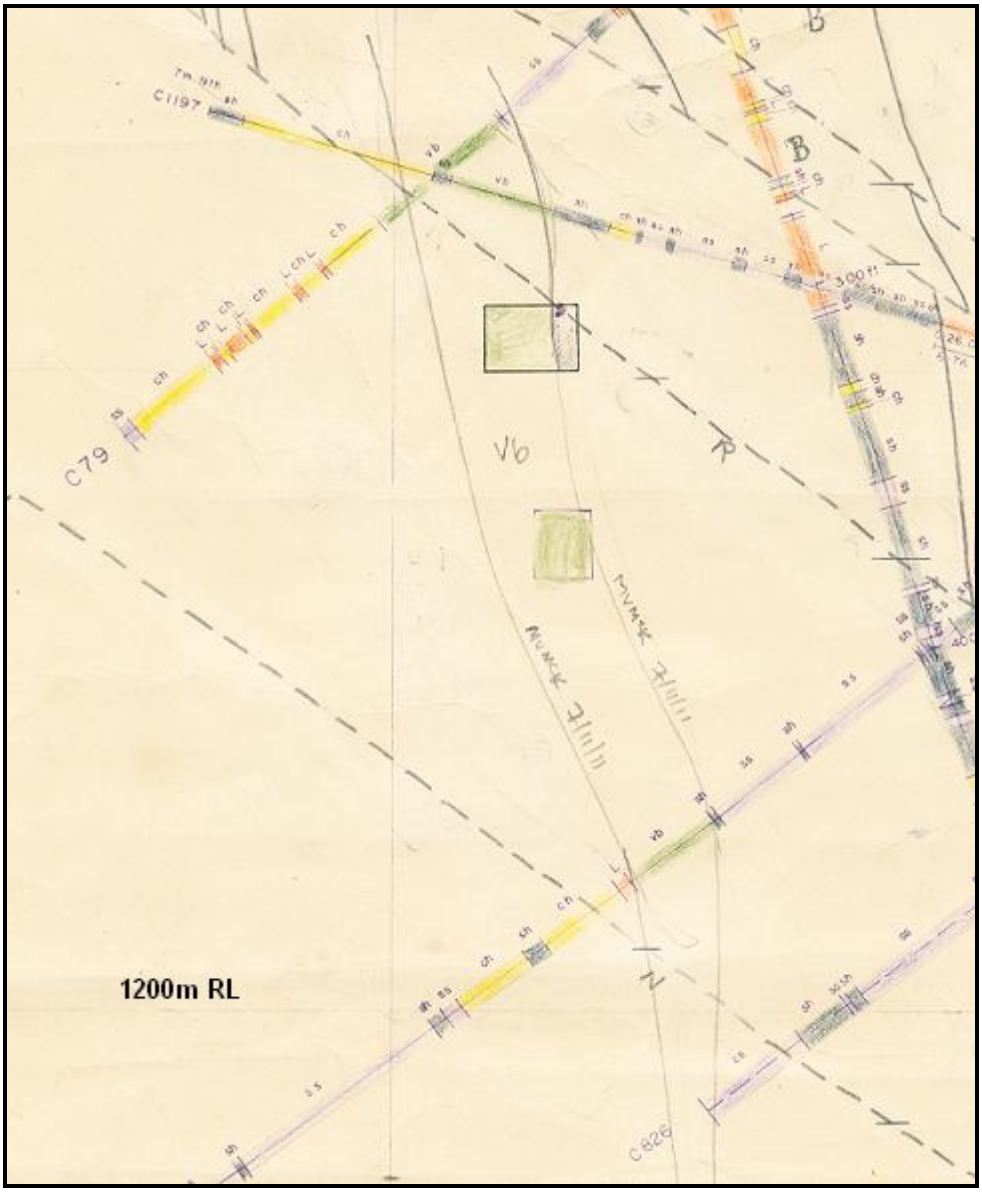


Figure 17 **Part of working section G: the heights of the development which is shown are about 5 metres; a suggested interpretation by the author is shown as synclinal fold closure pencilled in near the bottom of the figure; this interpretation would dispense with the requirement for the fault marked W on this section and to be fair this is the interpretation shown on working cross-section I.**

(Aberfoyle 1:500 working cross-sections)

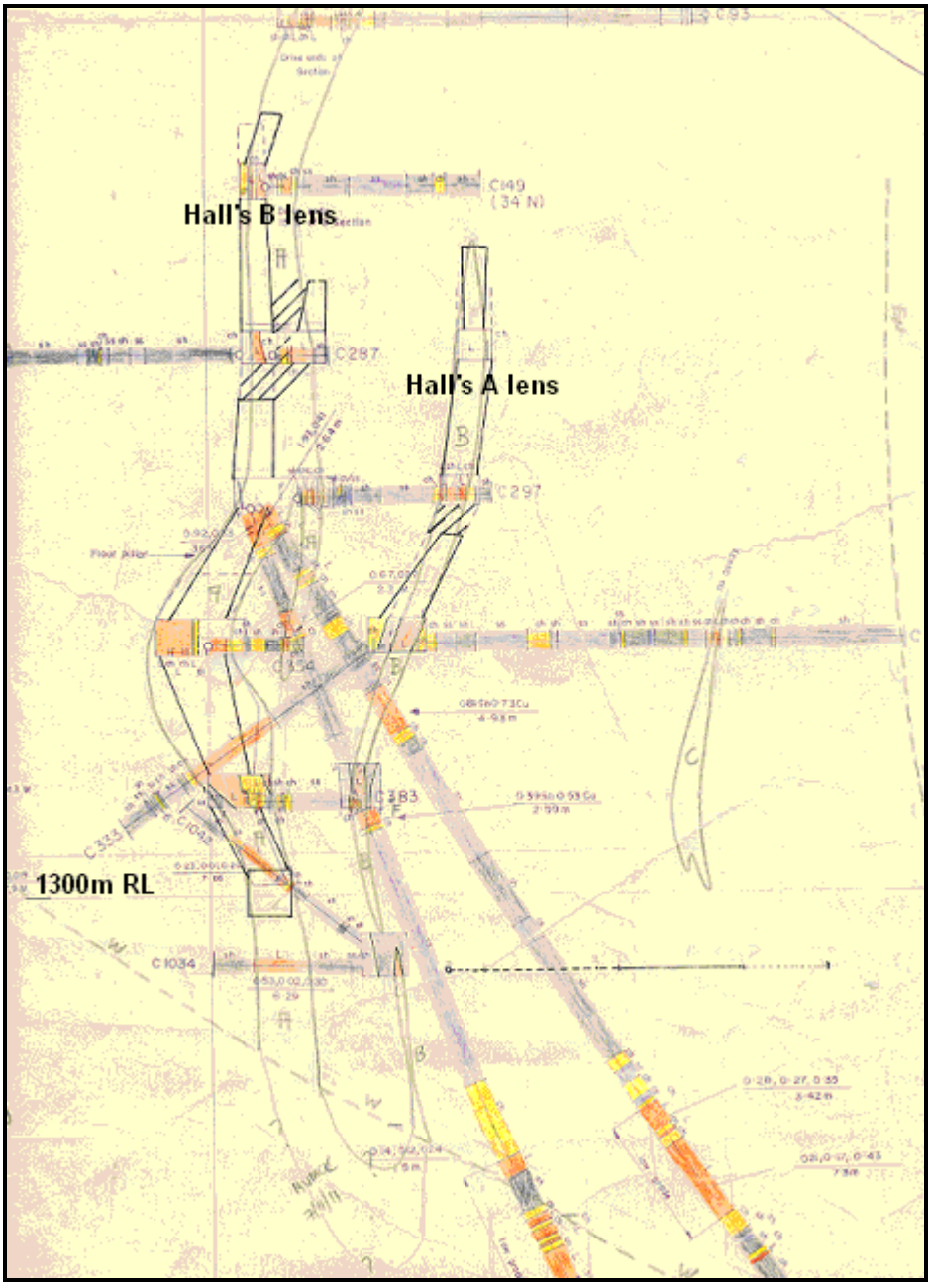


Figure 18 **Part of working cross-section N; it would be reasonable to connect the two pods of Henry's lode marked 1 to the pod marked 6.**

(Aberfoyle 1:500 working cross-sections)

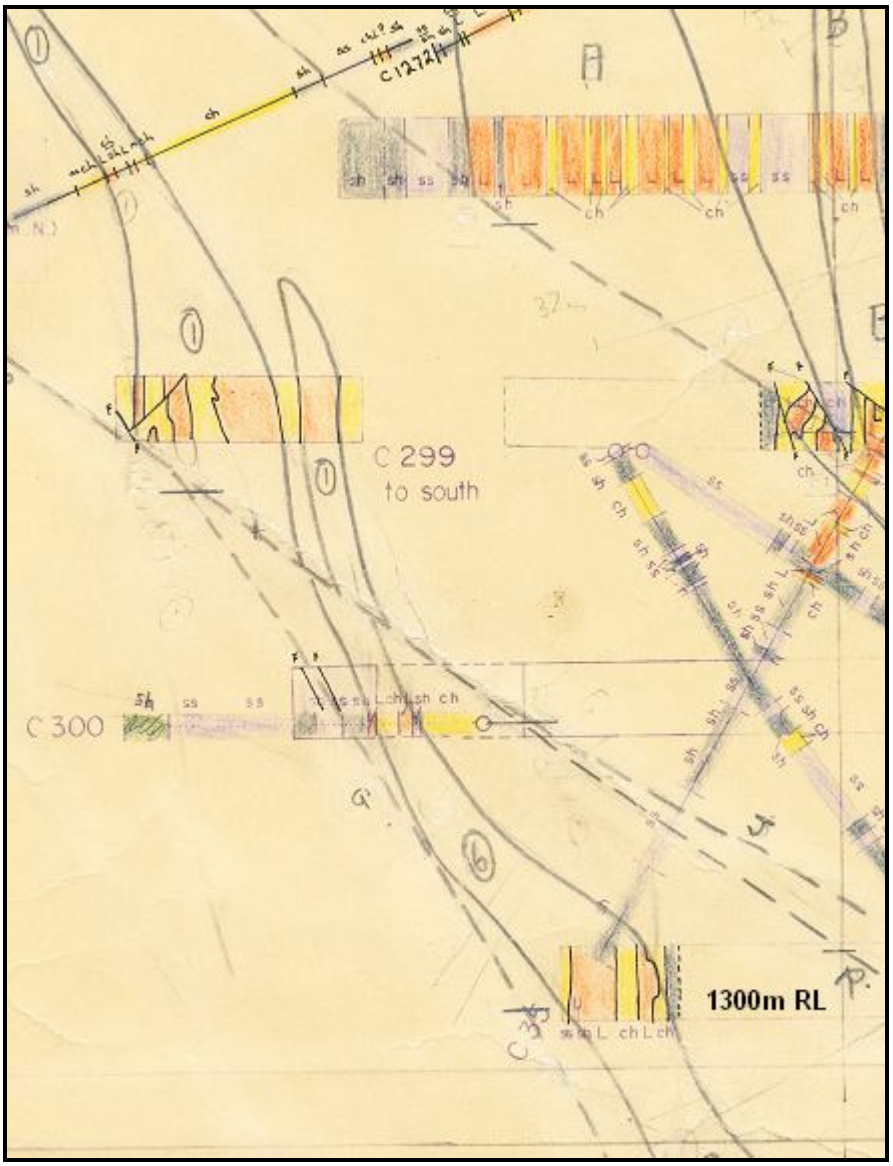
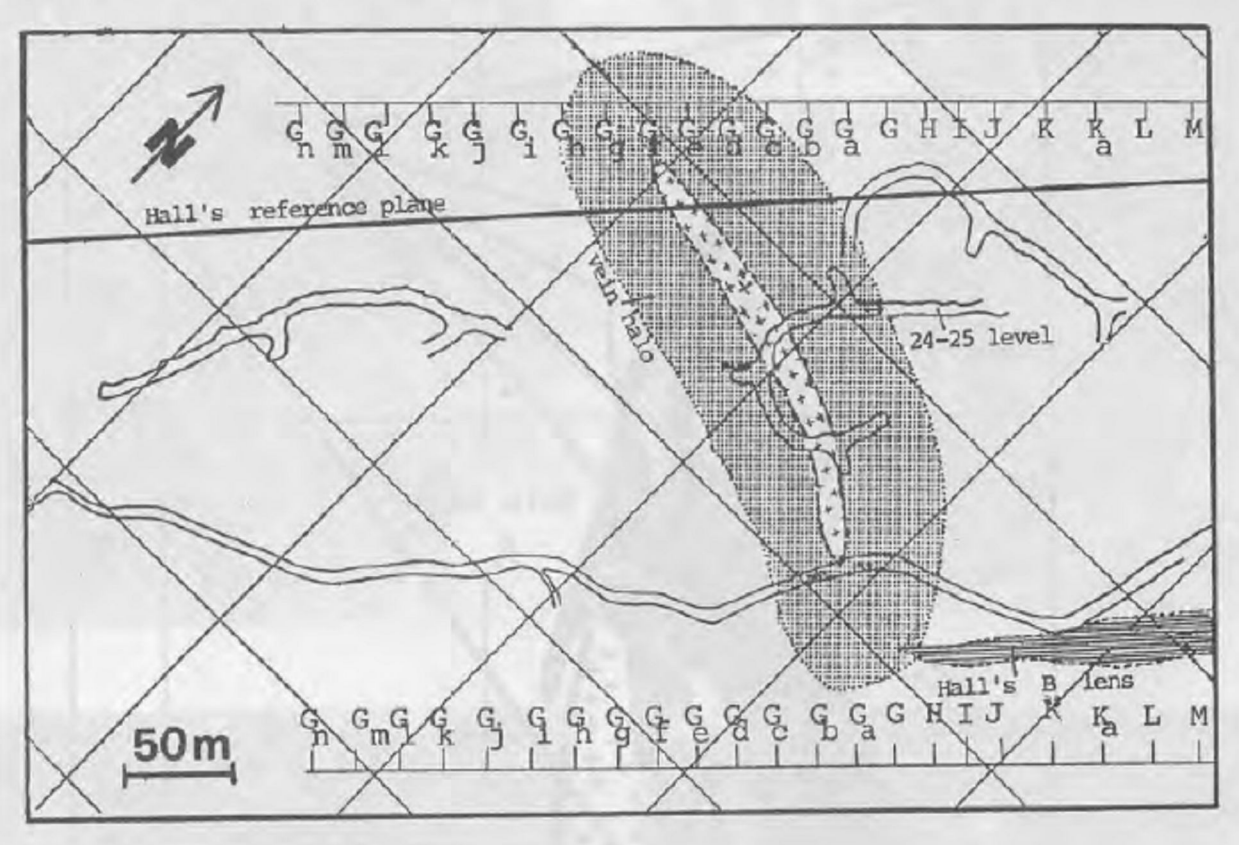


Figure 19 **Plan showing the quartz porphyry dyke and accompanying quartz vein halo and Hall's B lens.**

(Barth, 1986)



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5 DATABASE

5.1 Existing Data

Most of the information available for this report was compiled by Aberfoyle and associated parties over the period 1968 to 1986. There is a large repository of data and information regarding the Cleveland Mine which was accumulated by Aberfoyle and now held at the offices of the Burnie Research Lab, 39 River Road, Burnie, Tasmania. A catalogue of this data was made by Bright Phase and listed in a spreadsheet named "110723 BPRL Cleveland archive catalogue – Master.xlsx"

The Aberfoyle data includes drill logs, maps, reports and survey information. Drill logs exist for all holes drilled for geological purposes. A full set of 1:500 working cross-sections exists for the mine. ~~For the record, a complete set~~

MRT holds reports regarding exploration activity at and around Cleveland from around 1900 to the present day. These are all available via the Tiger Database on the MRT website. Many of these reports refer directly to the Cleveland Mine. Amongst the reports held by MRT is a report of the remaining resources made at mine closure (Dronseika, 1986).

MRT also holds many paper mine plans and sections. Of particular note is a set of plans and cross-sections showing the mine workings and bearing the date 1982. Despite the date on the plans, the plans appear to show the mine workings at mine closure, although this requires clarification. The mine plans show all development outlines and relevant survey station locations and numbers but not RLs. However, a file of survey station numbers with RLs was discovered in the Aberfoyle data held in Burnie; this data is considered critical and a copy of the spreadsheet of this data is attached (See Appendix 4).

MRT also holds drill core for 87 diamond drill holes at its Core Store at Mornington, Tasmania. For this report, samples taken from this core were used to verify the Aberfoyle assay data (See 5.2 Reliability of the Aberfoyle Data).

5.2 Reliability of the Aberfoyle Data

The Aberfoyle data was compiled during Aberfoyle's ownership of Cleveland from 1961 to 1986. During that time, Aberfoyle drilled 2040 diamond drill holes into the Cleveland deposit and mined about 5.65 million tonnes of ore over a period of 18 years, from 1968 to 1986. In the 1970s, Aberfoyle was one of the leading tin producers in Australia with four operating tin mines: Cleveland, the Storeys Creek and Aberfoyle mines in North-East Tasmania, and the Ardlethan mine in southern New South Wales. The author worked for Aberfoyle from 1970 to 1973 and was acquainted with many of the Aberfoyle staff who worked at Cleveland. He knows of no reason to doubt the technical competence of the geologists who worked at Cleveland~~.~~, in fact, Aberfoyle personnel were recognised as efficient operators with good record keeping and reporting practices.

During the work for this report, only one significant shortcoming in the data was discovered: only 1,547 of the drill logs included surveyed coordinates of the collars. However, it appears that all holes were plotted on the 1:500 working sections and, for the work for this report, the coordinates of 289 of the 493 holes which did not have records of surveyed coordinates were measured from the cross-sections. This meant that records of 204 holes were excluded from the database for the work for this report (See **Error! Reference source not found.**~~5.4~~ **Error! Reference source not found.**~~Data Used for the Creation of the Current Resource Block Model~~).

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Corollary validation of the data as it was used for the work for this report has confirmed the reliability of much of the data, for example, the collars of diamond drill holes drilled from the surface plot on the surface digital terrain model. There are discrepancies between the digital database and the data presented on the Aberfoyle working sections and these are discussed below (See 5.3 Digital Database).

An assessment of the validity of the Aberfoyle assay data was made by quartering some of the core held in the MRT Core Store and submitting the samples for assay at the Burnie Research Lab, a division of AMMTEC Ltd, and part of the ALS Group – a diversified international analytical laboratory group present in over 40 countries through a network of 140+ laboratories. Staff at the Burnie Research Lab are recognised experts in sample preparation and assaying for Sn.

111 samples were prepared by quartering drill core from parts of drill holes which had previously been split, sampled and assayed by Aberfoyle. The samples covered a range of Sn assays from about 0% to about 4% Sn. Sn content was determined by fused bead XRF, soluble Sn content by acid digest and AAS, and Cu content by AAS; the results are attached (See Appendix 6).

The length weighted average of the re-splits Sn assays was 0.84% compared with the length weighted average of the Aberfoyle Sn assays of 0.78%. As expected with smaller samples, the variance of the re-splits Sn assays was higher than the variance of the Aberfoyle Sn assays: 0.59 $\%^2$ compared with 0.44$\%^2$ (the “support effect”).

A graph of the two sets of Sn assays shows reasonable correlation between the two data sets with no obvious systematic error. Note that this is not a graph of re-assays of the same samples but a graph of samples taken, as far as possible and within the limits of the depth records in the core trays, adjacent to each other. Given these factors these results are a good confirmation of the reliability of the Aberfoyle Sn assay data.

The length weighted average of the re-splits Cu assays was 0.28% the same as the length weighted average of the Aberfoyle Cu assays. As expected with smaller samples, the variance of the re-splits Cu assays was higher than the variance of the Aberfoyle Cu assays: 0.21$\%^2$ compared with 0.13$\%^2$ (the “support effect”).

A graph of the two sets of Cu assays shows reasonable correlation between the two data sets with no obvious systematic error. Note, again, that this is not a graph of re-assays of the same samples but a graph of samples taken, as far as possible and within the limits of the depth records in the core trays, adjacent to each other. Given these factors these results are a good confirmation of the reliability of the Aberfoyle Cu assay data.

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Figure 20 Aberfoyle Sn Assays vs Re-splits Sn Assays
(111114 Cleveland drill logs – check assay comparison_MM.xls)

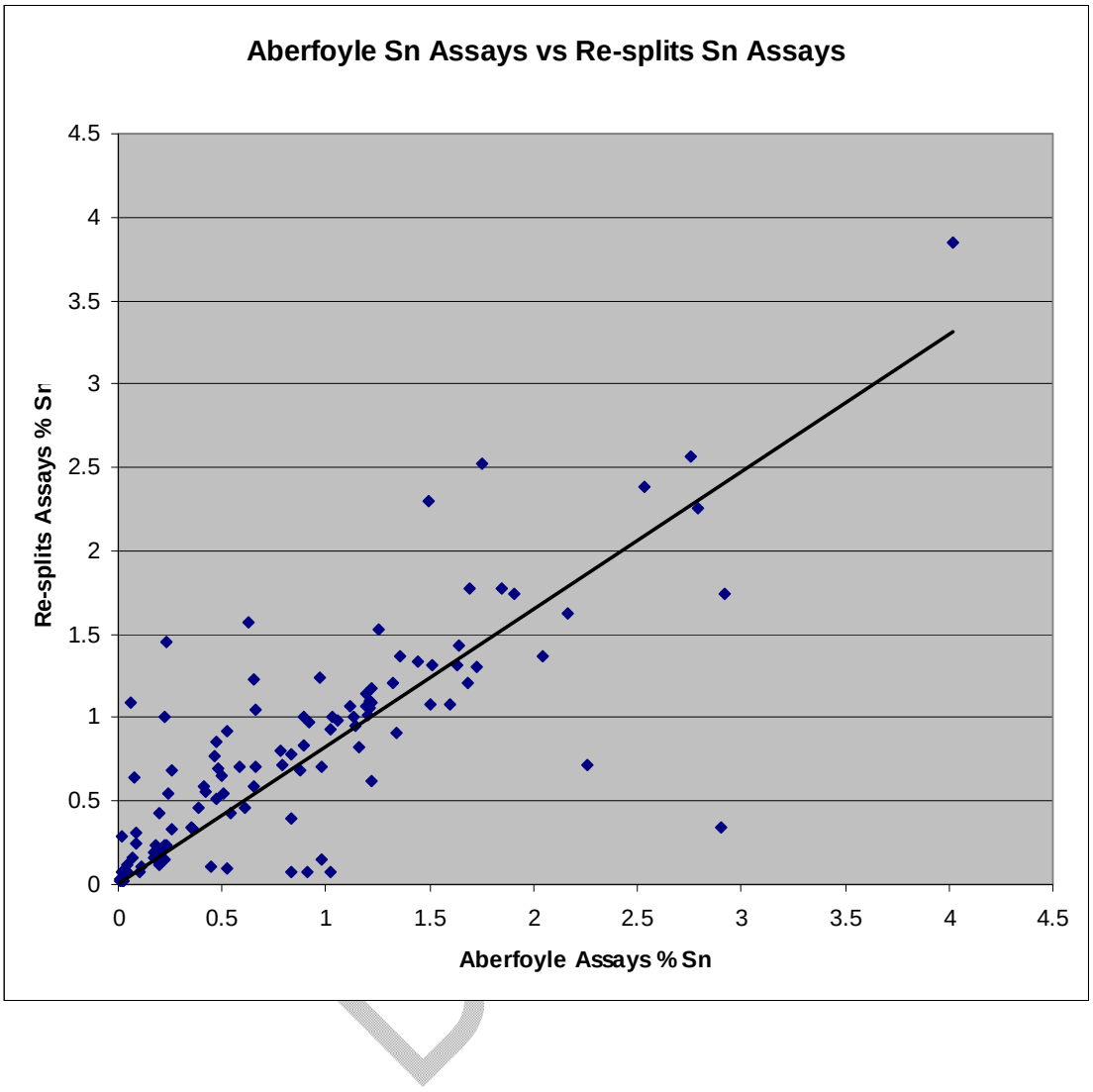
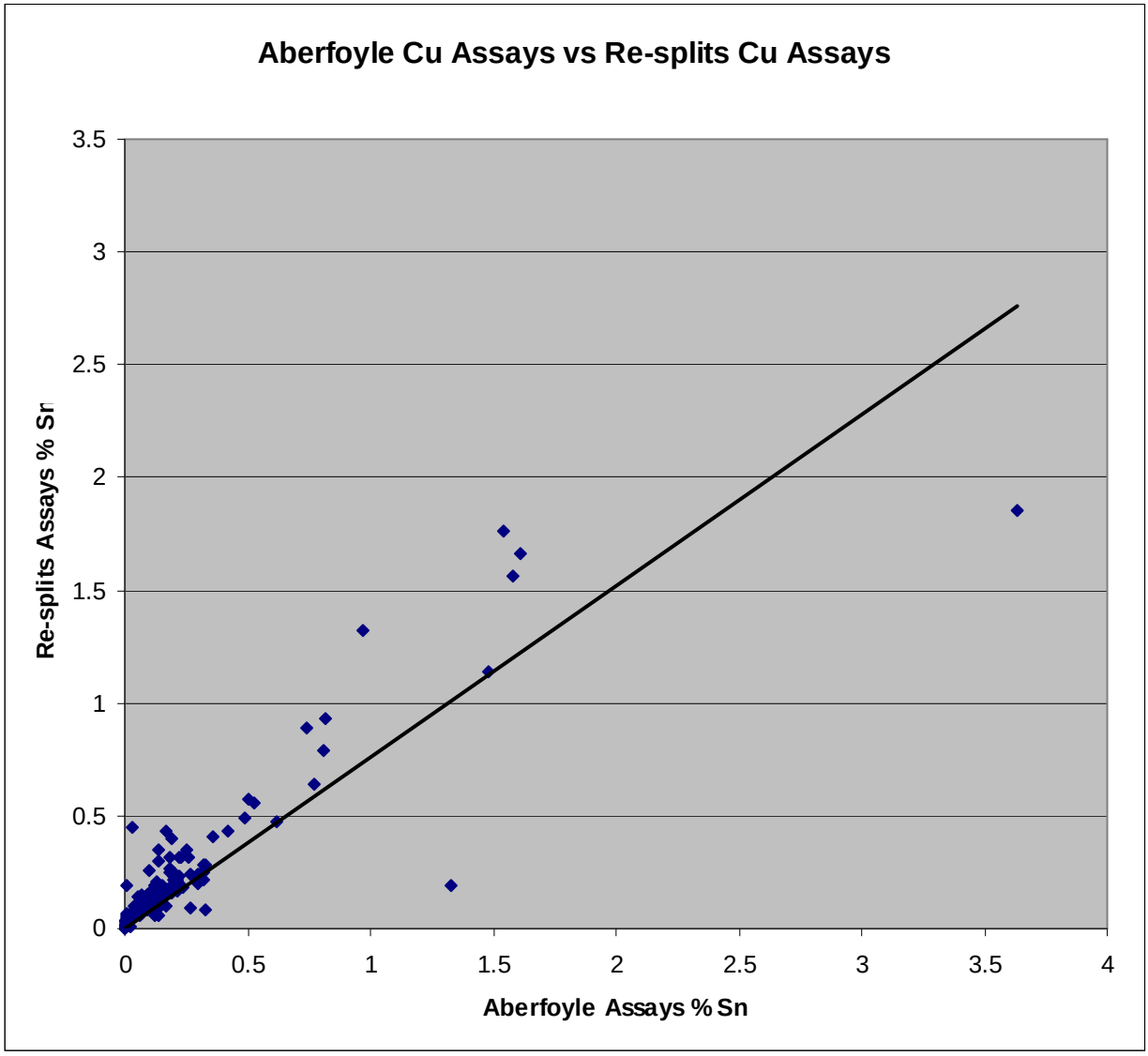


Figure 21 Aberfoyle Cu Assays vs Re-splits Cu Assays
(111114 Cleveland drill logs – check assay comparison_MM.xls)



5.3 Digital Database

Creation of a digital database of the Aberfoyle data is under way and the Aberfoyle data digitised so far includes:

- diamond drill hole collar locations;
- diamond drill hole surveys;
- assays of diamond drill core;
- lode intercepts, that is from depths and to depths of lodes as recorded by Dronseika in his 1986 resource report (Dronseika, 1986);

- mined out perimeters as recorded by Dronseika in his 1986 resource report (Dronseika, 1986);
- surface contours over the mine area;
- the location of the Cleveland Decline; this is correct in plan view but levels are approximate only.

As just mentioned, the drill hole database is still under way and, at present, records of 204 holes have been excluded from the database for the work infro this report (See 5.2 Reliability of the Aberfoyle Data). Also, during the work for this report, it was found that some of the drill hole data was incorrectly recorded or incorrectly entered into the database and, for now, data for holes with obvious errors have been excluded from the drill hole database; this has left data for 1819 drill holes in the database.

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6 MODELLING

6.1 Wireframes

Dronseika (1986) recorded 42 lodes (See Table 5). Of these, 11 were not modelled during the work for this report because they were small and, at this stage, continuity between cross-sections could not be assured.

Lode intercepts, that is depths from and depths to in drill holes, for Dronseika's 42 lodes were recorded in his resource report (Dronseika, 1986). These intercepts were plotted on cross-sections. Where fault traces were well defined on the 1:500 working cross-sections, they were also digitised.

Lode boundaries were interpreted on cross-sections in Surpac based on the following guides (For example, see Figure 22):

- drill hole plots of Dronseika's lode intercepts;
- drill hole plots of Sn assays;
- fault traces taken from the 1:500 working cross-sections;
- apparent stope limits based on the locations of the collars of some diamond drill holes, for example; see the lower part of Figure 22.

The lode boundaries were saved as Surpac strings.

The Surpac strings of the lode boundaries were linked to create wireframes, referred to in Surpac as digital terrain models ("DTMs") (See Figure 23).

The lode boundaries and wireframes are a first pass attempt only and clearly could be refined and extended. For example, the lodes which have not been modelled could be modelled and the boundaries of some lodes vary considerably from cross-section to cross-section (For example, see Figure 23). However, as a first attempt they are reasonable and, as discussed below (6.36.4 Global Resource EstimateResource Estimate) they provide reasonable confirmation of the Aberfoyle resource estimate made at mine closure (Dronseika, 1986)

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Table 5 **Lenses of lodes recorded by Dronseika; the lenses which have no Surpac wireframe file name in this table were not modelled for this report; note that Tulip, W, Ratchet, Nadir, Culshaw, En are all faults.**

(Dronseika, 1986)

Lens	Lens Code	Surpac Wireframe File Name
Henry's Lens Pod 1	HN01	
Henry's Lens Pod 2	HN02	
Henry's Lens Pod 3	HN03	
Henry's Lens Pod 3A	HN03A	
Henry's Lens Pod 5	HN05	
Henry's Lens Pod 6	HN06	lode06.dtm
Henry's Lens Pod 8	HN08	
Henry's Lens Pod 10	HN10	
Henry's Lens Pod 11	HN11	
Henry's West below Tulip	HNUT	lode10.dtm
Henry's West below Tulip	HNWUT	lode11.dtm
Henry's East below Tulip	HNEUT	lode12.dtm
Hall's A Lens above W Fault	HLA	lode13.dtm
Hall's B lens above W Fault	HLB	lode14.dtm
Hall's B Lens W – Ratchet Faults	HLBR	lode15.dtm
Hall's A1 Lens Ratchet – Nadir South of Culshaw	HLA1	lode16.dtm
Hall's A2 Lens Ratchet – Nadir South of Culshaw	HLA2	lode17.dtm
Hall's A2 Lens Ratchet – Nadir South of Culshaw	HLA3	lode18.dtm
Hall's A West Lens	HLAW	lode19.dtm
Hall's A East lens	HLAE	lode20.dtm
Hall's B lens Ratchet – Nadir South of Culshaw	HLBRN	lode21.dtm
Hall's B Lens West En - Tulip	HLBWT	lode22.dtm
Hall's B East Lens En - Tulip	HLBET	lode23.dtm
Hall's B lens below Tulip Fault	HLBUT	lode24.dtm

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Hall's B Lens above Ratchet Fault	HLCR	lode25.dtm
Hall's C Lens Ratchet - Nadir	HLCRN	lode26.dtm
Hall's C West Lens En - Tulip	HLCWT	lode27.dtm
Hall's C East Lens En - Tulip	HLCET	lode28.dtm
Hall's C Lens below Tulip Fault	HLCUT	lode29.dtm
Hall's D Lens above Ratchet	HLDR	lode30.dtm
Hall's D Lens En - Tulip	HLDT	lode31.dtm
Hall's D Lens Ratchet - Nadir	HLDRN	lode32.dtm
Hall's D Lens below Tulip	HLDUT	lode33.dtm
Hall's E Lens above Ratchet	HLER	
Hall's E lens En - Tulip	HLET	
Khaki West Lens	KKW	lode36.dtm
Khaki East Lens	KKE	lode37.dtm
Luck's Lode	LL	
B-South below 11	BS	lode39.dtm
Battery West Lens above 17 Level	BTW	lode40.dtm
Battery Lens Lens above 17 Level	BTE	lode41.dtm
Battery Lens below 17 Level	BT	

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Figure 22 **Part of cross-section G showing interpretation of Khaki East Lode in red; note that diamond drill holes C0848 and C0944 could reasonably be assumed to have been drilled from within a stope on Khaki East Lode.**

(cleveland.mdb, lode37.dtm)

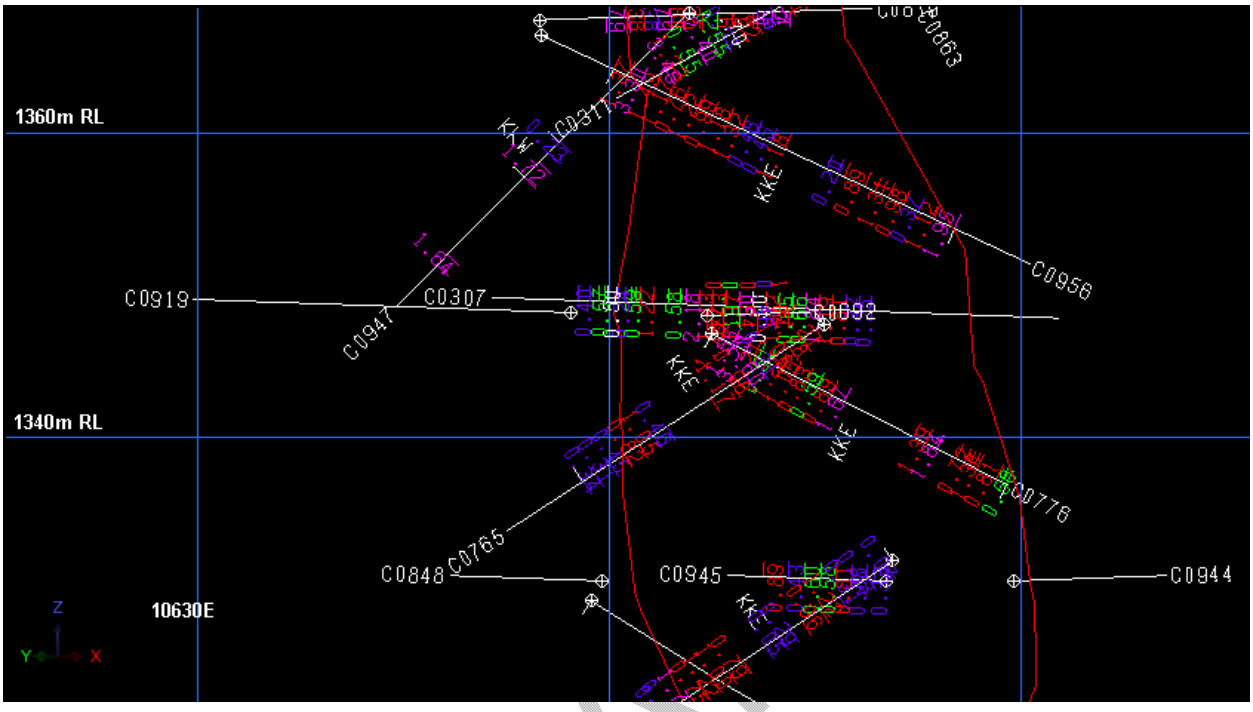

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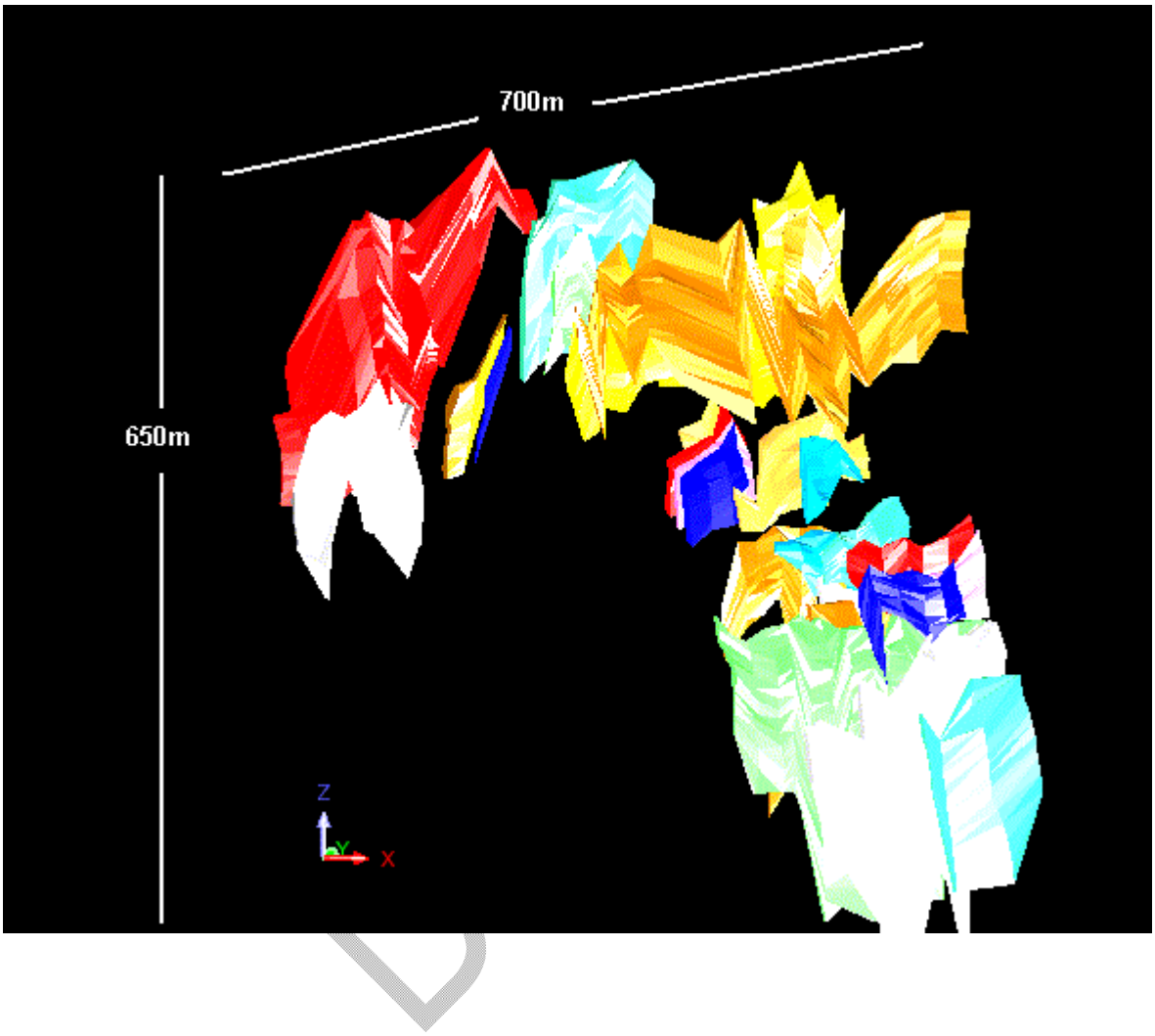
Figure 23 **Oblique view of the Surpac wireframes; note the orientation axes at the bottom right, Y is north and X is east; for example, Khaki East Lode is in red at the top left, and Hall's D Lens below; Tulip Fault is in pale blue at the bottom right.**



6.2 Block Model

6.2.1 Block Model Orientation and Block Size

A Surpac block model of the lodes was made using block model rotated to be parallel to the strike of Hall's Reference Plane.

The blocks in the model had the dimensions of 10m along strike, 10m vertically and 2m across strike with no sub-blocking allowed. Given the general cross-section spacing of about 20 to 25m, the relatively long dimensions of the lodes along strike and down dip compared to across trike, this block size was reasonable.

6.2.2 Attributes in the Block Model

Blocks were flagged with the attributes listed in Table 6.

Table 6 Attributes in Block model mocl1101.mdl (mocl1101.mdl)

Attribute	Description
lode_number	lode number as recorded in Table 5
bulk density	material density
mined_out	mined out flag: mined out = 1, not mined =0
sn_id2	Sn grade estimated by inverse distance squared method
cu_id2	Cu grade estimated by inverse distance squared method

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Lode numbers were assigned to appropriate blocks in the block model based on the wireframes listed in Table 5.

Bulk densities were allocated to air, waste rock and lodes:

- air = 0,
- waste rock = 2.7 tonnes per cubic metre, and
- lodes = 3.1 tonnes per cubic metre.

The lode bulk densities were based on those quoted in Dronseika (1986) of 3.05 tonnes per cubic metre for Henry's and Hall's Lodes and 3.08 tonnes per cubic metre for Khaki, B South and Battery Lodes. A density of 3.1 in a two component rock consisting of quartz and pyrrhotite only implies a S content due to pyrrhotite of about 8% which is reasonable given the mineral composition of the lodes.

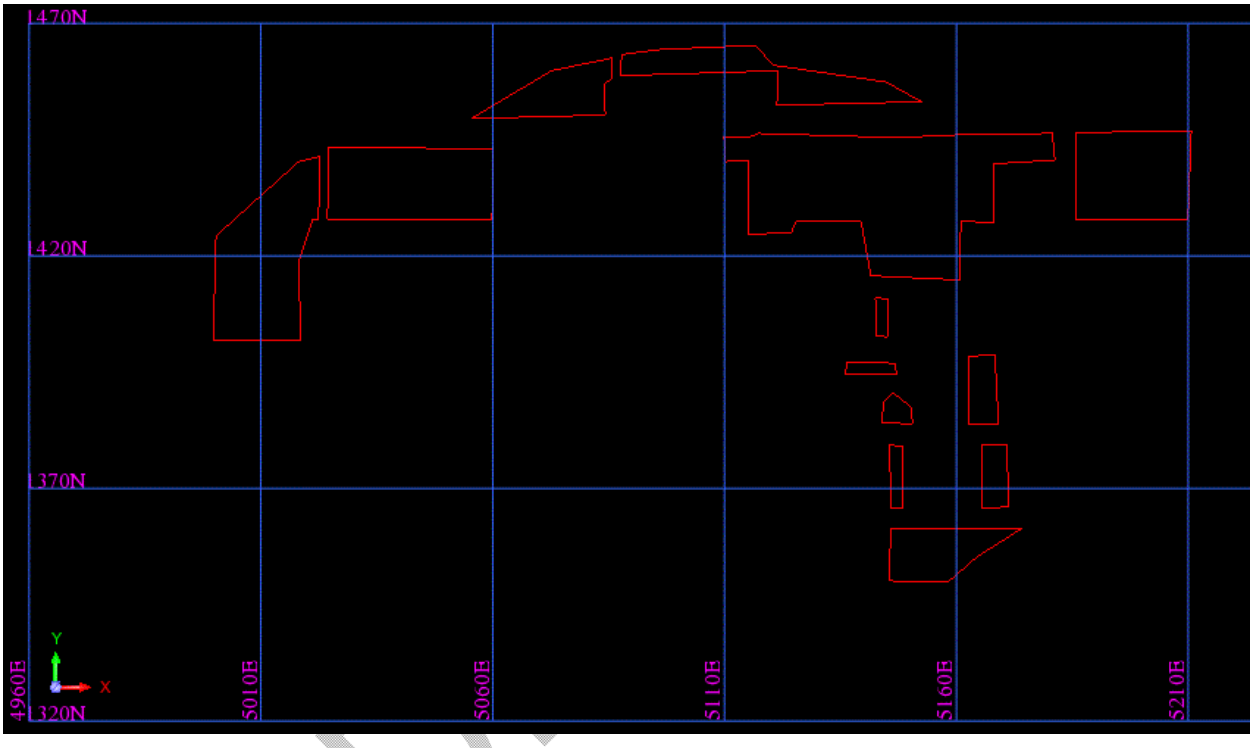
Two dimensional outlines of the mined-out parts of the lodes were included in Dronseika's closure resource report as longitudinal projections. These outlines were digitised (For example, see Figure 24) and used as cookie cutters to flag the blocks in the block model which had been mined out. No differentiation was made on the basis that some mine workings may not have

taken out the full width of the mineralisation and the full width of the mineralisation was depleted.

Interpolated Sn and Cu grades were stored in the attributes sn_id2 and cu_id2 and these are described below.

Figure 24 Depleted Parts of Hall's A Lens above W Fault: the depleted zones are outlined in red.

(lode_13_mined1.str)



6.2.3 Interpolation of Sn and Cu Grades into the Block Model

As mentioned above (5.3_Digital Database), Dronseika had listed the lode intercepts used for his 1986 resource estimate in his report and these had been taken into account for the geological interpretation and included in the database during the work for this report. These lode intercepts were used as flags to select the assays to be used for the grade interpolation for each of the 31 lenses modelled. For each lens, the assays were selected and composited to the appropriate length of 1.0m and used as the inputs to the Sn and Cu grade interpolations.

The locations of the composites generally coincided but tended to extend beyond the wireframes (For example, see **Error! Reference source not found.**~~Figure 25~~). This suggests that the digital interpretation used in the modelling work for this report requires refinement and will lead to an under-estimate of resources (See 6.3 Global Resource Estimate~~Resource Estimate~~). Some other composites plotted well away from their corresponding wireframes, suggesting errors during geological interpretation or data input. Despite, these kinds of error, given the time available for the creation of the block model for this report and the relatively low frequency of such error, no attempt to resolve the apparent errors was made which was reasonable for the purposes of this report.

Time did not permit a complete assessment of the basic statistics and geostatistics of the assays used for the grade interpolations for the block model, however, so far, preliminary statistics have provided one observation which will be useful in future resource estimates.

As expected the distribution of Sn assays in lodes is approximately log-normal but there appears to be more than one population of Sn assays within each lode (For example, see Figure 26): a lower grade population which probably represents assays of waste included within the lode boundaries, a middle grade population which constitutes the bulk of the assays, and, interestingly, a high grade population.

The existence of three populations of Sn assays, including a high grade population, is also illustrated by log-probability plots (For example, see Figure 27). This in turn reinforces an impression gained from scanning the assay database that higher grade assays of drill core tend to cluster together. The nature and extent of these higher grade Sn assays is currently not known.

The presence of mixed populations of Sn assays suggests that grade interpolations would best be made by multiple kriging runs or indicator kriging. Given the imperfect state of the digital drill hole database and the time available to prepare the block model for this report, variography adequate for any type kriging was not possible, so, grades were interpolated using a three dimensional inverse distance squared method. This method should result in a reasonably reliable estimate of global grades, that is grades of entire lodes but is less reliable in estimating lode grades above a cut-off grade.

Sn and Cu grades were interpolated using a search ellipsoid oriented with its major axis parallel to the general strike of the lodes, that is the strike of Hall's Reference Plane, its semi-major axis parallel to the general dip of the lodes, that is vertical, and its minor axis across the general dip of the lodes, that is perpendicular to Hall's Reference Plane. The search ellipse extended 100m along strike and down-dip and 10m across strike. Given the drill hole spacing, this search distance will ensure that most blocks are informed by multiple samples.

The minimum number of samples necessary to inform a block was set at 1 and the maximum number at 10.

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Figure 25 **Location of Samples used in the Grade Interpolation for Hall's C Lens above Ratchet Fault: the lode wireframe is in yellow, the composite sample locations are shown as blue crosses.**

(lode25.dtm and comps25.str)

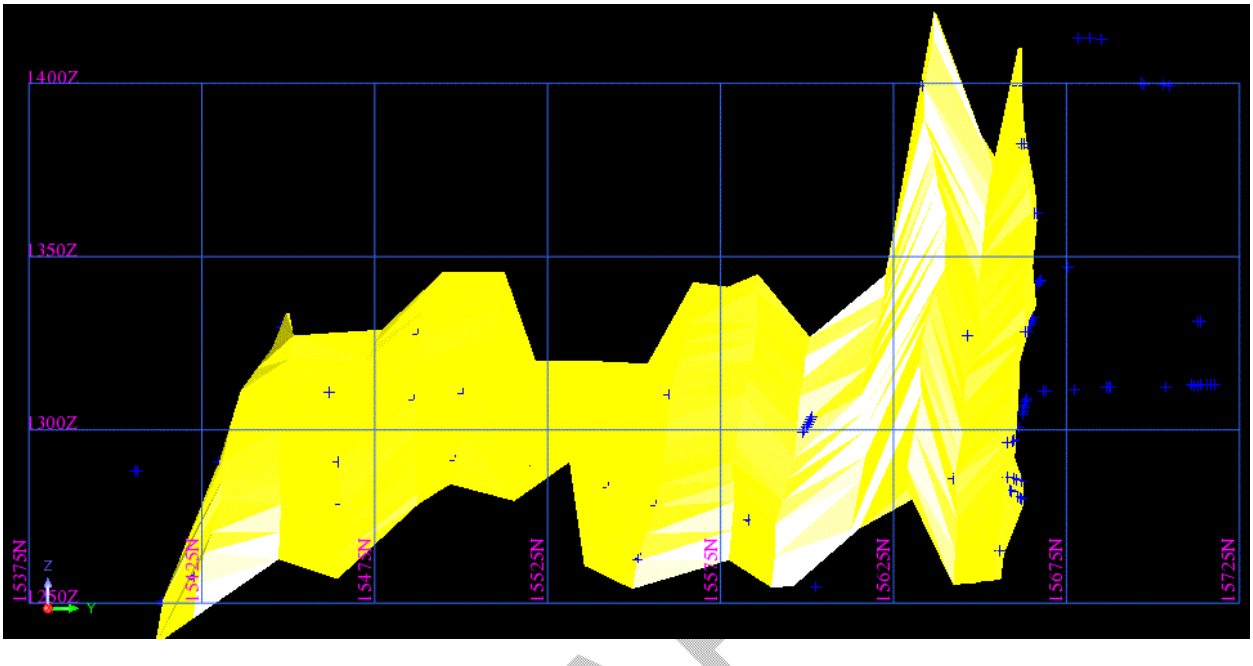

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Figure 26 **Histogram of log10(%Sn) in Composited Assays from Hall's C Lens above Ratchet Fault; note that the histograms slightly skewed and apparently contains more than one population of assays centred around -1.2 = about 0.1% Sn, 1.0 = 1.0% Sn, and 0.8 = 5.3% Sn.**

(comps25.str)

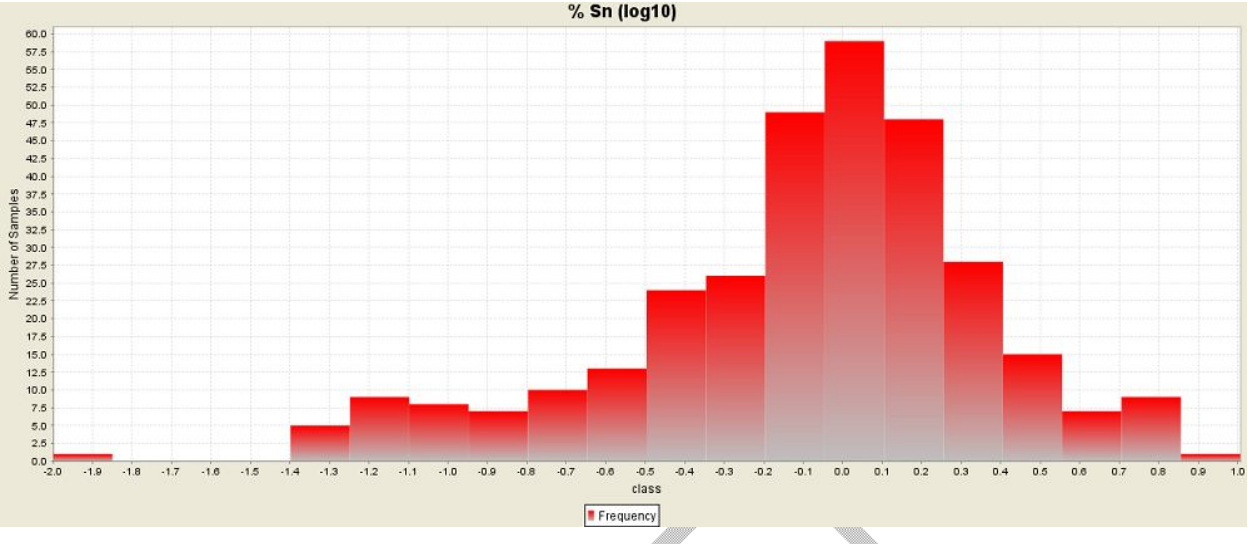
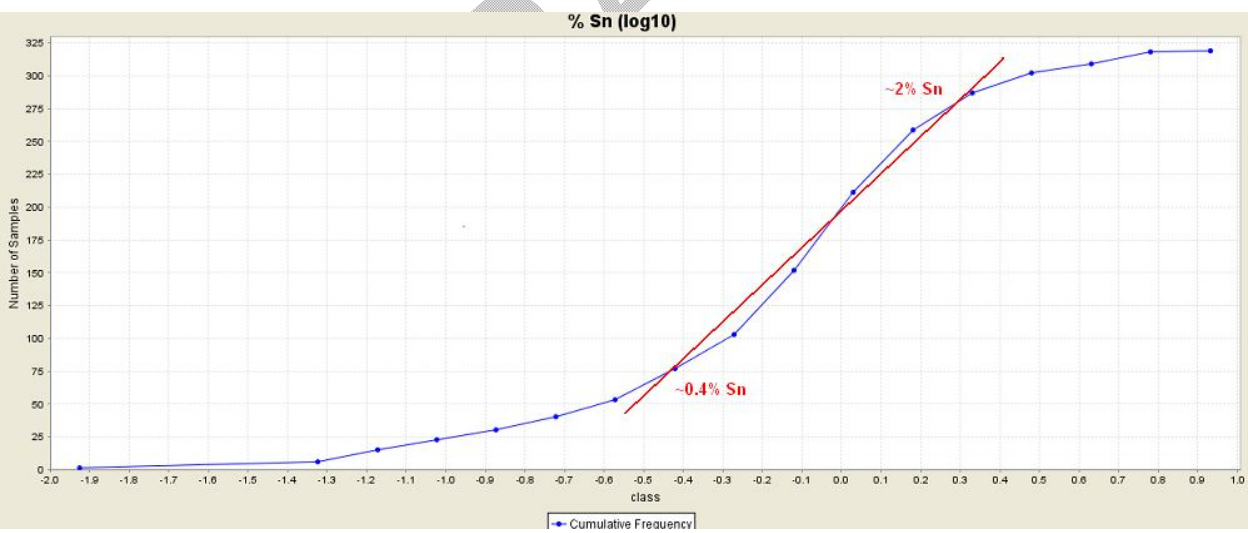


Figure 27 **Log-probability Plot of Composite assays from Hall's C Lens above Ratchet Fault: note the breaks in the distribution at about 0.4% Sn and 2.0% Sn.**

(comps25.str)



6.3 Global Resource Estimate

The global resource estimate from the current block model is listed in Table 7. The two estimates show very good agreement in grades and reasonable agreement in tonnes given that not all the lode mineralisation was modelled in the current block model. The Aberfoyle estimate of the remaining resource which was made at mine closure appears to be confirmed as a reasonable estimate.

An increase in the resource tonnage in the current block model will come from inclusion of mineralisation in:

- Currently un-modelled lenses: Henry's Lens Pods 1,2,3, 3A, 5, 8,10 and 11; Hall's E Lens above Ratchet and Hall's E Lens En – Tulip; Lucks Lode; Battery Lens below 17 Level.
- Extensions of current digital lode interpretations on cross-sections so that the lode interpretations are geologically continuous from cross-section to cross-section.
- Extensions of current digital lode interpretations along strike and down-dip so that the lode interpretations terminate in a geologically sensible way.

In addition, accurate digitising of the existing mine workings will add a small tonnage to the global resource as well as facilitating future mine planning.

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Table 7 Comparison of the Global Resource Estimate for this Report and the Aberfoyle 1986 Resource Estimate.

(mocl1101.mdl and global.xls and Dronseika, 1986)

Lode	This Estimate (no cut-off)			Aberfoyle Estimate (0.35% Sn cut-off)		
	tonnes	% Sn	% Cu	tonnes	% Sn	% Cu
Hall's	4,030,000	0.69	0.27	4,500,000	0.71	0.30
Henry's	1,120,000	0.70	0.48	450,000	0.81	0.47
Khaki and Luck's	500,000	0.70	0.22	720,000	0.70	0.22
Battery and B-South	240,000	0.55	0.25	810,000	0.64	0.25
Total	**4,900,000**	**0.69**	**0.27**	**6,500,000**	**0.70**	**0.31**

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7 EXPLORATION POTENTIAL

As the work for this report progressed, potential for future exploration in the Cleveland Mine became clearer:

There is potential for further lode discovery down-dip and a re-interpretation of the lode boundaries will assist with assessing likely down-dip targets.

Since the 1960s no new lodes have been discovered at Cleveland; all the additions to the resource have come from the delineation of down-dip extensions of the known lodes: Hall's, Henry's, Khaki, Luck's and battery lodes all of which were identified in outcrop. The replacement style of the lode mineralisation in a large package of sedimentary rocks and comparison with Renison suggest that this should not be so. There is potential to test for new lodes within the mine itself, along strike of, and between, the known lodes, and along strike beyond the limits of the known lode system. At Renison, the mineralisation plunges significantly both to the north and south of the mine and this could also be the case at Cleveland.

There is currently no reason why the mineralisation does not extend beyond the known limits. The granite beneath the mine has not been met with in drilling and, even if it were, it would not necessarily provide a base to the mineralisation, for example, in Cornwall many tin lodes extend down to be hosted in granite.

This report did not address the tungsten resource in Foley's Lode and the reader is referred to separate reports (Dronseika, 1983 and McKeown, 2011) for details of that mineralisation.

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8 REFERENCES

Barth, von Wolfgang H., 1986. Geology of the Cleveland tin mine, Tasmania, Australia with special reference to mineral chemistry and rare earth distribution. Doctoral thesis, University of Heidelberg, Germany.

Carey, S.W., 1945. Geological Report of the Mt. Cleveland Tin Mine. Unpublished Report, Tasmania Department of Mines, 10th April 1945.

Collins, P.L.F., 1981. The geology and genesis of the Cleveland tin deposit, Western Tasmania: fluid inclusion and stable isotope studies *in Economic Geology*, volume 76, pages 365-392.

Collins, P.L.F., Brown, S.G., Dronseika, E.V. and Morland, R., 1989. Mid-Palaeozoic Ore Deposits *in Geology and Mineral Resources of Tasmania (Eds. C.F. Burrett and E.L. Martin), Special Publication 15, Geological Society of Australia Incorporated.*

Cottle, V.M., 1953. Magnet silver-lead mine *in Geology of Australian Ore Deposits, Fifth Empire Mining and Metallurgical Congress Australia and New Zealand, 1953 (Ed. A.B. Edwards), The Australasian Institute of Mining and Metallurgy.*

Cox, R. and Glasson, K.R., 1967. The Geology and Mineralisation of Cleveland Mine in The Geology of Western Tasmania –a Symposium, University of Tasmania, Department of Geology, November 1967.

Dronseika, E.V., 1983. Geological assessment of the Foley zone mineralisation at Cleveland mine Tasmania, May 1983. Unpublished report for Cleveland Tin Ltd.

Dronseika, E.V., 1986. Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Unpublished report for Aberfoyle Resources Limited, Cleveland Division by E.V. Dronseika, Senior Mine Geologist.

Hughes, T.D., 1952. The Cleveland Mine. Unpublished Report, Tasmania Department of Mines, 4th November 1952.

Hughes, T.D., 1953a. The Mount Cleveland Mine. Unpublished Report, Tasmania Department of Mines, 13th July 1953.

Hughes, T.D., 1953b. Cleveland Mine. Unpublished Report, Tasmania Department of Mines, 123rd October 1953.

Hughes, T.D., 1954. The Mt. Cleveland Mine – Supplementary Report. Unpublished Report, Tasmanian Department of Mines, 2nd June 1954.

Jackson, P., Changkakoti, A., Krouse, H.R. and Gray, J., 2000. The origin of the greisen fluids of the Foleys zone, Cleveland tin deposit, Tasmania, Australia *in Economic Geology volume 95, pages 227-236.*

Keunecke, O. and Tate, K.H., 1954. Records 1954 No. 7. Geophysical Survey at Mt. Cleveland Mine, Waratah, Tasmania. Commonwelath of Australia, Department of National Development, Bureau of Mineral Resources, Geology and Geophysics.

Leaman, D.E. and Richardson, R.G., 1989. The granites of west and north-west Tasmania – a geophysical interpretation. Geological Survey Bulletin 66, Tasmania Department of Mines.

Leaman, D.E. and Richardson, R.G., 2003. A geophysical model of the major Tasmanian granitoids. Tasmanian Geological Survey Record 2003/11, Mineral Resources Tasmania.

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Mason, A.A.C., 1965. Tin ore deposits of Mount Cleveland *in Geology of Australian Ore Deposits, Eighth Commonwealth Mining and Metallurgical Congress, Australia and New Zealand, 1965 (Ed. John McAndrew), The Australasian Institute of Mining and Metallurgy.*

Mason, A.A.C., Glasson, K.R. and Hopwood, T., 1963. Outline of proposed exploratory development and ore testing programme. Aberfoyle Tin Development Partnership (Mount Cleveland Project), November 1963.

McKeown, M.V., 2011. Cleveland Mine, Luina, Tasmania, Independent Geologist's Report for Bright Phase Resources Pty ~~l~~Ltd.

Ransom, D.M. and Hunt, F.L., 1975. Cleveland tin mine in Knight, C.L. (editor), 1975, Economic Geology of Australia and Papua New Guinea, Monograph Series No. 5, The Australasian Institute of Mining and Metallurgy.

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Appendix 1

Grid Convention

MEMORANDUM

To:	**File**		
From:	**Mick McKeown**	**Date:**	**28 June 2011**
Project:	**Bright Phase Resources Limited – Cleveland Mine**		
Subject:	**ABERFOYLE GRIDS**		

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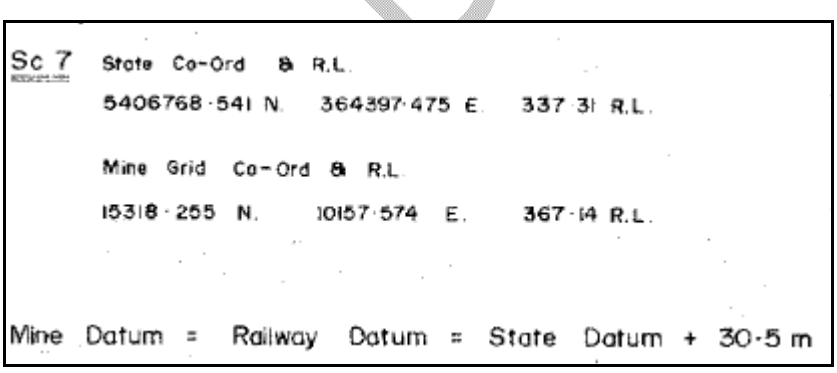
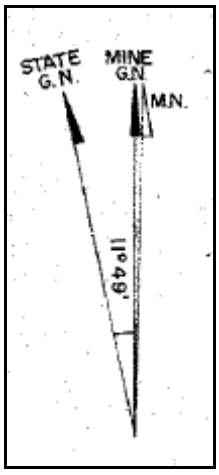
Cleveland Mine Grid

The relationship between the Cleveland Mine Grid and the Tasmanian State Grid was shown on a plan prepared by Aberfoyle Ltd in December 1980 (See below).

Note that the State Grid referred to on the Aberfoyle plan is the Australian Geodetic Datum 1966 known as AGD66. This is the older datum which was generally in use prior to 31 March 2003. Tasmania now operates on a new State Grid known as GDA94 and coordinates in the two systems are significantly different.

To convert form AGD66 to GDA94 or vice versa, there is a calculator on the Land Victoria website which can be accessed using this hyperlink: GDAit Online Coordinate Transformations.





The floor level at 7 Adit Portal is at approximately 343m RL.

References

Plan 216_010c Lease plan Dec 1980.pdf

Dronseika, E.V., 1986. Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Open file report for Aberfoyle Resources Limited, Cleveland Division by E.V. Dronseika, Senior Mine Geologist. (MRT 87_2624)

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Appendix 2

Aberfoyle Reference Planes and Cross-section Conventions

MEMORANDUM

To:	**File**		
From:	**Mick McKeown**	**Date:**	**8 November 2011**
Project:	**Bright Phase Resources Limited – Cleveland Mine**		
Subject:	**ABERFOYLE REFERENCE PLANES AND SECTION NUMBERS**		

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The relationship between the Cleveland Mine Grid and the Tasmanian State Grid is explained in a separate memo.

The Cleveland Mine Grid is not parallel to the strike of any of the mineralisation. Consequently, two reference planes were established for cross-sections and longitudinal projections:

- Hall's Reference Plane
- Battery Reference Plane

Hall's Reference Plane (Hall's, Henry's and Khaki Lodes)

Hall's Reference Plane strikes $42^{O}16'25" = 42.2736^{O}$ east of Cleveland Mine Grid north (for example, see Level Plan MLP-14Sa).

Hall's Grid was defined for work by Mining One:

- at G Section where Halls' Reference Plane and the section intersect at 5000N 3000E on Hall's Grid = 15446.4N 10774.7E on Cleveland Mine Grid.
- where Hall's Reference Plane at 5410.3N 3000E passes through 15750.0N 11050.7E as measured from mine level plans.

Cross-sections along Hall's Reference Plane are numbered from south-west to north-east (on the Cleveland Mine Grid) from Gp to Z and the cross-section planes are not regularly spaced, for example refer to Figure 1 below. Table 1 lists the coordinates of the cross-section planes on Hall's Reference Plane as noted in Aberfoyle data.

Coordinates for transformation from Hall's to mine Grid and back are:

Hall's Grid	Cleveland Mine Grid
Y1 = 5000	Y1 = 15446.4
X1 = 3000	X1 = 10774.7
Y2 = 5410.3	Y2 = 15750
X2 = 3000	X2 = 11050.7

Battery Reference Plane

Battery Reference Plane strikes 020.00^{O} relative to Cleveland Mine Grid north.

Table 2 Cross-section Coordinates on Battery Reference Plane; these were measured from a plan (Dronseika, 1985)

Cross-section on Battery Reference Plane	Cleveland Mine Grid Coordinates	
	north	east
D	15,333.5	10,810.5
F	15,381.5	10,827.5

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Table 1 Cross-section Coordinates on Hall's Reference Plane

Cross-section on Hall's Reference Plane	Reference Line Northing (G at 5000mN)	Distance south of G Section metres	Cleveland Mine Grid Coordinates	
			north	east
Gn	4732	-268		
Gm	4752	-248		
Gl	4772	-228		
Gk	4792	-208		
Gj	4812	-188		
Gi	4832	-168		
Gh	4852	-148		
Gg	4872	-128		
Gf	4890	-111		
Ge	4909	-91		
Gd	4927	-73		
Gc	4945	-55		
Gb	4963	-37		
Ga	4982	-18		
G	5000	0	15,446.4	10,774.7
H	5018	18		
I	5033	33		
J	5049	49		
K	5072	72		
Ka	5095	95		
L	5118	118		
M	5139	139		
N	5158	158		
O	5180	180		
P	5200	200		
Q	5222	222		

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Qa	5240	244		
Qb	5258	266		
R	5277	277		
S	5292	292		
T	5310	310		
Ta	5323	323		
U	5336	336		
V	5361	361		
Va	5384	384		
W	5407	407		
Wa	5437	437		
X	5457	457		
Y	5497	497		
Z	5517	517		

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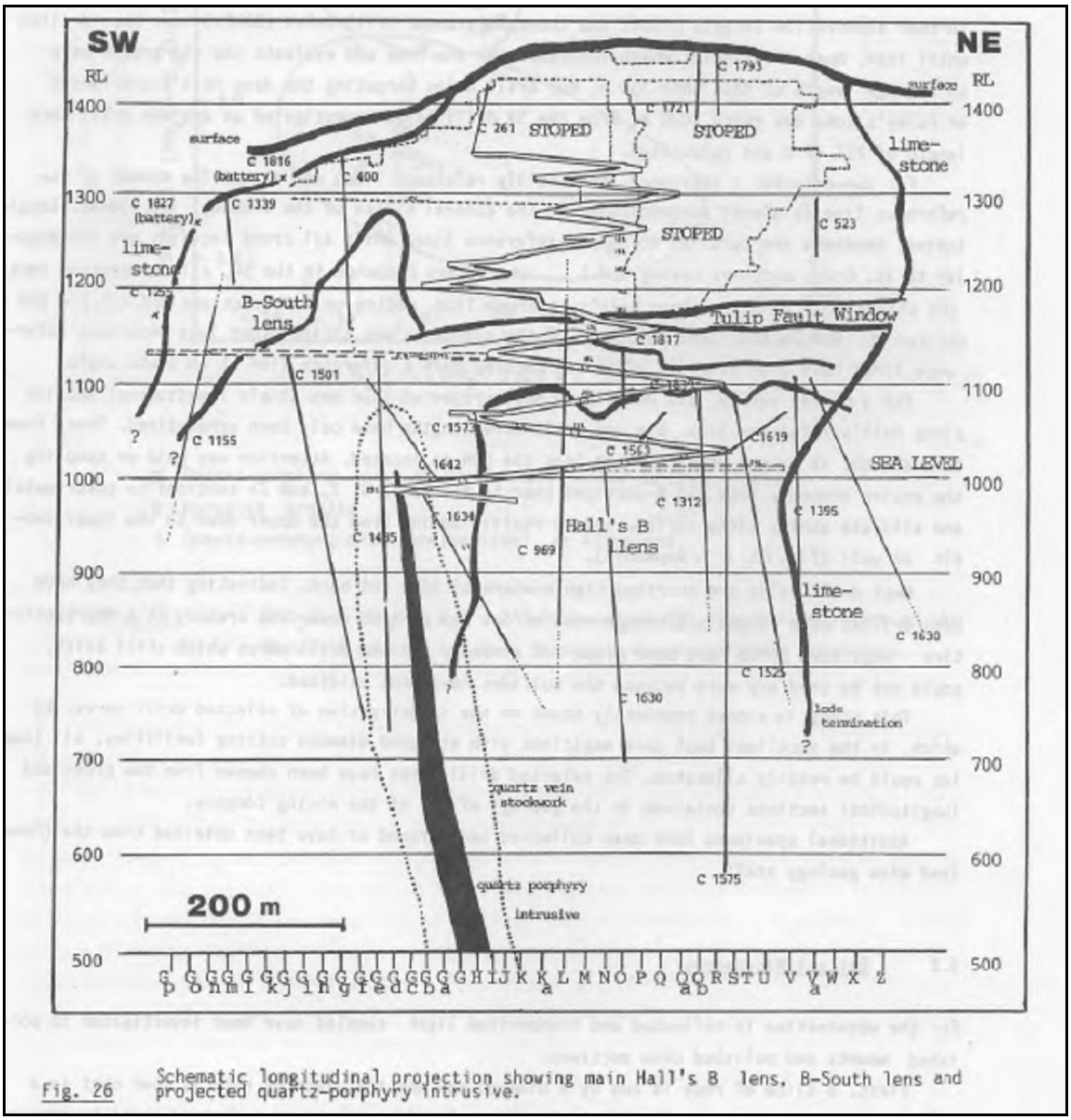
Figure 1 Drawing showing cross-section numbers along Hall's Reference Plane (Barth, 1986)


SW
NE
RL
1400
1300
1200
1100
1000
900
800
700
600
500
surface
C 1816
(battery)
C 400
C 1827
(battery)
C 1339
C 261
STOPED
C 1721
STOPED
C 1793
lime-
stone
C 523
STOPED
B-South
lens
Tulip Fault Window
C 1817
C 1501
C 1155
C 1573
C 1642
C 1634
C 1485
C 969
C 1561
C 1312
C1619
SEA LEVEL
C 1395
Hall's B
lens
lime-
stone
C 1630
C 1525
C 1630
lode
termination
quartz vein
stockwork
quartz porphyry
intrusive
C 1575
200 m
G G G

Battery Reference Plane

Battery Reference Plane strikes 020.00^{O} relative to Cleveland Mine Grid north.

Table 2 Cross-section coordinates on Battery Reference Plane

Cross-section on Battery Reference Plane	Cleveland Mine Grid Coordinates	
	north	east
D	15,333.5	10,810.5
F	15,381.5	10,827.5

References

Barth, von Wolfgang H., 1986. Geology of the Cleveland tin mine, Tasmania, Australia with special reference to mineral chemistry and rare earth distribution. Doctoral thesis, University of Heidelberg, Germany.

Dronseika, E.V., 1985. Plan: EL34/82 Cleveland Tin Ltd, Geological Interpretation 1:1000, August 1985.

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Appendix 3

Level Elevations in the Cleveland Mine

MEMORANDUM

To:	File		
From:	Mick McKeown	Date:	18 July 2011
Project:	Bright Phase Resources Limited – Cleveland Mine		
Subject:	ABERFOYLE LEVELS		

The RLs of the Cleveland Mine Levels currently assumed are listed in Table 1. There are no RLs shown on the plans received from MRT and dated 31 December 1981.

The levels were measured from a cross-section included in Collins et al, 1989.

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Table 1 Cleveland Mine – Levels and RLs

Level	Floor RL
1	
2	
3	
4	
5	
6	
7	1350 (portal 1343)
8	1330
9	1310
10	1290
11	1270
12	1250
13	1230
14	1210
15	1190
16	1170

17	1150
18	1130
19	1110
20	1090
21	1070
22	1050
23	1030
24	1010
25	990
26	970
27	950
28	930
29	910
30	890

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References

Collins, P.L.F., Brown, S.G., Dronseika, E.V. and Morland, R., 1989. Mid-Palaeozoic Ore Deposits in Geology and Mineral Resources of Tasmania (Eds. C.F. Burrett and E.L. Martin), Special Publication 15, Geological Society of Australia Incorporated.

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Appendix 4

Survey Station Numbers and Coordinates at Cleveland

Station Number	N	E	RL
715	1539?.?6	10892.58	
716	15419.04	10914.30	
717	15444.10	10939.35	
718	15479.62	10975.34	
719	15501.92	10986.87	
720	15511.91	10976.77	
801	15514.80	10960.00	
812	15493.69	10952.90	
830A	15445.79	10899.28	
831	15424.17	10893.42	
832	15415.45	10916.12	
901	15460.66	10958.81	
D9/1	15503.35	10998.59	
D9/2	15514.01	11018.02	
D9/3	15495.60	11030.60	
D9/4	15486.41	11028.24	
D9/5	15460.76	11003.93	294.925
D10/1	15438.29	10983.05	293.114
D10/2	15405.41	10954.14	288.127
D10/3	15394.56	10938.70	284.668
D10/4	15401.92	10919.79	281.675
D10/5	15420.30	10921.14	280.492
D10/6	15427.16	10927.52	279.172
D11/1	15460.32	10957.62	275.152
D11/2	15480.755	10976.816	270.485
D11/3	15486.969	10991.658	267.548
D11/4	15481.555	11003.022	266.000
D11/5B	15463.407	11008.902	264.004
D11/6A	15452.062	10996.205	262.371
D11/7A	15445.567	10947.914	256.718
D12/1	15548.607	10849.940	257.738
D12/3	15576.474	10817.521	251.718
D12/4	15572.670	10797.905	250.134
D12/5	15548.427	10788.307	247.468
D12/6	15516.181	10795.088	243.442
D12/7	15484.397	10805.050	239.229
D13/1	15460.962	10812.400	237.112
D13/2	15442.499	10818.155	234.588
D13/3	15416.596	10813.560	231.116

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D13/5	15412.560	10769.268	228.035
D13/6	1543?.?02	10757.870	226.076
D13/7	15454.?96	10765.355	223.760
D13/8	15466.299	10782.154	222.551
D14/2	15425.644	10819.330	216.836
D14/3	15393.362	10793.567	212.118
D14/4	15381.691	10778.591	208.520
D14/5	15386.270	10755.588	205.548
D14/6	15404.126	10750.086	204.690
D14/7	15411.891	10753.187	204.497
D14/8	15415.211	10756.061	204.677
D14/9	15431.017	10770.386	202.884
D14/10	15453.695	10790.654	201.762
D14/11	15464.235	10797.878	201.171
D15/1	15486.474	10814.501	197.157
D15/2	15478.494	10837.880	
D15/2A	15478.477	10837.878	196.083
D15/3	15455.780	10866.611	189.372
D15/4	15432.272	10890.393	185.571
D15/5	15432.405	10909.372	183.441
D16/1	15447.941	10922.317	182.179
D16/2	15468.725	10920.514	179.168
D16/2A	15473.978	10917.524	179.022
D16/3	15497.979	10904.576	174.284
D16/4	15516.437	10895.145	171.672
D16/5	15537.531	10896.973	168.422
D16/6	15552.502	10913.350	165.397
D16/7	15554.231	10932.572	163.122
D16/8	15538.735	10950.516	161.072
D16/9	15516.191	10953.475	158.502
D16/10A	15499.981	10938.725	155.238
D17/1	15484.971	10910.714	151.123
D17/2	15468.660	10880.519	146.933
D17/3	15458.109	10853.441	143.149
D17/4	15430.874	10833.491	139.454
D17/5	15402.641	10839.378	136.025
D17/6	15389.218	10857.095	132.820
D17/8A	15422.880	10905.396	
D17/7B	15388.944	10884.076	
D17/9A	15419.???	10903.153	127.38
D17/10	15466.?67	10909.266	121.772
D18/1	15504.242	10914.551	118.460
D18/2	15545.605	10921.331	113.900
D18/3	15583.049	10924.306	110.700

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D18/4	15606.887	10933.618	
D18/5	15610.642	10941.176	108.280
D18/6	15620.342	10955.823	106.058
LP18/1	15617.706	10962.568	
D18/6	15620.342	10955.823	106.058
D19/1	15612.118	10984.674	103.965
D19/2	15589.582	10995.583	101.480
D19/4	15524.929	10945.471	95.555
D20/1A	15494.375	10907.078	88.88
D20/2	15469.263	10877.330	82.945
D20/3	15441.416	10842.904	76.865
D20/4A	15417.938	10810.576	72.435
D20/5	15417.998	10789.319	69.50
D20/6A	15437.545	10771.593	66.534
D20/7	15461.271	10776.018	63.890
D20/8	15473.968	10787.754	61.975
D20/9	15477.305	10817.935	60.130
D20/10	15482.280	10859.102	55.040
D20/11	15484.073	10882.123	
D19/3A	15559.391	10985.746	
D22/1	15490.011	10888.556	51.834
D22/2	15510.627	10900.137	49.022
D22/3	15541.439	10917.146	46.098
D22/2A	15568.505	10837.872	254.339
D22/4	15569.607	10932.307	41.570
D22/5	15613.873	10956.648	34.285
D22/6	15621.438	10975.329	32.835
D22/7	15614.085	10999.617	vent covering
D22/8	15588.162	11008.640	28.565
D22/9	15561.412	10989.839	25.628
D23/1	15540.007	10959.992	22.770
D23/2	15518.806	10928.864	18.933
D24/1	15484.193	10883.302	13.333
D24/2	15448.547	10850.161	1007.999
D24/3	15408.024	10811.506	1000.13
D24/4	15386.128	10791.675	996.647
D25/1	15343.115	10812.922	990.964
D25/2	15347.366	10838.129	989.434
D25/3	15367.229	10848.834	985.665
D25/4	15408.071	10863.838	980.780
D25/5	15433.876	10873.308	977.485
25LP2	15441.666	10876.231	976.055
D26/1	15475.229	10888.484	972.865
D25/6	15354.593	10849.513	987.231

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D26/2	15488.802	10895.153	971.440
D26/3	15513.252	10892.958	967.610
D26/4	15526.855	10879.553	965.043
1450/1	15654.482	10946.346	1449.00
1450/2	15667.045	10932.096	1454.99
1442/1	15488.621	10817.214	1450.25
1442/2	15505.965	10824.919	1450.30
1442/3	15514.603	10836.731	1450.52
1442/4	15528.107	10844.188	1452.07
LP1442/1	15531.069	10847.279	1451.83
S1	15498.53	10913.76	
S2	15489.50	10927.33	
201	15512.11	10918.21	
202	15534.56	10908.58	
203	15538.30	10906.91	
204	15552.58	10891.61	
206	15566.38	10868.03	
207	15554.61	10856.04	
208	15584.07	10888.40	
209	15539.23	10843.55	
205A	15561.82	10872.86	
KD1	15574.25	10856.19	416.110
KD2	15576.59	10838.99	416.969
KD3	15565.27	10319.41	
KD4	15553.46	10793.21	418.329
KD5	15528.08	10750.44	423.715
KD6A	15509.547	10728.202	426.090
KD7	15492.521	10719.989	425.816
KD8	15503.420	10713.476	425.942
KD9	15508.404	10703.058	425.383
KD10	15502.184	10691.862	425.328
KD11	15487.529	10683.739	424.669
KD12	15504.541	10707.429	
LP2HI/1	15410.42	10824.66	1407.90
2HI/2	15414.869	10825.158	1408.89
2HI/3	15453.441	10826.405	1412.50
2HI/4	15502.595	10843.711	1414.60
2HI/5	15521.521	10849.964	1415.23
218	15570.30	10857.26	
219	15598.81	10857.58	1416.87
221	15647.88	10879.96	
220	15626.71	10866.62	1416.445
222	15651.93	10893.59	
223	15671.36	10882.67	

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2SL1	15631.245	10869.286	1429.35
2SL2	15627.384	10866.076	1429.73
2SL3	15635.133	10871.147	1429.40
301	15515.??	10931.78	1399.775
302	15521.76	10925.69	
302A	15521.76	10925.68	
303	15540.26	10905.49	
304	15564.73	10876.78	
305	15570.98	10865.36	
306	15576.282	10859.097	402.022
309	15577.127	10984.577	
310	15580.504	10980.878	
314	15596.527	10962.519	
315	15606.610	10951.183	
316	15625.187	10930.414	
321	15585.326	10849.459	
307	15550.03	10846.74	
308	15538.36	10843.45	
311	15579.58	10876.12	
312	15585.94	10882.22	
313	15601.92	10897.71	
317	15517.27	10835.63	
318	15500.40	10825.68	
319	15478.34	10811.47	
320	15455.78	10795.96	
322	15616.47	10918.86	
316A	15625.06	10930.28	
323	15641.07	10948.97	
324	15659.58	10966.14	
325	15671.33	10976.84	
326	15596.40	10848.58	402.193
329	15610.80	10861.16	402.284
327	15689.30	10995.99	
328	15699.33	11017.18	
330	15622.84	10879.61	
331	15642.27	10888.57	
T STN	15351.97	10696.49	
K301	15356.27	10683.88	401.925
K302	15370.16	10667.59	402.604
K303	15391.22	10648.24	
K304	15410.54	10655.93	
K305	15421.67	10661.40	405.329
K306A	15454.06	10663.00	
K307	15482.23	10673.47	406.103

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K308	15491.20	10696.63	
K309	15432.85	10675.59	
314	15596.???	10962.519	
QA1	15589.672	10968.253	
QA2	15594.604	10963.337	
QA3	15598.092	10959.443	
QA4	15603.325	10953.637	
TS	15603.371	10954.822	
QA5	15606.790	10590.471	
QA6+1M?	15609.961	10948.677	
QA6	15610.029	10948.750	
350	15658.16	10902.50	1397.07
351	15664.50	10912.51	1398.58
352	15667.75	10917.87	1399.72
353	15670.84	10895.01	1403.74
354	15665.70	10891.72	1404.75
355	15672.59	10896.75	1403.96
303	15540.295	10905.494	
301	15515.423	10931.777	40?.925
CS1	15511.360	10957.594	
CS2	15501.666	10983.071	
405A	15537.295	10907.683	
407A	15561.214	10880.605	382.372
408A	15575.256	10864.426	382.067
435	15581.269	10872.554	382.183
4KD1	15600.882	10861.027	
4KD2	15594.215	10850.508	382.617
4KD3	15580.822	10833.141	382.056
4KD4	15565.924	10812.892	379.486
4KD5	15551.672	10795.538	379.370
4KD6A	15540.332	10775.075	380.025
4KD7	15520.348	10751.388	383.955
4KD8	15500.433	10723.241	386.352
4KD9A	15497.079	10696.610	
4KD5	15551.672	10795.538	379.370
5KD1	15523.911	10781.553	378.083
5KD2	15521.527	10767.088	376.809
5KD3	15508.163	10747.937	374.709
5KD4	15493.622	10729.489	
303	1554?.?95	10905.494	
301	15515.423	10931.777	
CS1	15511.360	10957.594	
CS2	15501.666	10983.071	
405A	15537.295	10907.683	

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407A	15561.214	10880.605	382.372
408A	15575.256	10864.426	382.067
435	15581.269	10872.554	382.183
4KD1	15600.882	10861.027	
4KD2	15594.215	10850.508	382.617
4KD3	15580.822	10833.141	382.056
4KD4	15565.924	10812.892	379.486
4KD5	15551.672	10795.538	379.370
4KD6A	15540.332	10775.075	380.025
4KD7	15520.348	10751.388	383.955
4KD8	15500.433	10723.241	386.352
4KD9A	15497.079	10696.610	388.842
K401	15471.358	10672.623	390.139
K402	15443.470	10657.052	391.283
K403	15409.028	10651.950	390.638
4KD9AB	15497.057	10696.569	388.842
K.401A	15471.343	10672.598	390.139
K.404	15464.520	10681.380	
K.405	15434.265	10665.945	
K406	15416.119	10667.429	
K407	15393.259	10643.283	
K408	15425.610	10640.785	390.396
450	15606.966	10871.442	1383.405
451	15650.648	10896.522	1383.602
SO18	15424.26	10994.85	
501	15446.56	10961.66	
502	15451.73	10958.07	
503	15460.10	10952.27	
504	15463.61	10949.77	
505	15505.65	10919.87	
506	15531.51	10901.57	363.038
507A	15561.47	10881.47	364.477
508	15572.70	10872.56	
510	15548.14	10868.80	
511	15570.35	10889.48	363.934
509	15563.01	10864.08	
513	15582.08	10904.68	364.288
512	15540.61	10849.72	
517	15514.91	10889.54	
518	15497.42	10825.57	365.175
519	15536.42	10898.13	363.535
514A	15596.38	10918.99	364.288
515A	15614.60	10936.36	365.437
516A	15632.44	10951.07	365.483

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523	15525.77	10881.43	
524	15512.93	10880.48	
525	15494.78	10868.56	
527	15663.26	10970.30	
528	15673.93	10985.67	365.114
529	15611.28	10970.69	
531	15515.85	10818.30	
530	15475.62	10802.21	
520A	15552.42	10902.63	
521A	15557.40	10925.15	
526A	15583.88	10948.87	
533	15474.73	10801.48	364.623
534	15527.73	10881.64	
535	15511.17	10879.23	
536	15480.14	10865.87	
537	15467.48	10860.28	
538	15457.82	10856.63	
539	15462.89	10817.55	
540	15439.49	10841.78	
544	15585.60	10877.41	363.870
545	15455.26	10794.74	364.553
546	15441.36	10778.41	
514A	15681.06	10995.23	
544A	15642.?0	10994.93	
545A	15517.67	10911.51	
549	15673.96	10996.43	
550	15685.36	11010.20	
551	15714.02	11031.17	
552	15717.65	11055.60	
553	15609.22	10874.16	
560	15621.49	10888.16	
561	15640.63	10907.87	
562	15660.65	10918.04	
580	15589.95	10878.38	1364.64
581	15615.49	10871.29	1364.81
582	15604.76	10858.69	1364.08
583	15622.73	10891.30	1365.74
585	15624.84	10867.22	1364.33
586	15667.26	10902.21	1367.60
4KD5	15551.???	10795.538	379.370
5KD1	15523.911	10781.553	378.083
5KD2	15521.527	10767.088	376.809
5KD3	15508.163	10747.937	374.709
5KD4	15493.622	10729.489	371.711

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K501	15482.747	10698.180	
K501A	15484.346	10703.639	371.508
K502	15479.393	10684.300	371.231
K503	15461.532	10667.754	372.471
K504	15450.155	10678.483	371.956
K505	15430.150	10674.681	372.274
K506	15396.454	10650.940	372.834
K507	15439.126	10654.546	373.081
K508	15413.404	10642.882	372.526
K509	15393.910	10623.551	372.800
701			345.887
702	15363.23	10876.95	
703	15429.16	10898.76	246.802
704	15506.48	10925.14	
708	15532.62	10963.90	
707	15522.92	10949.28	347.475
710A	15535.13	10908.98	
714	15578.36	10906.59	
721	15537.55	10861.20	
T.S.1	15418.79	10893.43	
715	15397.36	10892.58	346.567
702	15363.25	10876.94	
716	15419.04	10914.30	344.02
717	15444.10	10939.35	
718	15479.62	10975.34	
719	15501.92	10986.87	
726A	15491.78	10820.02	
727A	15459.70	10792.82	349.694
733	15437.78	10778.63	
734	15530.27	10932.49	347.780
735	15553.00	10945.31	
739	15451.83	10809.91	350.118
740	15431.61	10797.46	350.523
742	15412.21	10790.28	351.398
743	15389.56	10785.78	350.630
744	15568.44	10952.72	351.273
745	15588.30	10955.12	349.270
746	15615.29	10966.04	350.422
748	15639.81	10984.47	352.605
749	15673.33	11001.45	352.516
737	15474.61	10824.61	349.426
738	15468.69	10815.99	349.130
728	15438.46	10773.94	
723	15585.30	10919.94	347.454

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713A	15517.30	10928.77	
711B	15557.60	10884.93	
741B	15596.88	10883.42	
750	15607.94	10879.01	
751	15622.56	10900.40	
752	15597.06	10862.05	348.536
754	15388.60	10838.35	
755	15584.48	10821.93	349.816
756	15577.03	10807.69	349.674
757	15543.95	10781.36	350.228
758	15523.62	10753.62	351.029
759	15506.79	10729.69	351.137
760	15496.452	10718.069	351.362
761	15483.472	10710.793	351.282
762	15474.074	10694.065	351.383
763	15450.173	10676.373	351.332
764	15426.820	10659.770	351.762
765	15399.428	10644.030	351.022
766	15374.736	10622.837	351.915
767	15445.603	10686.912	351.301
768	15417.710	10674.186	351.748
769	15384.143	10648.144	352.996
702	15363.255	10876.946	
Temp	15307.578	10863.490	
R/S Pin	15262.270	10831.050	
PM	15257.228	10818.629	
B1	15282.696	10814.567	
B2	15303.864	10796.813	
B3	15312.514	10798.972	
B4	15311.741	10818.523	
B5	15315.388	10820.163	
B6	15322.131	10820.957	
801	15514.??	10960.00	330.614
802	15520.67	10933.41	330.790
803	15523.77	10924.09	330.394
805B	15557.51	10888.73	330.668
808B	15588.04	10861.43	
838	15408.84	10809.83	
823	15461.48	10808.63	333.052
824	15429.46	10788.34	
825	15401.98	10785.86	
826	15368.12	10770.40	
838	15480.84	10809.83	333.01
839	15411.84	10736.32	

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841	15389.95	10724.49	
815	15572.17	10875.73	331.001
816A	15599.33	10870.19	
836	15591.13	10868.11	330.651
837A	15571.91	10831.16	332.550
840	15555.87	10808.90	332.812
806	15558.78	10898.64	330.711
807A	15586.88	10922.80	330.818
812	15493.684 15617.20	10943.14 10934.46	331.247
K801	15551.262	10778.440	333.305
K802	15536.894	10761.812	332.044
K803	15527.231	10758.649	331.954
K804	15501.206	10734.971	
K803A	15527.134	10758.600	332.021
K804A	15503.294	10734.104	332.478
K805	15476.744	10707.045	333.928
K806A	15444.588	10699.526	334.904
K807	15411.557	10691.133	334.501
K808	15421.460	10680.590	334.902
K809	15412.784	10654.393	335.572
K810	15388.732	10651.230	335.246
K810A	15388.727	10651.234	335.249
K811A	15370.613	10621.874	335.487
K812A	15342.961	10596.492	336.195
K813	15404.632	10673.214	335.149
K814	15377.097	10657.289	335.406
K815	15363.479	10628.431	335.094
901	15460.66	10958.81	311.852
901A	15478.42	10948.31	311.570
902A	15524.92	10922.25	311.067
903	15551.27	10895.92	312.478
904	15574.95	10917.74	312.825
905A	15596.41	10924.72	313.539
911A	15639.96	10951.19	314.788
920	15656.30	10983.96	314.566
921	15690.78	11016.51	
926	15662.57	10996.64	315.617
906A	15589.20	10931.96	312.761
909	15619.48	10940.77	314.788
917	15581.67	10953.11	313.286
918	15596.41	10961.82	
936	15579.97	10970.42	313.886
938	15600.58	10981.28	315.413

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940	15704.15	11025.91	
941	15700.59	11038.32	
907A	15524.13	10872.07	312.908
908	15511.38	10843.23	
919	15482.94	10817.64	314.163
922	15451.15	10782.44	314.755
927	15430.54	10760.33	314.587
929	15413.96	10742.33	
931	15399.84	10737.01	316.017
933	15381.63	10756.12	315.370
934	15366.08	10750.51	315.767
935	15340.40	10730.56	316.236
937	15314.98	10724.70	316.428
939	15293.18	10710.68	
915	15534.33	10915.14	311.682
916	15556.96	10925.88	
910A	15575.50	10871.15	313.13
923	15563.82	10859.34	
924	15561.83	10846.87	
925	15560.20	10824.46	314.532
928	15541.33	10804.32	314.465
932	15536.97	10786.19	315.215
942	15709.028	11049.330	
943A	15714.493	11074.613	
944	15443.827	10789.042	313.034
945	15419.928	10780.746	
946	15527.???	10775.367	314.918
947	15521.560	10762.564	315.04
948A	15502.889	10740.959	315.286
949	15480.123	10726.304	316.003
950	15459.828	10704.510	315.377
951	15430.814	10701.078	316.288
952	15418.434	10669.996	317.035
953	15407.899	10655.805	317.107
954	15413.437	10699.105	316.816
956	15388.466	10667.491	316.638
957	15367.923	10656.295	317.575
958	15354.349	10632.972	317.378
959	15352.309	10615.952	317.563
960	15314.714	10588.422	318.729
961	15524.93	10922.19	1311.07
962	15544.15	10944.06	1312.79
963	15550.42	10961.78	1312.92
9DSL1	15548.907	10953.040	1319.83

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9DSL2	15553.26	10952.50	1319.96
9DSL3	15553.50	10956.84	1320.38
D9/3	1549?.?00	11030.600	301.063
EX1	15512.504	11029.765	302.208
EX2	15520.932	11040.153	302.314
EX3	15539.248	11060.278	301.616
EX4	15558.754	11074.593	301.740
1002	1546?.42	10958.49	1292.922
1003	15481.08	10947.04	1293.416
1004	15522.87	10924.09	1293.318
1005	15540.45	10904.52	1293.556
1007	15554.84	10918.70	1293.922
1008	15573.95	10927.95	1294.199
1010	15533.46	10920.69	1292.696
1011	15538.95	10928.69	1293.669
1009A	15568.98	10877.28	1293.812
1012	15505.19	10866.98	1293.245
1014	15569.18	10947.23	1294.483
1020	15595.45	10961.95	1294.790
1021	15623.31	10970.35	1294.952
1019	15606.16	10936.82	1293.791
1006	15524.89	10885.87	1293.986
1012	15505.19	10866.83	1293.248
1015	15491.11	10853.14	1293.845
1016	15477.40	10827.33	1293.608
1018	15472.03	10817.44	1294.147
1019	15606.16	10936.82	1293.791
1022	15640.73	10983.22	1295.861
1023	15642.71	10999.97	1295.825
1024	15641.55	11013.99	1296.271
1025	15658.85	11033.76	1296.502
1026	15653.512	10979.710	1295.297
1027	15669.499	10997.655	1295.467
1028	15518.164	10897.160	1292.85
1031	15504.236	10891.086	
1032	15415.254	10770.719	1295.592
1033	15394.274	10762.259	1295.835
1034	15369.137	10744.729	1295.416
1035	15577.394	10936.566	1293.969
1036	15407.826	10762.729	1295.616
1037	15357.802	10728.662	1296.274
1039	15328.537	10716.085	1296.725
1038	15399.497	10732.128	1295.479
1040	15389.073	10718.802	

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1040A	15390.788	10717.529	1296.195
1042A	15407.804	10687.580	1296.632
1046A	15404.288	10664.440	296.695
1048	15384.960	10652.386	297.427
1050	15418.392	10676.030	297.004
1054	15350.311	10655.311	296.983
1052A	15354.218	10641.559	297.883
1041	15297.491	10701.979	298.618
1056A	15326.440	10629.843	298.629
1058	15323.238	10610.205	298.083
1060	15300.295	10598.814	298.749
1043	15308.291	10716.218	297.712
1045	15287.403	10706.445	298.941
1047	15264.694	10703.064	299.921
1061	15301.791	10619.693	298.822
1062	15514.016	10858.442	295.646
1063	15500.524	10844.527	297.678
1013A	15548.39	10856.15	293.689
1017B	15535.656	10840.110	294.578
1064	15480.762	10814.754	301.270
1065	15458.438	10790.505	302.424
1066	15437.017	10773.508	303.68
1029A	15457.520	10807.069	294.643
1032	15415.254	10770.719	295.592
1067A	15437.176	10833.766	295.738
1068A	15465.769	10863.331	297.48
10V1	15474.623	10952.732	
1051	15471.849	10864.687	1303.76
1052	15474.955	10867.573	1304.06
1053	15466.803	10860.949	1303.85
1054	15495.33	10879.65	1304.85
1069	15531.32	10888.42	1293.63
1017A	15535.681	10840.122	
11010	15469.??	10952.06	274.134
11030	15515.35	10925.42	273.792
11040	15526.63	10917.85	274.667
11050	15514.83	10933.01	272.851
11060	15543.84	10931.51	274.214
11070	15533.464	10958.380	273.541
11080	15560.326	10972.681	274.359
11090	15555.231	10950.296	273.595
11100	15566.152	10952.091	274.421
11110	15579.391	10983.806	274.720
11120	15586.134	10965.582	274.739

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11130	15545.426	10896.628	273.663
11140	15558.779	10883.180	274.164
11150	15602.586	10998.985	274.718
11160	15547.450	10869.132	274.691
11170	15615.459	10973.743	274.686
11180	15627.537	11012.951	274.840
11190	15636.484	10985.283	274.826
1120A0	15567.011	10937.928	274.705
11210	15552.048	10977.965	274.472
11220	15557.339	10984.937	274.781
1117A0	15615.430	10973.747	274.686
11230	15623.525	10945.897	274.343
11240	15615.785	10928.394	275.877
11V1	15498.437	11004.263	1268.90
11KD1	15506.???	10803.589	291.196
11KD2	15482.446	10774.039	287.57
11KD3	15471.407	10759.157	1285.98
11KD4	15448.934	10729.853	281.390
11KD5	15460.008	10744.732	284.03
11KD5	15460.008	10744.732	284.03
K1101	15406.639	10681.213	277.82
K1102	15387.736	10663.841	278.50
K1103	15368.951	10652.727	278.84
K1104	15352.899	10638.314	280.59
K1104	15352.899	10638.314	280.59
K1105	15323.891	10619.473	281.230
K1102	15387.736	10663.841	278.50
10½HP5/1	15481.028	10744.573	1284.80
10½HP5/2	15466.211	10732.905	1286.12
10½HP5/3	15457.669	10718.353	1287.20
BS11/01	15425.?28	10741.052	1281.08
BS1102	15390.471	10736.075	1276.82
BS1103	15367.673	10732.358	1275.95
BS1104	15357.301	10723.470	1276.250
BS1105	15329.859	10721.463	1276.665
BS1106	15290.138	10706.179	1276.790
BS1107	15243.077	10691.041	1277.630
BS1108	15210.008	10674.162	1279.120
BS1109	15181.597	10656.985	
BS1110	15325.065	10717.697	1277.49
12KD1	15318.728	10672.698	1271.72
12KD2	15314.221	10638.802	1269.49
11KE01	1540?.???	10734.260	278.10
11KE02	15394.859	10724.038	277.507

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11KE03	15400.972	10693.788	276.589
11KE04	15384.401	10675.069	277.227
11KE05	15340.468	10646.365	280.070
11KE06	15303.061	10628.559	281.30
11KE07	15387.887	10680.147	276.371
11KE08	15363.424	10676.831	277.850
1201	15450.0??	10922.476	255.960
1202	15472.641	10894.547	256.523
1203	15479.742	10886.369	256.834
1204	15490.478	10874.762	256.794
1206	15516.536	10863.577	257.439
1205B	15509.044	10916.850	257.448
D12/1	15548.607	10849.940	257.735
1207	15445.950	10933.488	255.832
1208	15529.011	10933.229	257.490
1211	15560.570	10955.311	257.467
1209	15522.752	10944.915	257.183
1210	15529.754	10958.989	257.625
1212	15556.211	10975.184	258.063
1213	15586.871	10963.415	257.963
1214	15575.722	10984.812	258.136
1216	15603.885	11005.147	258.331
1215	15608.924	10979.556	258.034
1218	15629.917	11013.728	258.670
1219	15620.006	10987.553	258.007
12E1	15456.189	10909.205	255.569
12E2	15448.643	10891.984	255.725
BP12/1	15529.525	10829.668	255.982
BP12/2	15499.467	10831.428	255.864
BP12/3	15465.561	10833.865	255.386
BP12/4	15443.370	10847.435	256.519
BP12/5	15432.252	10869.555	255.844
BP12/6	15427.176	10899.241	256.530
BP12/7	15431.202	10936.806	
1301	15471.?31	10818.992	239.860
1303	15471.985	10818.410	239.515
1302	15453.222	10839.256	239.406
1304	15495.107	10836.485	238.313
1305	15473.118	10870.702	240.392
1308	15460.795	10851.406	239.51
1305	15473.117	10870.699	240.392
1306C	15480.999	10894.884	240.510
1307	15503.094	10919.932	240.761
1309	15540.238	10935.216	241.239

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1310	15571.505	10950.870	241.868
1311	15483.712	10917.343	241.617
1312	15496.943	10930.154	241.239
1313	15605.334	10975.322	242.300
1314	15524.265	10944.241	241.805
1315	15541.983	10958.327	242.000
1316	15557.707	10982.722	243.278
1317	15581.291	10977.724	242.880
1318	15573.248	10991.168	243.785
1319	15586.917	11005.824	243.337
D13/8	15466.299	??782.154	222.551
1401	15458.408	10812.998	220.486
1401A	15458.406	10812.990	220.488
1401B	15458.404	10813.001	220.483
1402	15447.834	10850.927	220.320
1403	15449.340	10879.724	221.169
1404	15449.418	10902.217	221.101
1405	15470.989	10918.687	
1405A	15471.025	10918.714	222.028
1406	15503.537	10939.410	221.979
1407	15482.387	10913.450	222.228
1408	15520.996	10956.189	222.371
1409	15543.687	10968.796	222.988
1409A	15543.657	10968.775	223.026
1410	15533.180	10973.780	
1410A	15533.177	10973.806	223.306
1411	15536.911	10988.137	223.593
1409B	15543.671	10968.798	223.006
1409B	15543.671	10968.798	223.006
1412	15575.990	10982.441	224.102
1413	15602.573	11001.722	224.247
1411A	15556.915	10988.147	223.590
1414	15586.278	11009.148	
1415	15588.471	11010.089	224.396
1413A	15602.358	11002.682	224.711
1416	15615.492	11022.598	225.415
1417	15539.867	10943.160	223.071
1418	15557.585	10946.307	227.548
1419	15573.773	10949.625	230.837
1420	15595.165	10969.405	
1421	15605.578	10975.284	
14V1	15442.727	10917.457	1221.169
14V2	15458.143	10956.238	1221.006
14V3	15474.141	10990.423	1221.471

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E14/1	15374.077	10763.819	206.638
E14/3	15316.806	10733.139	211.037
E14/4	15281.311	10715.100	212.522
B1401	15248.989	10705.538	212.585
B1403	15203.234	10670.308	213.371
B1404	15171.725	10652.825	214.429
B1402A	15226.924	10680.039	
DP4/1	15187.362	10645.519	214.437
DP3/1	15207.023	10658.816	215.553
DP2/1	15222.205	10688.757	215.873
14X/1	15266.853	10702.133	
14X/2	15261.861	10691.859	
14LP/1	15244.881	10673.070	
14X/3	15236.489	10666.857	
14X/4A	15207.776	10645.764	
K1401	15228.443	10623.836	212.951
K1402A	15253.327	10589.430	215.443
K1403	15222.139	10580.094	1214.503
K1404	15279.193	10597.360	215.191
K1405	15241.721	10606.416	1213.805
K1406	15258.296	10628.390	1213.643
E14/2A	15348.579	10753.193	1208.435
K1302	15247.949	10581.331	1234.412
K1301	15251.737	10584.966	1228.904
K1303A	15252.705	10582.873	1234.16
K1304	15281.061	10601.120	
K1305	15277.560	10595.579	
K1306	15269.18	10588.55	1233.35
K1307	15228.94	10578.15	1231.47
K1308	15229.96	10574.04	1232.62
K1309	15238.83	10572.94	1245.12
K1310	15237.06	10572.91	1242.11
14D/1	1534?.??3	10721.834	1206.430
14D/2	15313.475	10696.245	1201.681
14D/3	15292.590	10660.481	1196.382
14D/4	15285.520	10653.528	1196.222
15D/1	15268.413	10641.871	1194.115
15D/2	15245.313	10645.681	1189.105
15D/3	15237.560	10667.920	1187.035
15D/4A	15244.643	10686.113	1184.48
15D/5	15269.355	10692.201	1180.50
15D/6	15272.146	10709.579	1177.90
15BS1	15270.609	10664.029	1196.780
15LP1	15268.621	10669.125	1195.850

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15BS2	15251.877	10709.426	1195.830
15BS3	15238.906	10712.522	1195.87
15BS4	15212.101	10679.033	1195.89
15BS5	15178.657	10663.958	1196.07
15BS6	15148.460	10654.388	1196.88
15D/6	15272.146	10709.579	1177.90
16BS1	15242.962	10745.597	1171.6
blank	1545?.?95	10790.654	201.762
1501	15460.116	10818.197	200.310
1502	15452.379	10832.992	200.105
1503	15435.543	10869.503	201.094
1505	15459.191	10921.880	200.766
D14/11	15464.235	10797.878	201.171
1506	15471.479	10933.606	201.877
1507	15488.217	10928.092	201.452
1508	15495.258	10955.119	200.977
1509	15511.258	10956.953	201.893
1510	15540.977	10976.036	202.915
1511	15571.974	10931.129	203.285
1512	15493.630	10953.129	201.067
1513	15532.667	10958.221	201.549
1514	15498.414	10974.787	201.796
1515	15497.392	10965.538	201.933
1516	15526.423	10980.001	202.953
1517	15543.977	10991.495	203.261
1518	15564.672	11002.318	203.157
1519	15590.595	11020.274	203.157
1520	15590.739	11028.450	203.297
1504A	15435.002	10900.219	
1512B	15493.662	10953.162	
15AA1	15525.355	10934.710	1202.395
1601	15460.??0	10933.944	178.729
1602	15486.943	10954.263	179.310
1603	15493.165	10956.170	
1604	15500.693	10980.233	178.883
1605	15528.153	10988.794	
1606	15520.292	10986.153	181.133
1607	15544.151	10999.159	183.483
1608	15542.562	10978.331	184.506
1609	15552.202	10988.852	186.481
1610	15482.368	10953.017	178.847
1610	15482.368	10953.018	178.847
1611A	15485.038	10983.675	180.533
1612	15496.131	10996.635	181.388

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1613	15528.617	11012.100	183.102
1614	15543.015	11016.395	183.44
1615	15566.470	11035.110	184.96
1616	15586.357	11051.566	
1617	15607.439	11070.105	
1618	15484.700	10973.394	1179.602
16SL1	15500.452	10951.327	1156.107
16SL2	15489.829	10956.999	1157.675
16SL3	15475.404	10975.658	1159.230
16SL4	15462.787	10957.000	1162.605
16SL5	15464.184	10982.483	1160.700
16SL6	15443.701	10930.848	1162.968
16SL7	15448.068	10924.370	1164.162
LB17/1	15463.523	10846.150	
1702	15488.187	10930.162	
BS17/1	15369.041	10893.694	124.354
BS17/2	15356.732	10884.367	126.033
BS17/3	15351.438	10857.333	130.871
LP17/1	15336.925	10815.347	
LP17/2	15332.701	10803.146	132.699
LP17/3	15306.488	10746.044	
BS17/5	15311.852	10752.921	132.767
BS17/6	15286.252	10705.516	133.182
BS17/7	15274.836	10682.542	134.824
BS17/8	15260.198	10651.570	133.897
BS17/9A	15245.492	10640.852	133.965
BS17/10	15227.237	10623.889	135.180
BS17/11	15214.976	10622.203	136.200
BS17/12	15318.169	10766.537	
BS17/13	15180.607	10609.076	135.890
BS17/14	15151.181	10596.880	135.475
BS17/15B	15223.271	10677.187	
BS17/16	15197.323	10659.311	
BS17/17	15181.476	10661.320	
1703	15477.020	10895.648	1149.173
1704	15450.657	10926.047	1148.438
1705A	15443.934	10946.849	1148.145
1707	15456.885	10950.979	1146.286
1708	15469.171	10930.414	1143.365
1709	15481.455	11000.728	1148.03
1711	15538.430	11048.000	1148.392
1713	15509.459	10998.964	1147.95
1714	15532.954	11024.732	1149.37
1715	15564.400	11041.259	

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1716	15452.053	10969.930	1146.65
1709	15481.463	11000.704	1144.45
1717	15506.226	11016.989	1148.76
1718	15493.101	11008.897	1148.56
1719	15489.680	11019.544	1146.58
1720	15534.854	11060.293	1148.82
1801	154??.501	10920.205	121.038
D17/10A	15480.?47	10909.701	120.731
1801	15471.501	10920.205	121.038
1802	15454.274	10942.845	121.457
1803	15453.934	10960.515	122.505
1804	15460.587	10983.533	122.946
1805	15476.010	11004.298	123.262
1806	15501.149	10996.795	122.608
1807	15539.012	11023.865	123.67
1809	15499.485	11029.915	
1808C	15490.191	11015.967	123.821
1809	15499.485	11029.915	123.635
1810	15513.140	11051.912	123.763
1811	15536.548	11074.718	124.358
1814	15558.426	11137.231	124.900
19LP1	15553.2??	10993.513	99.887
19LP2	15540.896	11005.821	99.001
19/1	15505.174	11040.824	99.889
19/2	15516.252	11053.640	99.604
19/3	15528.659	11020.946	1099.511
19/4	15556.758	11045.172	1099.866
19/6	15526.374	11053.555	1099.66
19/7	15548.019	11073.788	1102.6
19/8	15522.539	11102.209	1104.7
19/5A	15575.158	11051.808	1099.96
19/9	15565.480	11057.481	1099.75
19/10	15503.382	10988.571	1104.744
19/11	15480.335	10984.444	1107.034
19/12	15540.614	11082.096	1103.73
19/13	15542.118	11103.616	1104.05
19/14	15516.238	11053.637	1099.60
19/15	15512.614	11069.629	1099.68
19/16	15559.9	11119.7	1104.6
DD1901	15634.405	11010.170	102.499
DD1902	15653.637	11031.511	103.195
DD1903	15705.808	11040.179	103.345
DD1904	15733.630	11057.630	102.652
2001	15469.881	10913.939	1088.380

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2002	15437.??8	10951.193	1090.376
2001A	15469.914	10913.630	1088.501
2002	15437.468	10951.193	1090.376
2003	15446.401	10952.139	1089.787
2005A	15456.643	10972.933	
2004	15410.884	10981.162	
2006	15398.274	10999.884	1092.361
2008	15360.695	10972.995	1091.571
2009	15408.900	10986.471	
2010	15475.353	10984.027	1090.29
2011	15480.252	11003.563	1090.51
2012A	15462.889	11022.134	1091.13
2014	15363.731	10956.433	1091.58
2015	15352.258	10959.721	
2016	15451.420	11032.542	1090.515
2017	15477.866	10974.635	1091.010
2018	15497.535	10985.610	1087.870
2019	15515.560	11006.954	1084.585
21LP1	15496.671	10993.59	
2020	15494.222	10983.054	1089.24
20FLP2	15495.422	10993.585	1088.287
2021	15500.536	11034.958	1082.58
2019	15515.5??	11006.954	1084.585
IMP	15540.???	11017.251	
2101	15557.835	11033.014	
2102	15554.323	11047.614	
2103	15572.309	11045.600	
2104	15550.331	11061.108	
2105	15485.768	11059.688	1080.377
2106	15530.203	11088.402	1080.60
21B1	15398.?74	10796.288	1072.317
LP21B1	15381.??9	10794.14	1073.010
LP21B2	15376.10	10793.26	1072.829
LP21B3	15345.90	10789.21	1072.75
LP21B4	15341.46	10788.61	1072.94
21B2	15303.638	10784.843	1073.505
21B3	15287.091	10780.551	1074.246
21B4	15281.424	10778.834	1074.818
21B5	15230.829	10765.961	1075.037
21B6	15219.414	10755.230	1075.607
21B7	15195.878	10703.360	1075.920
FLP21B7	15193.497	10700.567	1076.363
2201	15471.499	10900.178	51.048
D22/1	15490.0??	10888.556	51.982

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2204	15473.785	10973.323	52.647
2205	15497.093	10986.842	54.407
2206	15477.859	11009.976	53.885
2207	15532.149	11005.827	53.332
2202A	15448.648	10923.887	
2208	15550.355	11023.629	53.877
2210	15452.697	11040.586	55.712
2213	15577.356	11065.042	53.932
2214	15577.992	11083.814	
2209	15539.626	11019.839	1053.747
2212A	15402.417	11011.019	1054.452
2215	15373.203	10989.967	1055.177
2216	15349.705	10973.609	1054.732
2217	15470.187	11019.734	1053.679
2218	15454.146	11033.624	1054.48
2219	15456.291	11050.216	1054.28
2220	15509.577	11090.485	1054.59
2221	15541.674	11123.605	1055.985
2222	15523.152	11101.556	1056.360
2223	15558.688	11154.462	1056.870
2224	15515.247	11114.752	1055.530
2225	15530.242	11150.798	1056.035
2226	15504.768	11053.540	
2228	15455.943	11060.182	1054.97
2229	15479.063	11086.879	1054.465
2301	15529.043	10986.120	
2302	1551?.??0	10986.091	1026.909
2303	15495.853	10993.657	1025.92
2305	15515.322	11006.729	1026.375
2306	15533.453	11010.359	1025.850
2307	15553.657	11035.498	1026.535
2304A	15479.715	11014.583	1028.348
2309	15445.246	10039.085	1031.900
2308A	15467.814	11031.249	
2309	15445.244	11039.081	1031.900
2310	15438.834	11063.760	1033.175
2311	15464.115	11090.453	1034.740
2312			
2313	15544.067	11047.699	1026.71
2314	15548.146	10986.495	1025.1
2315	15548.278	11001.647	1025.05
2316	15511.042	11002.558	1026.370
2317	15519.159	11048.360	1027.70
FLP2315	15556.546	11010.671	1025.63

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2401A	15458.726	10919.565	1013.638
2402A	15459.449	10961.445	1014.058
2403	15460.181	10988.112	1014.673
2404	15460.482	11024.526	1014.248
2405	15444.107	11047.530	1015.972
2406	15419.739	11024.301	1015.446
2407	15395.877	11022.242	1015.954
2408	15386.995	11003.495	1017.473
2409	15363.512	10992.637	
2409A	15365.270	10990.562	1017.413
2410	15355.192	10970.998	1017.503
2411	15485.365	11074.656	1015.775
2412	15500.047	11094.523	1016.343
2413	15550.792	11129.853	1016.983
2414	15518.418	11107.499	1016.598
2415	15379.977	10998.405	1017.173
2416	15381.767	10977.133	1017.383
2419	15359.004	10952.484	
2417	15508.564	11119.208	
2418	15501.848	11125.260	1016.665
2420	15525.604	11140.135	
2421	15391.409	11020.352	1016.679
2422	15517.280	11152.362	1017.565
24LP3	15393.273	11013.648	1016.459
24LP1	15410.621	11025.086	1015.464
2423	15540.352	11159.212	
2424	15490.853	11136.961	1016.805
2425	15454.954	11014.254	1015.273
2426	15441.131	11012.827	1015.493
D25/4	15408.071	10863.838	980.780
DD2601	15422.674	10874.097	978.335
25DDP1	15402.962	10799.866	998.265
25DDP2	15405.278	10791.433	997.72
25DDP4	15437.711	10773.060	998.79

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Appendix 6

Repeat Sampling and Assaying of Drill Core

The assays by Burnie Research Lab are headed ALS, the assays by Aberfoyle as Orig. Soluble Sn, that is tin as stannite, assays are headed Sn (sol) %.

Comparison of Original and Check assays

Sample	From	To	Length	Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1308	0.00	1.13	1.13	1.44	1.34	0.03	0.03	0.17	0.43
C1308	19.95	20.28	0.33	0.2	0.12	0.01	0.01	0.32	0.22
C1308	108.23	109.20	0.97	1.21	1.10	0.01	0.01	0.04	0.10
C1308	109.20	110.39	1.19	0.79	0.72	0.00	0.02	0.07	0.09
C1308	110.39	111.27	0.88	1.36	1.37	0.01	0.02	0.14	0.16
C1308	111.27	112.06	0.79	0.07	0.16	0.01	0.01	0.01	0.06
C1308	112.06	113.23	1.17	1.14	0.95	0.01	0.02	0.11	0.08
C1308	113.23	114.11	0.88	0.52	0.92	0.00	0.03	0.11	0.16
C1308	114.11	115.10	0.99	1.02	0.93	0.01	0.03	0.07	0.13
C1308	115.10	116.30	1.20	0.47	0.51	0.00	0.02	0.12	0.09
C1308	116.30	117.27	0.97	0.78	0.80	0.01	0.02	0.09	0.09
C1308	117.27	117.81	0.54	1.68	1.21	0.02	0.04	1.48	1.14

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1356	0.00	1.00	1.00	0.36	0.33	0.00	0.02	0.13	0.08
C1356	1.00	2.00	1.00	0.39	0.46	0.00	0.03	0.13	0.11
C1356	2.00	3.00	1.00	0.42	0.56	0.00	0.02	0.09	0.08
C1356	3.00	4.00	1.00	0.61	0.46	0.00	0.03	0.01	0.07
C1356	4.00	5.00	1.00	0.22	0.21	0.00	0.03	0.04	0.06
C1356	5.00	6.00	1.00	0.83	0.40	0.01	0.30	0.14	0.06
C1356	6.00	7.00	1.00	0.50	0.65	0.02	0.04	0.07	0.11
C1356	7.00	7.30	0.30	0.65	1.23	0.02	0.04	0.11	0.13
C1356	7.30	8.00	0.70	0.19	0.21	0.00	0.02	0.01	0.04

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1393	129.09	129.65	0.56	0.04	0.07	0.00	0.01	0.07	0.11
C1393	129.65	130.64	0.99	2.92	1.74	0.00	0.02	1.58	1.56
C1393	130.64	131.75	1.11	1.19	1.07	0.00	0.02	0.82	0.93
C1393	133.96	135.07	1.11	0.17	0.19	0.00	0.02	0.07	0.15
C1393	135.07	136.14	1.07	0.21	0.19	0.00	0.02	0.13	0.15
C1393	136.14	137.12	0.98	0.09	0.25	0.01	0.02	0.01	0.19
C1393	137.92	139.24	1.32	0.11	0.11	0.00	0.02	0.02	0.06
C1393	139.24	139.88	0.64	0.02	0.03	0.00	0.02	0.19	0.40
C1393	142.30	143.28	0.98	2.16	1.63	0.00	0.02	0.17	0.17
C1393	143.28	144.33	1.05	0.20	0.18	0.00	0.03	0.81	0.79
C1393	144.33	145.30	0.97	0.18	0.23	0.01	0.03	1.33	0.19

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C1393	145.30	146.54	1.24	0.08	0.64	0.00	0.03	0.32	0.25
C1393	147.07	148.30	1.23	0.46	0.77	0.00	0.02	0.24	0.18
C1393	148.60	149.06	0.46	0.10	0.08	0.00	0.03	0.14	0.35
C1393	150.46	151.50	1.04	0.52	0.10	0.00	0.02	0.06	0.14
C1393	152.85	153.94	1.09	0.41	0.59	0.00	0.02	0.12	0.14
C1393	153.94	154.99	1.05	2.90	0.34	0.00	0.02	0.13	0.14
C1393	154.99	156.10	1.11	1.49	2.30	0.00	0.02	0.13	0.21
C1393	156.10	157.15	1.05	2.04	1.37	0.00	0.01	0.17	0.15
C1393	157.15	158.17	1.02	0.63	1.57	0.00	0.02	0.21	0.21
C1393	158.17	159.05	0.88	0.24	0.54	0.00	0.02	0.20	0.22

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1534	27.60	28.55	0.95	0.88	0.68	0.00	0.03	0.10	0.16
C1534	28.75	29.80	1.05	1.34	0.91		0.02	0.08	0.10
C1534	29.90	31.10	1.20	1.06	0.98	0.00	0.03	0.09	0.15
C1534	35.70	36.20	0.50	2.53	2.38	0.00	0.03	0.12	0.19
C1534	66.40	67.20	0.80	1.75	2.52	0.00	0.02	0.18	0.16
C1534	67.20	68.05	0.85	0.66	1.05	0.01	0.03	0.06	0.08
C1534	69.20	69.90	0.70	2.26	0.72	0.01	0.02	0.15	0.14

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1537	41.10	42.00	0.90	1.69	1.77	0.00	0.00	0.20	0.23
C1537	42.00	42.70	0.70	2.76	2.57	0.00	0.00	0.15	0.19
C1537	44.60	44.90	0.30	1.19	1.14	0.00	0.00	0.10	0.26

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1541	4.20	4.60	0.40	0.22	0.15	0.02	0.02	0.30	0.22
C1541	4.70	4.90	0.20	4.02	3.85	0.04	0.06	0.13	0.19

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1570	27.50	30.00	2.50	0.04	0.07	0	0.00	0.02	0.01
C1570	30.00	32.50	2.50	0.35	0.34	0	0.01	0.02	0.07

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1757	0.00	1.00	1.00	0.22	0.23	0.01	0.00	0.33	0.28
C1757	1.00	2.00	1.00	0.26	0.33	0.01	0.00	0.01	0.05
C1757	2.00	3.00	1.00	0.83	0.78	0.00	0.00	0.31	0.25
C1757	3.00	4.00	1.00	0.26	0.68	0.02	0.00	0.03	0.06
C1757	4.00	5.00	1.00	1.20	1.02	0.01	0.01	0.30	0.20
C1757	5.00	6.00	1.00	1.32	1.21	0.01	0.00	0.22	0.32

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C1757	6.00	7.00	1.00	1.50	1.08	0.00	0.01	0.17	0.10
C1757	7.00	8.00	1.00	1.64	1.43	0.02	0.02	0.30	0.24
C1757	8.00	9.00	1.00	2.79	2.26	0.02	0.02	0.12	0.19
C1757	9.00	10.00	1.00	1.63	1.31	0.01	0.01	0.09	0.11
C1757	10.00	11.00	1.00	0.97	1.24	0.00	0.01	0.15	0.17
C1757	11.00	12.00	1.00	1.85	1.77	0.02	0.02	0.18	0.18
C1757	12.00	13.00	1.00	1.51	1.32	0.03	0.03	0.26	0.32
C1757	13.00	13.90	0.90	1.60	1.08	0.04	0.04	0.27	0.24
C1757	26.30	27.70	1.40	1.73	1.30	0.03	0.04	1.54	1.76

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1854	42.70	43.10	0.40	0.22	1.01	0.01	0.00	0.03	0.45
C1854	43.10	43.50	0.40	0.06	1.09	0.00	0.01	0.06	0.06
C1854	43.50	44.50	1.00	0.83	0.08	0.08	0.06	0.22	0.23
C1854	44.50	45.50	1.00	0.91	0.08	0.11	0.13	0.23	0.32
C1854	45.50	46.70	1.20	1.13	1.00	0.06	0.08	0.25	0.35

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1858	31.80	32.80	1.00	0.89	1.01	0.06	0.06	0.20	0.25
C1858	32.80	33.80	1.00	1.22	1.09	0.08	0.07	0.18	0.25
C1858	33.80	34.20	0.40	1.02	0.08	0.05	0.04	0.21	0.17
C1858	34.20	35.00	0.80	0.02	0.08	0.00	0.00	0.02	0.05
C1858	35.00	36.00	1.00	1.03	1.00	0.09	0.10	0.21	0.22
C1858	36.00	37.00	1.00	0.92	0.97	0.06	0.08	0.21	0.19
C1858	37.00	37.50	0.50	0.09	0.31	0.02	0.04	0.19	0.16
C1858	54.30	55.30	1.00	1.25	1.53	0.11	0.15	0.42	0.43
C1858	55.30	56.30	1.00	1.16	0.82	0.10	0.10	0.49	0.49
C1858	56.30	57.30	1.00	0.58	0.71	0.06	0.08	0.53	0.56
C1858	57.30	58.30	1.00	0.20	0.43	0.01	0.03	0.50	0.57
C1858	58.30	58.80	0.50	1.22	0.62	0.05	0.05	0.18	0.32
C1858	58.80	59.20	0.40	0.45	0.11	0.06	0.02	0.33	0.08
C1858	59.20	59.80	0.60	0.23	1.45	0.01	0.09	0.14	0.30
C1858	59.80	60.00	0.20	0.98	0.15	0.08	0.01	0.27	0.09
C1858	60.00	60.50	0.50	1.12	1.07	0.02	0.06	0.05	0.14
C1858	60.50	61.20	0.70	0.04	0.12	0.01	0.00	<0.01	0.03

Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1867	23.70	24.70	1.00	0.98	0.71	0.05	0.04	0.36	0.41
C1867	24.70	25.70	1.00	0.89	0.83	0.04	0.03	0.07	0.10
C1867	25.70	26.70	1.00	0.47	0.86	0.03	0.03	0.32	0.28
C1867	26.70	27.70	1.00	0.54	0.43	0.03	0.02	0.18	0.27
C1867	27.70	28.70	1.00	0.51	0.54	0.02	0.01	0.06	0.09

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Sample	From	To		Sn (%)		Sn (sol) (%)		Cu (%)	
				ALS	Orig	ALS	Orig	ALS	Orig
C1936	0.00	1.40	1.40	0.23	0.23	0.01	0.00	0.02	0.03
C1936	1.40	2.40	1.00	0.03	0.02	0.01	0.00	<0.01	0.01
C1936	2.40	3.40	1.00	0.02	0.02	0.01	0.00	<0.01	0.00
C1936	3.40	4.50	1.10	0.01	0.02	0.01	0.00	0.01	0.01
C1936	4.50	5.00	0.50	0.17	0.16	0.01	0.00	0.07	0.07
C1936	5.00	6.40	1.40	0.01	0.03	0.01	0.00	<0.01	0.02
C1936	6.40	7.70	1.30	0.66	0.71	0.02	0.00	0.74	0.89
C1936	7.70	8.70	1.00	1.91	1.74	0.01	0.00	1.61	1.66
C1936	8.70	9.70	1.00	1.21	1.06	0.01	0.00	0.97	1.32
C1936	9.70	10.70	1.00	0.48	0.69	0.01	0.00	0.62	0.47
C1936	10.70	11.70	1.00	0.65	0.59	0.02	0.00	3.63	1.85
C1936	11.70	12.80	1.10	1.22	1.18	0.01	0.00	0.77	0.64
C1936	12.80	13.40	0.60	0.02	0.29	0.01	0.02	0.12	0.06

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Australian Government

Department of Sustainability, Environment, Water, Population and Communities

Referral of proposed action

What is a referral?

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) provides for the protection of the environment, especially matters of national environmental significance (NES). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the matters of NES without approval from the Australian Government Environment Minister or the Minister's delegate. (Further references to 'the Minister' in this form include references to the Minister's delegate.) To obtain approval from the Environment Minister, a proposed action should be referred. The purpose of a referral is to obtain a decision on whether your proposed action will need formal assessment and approval under the EPBC Act.

Your referral will be the principal basis for the Minister's decision as to whether approval is necessary and, if so, the type of assessment that will be undertaken. These decisions are made within 20 business days, provided that sufficient information is provided in the referral.

Who can make a referral?

Referrals may be made by or on behalf of a person proposing to take an action, the Commonwealth or a Commonwealth agency, a state or territory government, or agency, provided that the relevant government or agency has administrative responsibilities relating to the action.

When do I need to make a referral?

A referral must be made for actions that are likely to have a significant impact on the following matters protected by Part 3 of the EPBC Act:

- World Heritage properties (sections 12 and 15A)
- National Heritage places (sections 15B and 15C)
- Wetlands of international importance (sections 16 and 17B)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A)
- Protection of the environment from nuclear actions (sections 21 and 22A)
- Commonwealth marine environment (sections 23 and 24A)
- Great Barrier Reef Marine Park (sections 24B and 24C)
- The environment, if the action involves Commonwealth land (sections 26 and 27A), including:
    - actions that are likely to have a significant impact on the environment of Commonwealth land (even if taken outside Commonwealth land);
    - actions taken on Commonwealth land that may have a significant impact on the environment generally;
- The environment, if the action is taken by the Commonwealth (section 28)
- Commonwealth Heritage places outside the Australian jurisdiction (sections 27B and 27C)

You may still make a referral if you believe your action is not going to have a significant impact, or if you are unsure. This will provide a greater level of certainty that Commonwealth assessment requirements have been met.

To help you decide whether or not your proposed action requires approval (and therefore, if you should make a referral), the following guidance is available from:

- the Policy Statement titled Significant Impact Guidelines 1.1 – Matters of National Environmental Significance. Additional sectoral guidelines are also available.
- the Policy Statement titled Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies.

- the interactive map tool (enter a location to obtain a report on what matters of NES may occur in that location).

Can I refer part of a larger action?

In certain circumstances, the Minister may not accept a referral for an action that is a component of a larger action and may request the person proposing to take the action to refer the larger action for consideration under the EPBC Act (Section 74A, EPBC Act). If you wish to make a referral for a staged or component referral, read 'Fact Sheet 6 Staged Developments/Split Referrals' and contact the Referral Business Entry Point (1800 803 772).

Do I need a permit?

Some activities may also require a permit under other sections of the EPBC Act or another law of the Commonwealth. Information is available on the Department's web site.

Is your action in the Great Barrier Reef Marine Park?

If your action is in the Great Barrier Reef Marine Park it may require permission under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act). If a permission is required, referral of the action under the EPBC Act is deemed to be an application under the GBRMP Act (see section 37AB, GBRMP Act). This referral will be forwarded to the Great Barrier Reef Marine Park Authority (the Authority) for the Authority to commence its permit processes as required under the Great Barrier Reef Marine Park Regulations 1983. If a permission is not required under the GBRMP Act, no approval under the EPBC Act is required (see section 43, EPBC Act). The Authority can provide advice on relevant permission requirements applying to activities in the Marine Park.

The Authority is responsible for assessing applications for permissions under the GBRMP Act, GBRMP Regulations and Zoning Plan. Where assessment and approval is also required under the EPBC Act, a single integrated assessment for the purposes of both Acts will apply in most cases. Further information on environmental approval requirements applying to actions in the Great Barrier Reef Marine Park is available from http://www.gbrmpa.gov.au/ or by contacting GBRMPA's Environmental Assessment and Management Section on (07) 4750 0700.

The Authority may require a permit application assessment fee to be paid in relation to the assessment of applications for permissions required under the GBRMP Act, even if the permission is made as a referral under the EPBC Act. Further information on this is available from the Authority:

Great Barrier Reef Marine Park Authority

2-68 Flinders Street PO Box 1379
Townsville QLD 4810
AUSTRALIA

Phone: + 61 7 4750 0700
Fax: + 61 7 4772 6093

www.gbrmpa.gov.au

What information do I need to provide?

Completing all parts of this form will ensure that you submit the required information and will also assist the Department to process your referral efficiently.

You can complete your referral by entering your information into this Word file.

Instructions

Instructions are provided in green text throughout the form.

Attachments/supporting information

The referral form should contain sufficient information to provide an adequate basis for a decision on the likely impacts of the proposed action. You should also provide supporting documentation, such as environmental reports or surveys, as attachments.

Coloured maps, figures or photographs to help explain the project and its location should also be submitted with your referral. Aerial photographs, in particular, can provide a useful perspective and context. Figures should be good quality as they may be scanned and viewed electronically as black and white documents.

Maps should be of a scale that clearly shows the location of the proposed action and any environmental aspects of interest.

Please ensure any attachments are below two megabytes (2mb) as they will be published on the Department's website for public comment. To minimise file size, enclose maps and figures as separate files if necessary. If unsure, contact the Referral Business Entry Point for advice. Attachments larger than two megabytes (2mb) may delay processing of your referral.

Note: the Minister may decide not to publish information that the Minister is satisfied is commercial-in-confidence.

How do I submit a referral?

Referrals may be submitted by mail, fax or email.

Mail to:

Referral Business Entry Point
Environment Assessment Branch
Department of Sustainability, Environment, Water, Population and Communities
GPO Box 787
CANBERRA ACT 2601

- If submitting via mail, electronic copies of documentation (on CD/DVD or by email) are appreciated.

Fax to: 02 6274 1789

- Faxed documents must be of sufficiently clear quality to be scanned into electronic format.
- Address the fax to the mailing address, and clearly mark it as a 'Referral under the EPBC Act'.
- Follow up with a mailed hardcopy including copies of any attachments or supporting reports.

Email to: epbc.referrals@environment.gov.au

- Clearly mark the email as a 'Referral under the EPBC Act'.
- Attach the referral as a Microsoft Word file and, if possible, a PDF file.
- Follow up with a mailed hardcopy including copies of any attachments or supporting reports.

What happens next?

Following receipt of a valid referral (containing all required information) you will be advised of the next steps in the process, and the referral and attachments will be published on the Department's web site for public comment.

The Department will write to you within 20 business days to advise you of the outcome of your referral and whether or not formal assessment and approval under the EPBC Act is required. There are a number of possible decisions regarding your referral:

The proposed action is NOT LIKELY to have a significant impact and does NOT NEED approval

No further consideration is required under the environmental assessment provisions of the EPBC Act and the action can proceed (subject to any other Commonwealth, state or local government requirements).

The proposed action is NOT LIKELY to have a significant impact IF undertaken in a particular manner

The action can proceed if undertaken in a particular manner (subject to any other Commonwealth, state or local government requirements). The particular manner in which you must carry out the action will be identified as part of the final decision. You must report your compliance with the particular manner to the Department.

The proposed action is LIKELY to have a significant impact and does NEED approval

If the action is likely to have a significant impact a decision will be made that it is a *controlled action*. The particular matters upon which the action may have a significant impact (such as World Heritage values or threatened species) are known as the *controlling provisions*.

The controlled action is subject to a public assessment process before a final decision can be made about whether to approve it. The assessment approach will usually be decided at the same time as the controlled action decision. (Further information about the levels of assessment and basis for deciding the approach are available on the Department's web site.)

The proposed action would have UNACCEPTABLE impacts and CANNOT proceed

The Minister may decide, on the basis of the information in the referral, that a referred action would have clearly unacceptable impacts on a protected matter and cannot proceed.

Compliance audits

If a decision is made to approve a project, the Department may audit it at any time to ensure that it is completed in accordance with the approval decision or the information provided in the referral. If the project changes, such that the likelihood of significant impacts could vary, you should write to the Department to advise of the changes. If your project is in the Great Barrier Reef Marine Park and a decision is made to approve it, the Authority may also audit it. (See "*Is your action in the Great Barrier Reef Marine Park,"* p.2, for more details).

For more information

- call the Department of Sustainability, Environment, Water, Populations and Communities Community Information Unit on 1800 803 772 or
- visit the web site www.environment.gov.au/epbc

All the information you need to make a referral, including documents referenced in this form, can be accessed from the above web site.

Referral of proposed action

Project title: Cleveland Tin Mine - Tailings Mining and Reprocessing Project

1 Summary of proposed action

NOTE: You must also attach a map/plan(s) showing the location and approximate boundaries of the area in which the project is to occur. Maps in A4 size are preferred. You must also attach a map(s)/plan(s) showing the location and boundaries of the project area in respect to any features identified in 3.1 & 3.2, as well as the extent of any freehold, leasehold or other tenure identified in 3.3(i).

1.1 **Short description**

Use 2 or 3 sentences to uniquely identify the proposed action and its location.

Bright Phase Resources Ltd (BPRL) is proposing to mine and reprocess 4 million tonnes of old tailings contained in two large tailings storage facilities (TSF) at the closed Cleveland Mine at Luina in northwest Tasmania.

The aims of the project are:

- to recover and realise the significant mineral resource still contained in the TSFs
- to reduce the significant acid mine drainage emissions to the Whyte River which flows to the Pieman River at Corinna which in turn flows to the west into the Southern Ocean
- to store the treated and relatively benign tailings in more secure and stable facilities to ANCOLD and best practice standards
- to reuse or store the sulphidic tailings in more secure and stable facilities to ANCOLD and best practice standards
- to dewater and explore the old underground workings to determine if underground mining and mineral processing can recommence at the mine.

1.2 **Latitude and longitude**

Latitude and longitude details are used to accurately map the boundary of the proposed action. If these coordinates are inaccurate or insufficient it may delay the processing of your referral.

	Latitude			Longitude		
location point	degrees	minutes	seconds	degrees	minutes	seconds
Northwest corner	41	27	50	145	22	10
Southwest corner	41	29	10	145	22	10
Northeast corner	41	27	50	145	23	52
Southeast corner	41	29	10	145	23	52

Cleveland Mine is located within the bounding box defined by these coordinates (**WGS_1984** coordinate system)

The Interactive Mapping Tool may provide assistance in determining the coordinates for your project area.

If area less than 5 hectares, provide the location as a single pair of latitude and longitude references. If area greater than 5 hectares, provide bounding location points.

If the proposed action is linear (eg. a road or pipeline), provide coordinates for each turning point.

Do not use AMG coordinates.

1.3 **Locality and property description**

Provide a brief physical description of the property on which the proposed action will take place and the project location (eg. proximity to major towns, or for off-shore projects, shortest distance to mainland).

The location of the proposed project is shown in **Attachment A**: *Cleveland Tin Mine regional location map.*

The site is currently Crown Land – State Forest, managed by Forestry Tasmania.

1.4 **Size of the development footprint or work area (hectares)**

The 156 ha extent of the proposed project area will be used in the permit application and Mining Lease application and is delineated by the polygon in **Attachment B**.

The maximum project disturbance footprint will be approximately 81 ha inside the 156 ha project area proposed for the permit and mining lease applications. The final actual disturbance area will be less than the 81 ha, once preliminary geotechnical surveys and clay resource requirements are available for the new tailings storage facilities. The disturbed area footprint and plant layout is contained in **Attachment C**.

A marginally larger polygon was initially delineated and used for the Aboriginal Heritage and ecological surveys (before private land ownership was identified and excluded).

1.5 **Street address of the site**

There is no street address. The site is located immediately south of Waratah Road, at Luina.

1.6 **Lot description**

Describe the lot numbers and title description, if known.

The site is located on the Exploration Licence EL7/2005, covering an area of 18 km^2. The exploration licence and other relevant site appreciation information are contained in **Attachment D**.

Although the exploration licence is 18 km^2, the proposed project and mining lease application area will be approximately 156 ha inside the EL.

The site is currently Crown Land – State Forest, managed by Forestry Tasmania.

1.7 **Local Government Area and Council contact (if known)**

If the project is subject to local government planning approval, provide the name of the relevant council contact officer.

Waratah-Wynyard Council, Contact:

Mr Paddy Kennedy
Executive Manager Development Services
Contact Details: (03) 6443 8340
http://www.circularhead.tas.gov.au/site/page.cfm?u=401

1.8 **Time frame**

Specify the time frame in which the action will be taken including the estimated start date of construction/operation.

The following timeframe is currently anticipated:

- 2011: submission and approval of a Mining Lease Application (MLA) and submission and approval of a land use permit (supported by a Development Proposal and Environmental Management Plan (DPEMP)
- 2012: commencement construction and commissioning of operations
- 2012 to 2017: minimum 4 to 5 year project life, based on current planning
- Further exploration work on the lease may result in an extension of the anticipated life of the operation, including reopening of the mine.

1.9	**Alternatives to proposed action** Were any feasible alternatives to taking the proposed action (including not taking the action) considered but are not proposed?	✓	No
			Yes, you must also complete section 2.2
1.10	**Alternative time frames etc** Does the proposed action include alternative time frames, locations or activities?	✓	No
			Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3.3 (where relevant).
1.11	**State assessment** Is the action subject to a state or territory environmental impact assessment?		No
		✓	Yes, you must also complete Section 2.5
1.12	**Component of larger action** Is the proposed action a component of a larger action?	✓	No
			Yes, you must also complete Section 2.7
1.13	**Related actions/proposals** Is the proposed action related to other actions or proposals in the region (if known)?	✓	No
			Yes, provide details:
1.14	**Australian Government funding** Has the person proposing to take the action received any Australian Government grant funding to undertake this project?	✓	No
			Yes, provide details:
1.15	**Great Barrier Reef Marine Park** Is the proposed action inside the Great Barrier Reef Marine Park?	✓	No
			Yes, you must also complete Section 3.1 (h), 3.2 (e)

2 Detailed description of proposed action

NOTE: It is important that the description is complete and includes all components and activities associated with the action. If certain related components are not intended to be included within the scope of the referral, this should be clearly explained in section 2.7.

2.1 Description of proposed action

This should be a detailed description outlining all activities and aspects of the proposed action and should reference figures and/or attachments, as appropriate.

The original Cleveland tin mine opened near Waratah in 1908 and operated until 1917. Aberfoyle later reopened Cleveland in 1968, continuing to work the deposit until 1986 and processed about 5.7 million tonnes of ore. Hard rock mining operations ceased in 1986 due to the collapse of tin prices.

Due to technical limitations the original mining activities were not able to recover more than approximately 60% of the tin from the mined ore. Significant advances in minerals processing since that time have enabled the opportunity to reprocess the old mine tailings to win the previously unrecoverable mineral values. The project resource consists of approximately 4 million tonnes of historic mill tailings.

Bright Phase Pty Ltd proposes to mine and reprocess the tailings at the old Cleveland Tin Mine at a rate up to 100 tonnes per hour (tph) or approximately 900,000 tonnes per year (t/y). The initial rate of processing, based on the use a modular type plant, will be approximately 35 tph or 300,000 tt/y. The production rate will be increased by adding extra modular sections onto the preliminary plant.

The proposed operation will consist of the following:

- Infrastructure development - power, water, site access and transport
- Installation of a new modern modular processing plant
- Construction of a new TSF with dedicated cells for the different reprocessed tailings disposal streams
- Commissioning of new plant and new TSF
- Tailings reclamation
- Tailings disposal to new higher standard facilities
- Product transport and sales
- Metallurgical processes optimisation
- Mine dewatering for exploration.

A conceptual project layout is shown in **Attachment C**.

Tailings reclamation

The tailings are currently contained in two TSFs, known as the No. 1 Tailings Dam and the No. 2 Tailings Dam.

Reclamation of the tailings material will be undertaken utilizing a conventional excavator, dozer and high-shear pump hopper slurry bin mining method. The contents of both facilities are heterogeneous and will require mining by a “strip” method, where the slimes, fines and sands will be blended at the TSF subject to a defined ore typing protocol.

The different zones in the old TSFs will be mined and blended *in situ* and fed across a skid mounted vibratory grizzly screen to remove trash material such as residual vegetation and other waste materials, which will go to a dedicated disposal site.

The tailings will be transported by pumping to the processing mill feed tank via a pipeline. A skid mounted high-shear mixer and pumping system will be used to slurry and pump the tailings to the processing plant. The tailings will then undergo secondary screening and cleaning before the mineral processing operation.

Plant and new tailings dam locations

The general project area is heavily disturbed from the previous mining activities, with the existing old mill floor, some concrete pads, roads, culverts and bitumen around the old plant area. The new plant and infrastructure will be in the same location as the old plant, subject to the outcome of hydrological and other assessments conducted as part of the project detailed design studies.

Expert consultants will be engaged to develop a hydrogeological model for the Cleveland Project to be utilised for mine, process and tailings storage facility design.

Tailings, from which sulphide minerals have been removed, will be paste thickened and initially pumped to a dedicated cell in a new TSF to be constructed at a potentially suitable site within the proposed project area (see 'potential dams and clay borrow pits' in Attachment D).

These relatively benign tailings (sulphides removed) will then be disposed of into newly constructed cells made available on the old TSFs as mining makes space available. These new cells will be constructed sequentially in the old TSF sites to modern standards for permanent disposal.

As mining of the old tailings proceeds, sufficient space should become available for the construction of new sequential cells in the old TSFs. The rate of mining and processing will match the tailings disposal rate. Once sufficient space is available, the rate of mining and mineral processing will not affect the disposal rate and capacity.

High-sulphide tailings (not immediately reused in the process or for potential future sulphur production) will be stored, in the short-term, in a separate, dedicated, lined cell of the new TSF. Long-term disposal of the high-sulphide tailings will be underwater in known spent stopes in the old underground mine workings. The higher-grade underground mine stopes will not be used for tailings disposal but kept for possible future mining, subject to acceptable hydrogeological and resource exploration studies.

The TSFs and their dedicated cells will be designed, constructed and operated in accordance with ANCOLD standards and best practice environmental management.

After mining and processing of all the old tailings, the new cells in the new TSF as well as the new cells in the original TSFs will be closed, capped and revegetated to an agreed scope in consultation with the land manager, regulators, key stakeholders and interested parties. The mine is likely to be allowed to flood to natural levels. The closure and rehabilitation plan will be designed and implemented using best practice in mining guidelines, the Tasmanian EPA closure plan guidelines and the Strategic Framework for Mine Closure, Australian and New Zealand Minerals and Energy Council & Minerals Council of Australia guidelines. Retreatment of the tailings can also be viewed as a clean-up operation, with the additional benefit of helping alleviate future ongoing acid drainage issues.

Cleveland tailings, like many base-metal sulphide abandoned mine sites, contain acid-generating components that can result in acid mine drainage (AMD). A Cleveland tailings retreatment project will have a major positive impact on the long-term environmental pollution from the historic mine workings by removing acidic sulphide and metal contaminants at source, a key incentive for project to proceed.

Metallurgical processes

The operation will require the application of modern micro-characterization, ore typing and mineral processing techniques as well as access to the fast turnaround of specialist assays and metallurgical testing. An indicative process schematic diagram is shown in **Attachment E**.

A range of particle liberation, separation and concentration techniques will be used, incorporating a blend of established wisdom and modern commercially-proven innovations. Front-end processing will be required for the tailings reprocessing. The base case process diagram shows the recovery of coarse cassiterite using centrifugal gravity separators and fine cassiterite with fine froth flotation and centrifugal concentrators. Copper will be recovered upfront as a concentrate and a sulphide-rich concentrate will be also produced by fine froth flotation.

Modular process plant

The project will initially deploy a small conventional mobile modular gravity/flotation plant capable of a nominal 35 tph (300,000 t/y) throughput, sourced from an Australian company. The planned maximum rate of approximately 100 tph (900,000 t/y) will be achieved by retrofitting extra modules to the plant. The plant will process tailings in a suitably extended commissioning phase to simulate the finer hard rock component and hence derisk the operation technically and economically for any potential future underground hard rock ore processing.

Milling and attritioning

Blended tailings slurry will be fed initially at the initial nominal 35 tph into a trommel (a revolving cylinder screen used to separate materials by size). Oversize reject at +2 mm will be produced from this

beneficiation. Some disaggregation of cemented particles will also occur via the scrubbing action within the trommel. The trommel discharge will be fed into a ball mill with the Derrick screen oversize recycle.

As mentioned earlier, the throughput rate will be increased to approximately 100 t/h incrementally over time with the use of extra modules. A regrind mill will be used on the bulk sulphide flotation tail to promote liberation of cassiterite. Stirred milling will be employed as the most efficient method for this operation.

Gravity separation

Tin processing relies on the high specific gravity (the SG of cassiterite is 6.9 g/cm3) compared with the lighter gangue minerals (quartz, micas, chlorite ~2.6 g/cm3) and the iron-containing minerals (pyrite, pyrrhotite, hematite ~5 g/cm3). Hydrocyclones will be used on the reground bulk sulphide float tail to produce a coarse particle stream containing gravity recoverable cassiterite and fine particle stream containing flotation-recoverable cassiterite.

Coarse gravity recovery will be used on deslimed material to generate a high-grade coarse tin concentrate and conventional proven centrifugal concentration (C Falcon Separators) will be used for recovery of coarse cassiterite after liberation by stirred milling and classification.

Gravity separation of fine cassiterite in final flotation concentration will be undertaken as a final cleaning stage using UF Falcon centrifugal separators.

Flotation

Magnetic separation will be used for the removal of magnetic iron oxide minerals and some magnetic iron sulphides and conventional differential sulphide flotation will be used for the generation of a copper concentrate and removal of deleterious iron sulphide minerals.

Cassiterite flotation has been deployed at many commercial installations over the last fifty years. Addition of collector, depressant and frother reagents will be made to an aerated pulp in a suitably designed cell to ensure adherence of value mineral particles to bubbles for recovery as a froth overflow, whilst allowing the gangue minerals not to adhere to bubbles and to separate via gravity. A combination of roughers, cleaners and scavenging cells will be typically used for the separation.

Modern flotation reagents have been developed that are more selective than those historically used. Modern commercially-proven fine-particle flotation devices allowing fines to be more readily floated and will also be used as secondary scavenger cells.

Fine valuable mineral particles will be recovered from recleaners using fine particle gravity and flotation devices, selected from metallurgical test work results.

Products

Tin concentrates from the gravity and flotation processes will be recovered by thickening and filtration and blended to provide a bulk tin concentrate that will be bagged and transported for sale. Copper concentrate will also be recovered by thickening and filtration and blended to provide a bulk copper concentrate.

Tailings storage facilities

The proposed process life of the Cleveland Tailings Retreatment Project will be approximately 5 years, with a finite old tailings storage raw material resource of approximately 4 million tonnes.

Tailings engineering will include the necessary environmental considerations, such that mine tailings are impounded safely, responsibly and cost-effectively and the design process will include:

- Permitting and licensing.
- Tailings pumping, piping, initial earthworks, drainage and decant facilities and return water storage and pumping.
- Operating manuals specific to each facility.
- Closure planning, dam abandonment and site rehabilitation.

The design philosophy will incorporate:

- Risk-based design methods considering the high precipitation and environmentally sensitive region.
- Consideration of the acid mine drainage (AMD) producing properties of the material and site-wide.
- Optimisation of the disposal technique in minimizing water usage.
- Industry best-practice closure and rehabilitation plan.

Infrastructure

The current tailings are situated near the old mine and consequently the area is well accessed by existing infrastructure. The tailings area is only 15 kilometres from the nearest small town (Waratah) and 50 km from the nearest city (Burnie). Onsite roads will require minor refurbishment. Power runs very near the mine site; access is under discussion with the relevant parties.

The process plant will need a reliable supply of water throughout the year to be drawn from the Whyte River, which will supply an adequate amount of water. A water licence under the Tasmanian *Water Management Act 1999* will be required as part of the project approval.

A settlement dam and limestone neutralization facility will be provided to ensure that excess water from the reclamation and plant operations is captured and discharged according to the applicable regulations and Tasmanian *State Policy on Water Quality Management 1997* (State Water Policy). In this way, the current AMD issue from the historical operation will be positively impacted.

Only relatively small quantities of chemicals such as flotation reagents, flocculants and grinding media will be required. These will be easily supplied, given that several other operating mines and processing plants exist in the general area.

Exploration and geotechnical investigations

The historic Cleveland mine on the site is closed. Any future potential hard rock mining at Cleveland will be subject to exploration and geotechnical investigations and will be separate from this project. This project will however include the dewatering of the mine so that exploration and geotechnical assessment can proceed at some future date.

During the life of the tailings reprocessing operations, the historic Cleveland Mine workings will be investigated with a view to provide an ongoing resource to the processing plant once the tailings reprocessing is completed.

It is proposed to undertake surface and underground exploration drilling to determine if viable and economic tin, copper and tungsten resources exist, particularly in an area known as the 'Foley Zone'. In order to undertake the underground mine resource exploration and ground stability investigations, the mine will need to be dewatered and the water discharged to either Washington Creek or the Whyte River.

Mine dewatering and discharge

The mine dewatering will require a specific monitoring and management regime. The regime will consist of, as a minimum, the following practices.

- Daily monitoring of the physical water quality parameters such as pH, EC, turbidity
- Weekly monitoring of sulphate and heavy metals
- Maximising the volume of the mine water reused in the processing plant
- Minimising the volume of mine water for discharge
- Measuring the discharge flow rate to the receiving waters
- Controlling the discharge rate of the mine water to Washington Creek or the Whyte River in accordance with the *State Policy on Water Quality Management 1997* (State Water Policy)
- If necessary, establishing a discharge regime that achieves a water quality objective at the edge of a designated mixing zone in accordance with the State Water Policy
- If necessary, treating the mine water to a quality that allows for the implementation of the above practices.

Mine access

Mine access will be via the main mine portal. The currently closed portal will be reopened and the mine will be accessed down the main decline as the water level is lowered.

The water will be removed from the mine by two potential pumping operations. One by surface mounted diesel powered pumps with long reinforced suction hoses installed into the workings. The second by transportable skid mounted diesel powered pumps installed underground in the mine and moved as the level falls. The dewatering may ultimately involve both modes of operations or the use of submersible pumps.

The dewatering pump suction lines will be flexible reinforced hoses with air tight sealed fittings. The delivery lines are expected to be flexible black poly type lines that will deliver the mine water to flow detention ponds and settling ponds if required.

The mine will be accessed in a manner that minimises the risk of sludge disturbance which has the potential to affect mine water quality. No sludge is expected to be encountered in the upper levels of the old mine workings. If necessary, settling basins will be installed in the mine and outside of the mine to minimise the risk of mine sludge sediment loss from the operation.

The diesel for the diesel power supply or diesel drives for the pumps will be transported, stored and used in accordance with the dangerous goods requirements.

Any diesel or chemical spills over 20 L will be contained, cleaned up, reported and disposed of in accordance with the notification and waste management requirements of the *Environmental Management and Pollution Control Act 1994*.

Mine exploration & investigation
Any exploration above and below ground will be undertaken in accordance with the Tasmanian Exploration Code of Practice.

2.2 Alternatives to taking the proposed action
This should be a detailed description outlining any feasible alternatives to taking the proposed action (including not taking the action) that were considered but are not proposed (note, this is distinct from any *proposed* alternatives relating to location, time frames, or activities – see section 2.3).

There are no feasible alternatives. The "no action" alternative would result in the benefits of the valuable resource being foregone.

2.3 Alternative locations, time frames or activities that form part of the referred action
If you have identified that the proposed action includes alternative time frames, locations or activities (in section 1.10) you must complete this section. Describe any alternatives related to the physical location of the action, time frames within which the action is to be taken and alternative methods or activities for undertaking the action. For each alternative location, time frame or activity identified, you must also complete (where relevant) the details in sections 1.2-1.9, 2.4-2.7, 3.3 and 4. Please note, if the action that you propose to take is determined to be a controlled action, any alternative locations, time frames or activities that are identified here may be subject to environmental assessment and a decision on whether to approve the alternative.

Not applicable.

2.4 Context, planning framework and state/local government requirements
Explain the context in which the action is proposed, including any relevant planning framework at the state and/or local government level (e.g. within scope of a management plan, planning initiative or policy framework). Describe any Commonwealth or state legislation or policies under which approvals are required or will be considered against.

State Legislation:
The Tasmanian Resource Management and Planning System (RMPS) was established to achieve sustainable outcomes from the use and development of the State's natural and physical resources. Several pieces of legislation embody the aims of the RMPS.

Within the context of this development proposal, there are a number of applicable statutes:

- *State Policies and Projects Act 1993*
- *Land Use Planning and Approvals Act 1993*
- *Environmental Management and Pollution Control Act 1994* (see discussion in section 2.5).

State Policies and Projects Act 1993

The *State Policies and Projects Act 1993* establishes the process to put in place State Policies in relation to the Resource Management and Planning System of Tasmania. State policies seek to ensure a consistent and coordinated approach and incorporate the minimum amount of regulation necessary to achieve their objectives of managing natural resources. State Policies are implemented through their integration into Local Government Planning Schemes.

Currently there are three State Policies:

- *State Coastal Policy 1996* (Coastal Policy)
- *State Policy on Water Quality Management 1997* (Water Quality Policy)
- *State Policy on Protection of Agricultural Land 2009* (PAL Policy).

***State Coastal Policy 1996* (Coastal Policy)**

The purpose of the *State Coastal Policy 1996* is to implement the sustainable development objectives of the RMPS in Tasmania's coastal areas.

The Policy is based on the following three core principles that address these objectives:

- "Natural and cultural values of the coast shall be protected;
- The coast shall be used and developed in a sustainable manner; and
- Integrated management and protection of the coastal zone is a shared responsibility."

The Coastal Policy is applicable to all Tasmanian State waters and land (excepting Macquarie Island) within one kilometre inland of the high-water mark. The Coastal Policy is not applicable to any part of this proposal as no part of the site is within one kilometre of the high-water mark.

***State Policy on Water Quality Management 1997* (Sate Water Policy)**

The purpose of the Water Quality Policy is to achieve the sustainable management of Tasmania's surface water and groundwater resources by protecting or enhancing their qualities while allowing for sustainable development in accordance with the objectives of the RMPS.

A baseline surface water monitoring program has been implemented to investigate water quality data and to ensure that any potential project impacts on the waterways are monitored, controlled or managed appropriately (Refer: Section 4, Measures to avoid or reduce impacts). Groundwater monitoring will be installed before the main pit is developed and processing commences.

The management measures that will be applied to ensure compliance with the State Water Policy include:

1. Construction areas will be clearly demarcated in contract documents so that disturbed areas are kept to a minimum and no unnecessary soil or vegetation disturbance occurs;
2. Where required, erosion and sediment control measures such as silt stop fencing, sediment traps and erosion control matting will be installed prior to the commencement of construction activities;
3. Overland drainage flow will be diverted away from disturbed areas and bare soil to outfalls with sediment traps to reduce the potential for erosion;
4. Rehabilitation and revegetation of disturbed areas will occur as soon as practicable on completion of construction to reduce the potential for ongoing soil erosion to occur;
5. Stockpiled materials will be managed to ensure that dust and potential runoff is minimised and does not enter watercourses;
6. Erosion control measures and sediment traps will be regularly monitored; sediment material will be collected and disposed of on site.

The mine dewatering will involve a specific monitoring and management regime to ensure all water discharged as a result is fully compliant with the State Water Policy. The mine water will be treated, if necessary, to ensure the appropriate water quality objectives are met in accordance with the Water Quality Policy.

***State Policy on Protection of Agricultural Land 2009* (PAL Policy)**

The purpose of the PAL Policy is to "conserve and protect agricultural land so that it remains available for the sustainable development of agriculture, recognising the particular importance of prime agricultural land". The main objective of the PAL Policy is to ensure that the productive capacity of agricultural land is appropriately recognised and protected in the use and development of agricultural land.

The PAL Policy focuses on protecting prime agricultural land (land capability classes 1, 2 and 3) from conversion to non-agricultural uses or from being fettered from being used for agricultural activities. There is no prime agricultural land in the area of the proposed development.

Land Use Planning and Approvals Act 1993 (LUPAA)

Under LUPAA, Councils are required to administer the development and use of land within their municipal boundary. The assessment of development and use is undertaken in accordance with the relevant planning scheme(s).

The proposed development is located within the boundaries of the Waratah-Wynyard Municipality. The proposed use and development within the municipality will be assessed in accordance with the *Waratah-Wynyard Planning Scheme 2000*.

Waratah-Wynyard Planning Scheme 2000
The Mining Lease and surrounding area are within the Primary Industries Zone of the *Waratah-Wynyard Planning Scheme 2000* (the Scheme).

The intent (clause 9.2) of the Primary Industries Zone is:

> *(a) To protect and allow for the sustainable use and development of the natural and non-natural resources on which agriculture, aquaculture, forestry and mining depend; and*
> *(b) To allow a range of other uses in ways and in locations that do not affect the viability of use or development associated with the primary uses of the zone.*

The proposed development is defined by the Scheme as Resource Development, which is a primary use class in this zone.

The Resource Development Use Class is defined as:

> *Use of land for primary production which involves the use, and the planting, growing, harvesting or extraction of natural resources and processing of primary produce.*
>
> *It includes but is not necessarily limited to:*
> *animal husbandry, cropping, forestry, extraction of rocks and minerals, grain and vegetable production, grazing, horticulture, marine farming and aquaculture. It includes buildings and works directly associated with these uses.*

2.5 Environmental impact assessments under Commonwealth, state or territory legislation
If you have identified that the proposed action will be or has been subject to a state or territory environmental impact statement (in section 1.11) you must complete this section. Describe any environmental assessment of the relevant impacts of the project that has been, is being, or will be carried out under state or territory legislation. Specify the type and nature of the assessment, the relevant legislation and the current status of any assessments or approvals. Where possible, provide contact details for the state/territory assessment contact officer.
Describe or summarise any public consultation undertaken, or to be undertaken, during the assessment. Attach copies of relevant assessment documentation and outcomes of public consultations (if available).

Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999

Tasmanian State Legislation

Environmental Management and Pollution Control Act 1994
The project is a level 2 activity under Schedule 2 of the *Environmental Management and Pollution Control Act 1994* and a Development Proposal and Environmental Management Plan (DPEMP) will be submitted to Environment Protection Authority for assessment and approval.

Aboriginal Relics Act 1975
A search of the Tasmanian Aboriginal Site Index has been undertaken by Aboriginal Heritage Tasmania (the Tasmanian State Government Department responsible for the management of Aboriginal Heritage. This search indicated that there are no Aboriginal heritage sites recorded within or close to the property.

The correspondence from Aboriginal Heritage Tasmania regarding this matter is included as **Attachment F**.

Threatened Species Protection Act 1995
No flora species, listed as threatened under the Tasmanian *Threatened Species Protection Act 1995* were recorded from the study area. The following species have previously been recorded from within 5 km of the study area:

- *Comesperma defoliatum* (leafless milkwort)
- *Epacris glabella* (smooth heath)
- *Hypolepis muelleri* (harsh groundfern)
- *Micrantheum serpentinum* (western tridentbush)
- *Viola cunninghamii* (alpine violet)

No fauna species, listed as threatened under the Tasmanian *Threatened Species Protection Act 1995* were recorded from the study area. The following species have previously been recorded from within 5 km of the study area:

- *Sarcophilus harrisii* (tasmanian devil)
- *Beddomeia hullii* (hydrobiid snail – Heazlewood River)
- *Dasyurus maculatus* subsp. *maculatus* (spotted-tailed quoll)
- *Lathamus discolor* (swift parrot)
- *Phrantela annamurrayae* (hydrobiid snail – Heazlewood River)
- *Phrantela marginata* (hydrobiid snail – Heazlewood River)

Historic Cultural Heritage Act 1995
There are no known or anticipated features of historic heritage significance in the area of the proposed mine development.

Forest Practices Act 1985

For many activities a Forest Practices Plan (FPP) is required under the *Forest Practices Act 1985* where the clearing of forest is in excess of 1 hectare or 100 tonnes of timber (in areas of 'vulnerable land' these thresholds are lower). However, mining operations are explicitly excluded from this requirement where a LUPAA permit is in place, which will be the case for this project.

2.6 Public consultation (including with Indigenous stakeholders)
Your referral must include a description of any public consultation that has been, or is being, undertaken. Where Indigenous stakeholders are likely to be affected by your proposed action, your referral should describe any consultations undertaken with Indigenous stakeholders. Identify the relevant stakeholders and the status of consultations at the time of the referral. Where appropriate include copies of documents recording the outcomes of any consultations.

Consultation has been undertaken with:

- Mineral Resources Tasmania
- Tasmanian EPA (several presentations)
- Forestry Tasmania
- Crown Land Services (in relation to land ownership)
- Waratah-Wynyard Council
- Tasmania Police
- The Tarkine Coalition

2.7 A staged development or component of a larger project

If you have identified that the proposed action is a component of a larger action (in section 1.12) you must complete this section. Provide information about the larger action and details of any interdependency between the stages/components and the larger action. You may also provide justification as to why you believe it is reasonable for the referred action to be considered separately from the larger proposal (eg. the referred action is 'stand-alone' and viable in its own right, there are separate responsibilities for component actions or approvals have been split in a similar way at the state or local government levels).

Not applicable.

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

Describe the affected area and the likely impacts of the proposal, emphasising the relevant matters protected by the EPBC Act. Refer to relevant maps as appropriate. The interactive map tool can help determine whether matters of national environmental significance or other matters protected by the EPBC Act are likely to occur in your area of interest.

Your assessment of likely impacts should refer to the following resources (available from the Department's web site):

- specific values of individual World Heritage properties and National Heritage places and the ecological character of Ramsar wetlands;
- profiles of relevant species/communities (where available), that will assist in the identification of whether there is likely to be a significant impact on them if the proposal proceeds;
- *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*; and
- associated sectoral and species policy statements available on the web site, as relevant.

Note that even if your proposal will not be taken in a World Heritage area, Ramsar wetland, Commonwealth marine area, the Great Barrier Reef Marine Park or on Commonwealth land, it could still impact upon these areas (for example, through downstream impacts). Consideration of likely impacts should include both direct and indirect impacts.

3.1 (a) World Heritage Properties

Description

There are no places within or adjacent to the proposed mine development that are contained in World Heritage lists.

Nature and extent of likely impact

Address any impacts on the World Heritage values of any World Heritage property.

Not applicable

3.1 (b) National Heritage Places

Description

There are no listed National Heritage places within or adjacent to the proposed mine development.

The proposal project does not fall within the Tarkine Wilderness Area, listed on the Register of the National Estate (RNE).

Nature and extent of likely impact

Address any impacts on the National Heritage values of any National Heritage place.

Not applicable

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

There are no wetlands of international importance (declared Ramsar wetlands) in the vicinity of the proposed development.

Nature and extent of likely impact

Address any impacts on the ecological character of any Ramsar wetlands.

Not applicable

3.1 (d) Listed threatened species and ecological communities

Description

There are no vegetation communities, flora or fauna listed under either State or Commonwealth legislation located in the area.

Nature and extent of likely impact

Address any impacts on the members of any listened threatened species (except a conservation dependent species) or any threatened ecological community, or their habitat.

Not applicable

3.1 (e) Listed migratory species

Description

No listed migratory species have been recorded from the area.

Nature and extent of likely impact

Address any impacts on the members of any listed migratory species, or their habitat.

Not applicable

3.1 (f) Commonwealth marine area
(If the action is in the Commonwealth marine area, complete 3.2(c) instead. This section is for actions taken outside the Commonwealth marine area that may have impacts on that area.)

Description

Not applicable

Nature and extent of likely impact

Address any impacts on any part of the environment in the Commonwealth marine area.

3.1 (g) Commonwealth land
(If the action is on Commonwealth land, complete 3.2(d) instead. This section is for actions taken outside Commonwealth land that may have impacts on that land.)

Description

If the action will affect Commonwealth land also describe the more general environment. The Policy Statement titled *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* provides further details on the type of information needed. If applicable, identify any potential impacts from actions taken outside the Australian jurisdiction on the environment in a Commonwealth Heritage Place overseas.

Not applicable

Nature and extent of likely impact

Address any impacts on any part of the environment in the Commonwealth land. Your assessment of impacts should refer to the *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* and specifically address impacts on:

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage values of places; and
- the social, economic and cultural aspects of the above things.

3.1 (h) The Great Barrier Reef Marine Park

Description

Not applicable

Nature and extent of likely impact

Address any impacts on any part of the environment of the Great Barrier Reef Marine Park.

Note: If your action occurs in the Great Barrier Reef Marine Park you may also require permission under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act). If so, section 37AB of the GBRMP Act provides that your referral under the EPBC Act is deemed to be an application under the GBRMP Act and Regulations for necessary permissions and a single integrated process will generally apply. Further information is available at www.gbrmpa.gov.au

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3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

You must describe the nature and extent of likely impacts (both direct & indirect) on the whole environment if your project:

- is a nuclear action;
- will be taken by the Commonwealth or a Commonwealth agency;
- will be taken in a Commonwealth marine area;
- will be taken on Commonwealth land; or
- will be taken in the Great Barrier Reef marine Park.

Your assessment of impacts should refer to the *Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies* and specifically address impacts on:

- ecosystems and their constituent parts, including people and communities;
- natural and physical resources;
- the qualities and characteristics of locations, places and areas;
- the heritage values of places; and
- the social, economic and cultural aspects of the above things.

3.2 (a)	**Is the proposed action a nuclear action?**	✓	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (b)	**Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?**	✓	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (c)	**Is the proposed action to be taken in a Commonwealth marine area?**	✓	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))

3.2 (d)	**Is the proposed action to be taken on Commonwealth land?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))		

3.2 (e)	**Is the proposed action to be taken in the Great Barrier Reef Marine Park?**	✓	No
			Yes (provide details below)
	If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))		

3.3 Other important features of the environment

Provide a description of the project area and the affected area, including information about the following features (where relevant to the project area and/or affected area, and to the extent not otherwise addressed above). If at Section 2.3 you identified any alternative locations, time frames or activities for your proposed action, you must complete each of the details below (where relevant) for each alternative identified.

3.3 (a) Flora and fauna

An ecological assessment of the site has been undertaken by Environmental Consulting Options Tasmania[1]. A copy of this report is included as **Attachment G**. The key findings of this investigation are as follows:

- Threatened flora:
  - No flora species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
- Threatened fauna:
  - No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
  - The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil, but it is unlikely that features such as nests or dens are present within the study area itself.
  - The wider area supports potential nesting habitat for the wedge-tailed eagle (Aquila audax subsp. fleayi). No wedge-tailed eagle nest sites were identified during the course of the field assessment or two aerial searches. Please refer to the Ecological Assessment in Attachment G for further details.

3.3 (b) Hydrology, including water flows

Drainage:
Drainage in the area is via the Whyte River, which flows to the southwest to the confluence with the Pieman River just above Corinna. The Pieman River flows west to the Southern Ocean.

Water flows:
There is no water flow data currently available for the Whyte River. However, "normal flow" in the Whyte River is estimated to be of the order of 0.1 cumecs to about 2 cumecs.

Bright Phase has recently initiated a water monitoring program in the area.

3.3 (c) Soil and Vegetation characteristics

[1] ECO*tas* (2011). *Ecological Assessment of Proposed Tailings Reprocessing Project, Cleveland Mine, Luina, Northwest Tasmania*. Report by Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd.

Soils:

The proposed mine site and surrounding areas are located on the following land system, as mapped by Richley[2]:

824241 Huskisson River
This land system has developed on the deeply dissected Cambrian sedimentary and volcanic rocks in an area with an average annual rainfall of 2000 – 2500 mm. The vegetation on this land system is typically tall closed forest, with gum-topped stringybark, myrtle, sassafras, dogwood, leatherwood, horizontal scrub and soft tree ferns.

Stony, gravelly, friable, yellowish red gradational soils have developed on the steep upper slopes (average sidelslope of 18^0). These soils have a peaty loam surface texture, high permeability and a high susceptibility to sheet erosion. These soils have an average depth of 1.0 m, but vary considerably in depth, ranging from 0.5 m to >2 m.

The soils in the swales (average sideslope 14^0) are gravelly, strong brown gradational soils with a peaty loam surface texture, moderate permeability, an average depth of 1.3 m and a high susceptibility to sheet erosion.

On the footslopes (average sideslope 10^0) the soils are gravelly, yellowish brown gradational soils with a peaty loam surface texture, moderate permeability, an average depth of 1.8 m and a high susceptibility to sheet erosion.

The soils in the flowlines are stony, yellowish brown gradational soils that have developed on fluviatile Tertiary basalt (average sideslope 1^0), derived from the Tertiary basalt capping on adjoining areas. These soils have a peaty loam surface texture, moderate permeability, an average depth of 1.5 m and are subject to moderate flooding and siltation.

Land Capability:

Although a land capability survey has not been undertaken for this area, an estimation of the likely land capability classes can be made, based on the known geology, land systems and land usage. As the area is currently protected in either State Forest, it would be excluded from agricultural use (classified as Exclusion Areas in land capability mapping).

If any of this land was capable of being converted to an agricultural land classification, it would likely be classified as land capability Class 7 (*land with very severe to extreme limitations which make it unsuitable for agricultural use*) or Class 6 (*land marginally suitable for grazing because of severe limitations*).

3.3 (d) Outstanding natural features

There are no outstanding natural features, including caves, or features of geological conservation significance in the vicinity of the proposed mine development.

3.3 (e) Remnant native vegetation

The area is predominantly cleared land associated with the old Luina Township or revegetation from the rehabilitation of old mining areas. A site appreciation can be gained from the aerial photographs and relevant documents contained in Attachment D.

The ecological assessment of the site (depicted in Figure 4, p12 of **Attachment G**):

- Identified the following five native vegetation mapping units:
    - *Acacia melanoxylon* forest on rises (TASVEG code: NAR)
    - *Eucalyptus obliqua* dry forest and woodland (TASVEG code: DOB)
    - *Eucalyptus obliqua* forest with broad-leaf shrubs (TASVEG code: WOB)
    - *Eucalyptus obliqua* forest over rainforest (TASVEG code: WOR)

[2] Richley, LR. 1978. *Land Systems of Tasmania Region 3*. Department of Agriculture, Tasmania.

  - *Nothofagus-Arherosperma* rainforest (TASVEG code: RMT)

- Identified the following three non-native vegetation groups
  - Extra-urban miscellaneous (TASVEG code: FUM)
  - Permanent easement (TASVEG code: FPE)
  - Regenerating cleared land (TASVEG code: FRG)
- None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

3.3 (f) Gradient (or depth range if action is to be taken in a marine area)

Elevation varies considerably over the site, ranging from approximately 290 m AHD to 400 m AHD. Gradients are greatest on the eastern side of the site, particularly on the southeastern section of the site where it extends up across Crescent Spur.

3.3 (g) Current state of the environment

Include information about the extent of erosion, whether the area is infested with weeds or feral animals and whether the area is covered by native vegetation or crops.

Weeds:
The following four species classified as "declared weeds" within the meaning of the Tasmanian *Weed Management Act 1999* where observed in the ecological study area:

- *Erica lusitanica* (spanish heath)
- *Cytisus scoparius* (english broom)
- *Rubus fruticosus* .agg (blackberry)
- *Salix* sp. (willow)

These weeds generally occur in and around the old Luina township.

Other potentially invasive species recorded include:

- *Chasmanthe floribunda* (african cornflag)
- *Cirsium vulgare* (scotch thistle)
- *Cotoneaster* sp. (cotoneaster)
- *Digitalis purpurea* (foxglove)

Disease:
There was no symptomatic evidence of the root-rot pathogen *Phytophthora cinnamomi* observed in the ecological study area. Due to the disturbed nature of the vegetation and the lack of plant species susceptible to the pathogen, no special management prescriptions are considered warranted.

No evidence of myrtle wilt was recorded from within the study area.

Feral animals:
No feral animals have been observed in the area.

Cover of the area:
Cover of the area comprises the old Luina township, extensive roads, rehabilitation and revegetation areas, the Cleveland Mine site and some limited old growth forest.

Erosion:
The soils of the area have a high susceptibility to sheet erosion.

3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values

There are no Commonwealth Heritage Places or other places recognised as having heritage values in the area of the proposed mine development.

3.3 (i) Indigenous heritage values

There are no identified Aboriginal cultural heritage values identified in the area (see correspondence from Aboriginal Heritage Tasmania included as Attachment F).

3.3 (j) Other important or unique values of the environment

Describe any other key features of the environment affected by, or in proximity to the proposed action (for example, any national parks, conservation reserves, wetlands of national significance etc).

There are no other important or unique values of the environment on the site. The EPBCA *Protected Matters Area* report (SEWPAC 2011) indicates that the "Tarkine TAS" (indicative place) and "Tarkine Wilderness Area TAS" (registered) are adjacent to but outside the project area.

The area of proposed development has low environmental values due to long term disturbance associated with past mining activities.

The project has the potential to remediate historic site degradation and improve the quality of the local environment and fauna habitat.

3.3 (k) Tenure of the action area (eg freehold, leasehold)

All the land in the area of the proposed mining and mineral processing activities is Crown land – State Forest, managed by Forestry Tasmania. It contains an informal reserve in the project area which will be addressed in consultation with Forestry Tasmania (the land manager) as part of the approvals process.

3.3 (l) Existing land/marine uses of area

The wider area is currently used for forestry and conservation activities.

3.3 (m) Any proposed land/marine uses of area

The proposed land use in the area the subject of this EPBC referral is for a mining and mineral processing operation. There are no other proposals for the area.

4 Measures to avoid or reduce impacts

Note: If you have identified alternatives in relation to location, time frames or activities for the proposed action at Section 2.3 you will need to complete this section in relation to each of the alternatives identified.

Provide a description of measures that will be implemented to avoid, reduce, manage or offset any relevant impacts of the action. Include, if appropriate, any relevant reports or technical advice relating to the feasibility and effectiveness of the proposed measures.

For any measures intended to avoid or mitigate significant impacts on matters protected under the EPBC Act, specify:

- what the measure is,
- how the measure is expected to be effective, and
- the time frame or workplan for the measure.

Examples of relevant measures to avoid or reduce impacts may include the timing of works, avoidance of important habitat, specific design measures, or adoption of specific work practices.

Provide information about the level of commitment by the person proposing to take the action to implement the proposed mitigation measures. For example, if the measures are preliminary suggestions only that have not been fully researched, or are dependent on a third party's agreement (e.g. council or landowner), you should state that, that is the case.

Note, the Australian Government Environment Minister may decide that a proposed action is not likely to have significant impacts on a protected matter, as long as the action is taken in a particular manner (section 77A of the EPBC Act). The particular manner of taking the action may avoid or reduce certain impacts, in such a way that those impacts will not be 'significant'. More detail is provided on the Department's web site.

For the Minister to make such a decision (under section 77A), the proposed measures to avoid or reduce impacts must:

- clearly form part of the referred action (eg be identified in the referral and fall within the responsibility of the person proposing to take the action),
- be must be clear, unambiguous, and provide certainty in relation to reducing or avoiding impacts on the matters protected, and
- must be realistic and practical in terms of reporting, auditing and enforcement.

More general commitments (eg preparation of management plans or monitoring) and measures aimed at providing environmental offsets, compensation or off-site benefits CANNOT be taken into account in making the initial decision about whether the proposal is likely to have a significant impact on a matter protected under the EPBC Act. (But those commitments may be relevant at the later assessment and approval stages, including the appropriate level of assessment, if your proposal proceeds to these stages).

Avoidance of native vegetation and habitat:
To ensure avoidance and reduced impacts to native vegetation and fauna habitat, a project site assessment was undertaken by ECOTas environmental consultancy. The report is contained in **Attachment G**.

No endangered or high value flora was identified on the proposed project site. Key findings for the habitat survey are summarised below. While there will be a loss of some potential habitat for some species (modified already), the loss is not such that it is likely to:

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat
- introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species.

The conceptual project layout has been designed to avoid impacts on potential habitat occurring in native vegetation.

The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil. However, no evidence of these species was identified from within the study area and it is unlikely that features such as nests or dens are present. No wedge-tailed eagle nest sites were identified during the course of the field assessment or two aerial searches undertaken for the project area and a 1 km buffer of potential habitat.

Table 1 below identifies the quantum and type of vegetation being impacted in relation to the actual area surveyed.

Vegetation Type	**Flora/fauna habitat study area (Hectares)**	**Maximum potential project impacted area (Hectares)**
Extra-urban miscellaneous (FUM)	17.92	6.41
Permanent easement (FPE)	3.71	1.63
Regenerating cleared land (FRG)	48.57	43.2
Sub-total	70.20	51.24
Acacia melanoxylon forest on rises (NAR)	8.36	1.25
Eucalyptus obliqua dry forest (DOB)	4.29	3.86
Eucalyptus obliqua forest with broadleaf shrubs (WOB)	49.31	23.7
Eucalyptus obliqua forest over rainforest (WOR)	27.71	1.26
Nothofagus- Atherosperma rainforest (RMT)	1.90	0.04
Sub-total	91.57	30.11
Total	161.77	81.35

The conceptual project layout will avoid the native vegetation to the maximum extent possible and mainly impact on non-native anthropogenic derived vegetation (approximately 51.24 hectares). The currently stated extent of clearance is based on the worst case scenario. It is expected that the project area will be reduced following detailed project design. The elements likely to reduce in dimension are the 'potential tailings dam and clay borrow pits' - this area is mapped as *Eucalyptus obliqua* forest with broadleaf shrubs (WOB), so the 23.7 ha of impact may in fact be significantly lower following detailed design.

Extra-urban miscellaneous (FUM) is used to describe the quarry areas and old infrastructure sites, which are common across the site. Permanent easement (FPE) is used to describe the large power transmission line that crosses the centre of the study area. The vegetation associated with the power lines is managed with regular fire management clearing occurring. Regenerating cleared land (FRG) is the dominant mapping unit

across the study area. FRG in this case is used to describe the actively rehabilitated tailings dump areas, old quarry sites, run-of-mine pad, old mill and crusher plant, processing plant and workshops areas which are being recolonised by native plant species or have had native seed sown to encourage rehabilitation.

The maximum possible impact on native vegetation (maximum approximately 30.11 hectares) has been minimised and will occur on the edge of contiguous vegetation communities existing in the broader landscape. It may be the case that the areas of native vegetation identified to be impacted in Table 1, may not actually be impacted to the extent delineated (this is especially the case with the larger extent of *Eucalyptus obliqua* forest with broadleaf shrubs (WOB)). This is because the area for the 'potential tailings dam and clay borrow pits' area is initially overestimated until the detailed geotechnical details are available and the amount of clay resource required for the project is verified.

Any potential reductions in the development footprint will therefore occur in the WOB native forest component. When clearance of high value native vegetation does occur it will be staged and proceed after the site clearance measures articulated below are implemented.

Site clearance measures:
It is unlikely that suitable threatened fauna habitat is present within the study area itself. However, as some native vegetation will be cleared in future stages, it is important that appropriate safeguards are put in place to identify any threatened fauna habitat (for example denning opportunities, habitat trees or nests) which may come to exist between the original ECOTAS survey and when clearance actually takes place.

When native vegetation is proposed to be cleared, preclearance surveys will be undertaken by a suitably qualified person. Appropriate mitigation and avoidance measures to reduce impacts on threatened fauna habitat will be implemented as required and recommended by a suitably qualified ecologist.

Road kill
The transport route is via the Waratah Road, Ridgley Highway, Massey Greene Road (heavy truck road) and the Bass Highway to the Burnie wharf area (see **Attachment H** for map of transport route).

Increased vehicular movements associated with the proposed action may potentially increase the risk of road kill for both the tasmanian devil and spotted-tailed quoll. However, in the case of this proposed action it is unlikely a significant impact will occur. This is based on a combination of factors associated with the proposed transport activity and the proposed transport route as summarised below:

- Daylight operation of product transport - product transport trucks will only operate during daylight hours - even in the shorter months of winter. Road kill for both the tasmanian devil and spotted tailed quoll is more likely to occur between dusk and dawn
- The utilisation of a worker transport bus - instead of individual workers commuting to the site, they will be required to use a worker transport bus. This will reduce the volume of traffic movements therefore lowering the risk of road kill along the transport route
- Steep terrain - the product transport trucks and worker transport bus are unlikely to exceed 40 km per hour along Waratah Road for the 4 km section east of Luina. This section of road is steep and windy and it is unlikely that trucks and buses would be able to travel at fast speeds. Higher speeds (particularly over 60 km/h) increases the risk of road kill
- The proposed action does not significantly increase the volume of traffic along the transport route compared to already existing traffic movements - product transport from the operating mine has been estimated to be in the order of a maximum of 6 truck movements per day (3 loads to Burnie per day). The worker transport bus has been estimated to be in the order of 4 bus movements per day (2 trips to Burnie per day). It could also be the case that this may not be an additional increase as the workers may utilise the bus service already operating between Burnie and the Savage River mine
- Miscellaneous traffic (for example subcontractors, visitors etc.) has been estimated to be in the order of 8 movements per day (4 trips to Burnie per day). Therefore, the total movements along the transport route are estimated to be in the order of 18 movements per day with the worst case scenario likely to a maximum of 12 movements potentially occurring just before dawn and just after dark especially in winter and in the order of 6 truck movements occurring during daylight hours
- The construction phase is not expected to have a much higher traffic load than the operating mode. Construction workers and equipment transport to the site will be minimal due to the modular nature of the plant and the basic nature and establishment of the mining and other infrastructure.

- An analysis of the traffic movements along the transport route has been undertaken (using data supplied from the Tasmanian Department of Infrastructure, Energy and Resources) which indicates Annual Average Daily Traffic[3] (AADT) for the relevant sections of the Waratah Road to be 250 and Ridgley Highway 1602
- The potential AADT increase on Waratah Road is approximately 7% (18/250 x100). The potential AADT increase on the Ridgley Highway is approximately 1% (18/1602 x 100)

Weed management measures:

A weed management and spread prevention plan will be developed for the site in order to manage the containment or spread of weeds identified above.

Site rehabilitation:

A conceptual rehabilitation plan and closure plan will be included in the development proposal and environmental management plan (DPEMP) to be submitted for State Government approval of the project. A more detailed rehabilitation plan will be prepared following project approval and detailed project design.

Site rehabilitation and closure planning will involve the closure, capping and revegetation of the old and new TSFs to an agreed scope and design in consultation with the land manager, regulators, key stakeholders and interested parties. It is expected that the mine will be allowed to flood to natural levels.

The closure and rehabilitation plan will be designed and implemented using best practice in mining guidelines, the Tasmanian EPA closure plan guidelines and the Strategic Framework for Mine Closure, Australian and New Zealand Minerals and Energy Council & Minerals Council of Australia guidelines.

Retreatment of the tailings can essentially be viewed as a clean-up operation by proxy, with the additional benefit of helping alleviate future acid drainage issues.

Water quality management:

The Whyte River is currently heavily impacted from the acid mine drainage from the original Cleveland Mine TSFs. Baseline water quality and flow data is currently being gathered for inclusion in the project DPEMP.

The protected environmental values of all Tasmanian surface waters have been established by the Tasmanian EPA Board in accordance with the *State Policy on Water Quality Management 1997*. The baseline data will be used to establish water quality objectives in accordance with the ANZECC guidelines.

The DPEMP will include a water quality monitoring regime expected to include as a minimum upstream and downstream monitoring of the Whyte River as well as designated aqueous emission sources.

Ground water monitoring will also be undertaken.

[3] The number of vehicles (including commercials) summed over all the available lanes in both directions at the specified site, averaged over all days of the year.

5 Conclusion on the likelihood of significant impacts

Identify whether or not you believe the action is a controlled action (ie. whether you think that significant impacts on the matters protected under Part 3 of the EPBC Act are likely) and the reasons why.

5.1 Do you THINK your proposed action is a controlled action?

✓	No, complete section 5.2
	Yes, complete section 5.3

5.2 Proposed action IS NOT a controlled action.

Specify the key reasons why you think the proposed action is NOT LIKELY to have significant impacts on a matter protected under the EPBC Act.

The proposed action, the development of the tailings reprocessing facility, is not considered to be a controlled action for the following reasons:

Vegetation communities:

There are no vegetation communities of national (*Environment Protection and Biodiversity Conservation Act 1999*) significance within the proposed site.

Flora:

No species of national (*Environment Protection and Biodiversity Conservation Act 1999*) significance were recorded from within the study area.

Fauna:

The study area may form part of the home range of the masked owl, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil[4]

- The masked owl potential habitat is lowland dry sclerophyll forests with old growth components, although it has been recorded in wet forest types. The development will not result in substantial removal of potential foraging or nesting habitat. There were no nesting opportunities found during the survey. Despite this, a conservative approach of pre-clearance surveys has been proposed to ensure (beyond doubt) that no masked owl nesting opportunities will be lost as a result of the limited clearance associated with the proposed development.
- Potential habitat for the spotted-tailed quoll is wetter forest types, coastal heath and bush-pasture interfaces. At a local scale the proposed development will result in a small loss of potential habitat when compared to the larger expanses of habitat in the wider area. The development will not result in a significant impact on the species habitat.
- No wedge-tailed eagle nest sites were identified during the course of the field assessment; however it is likely that the area is used as foraging habitat. Potential habitat is described as "large tracts (more than 10 ha) of eucalypt or mixed forest" (FPA 2011). This habitat is extensive surrounding the study area[5]. In addition to the ground based surveys, two aerial searches were undertaken for the project area and a 1 km buffer of potential habitat. No nests were detected. Please refer to the Ecological Assessment in Attachment G for further details.
- No evidence of Tasmanian devils was identified in the study area and the surrounding vegetation (dense wet sclerophyll, mixed forest and rainforest) suggests that the area surrounding the proposed development is unlikely to be prime habitat for the species. The proposed development will re-work and rehabilitate old mine workings. The development will not introduce or lead to long term disease, reduce the area of occupancy, fragment an existing population, fragment an existing habitat or interfere with the recovery of the species.

[4] ECO*tas* (2011). *Ecological Assessment of Proposed Tailings Reprocessing Project, Cleveland Mine, Luina, Northwest Tasmania*. Report by Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd.
[5] ECO*tas* (2011).

The extent of vegetation clearance is minimal, and predominantly involves minor 'edge clearance' directly adjacent to the existing disturbed areas. None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The Ecological Assessment concluded that the proposed development would not constitute a "significant impact" because:

> "...while there will be a loss of some potential habitat of these species (modified already), the loss is not such that it is likely to lead to a long-term decrease in the size of an important population of a species, reduce the area of occupancy of an important population, fragment an existing important population, fragment an existing important population into two or more populations, adversely affect habitat critical to the survival of a species, disrupt the breeding cycle of an important population, modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat, introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species."[6]

Proposed avoidance and mitigation measures:

The conceptual project layout largely avoids impacts on potential fauna habitat. The study area may form part of the home range of species such as the masked owl, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil. However, no evidence of these species was identified from within the study area and it is unlikely that features such as nests or dens are present. When native vegetation is proposed to be cleared preclearance surveys will be undertaken by a suitably qualified person. Appropriate mitigation and avoidance measures to reduce impacts on threatened fauna habitat will be implemented as required and recommended by a suitably qualified ecologist.

The conceptual project layout will mostly avoid the native vegetation and mainly impact on non-native anthropogenic derived vegetation (approximately 51.24 hectares).

The project will be approved and regulated in accordance with Tasmanian legislation and Policies. A DPEMP will outline the mitigation measures required to protect the area values. This will also include water quality monitoring and a rehabilitation and closure plan.

It is expected that on completion the project will result in a cleaner, a more chemically, physically and biologically stable site and potentially more acceptable site for future flora and fauna habitat establishment.

5.3 Proposed action IS a controlled action

Type 'x' in the box for the matter(s) protected under the EPBC Act that you think are likely to be significantly impacted. (The 'sections' identified below are the relevant sections of the EPBC Act.)

	Matters likely to be impacted
	World Heritage values (sections 12 and 15A)
	National Heritage places (sections 15B and 15C)
	Wetlands of international importance (sections 16 and 17B)
	Listed threatened species and communities (sections 18 and 18A)
	Listed migratory species (sections 20 and 20A)
	Protection of the environment from nuclear actions (sections 21 and 22A)
	Commonwealth marine environment (sections 23 and 24A)
	Great Barrier Reef Marine Park (sections 24B and 24C)
	Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)

[6] ECO*tas* (2011). *Ecological Assessment of Proposed Tailings Reprocessing Project, Cleveland Mine, Luina, Northwest Tasmania*. Report by Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd.

	Protection of the environment from Commonwealth actions (section 28)
	Commonwealth Heritage places overseas (sections 27B and 27C)

Specify the key reasons why you think the proposed action is likely to have a significant adverse impact on the matters identified above.

6 Environmental record of the responsible party

NOTE: If a decision is made that a proposal needs approval under the EPBC Act, the Environment Minister will also decide the assessment approach. The EPBC Regulations provide for the environmental history of the party proposing to take the action to be taken into account when deciding the assessment approach.

		Yes	No
6.1	**Does the party taking the action have a satisfactory record of responsible environmental management?**		✓

Provide details

As Bright Phase has not yet been involved in the development of a mine, the company has no track record of responsible environmental management. However company personnel, in particular Dr Mike Adams and Dr Will Goodall, have had extensive experience in environmental management associated with mining operations.

Dr Adams is recognised as a world expert for his work in the environmental management of cyanide:

- Published fourteen peer-reviewed papers in the field
- Consulted to industry on environmental impact and treatment of cyanide effluents:
    - Australia: Boddington, Beaconsfield, KCGM, Lawlers, Plutonic, Darlot, Kanowna Belle, Stawell, Jundee, St Ives, Granny Smith, Telfer, KCGM
    - Brazil: Anglo American of South America, Rio Paracatu Mineracao
    - Finland: Riddarhyttan
    - France: Salsigne
    - New Zealand: Waihi
    - Romania: Rosia Montana
    - South Africa: Fairview, Kinross
    - Turkey: Ovacik
    - Phillipines: Puro
    - USA: Phoenix
- Assisted three mine sites in obtaining compliance with the International Cyanide Management Code via a peer-reviewed MERIWA study:
    - Australia: Kanowna Belle, St Ives, Granny Smith
- Currently consults with Maelgwyn Mineral Services in developing a new cyanide destruction process
- Acid Mine Drainage consulting and mitigation:
    - Mt Gordon, Australia – initiation and process development of a 240 m^3/h plant for removal of metals from AMD that operated commercially for over twelve months
    - Mt Lyell, Australia – consulted to technology developers
- Identification and analysis of respirable dusts:
    - South Africa – determined crystobalite presence in nuisance dust, cause of pneumoconiosis in workers at a silicon plant
- Removal of mercury from plant streams:
    - China – process development, design and commissioning of a mercury treatment plant at a gold mine
    - Australia and North America – design setpoint for mercury on kiln and calciner off-gases to enable design of appropriate scrubbing systems

Dr Will Goodall:

- Has three years experience in analysis of mining-caused environmental problems
- Author of the paper "Automated mineralogy in the prediction of acid mine drainage: Accessible mineralogy using QEMSCAN", presented at the SME conference in Salt Lake City, Utah, USA in 2008
- Is currently undertaking acid base accounting (ABA) work for Aura Energy on the Haggan Uranium Project, Sweden

6.2	**Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?**		✓

	If yes, provide details		
6.3	**If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework?** **If yes, provide details of environmental policy and planning framework** Bright Phase is currently in the process of preparing their environmental policy and planning framework. These documents are not yet available.	✓	
6.4	**Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?** **Provide name of proposal and EPBC reference number (if known)**		✓

7 Information sources and attachments

(For the information provided above)

7.1 References

- List the references used in preparing the referral.
- Highlight documents that are available to the public, including web references if relevant.

Richley, LR., 1978. *Land Systems of Tasmania Region 3*. Department of Agriculture, Tasmania.

ECOtas, 2010. *Ecological Assessment of Proposed Tailings Reprocessing Project, Cleveland Mine, Luina, Northwest Tasmania*. Report by Environmental Consulting Options Tasmania (ECOtas) for Bright Phase Resources Ltd, 16 August 2011.

7.2 Reliability and date of information

For information in section 3 specify:

- source of the information;
- how recent the information is;
- how the reliability of the information was tested; and
- any uncertainties in the information.

Information Sources

- Information sources utilised consist of published reports and the results of surveys commissioned for this particular project.
- The sources of the information are shown in section 7.1 (references) and in the relevant sections within the report.

Information Dates

- The dates of preparation / publication of the information sources are shown in section 7.1 (references) and in the relevant sections within the report.

Reliability of the Information

- The environmental investigations have been managed by **pitt&sherry** under their ISO9001 Quality System and their ISO14001 Environmental Management System.
- The ecological survey (flora, fauna) has been undertaken by a highly experienced consultant in accordance with accepted practice.

Uncertainties

- Following the ecological assessment, uncertainty existed regarding presence/absence of wedge-tailed eagle nest(s) on the proposed mine site.

Reduction of Uncertainties

- Two opportunistic helicopter based eagle nest search was recently undertaken to address this uncertainty. No eagle nests were located on the site during this survey. The results of this survey are included in the ecological assessment report in Appendix G. The findings are summarised below.

7.3 Attachments

Indicate the documents you have attached. All attachments must be less than two megabytes (2mb) so they can be published on the Department's website. Attachments larger than two megabytes (2mb) may delay the processing of your referral.

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the project locality (section 1)	✓	Attachment A Regional location map Attachment B Project area maps
	figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 3)	✓	Attachment C: Conceptual layout Attachment D: Site appreciation Attachment E: Indicative process schematic diagram Attachment H: Transport route map
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.5)	✓	Attachment F Correspondence from Aboriginal Heritage Tasmania
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)		
	copies of any flora and fauna investigations and surveys (section 3)	✓	Attachment G Ecological assessment
	technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3 and 4)	✓	Attachment G Ecological assessment
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)		

Attachment A: Location map
Attachment B: Project area maps
Attachment C: Conceptual project layout
Attachment D: Site appreciation information
Attachment E: Indicative process schematic diagram
Attachment F: Aboriginal Heritage Tasmania advice
Attachment G: Ecological assessment report
Attachment H: Transport route map

8 Contacts, signatures and declarations

NOTE: Providing false or misleading information is an offence punishable on conviction by imprisonment and fine (s 489, EPBC Act).

Under the EPBC Act a referral can only be made by:

- the person proposing to take the action (which can include a person acting on their behalf); or
- a Commonwealth, state or territory government, or agency that is aware of a proposal by a person to take an action, and that has administrative responsibilities relating to the action[7].

Project title:

8.1 Person proposing to take action

This is the individual, government agency or company that will be principally responsible for, or who will carry out, the proposed action.

If the proposed action will be taken under a contract or other arrangement, this is:

- the person for whose benefit the action will be taken; or
- the person who procured the contract or other arrangement and who will have principal control and responsibility for the taking of the proposed action.

If the proposed action requires a permit under the Great Barrier Reef Marine Park Act[8], this is the person requiring the grant of a GBRMP permission.

The Minister may also request relevant additional information from this person.

If further assessment and approval for the action is required, any approval which may be granted will be issued to the person proposing to take the action. This person will be responsible for complying with any conditions attached to the approval.

If the Minister decides that further assessment and approval is required, the Minister must designate a person as a proponent of the action. The proponent is responsible for meeting the requirements of the EPBC Act during the assessment process. The proponent will generally be the person proposing to take the action[9].

Name	Chris Dunks
Title	Managing Director
Organisation	Bright Phase Pty Limited
ACN / ABN (if applicable)	127 819 710
Postal address	PO Box 256 HOLLAND PARK QLD 4121
Telephone	+61 410 435 554
Email	chrisd@brightphase.com.au
Declaration	I declare that the information contained in this form is, to my knowledge, true and not misleading. I agree to be the proponent for this action.
Signature	Date

[7] *If the proposed action is to be taken by a Commonwealth, state or territory government or agency, section 8.1 of this form should be completed. However, if the government or agency is aware of, and has administrative responsibilities relating to, a proposed action that is to be taken by another person which has not otherwise been referred, please contact the Referrals Business Entry Point (1800 803 772) to obtain an alternative contacts, signatures and declarations page.*

[8] *If your referred action, or a component of it, is to be taken in the Great Barrier Reef Marine Park the Minister is required to provide a copy of your referral to the Great Barrier Reef Marine Park Authority (GBRMPA) (see section 73A,* EPBC Act*). For information about how the GBRMPA may use your information, see http://www.gbrmpa.gov.au/privacy/privacy_notice_for_permits.*

[9] *If a person other than the person proposing to take action is to be nominated as the proponent, please contact the Referrals Business Entry Point (1800 803 772) to obtain an alternative contacts, signatures and declarations page.*

8.2 Person preparing the referral information (if different from 8.1)

Individual or organisation who has prepared the information contained in this referral form.

Name	Dr Michael Pollington
Title	Senior Environmental Scientist
Organisation	pitt&sherry
ACN / ABN (if applicable)	77 009 586 083
Postal address	GPO Box 94
	HOBART TAS 7001
Telephone	(03) 6210 1412
Email	mpollington@pittsh.com.au

Declaration I declare that the information contained in this form is, to my knowledge, true and not misleading.

Signature Date

REFERRAL CHECKLIST

NOTE: This checklist is to help ensure that all the relevant referral information has been provided. It is not a part of the referral form and does not need to be sent to the Department.

HAVE YOU:

- ❑ Completed all required sections of the referral form?
- ❑ Included accurate coordinates (to allow the location of the proposed action to be mapped)?
- ❑ Provided a map showing the location and approximate boundaries of the project area?
- ❑ Provided a map/plan showing the location of the action in relation to any matters of NES?
- ❑ Provided complete contact details and signed the form?
- ❑ Provided copies of any documents referenced in the referral form?
- ❑ Ensured that all attachments are less than two megabytes (2mb)?
- ❑ Sent the referral to the Department (electronic and hard copy preferred)?

Notice of Intent
Cleveland Mine
Tailings Reprocessing and Mine Exploration Project 2011

Prepared for:	Bright Phase Pty Ltd
Prepared by:	Linda Drummond & Jim Lockley December 2011

transport infrastructure | community infrastructure | industrial infrastructure | climate change

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Attachment E Regional Setting
Attachment F Aboriginal Heritage Tasmania Correspondence
Attachment G Ecological Report
Attachment H Transport Route

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Authorised by: _____ Date: 20 December 2011
Jim Lockley

TASMANIAN AWARDS FOR ENVIRONMENTAL EXCELLENCE
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1. Introduction

Bright Phase Pty Ltd (Bright Phase) is a wholly owned subsidiary of Bright Phase Resources Ltd (BPRL). Bright Phase is proposing to mine and reprocess approximately 4 million tonnes of tailings contained in two historic tailings storage facilities (TSF) at the closed Cleveland Mine at Luina in northwest Tasmania.

Bright Phase is also proposing during the life of the tailings reprocessing operation to dewater and explore the historic Cleveland Mine, which is currently flooded, to determine the viability of any future underground hard rock mining.

It is proposed to locate the reprocessing facilities in the area of the original mill site. The tailings from the reprocessing will be returned to the mined out historic TSFs and the TSFs will then be rehabilitated. Sulphidic tailings resulting from the tailings reprocessing will be stored in new TSF cells. By reprocessing the tailings the acid producing metals and sulphides will be removed which should reduce the existing acid mine drainage in the area.

The aims of the project are:

- To recover and realise the significant mineral values contained in the historic TSFs
- To reduce the significant acid mine drainage emissions to the Whyte River which flows to the Pieman River at Corinna which in turn flows to the west into the Southern Ocean
- To store the treated and relatively benign tailings in more secure and stable facilities to ANCOLD and best practice standards
- To reuse or store the sulphidic tailings in more secure and stable facilities to ANCOLD and best practice standards
- To dewater and explore the old underground workings to determine if underground mining and mineral processing can recommence at the mine.

2. Notice of Intent

The NOI has been developed in accordance with the Tasmanian Environment Protection Authority NOI guidelines and the requirements of Section 27B of the *Environmental Management and Pollution Control Act 1994*.

The general NOI requirements are addressed in this section in the order that the requirements appear in the guidelines.

2.1 Contact Details

"1. The name and contact details of the person lodging the application."

Dr Mike Adams – Technical Director
Bright Phase Pty Ltd
PO Box 374, Guildford WA 6935
Phone: +61 417 776 095
Email: mikea@brightphase.com.au

2.2 Project Name and its Location

"2. The name of the proposed project and its location."

The project name will be the Cleveland Mine – Tailings Reprocessing and Mine Exploration Project. The designated project area of 156 ha is located on the Exploration Licence EL7/2005 which covers an area of 18 km^2. The project area is shown in Figure 1 below and **Attachment A.**

The exploration licence, former mining lease and other relevant site appreciation information are contained in **Attachment B**. The designated project area is on Crown Land – State Forest, managed by Forestry Tasmania.

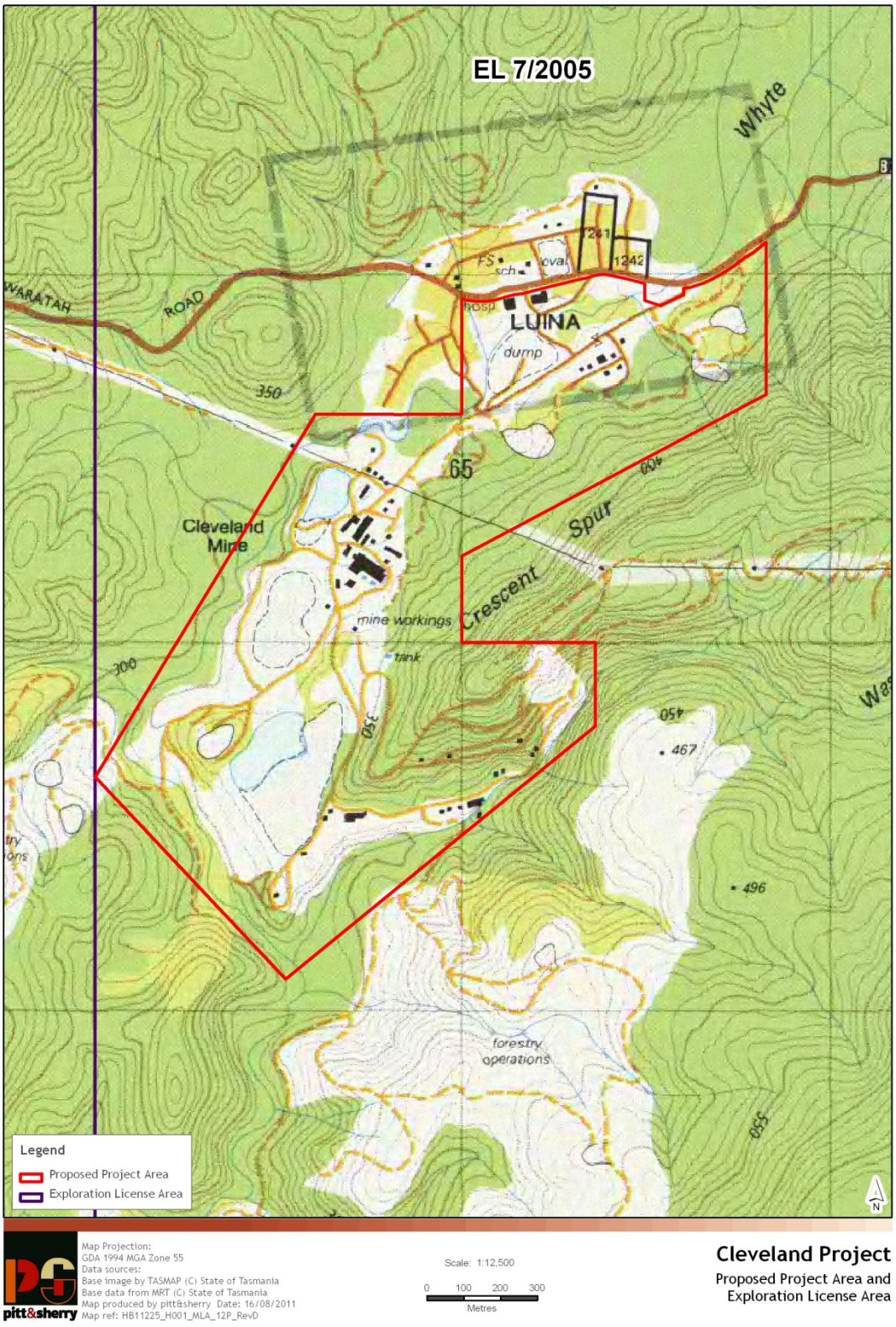


Figure 1 - Cleveland Mine – Tailings Reprocessing and Mine Exploration Project

2.3 Proponent Background

"3. Background of the project proponent, including details of the proponent's experience and financial capacity to undertake the project and his, her or its contact details."

Bright Phase Pty Ltd (Bright Phase) is a company involved with the development of mineral resources projects and is a wholly owned subsidiary of Bright Phase Resources Limited, a public unlisted Australian-based company.

Bright Phase has an exclusive agreement covering staged ownership and the rights to develop the Cleveland Project, based around the historic Cleveland tin-copper mine located in North Western Tasmania.

Bright Phase has not yet been involved in the development of a mine. The company has no track record of operational experience. However, company personnel have had extensive experience in metallurgical processes and environmental management associated with mining operations.

Contact details are contained in Section 2.1.

2.4 Project Description

" 4. A description of the proposed project, including its key physical components."

The original Cleveland tin mine opened near Waratah in 1908 and operated until 1917. Aberfoyle Resources Limited later reopened Cleveland in 1968, continuing to work the deposit until 1986 and processed about 5.7 million tonnes of ore. Underground hard rock mining operations ceased in 1986 due to the collapse of tin prices.

Due to technical limitations at the time, the original mining activities were not able to recover more than approximately 60% of the tin from the mined ore. Significant advances in minerals processing since that time have enabled the opportunity to reprocess the old mine tailings to win the previously unrecoverable mineral values. The project resource consists of approximately 4 million tonnes of historic mill tailings.

Bright Phase Pty Ltd proposes to mine and reprocess the tailings at the old Cleveland Tin Mine at a rate up to 100 tonnes per hour (tph) or approximately 900,000 tonnes per year (t/y). The initial rate of processing, based on the use a modular type plant, will be approximately 35-40 tph or 300,000-500,000 t/y. The production rate will be increased by adding extra modular sections onto the preliminary plant.

The proposal will consist of the following:

- Infrastructure development - power, water, site access and transport
- Installation of a new modern modular processing plant
- Construction of a new TSF with dedicated cells for the different reprocessed tailings disposal streams
- Commissioning of new plant and new TSF
- Tailings reclamation
- Tailings disposal to new higher standard facilities
- Product transport and sales
- Metallurgical processes optimisation
- Mine dewatering for exploration.

A conceptual project layout is shown in **Attachment C**.

Tailings reclamation

The tailings are currently contained in two TSFs, known as the No. 1 Tailings Dam and the No. 2 Tailings Dam. The tailings material from both dams will be reclaimed using an excavator feeding a pump hopper along with process water.

The tailings will be transported by pumping a slurry of the tailings to the processing mill feed tank via a pipeline. The tailings will then undergo secondary screening and cleaning before the mineral processing operation.

Plant and new tailings dam locations

The designated project area contains areas that have been heavily disturbed from the historic mining, mineral processing and rehabilitation activities. The location of the old mill footprint, concrete pads and footings, roads, culverts and bitumen sealed areas around the old plant area dictates that these areas should be used again.

The new plant and infrastructure will therefore be in the same location as the old plant, subject to the outcome of hydrological and other assessments conducted as part of the project detailed design studies.

Tailings from which sulphide minerals have been substantially removed will be paste thickened and initially pumped to a dedicated cell in a new TSF to be constructed within the proposed project area marked 'potential dams and clay borrow pits' in **Attachment C**.

The tailings containing sulphides will be paste thickened and pumped to dedicated cells in a new TSF to be constructed within the proposed project area marked as 'potential dams and clay borrow pits' in **Attachment C**.

The TSFs and their dedicated cells will be designed, constructed and operated in accordance with ANCOLD standards and best practice environmental management.

As the mining and reprocessing of the old tailings progresses, it is expected that the reprocessed tailings (from which the sulphides have been substantially removed) will be stored in new cells created in the historic TSFs once space has been made available.

The individual cells and ultimately the TSFs will be closed, capped and revegetated to an agreed scope in consultation with the land manager, regulators, key stakeholders and interested parties.

Should the underground mine be dewatered and mining recommenced, then on closure the underground mine will be allowed to flood to natural levels, as currently exist.

The closure and rehabilitation plan will be designed and implemented using best practice in mining guidelines, the Tasmanian EPA closure plan guidelines and the Strategic Framework for Mine Closure, Australian and New Zealand Minerals and Energy Council & Minerals Council of Australia guidelines.

The retreatment of the tailings can be viewed as a clean-up operation, with the additional benefit of helping alleviate future ongoing acid drainage issues.

Metallurgical processes

The operation will require the application of modern micro-characterization, ore typing and mineral processing techniques as well as access to the fast turnaround of specialist assays and metallurgical testing. An indicative process schematic diagram is shown in **Attachment D**.

A range of particle liberation, separation and concentration techniques will be used, incorporating a blend of established and modern commercially-proven innovations. Basic front-end process preparation will be required before the tailings enter the reprocessing plant proper. The process will result in the recovery of coarse cassiterite using conventional and centrifugal gravity separators and fine cassiterite with fine froth flotation and centrifugal concentrators. Copper will be recovered upfront as a concentrate and a copper sulphide-rich concentrate will be also produced by fine froth flotation.

Modular process plant

The project will initially deploy a small conventional mobile modular gravity/flotation plant capable of a nominal 35-40 tph (300,000-500,000 t/y) throughput. A reprocessing rate of up to approximately 100 tph (equivalent to 900,000 t/y) may be achieved, subject to techno-economic assessment, by retrofitting extra modules to the plant.

During the tailings reprocessing activity, the plant will also serve to gather techno-economic data for any potential future underground hard rock ore processing operation.

Milling and attritioning

A blended tailings slurry will be fed at an initially rate 35-40 tph into a trommel (a revolving cylindrical screen). Some disaggregation of cemented particles will also occur via the scrubbing action within the trommel. Oversize material >2 mm will be discharged from the end of the trommel and will be fed into a ball mill along with the Derrick screen oversize recycle from the process. The <2 mm size material passing through the trommel will proceed to the next unit process operation.

At this stage it is not proposed to treat any HMS Float material that may remain stored on site. However if it is treated in future, it will be fed at a nominal 10-16 tph into a bin feeding a hammer mill screening at 12 mm for feeding into the tailings processing plant ball mill (separate or blended with the old tailings mill feed).

A regrind mill will be used on the bulk sulphide flotation tail to promote liberation of cassiterite. Stirred milling for a nominal feed rate of 35-40 tph will be employed as the most efficient method for this operation.

Gravity separation

Tin ore processing typically relies on the high specific gravity of the tin ore (the S.G. of cassiterite is 6.9 g/cm^3) compared with the lighter gangue minerals (quartz, micas, chlorite S.G. ~2.6 g/cm^3) and the iron-containing minerals (such as pyrite, pyrrhotite, hematite S.G. ~5 g/cm^3).

Hydrocyclones will be used on the reground bulk sulphide float tail to produce a coarse particle stream containing gravity-recoverable cassiterite and fine-particle stream containing flotation-recoverable cassiterite.

Coarse gravity recovery will be used on de-slimed material to generate a high-grade coarse tin concentrate and conventional proven centrifugal concentration (e.g. Falcon C Series Separators) will be used for recovery of coarse cassiterite after liberation by stirred milling and classification.

Gravity separation of fine cassiterite in final flotation concentration will be undertaken as a final cleaning stage using Falcon UF series centrifugal separators.

Flotation

Magnetic separation, using wet high intensity magnetic separators, will be used for the removal of magnetic iron oxide minerals and some magnetic iron sulphides. Following this conventional differential sulphide flotation will be used for the generation of a copper concentrate and removal of deleterious iron sulphide minerals.

Cassiterite flotation has been deployed at many commercial installations over the last fifty years. Addition of collector, depressant and frother reagents will be made to an aerated pulp in a suitably designed cell to ensure adherence of value mineral particles to bubbles for recovery as a froth overflow, whilst allowing the gangue minerals not to adhere to bubbles and to separate via gravity. A combination of roughers, cleaners and scavenging cells will be typically used for the separation.

Modern flotation reagents have been developed that are more selective than those historically used. Modern commercially-proven fine-particle flotation devices allowing fines to be more readily floated will also be used as secondary scavenger cells.

Fine valuable mineral particles will be recovered from re-cleaners using fine particle gravity and flotation devices, selected from metallurgical test work results.

Products

Tin concentrates from the gravity and flotation processes will be recovered by thickening and filtration and blended to provide a bulk tin concentrate that will be bagged and transported for sale.

Copper concentrate will also be recovered by thickening and filtration and blended to provide a bulk copper concentrate.

Tailings storage facilities

The proposed life of the Cleveland Mine Tailings Reprocessing and Mine Exploration project will be approximately 5 years (up to approximately 10 years), with a finite old tailings storage and raw material resource of approximately 4 million tonnes.

Tailings storage engineering will include the necessary environmental considerations, such that mine tailings are impounded safely, responsibly and cost-effectively and the design process will include:

- Design approvals
- Tailings pumping, piping, initial earthworks, drainage and decant facilities and return water storage and pumping
- Operating manuals specific to each facility
- Closure planning, dam abandonment and site rehabilitation.

The design philosophy will incorporate:

- Hazard rating
- Risk-based design methods considering the high precipitation and environmentally sensitive region
- Consideration of the acid mine drainage (AMD) producing properties of the individual tailings materials
- Optimisation of the disposal technique in minimizing water usage
- Industry best-practice closure and rehabilitation plan.

Infrastructure

The historic tailings are situated near the old mine and mill areas and consequently the area is well accessed by historic infrastructure. The project area is only 13 kilometres from the nearest town (Waratah) and approximately 60 km from the nearest city (Burnie) and will be serviced by the existing sealed roads.

Onsite roads will require refurbishment. High voltage power lines run through the project area; access is under discussion with the relevant parties. The process plant will need a reliable supply of water throughout the year. This will be drawn from the Whyte River, which is expected to have the capacity to supply an adequate amount of water. A water licence under the Tasmanian *Water Management Act 1999* will be required as part of the project approval.

It is likely that a limestone neutralization facility will be required for the treatment of strong process bleed offs, if present. For low strength discharges it is likely that passive treatment will be adopted followed by a settlement dam and wetlands.

Appropriate treatment is proposed to ensure that discharge water from the plant operations and mine dewatering will be discharged in accordance to the Tasmanian *State Policy on Water Quality Management 1997* (State Water Policy). In this way, the current AMD issue from the historical operation will be positively impacted.

Only relatively small quantities of chemicals such as flotation reagents, flocculants and grinding media will be required under the current plan. These will be easily supplied, given that several other operating mines and processing plants exist in the general region.

Exploration and geotechnical investigations

The historic Cleveland underground mine is currently closed and flooded to natural levels. Any future underground hard rock mining at Cleveland will be subject to exploration and geotechnical investigations and is separate from this project. This project will however include the dewatering of the mine so that exploration and geotechnical assessment can proceed at some future date.

During the tailings reprocessing operations, exploration and geotechnical investigations of the historic Cleveland Mine workings will be undertaken with a view to provide an ongoing resource to the processing plant once the tailings resource approaches depletion.

It is proposed to undertake surface and underground exploration drilling to determine if viable and economic tin, copper and tungsten resources exist, both in known remaining tin lodes and in an area of tungsten mineralisation known as the 'Foley Zone'. In order to undertake the underground exploration and ground stability investigations, the mine will need to be dewatered and the water discharged to either Washington Creek or the Whyte River.

Mine dewatering and discharge

The mine dewatering will require a monitoring and management regime. It is expected that the mine water quality monitoring will consist of the following practices.

- Daily monitoring of the physical water quality parameters such as pH, EC, turbidity
- Weekly monitoring of sulphate and heavy metals
- Maximising the volume of the mine water reused in the processing plant
- Minimising the volume of mine water for discharge
- Measuring the discharge flow rate to the receiving waters

- Controlling the discharge rate of the mine water to Washington Creek or the Whyte River in accordance with the State Policy on Water Quality Management 1997 (State Water Policy)
- If necessary, establishing a discharge regime that achieves a water quality objective within a designated mixing zone in accordance with the State Water Policy
- If necessary, treating the mine water to an appropriate discharge quality.

Mine access

Mine access will be via the main mine portal. The currently closed portal will be reopened and the mine will be accessed down the main decline as the water level is lowered.

The water will be removed from the mine by potentially two pumping methods. One by surface mounted diesel powered pumps with long reinforced suction hoses installed into the historic workings or in new shafts. The second by transportable skid mounted diesel powered pumps deployed underground and moved down into the mine as the level falls. The dewatering may ultimately involve both modes of operations as well as the use of submersible pumps.

The dewatering pump suction lines will be flexible reinforced hoses with air tight sealed fittings. The delivery lines are expected to be flexible black poly type lines that will deliver the mine water to flow detention ponds and settling ponds for reuse in the process or for discharge.

The mine will be accessed in a manner that minimises the risk of sludge disturbance which has the potential to affect mine water quality. No sludge is expected to be encountered in the upper levels of the old mine workings. If necessary, settling basins will be installed in the mine and outside of the mine to minimise the risk of mine sludge sediment loss from the operation.

The diesel for the diesel power supply or diesel drives for the pumps will be transported, stored and used in accordance with the dangerous goods requirements.

Any diesel or chemical spills over 20 L will be contained, cleaned up, reported and disposed of in accordance with the notification and waste management requirements of the *Environmental Management and Pollution Control Act 1994*.

Mine exploration & investigation

Any exploration above and below ground will be undertaken in accordance with the Tasmanian Mineral Exploration Code of Practice.

2.5 Project Location

"5. An outline of the proposed location of the project and a general site location map."

The proposed project area of 156 ha is located on the Exploration Licence EL7/2005. EL7/2005 is located over the former Luina township area and covers an area of approximately 18 km^2. The project lies in Western Tasmania to the west of Waratah and southwest of Burnie (TASMAP 1:25,000 series, Luina map sheet 3640).

Access to the site from Burnie is via the following major sealed roads:

- Bass Highway;
- Massey Green Development Road;
- Ridgley Highway; and
- Waratah Road.

The project regional setting is shown in Figure 2 below and **Attachment E**. The local setting is shown in Figure 3 below.

The locations of the project infrastructure have already been indicated in **Attachment A** and **Attachment C**.

Figure 2 Regional setting

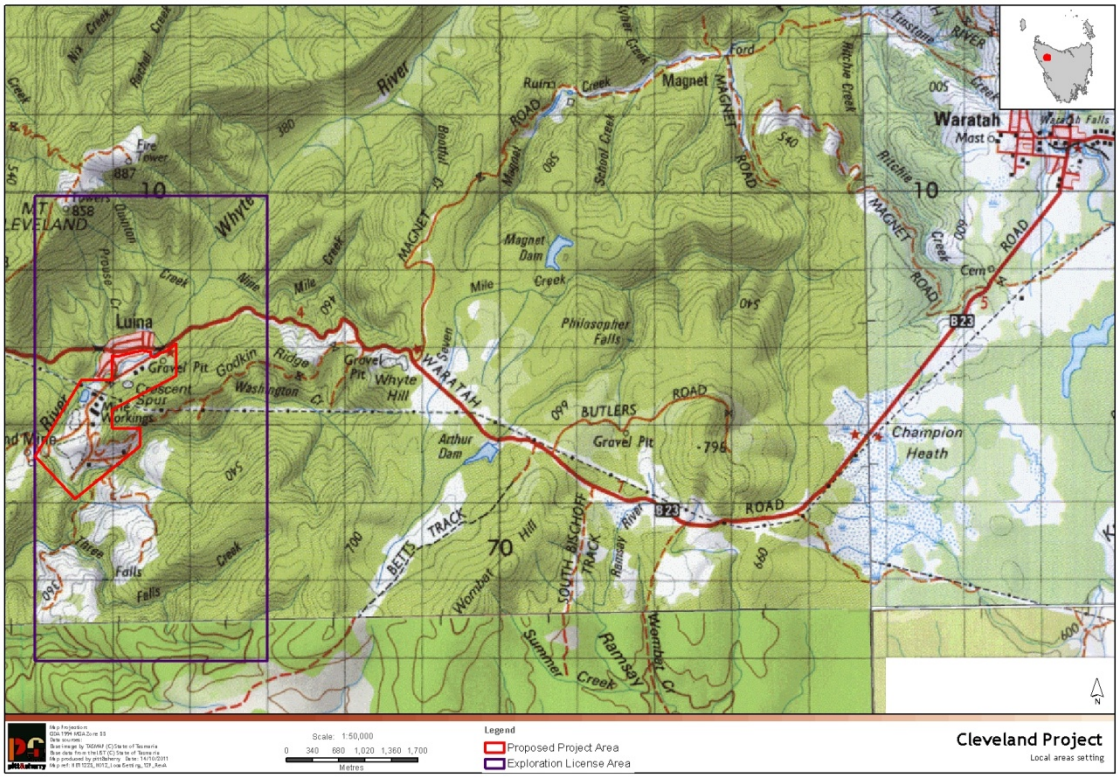


Figure 3 Local setting

2.6 Stakeholder Consultation

"6. An outline of the stakeholder consultation process undertaken or proposed to be undertaken, including the consultation method, stakeholders consulted or to be consulted and the issues raised or to be raised."

Consultation has been undertaken with key stakeholders and regulators including:

- Aboriginal Heritage Tasmania
- Crown Land Services
- Commonwealth Department of Sustainability, Environment, Water, Population and Communities (EPBC referral)
- Forestry Tasmania
- Mineral Resources Tasmania
- Tasmanian EPA
- Tasmanian Police
- Tarkine National Coalition
- Waratah-Wynyard Council.

2.7 Physical Environment

"7. A general description of the physical environment that may be affected by the project."

The proposed mine site is located on predominantly disturbed and rehabilitated land associated with the former Luina township and historic mining and mineral processing areas. A site appreciation can be gained from aerial photographs and relevant documents contained in **Attachment B**.

Elevation varies considerably over the site, ranging from approximately 290 m AHD to 400 m AHD. Gradients are greatest on the eastern side of the project area, particularly where it extends up across Crescent Spur.

Drainage in the areas is via the Whyte River and Washington Creek, a tributary of the Whyte River. The Whyte River flows to the southwest to the confluence with the Pieman River just above Corinna. The Pieman River flows into the Southern Ocean.

As the proposed mining of the tailings will use the existing infrastructure, there should not be a large impact on the existing physical environment.

The project is not located in the 'Tarkine' as registered on the national estate but is surrounded by the 'Tarkine' and a forest reserve exists in the project area which will require assessment and management in consultation with Forestry Tasmania.

2.8 Key Issues

"8. The key environmental, health, economic and social issues identified for the project to date."

Environmental issues

The key potential environmental issues identified for the project are:

- Aboriginal heritage. Aboriginal Heritage Tasmania has undertaken a desktop assessment and no further assessment is deemed necessary. The AHT correspondence is contained in Attachment F
- The project area may form part of the home range of species including the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil, but it is highly unlikely that features such as nests or dens are present within the study area itself. Refer to the ecological assessment in Attachment G for further details
- The wider area supports potential nesting habitat for the wedge-tailed eagle (Aquila audax subsp. fleayi). Please refer to the Ecological Assessment in Attachment G for further details
- Soils of the area have a high susceptibility to sheet erosion
- Maximum possible impact on native vegetation is approximately 30 ha. None of the potentially impacted native vegetation communities are listed as threatened under the Schedule 3A of the Nature Conservation Act 2002 or under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999
- Weed management
- PC management. Not likely to be an issue on the site. Refer to Attachment G Management plans will be implemented if required
- Materials transport, storage and handling
- Road kill due to increased traffic movements
- Surface water management
- Acid Mine Drainage
- Stable landform establishment
- Dust management.

The project has the potential to remediate historic site degradation and improve the quality of the local environment and fauna habitat.

Cleveland tailings, like many base-metal sulphide abandoned mine sites, contain acid-generating components that can result in acid mine drainage (AMD). A Cleveland tailings retreatment project will have a major positive impact on the long-term environmental pollution into the Whyte River from the historic mine workings by removing acidic sulphide and metal contaminants at source, a key incentive for project to proceed.

Health issues

The potential health impacts identified to date are:

- Potential dust generation
- Slight increase in traffic movements on existing road infrastructure.

Economic and social issues

There appears to be no economic or social downside to the project, and there is the potential to provide economic and social benefits at the local, regional and state levels. It is predicted that

- ~50 jobs will be created during construction
- ~30 jobs will be created when operational.

The estimated cost of the project will be in the order of $18M. The estimated value of the resource based on the current resource understanding and forecast prices is approximately $350M.

2.9 Surveys and Studies

"9. The surveys and studies proposed or underway in relation to the key issues for the project."

The following surveys and studies have been completed, are underway, or are proposed, in order to address the key issues identified with the project:

- Flora and fauna assessment: completed September 2011
- Helicopter based eagle nest survey: completed September 2011
- Baseline surface water quality surveys: commenced Feb 2010
- Tailings dams exploration drilling Round 2 proposed
- Pre-feasibility geotechnical surveys and mine planning: proposed
- Operational surface water quality monitoring: proposed
- Operational mine water monitoring: proposed
- Groundwater monitoring: proposed
- Detailed geotechnical surveys: proposed
- Detailed project design: proposed.

2.10 Proposed Timetable

"10. The proposed timetable for the project."

The following timetable is currently anticipated:

- Late 2011 / early 2012: NOI submission to EPA Board for issuing of project specific Development Proposal and Environmental Management Plan (DPEMP) guidelines
- Late 2011 / early 2012: Mining Lease Application (MLA) to Mineral Resources Tasmania (MRT)
- Early 2012: Receipt of EPA Board DPEMP guidelines
- Early 2012: Drafting of the DPEMP
- First Quarter 2012: Finalising DPEMP with proponent and EPA
- First quarter 2012: DA application to Waratah Wynyard Council (supported by DPEMP)
- Mid 2012: Project planning and environmental approval
- Mid 2012: Commencement of construction early works
- Late 2012: Commissioning of operations
- Late 2012 to 2017: Planned 5 year project life (may be up to ~10 years)
- 2012 – 2017: Dewatering and exploration of old underground mine workings.

Exploration of the underground workings may result in reopening of the mine. This reopening and further ongoing underground exploration work may result in an extension of the anticipated life of the project.

Exploration on other areas of the lease may also result in an extension of the project life.

2.11 Commonwealth Approval

11. Any other details that the Board may consider relevant to the project. For the purposes of Section 27B(2)(k) of the EMPC Act, the Board has specified that a NOI is to contain the following relevant details:

a) Whether the project requires or is likely to require approval under the *Environment Protection and Biodiversity Conservation Act 1999* (which will be determined by the project's potential to impact upon matters of national environmental significance or upon Commonwealth land); and

b) Whether the proponent has or intends to refer the project to the Commonwealth Government for a determination on whether approval under the *Environment Protection and Biodiversity Conservation Act 1999* is required.

Nationally listed species

The project area may form part of the home range of species including:

- Tyto novaehollandiae subsp. castanops (masked owl) - vulnerable
- Aquila audax subsp. fleayi (wedge-tailed eagle) - endangered
- Dasyurus maculatus subsp. maculatus (spotted-tailed quoll) - vulnerable
- Sarcophilus harrisii (tasmanian devil) - endangered.

The wider area supports potential nesting habitat for the wedge-tailed eagle (*Aquila audax* subsp. *fleayi*).

The project has been referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities for approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA).

The referral dated 28 September 2011 was posted to SEWPC 29 September 2011.

SEWPC notified the proponent 14 November 2011 that the project was a controlled action under the EPBCA. The SEWPC is yet to advise if the project will be assessed under the bilateral agreement between the State and the Commonwealth governments under the EPBCA.

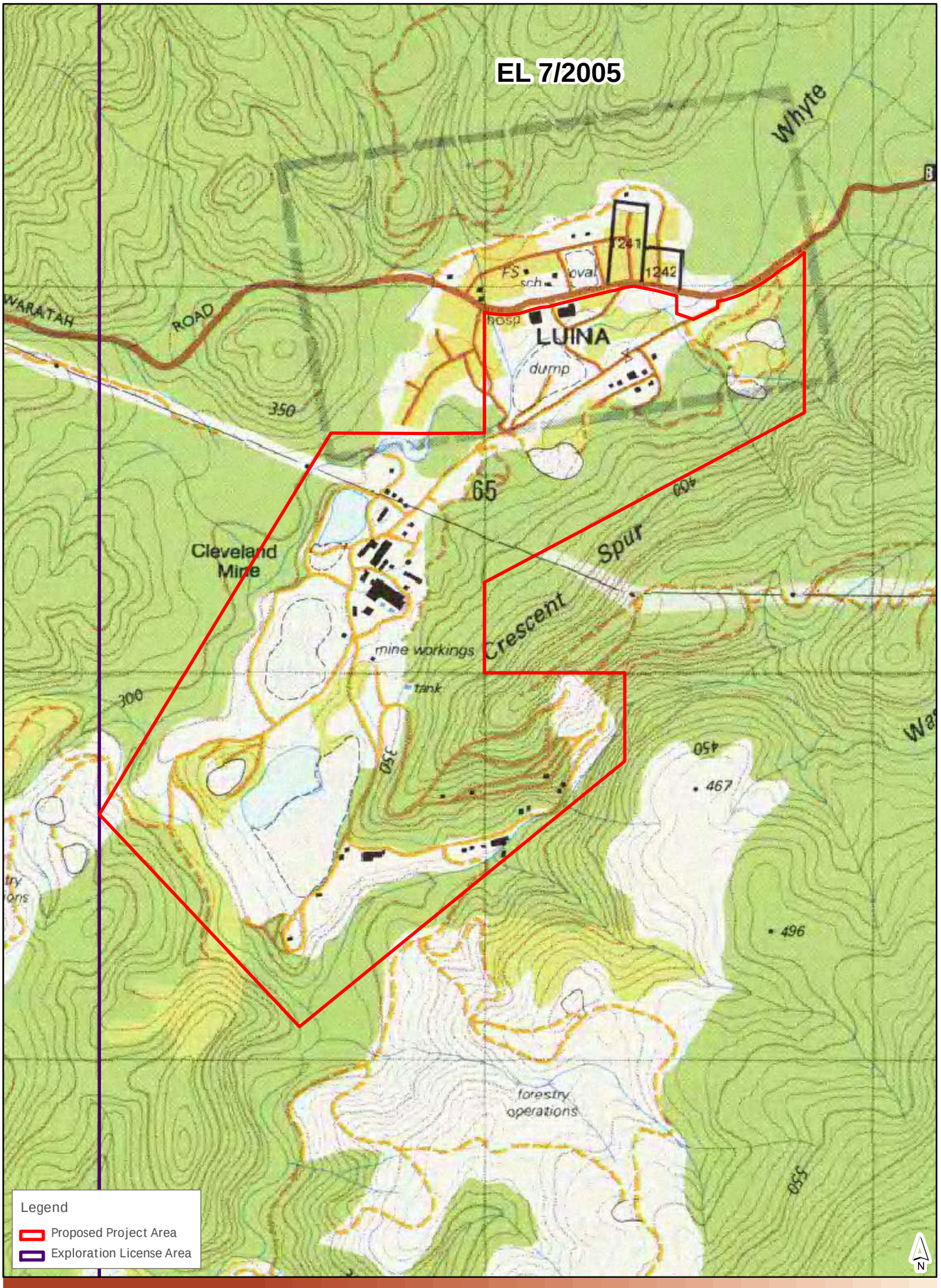
3. Extra Project Details

The traffic impact is expected to be minimal as only a maximum of 3 truckloads of tin concentrate and copper concentrate will be transported to Burnie each day. A desktop traffic impact assessment will be undertaken as part of the DPEMP.

The transport route is shown in **Attachment H.**

Attachment A

Project Area Maps



Map Projection:
GDA 1994 MGA Zone 55
Data sources:
Base image by TASMAP (C) State of Tasmania
Base data from MRT (C) State of Tasmania
Map produced by pitt&sherry Date: 16/08/2011
Map ref: HB11225_H001_MLA_12P_RevD

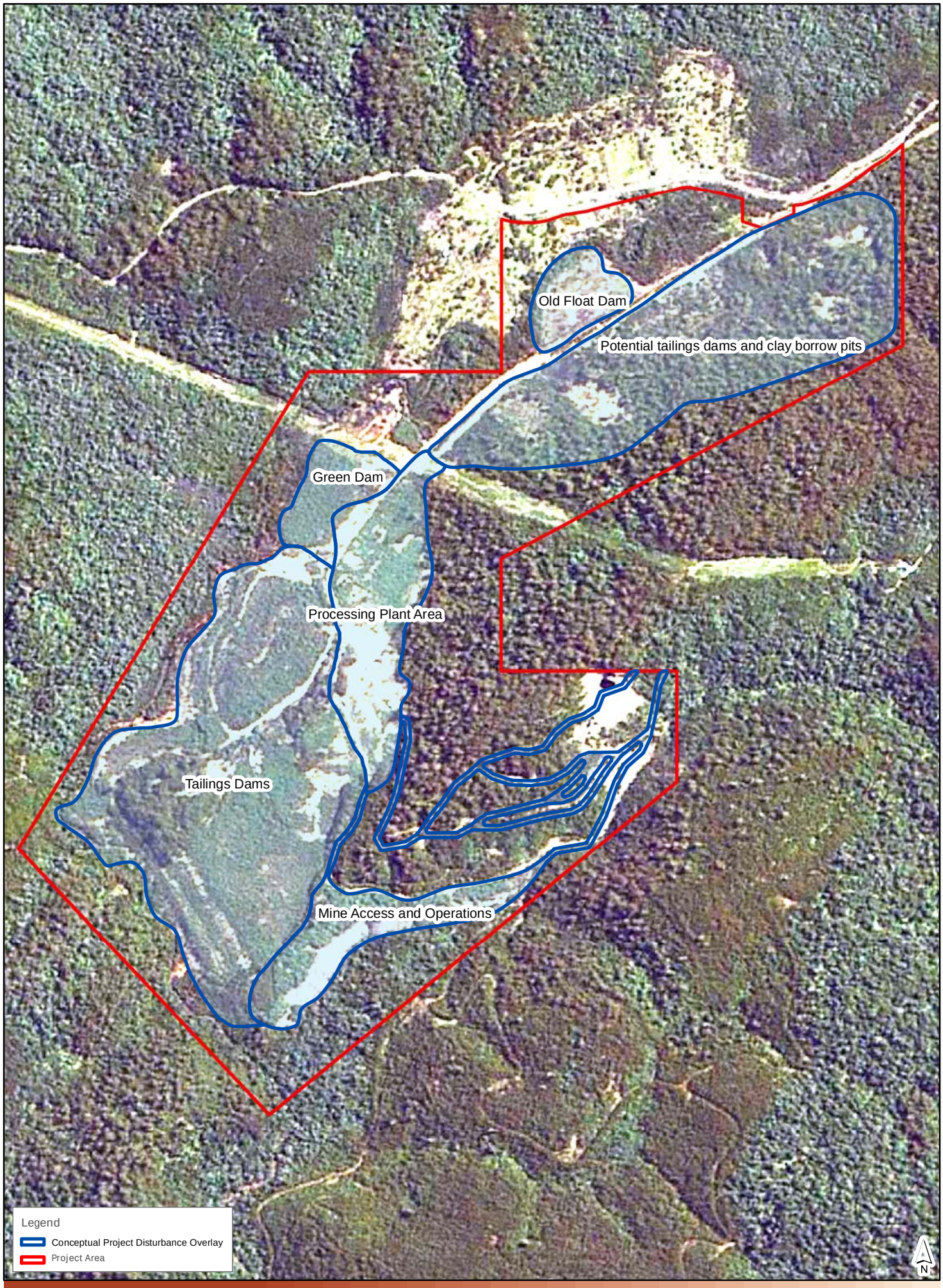
pitt&sherry

Scale: 1:12,500

0 100 200 300
Metres

Cleveland Project

Proposed Project Area and
Exploration License Area



Map Projection:
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Base data from theLIST (C) State of Tasmania
Map produced by pitt&sherry Date: 8/09/2011
Map ref: HB11225_H010_ProjectFootprint_Aerial_12P_RevC

Scale: 1:10,000

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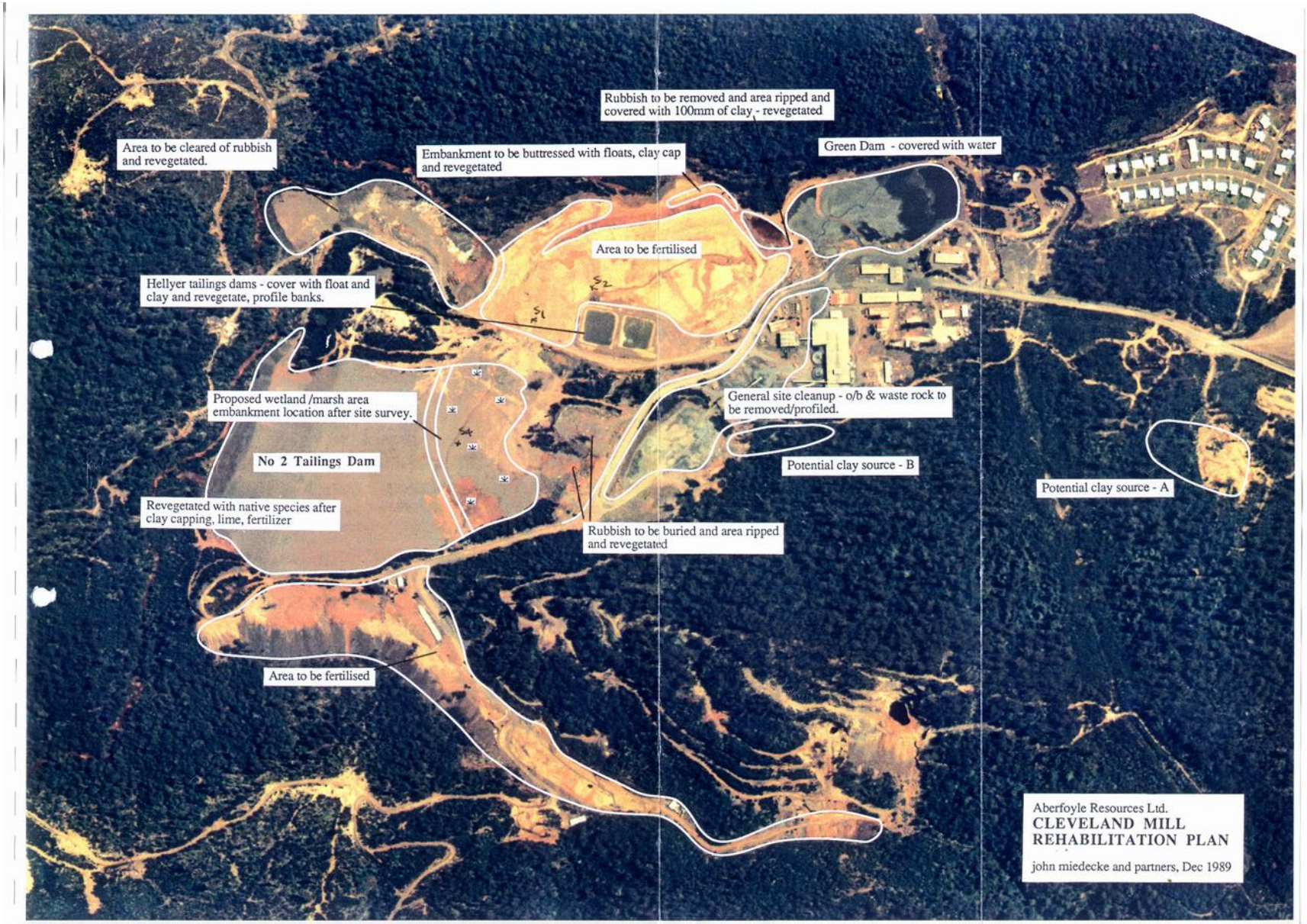
Metres

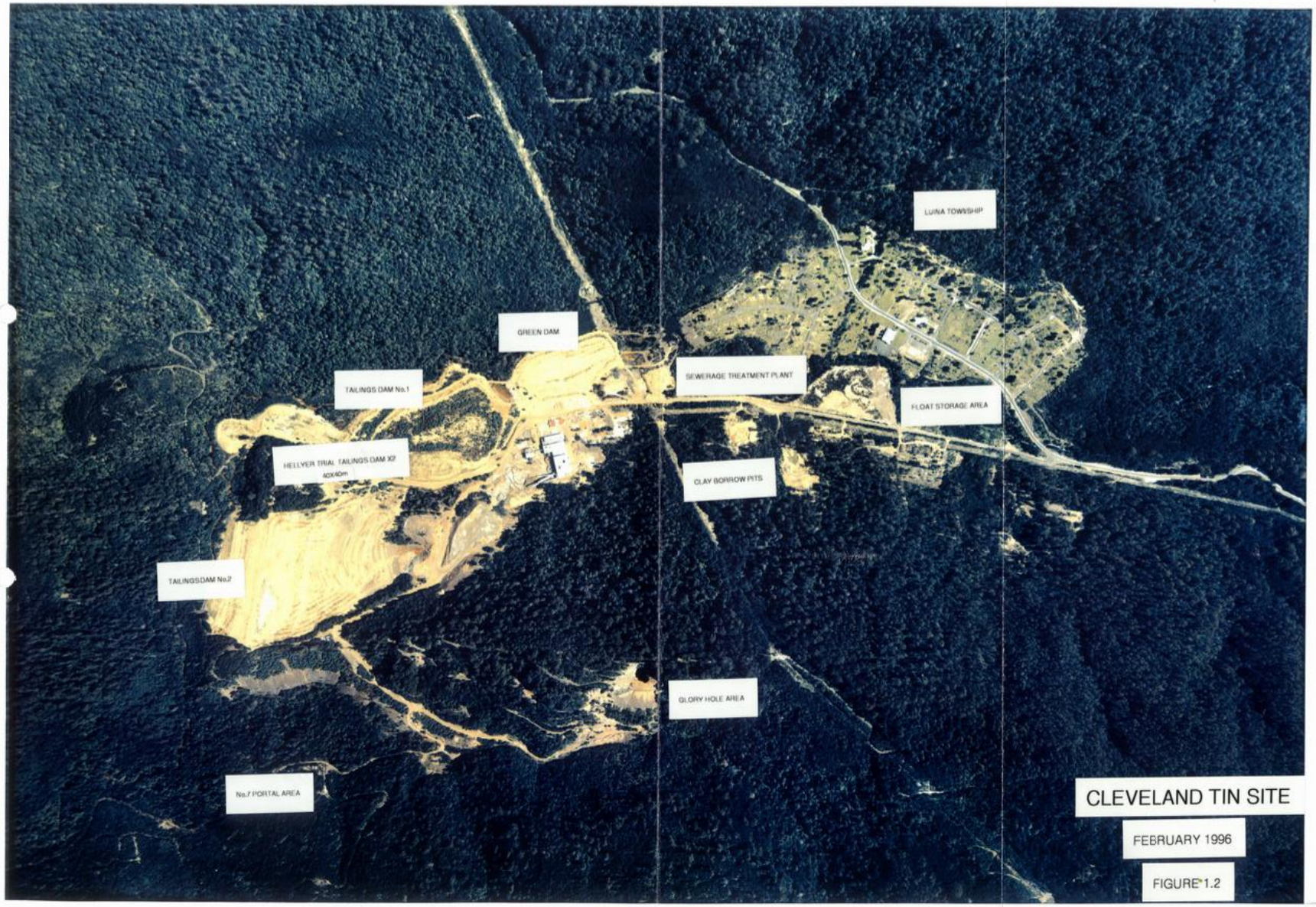
Cleveland Project

Conceptual Project Disturbance Overlay

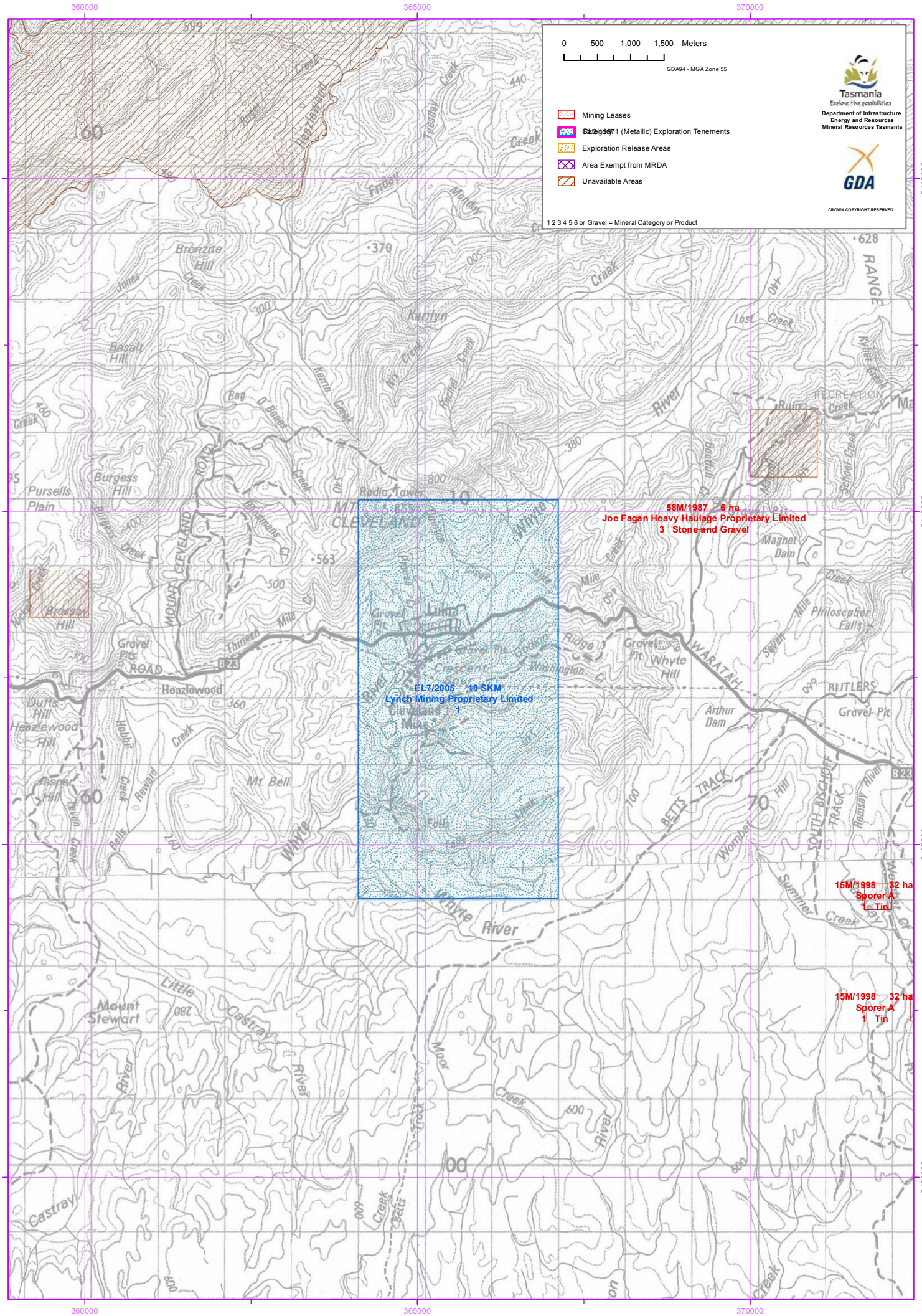
Attachment B

Site Appreciation Information


Rubbish to be removed and area ripped and covered with 100mm of clay - revegetated
Area to be cleared of rubbish and revegetated.
Embankment to be buttressed with floats, clay cap and revegetated
Green Dam - covered with water
Area to be fertilised
Hellyer tailings dams - cover with float and clay and revegetate, profile banks.
Proposed wetland /marsh area embankment location after site survey.
General site cleanup - o/b & waste rock to be removed/profiled.
No 2 Tailings Dam
Potential clay source - B
Potential clay source - A
Revegetated with native species after clay capping, lime, fertilizer
Rubbish to be buried and area ripped and revegetated
Area to be fertilised
Aberfoyle Resources Ltd.
CLEVELAND MILL
REHABILITATION PLAN
john miedecke and partners, Dec 1989


LUINA TOWNSHIP
GREEN DAM
SEWERAGE TREATMENT PLANT
TAILINGS DAM No.1
FLOAT STORAGE AREA
HELLYER TRIAL TAILINGS DAM X2
40X40m
CLAY BORROW PITS
TAILINGSDAM No.2
GLORY HOLE AREA
No.7 PORTAL AREA
CLEVELAND TIN SITE
FEBRUARY 1996
FIGURE 1.2

Photos of acid drainage from tailings dam wall to Whyte River.


0 500 1,000 1,500 Meters
GDA94 - MGA Zone 55
Tasmania
Department of Infrastructure Energy and Resources
Mineral Resources Tasmania
GDA
CROWN COPYRIGHT RESERVED
Mining Leases
Exploration Licences
Current (Metallic) Exploration Tenements
Exploration Release Areas
Area Exempt from MRDA
Unavailable Areas
1 2 3 4 5 6 or Gravel = Mineral Category or Product
360000
365000
370000
5415000
5410000
5405000
5400000
58M/1987 6 ha
Joe Fagan Heavy Haulage Proprietary Limited
3 Stone and Gravel
EL7/2005 18 SKM
Lynch Mining Proprietary Limited
1
15M/1998 32 ha
Sporer A
1 Tin
15M/1998 32 ha
Sporer A
1 Tin
Cleveland
Mount Cleveland
Heazlewood
Pursells Plain
Burgess Hill
Bronzite Hill
Basalt Hill
Fraser Hill
Duffs Hill
Heazlewood Hill
Jasper Hill
Mt. Bell
Whyte River
Mount Stewart
Castray River
Little Castray River
Whyte Hill
Arthur Dam
Magnet Dam
Philosopher Falls
Gravel Pit
Gravel Pits
Radio Tower
ROAD
B23
BETTS TRACK
SOUTH BISCHOFF TRACK
RANGE
RECREATION

Tasmania

DEPARTMENT *of*
TOURISM, ARTS *and the* ENVIRONMENT

MEMORANDUM

File No: 038262

TO: Warren Jones
CC: Anthony Brown, Carol Bacon, Wojciech Grun, Robin Halfacre, Floyd Browne, David Mitchell
FROM: Bruce Terry **EXT:** 2411

DATE: **1 December 2006**

SUBJECT: **Cleveland Mine Rehabilitation & ARD Seepages**

Background

This document is in response to the memorandum from Wojciech Grun (WG), addressed to the Director of Mines with CC to the Director of Environmental Management, dated 7 July 2006 and titled 'Luina tailings, seepage into Whyte River'. WG's memorandum outlines an inspection he did with Robin Halfacre on 23 June 2006 at the former Cleveland Tin tailings storage facility (TSF). WG highlighted issues with the rehabilitation and the water quality. The recommended action proposed was to establish the need for remediation works and a thorough joint inspection between MRT and DTAE at the site.

Some of the images from WG's inspection, showing acid rock drainage (ARD) seepages, were used by the Director of Environmental Management in the presentation at the Tasmanian Minerals Council Sustainable Development Conference on 15 September 2006.

With an aim of confirming the observations made by WG, and collecting evidence to assist with future decision making, I undertook a subsequent inspection on 21 September 2006. Several hours were spent looking at the condition of rehabilitation, taking photos and collecting water samples.

Synthesis

Analysis of the information collected during the inspection on 21 September 2006 confirms the observations made by WG, notably there is ARD generation on site and some of the rehabilitation is failing. It would appear that the site is degrading and presents a liability to the State.

More work is required to fully quantify the issues on site. Once sufficient information is obtained on the issues then a fully informed decision can be made on what course of action is required. One of the key criteria that needs to be established for any future work, is the need to document what lessons can be learnt from the remediation at the Cleveland Mine, including why current issues exist and how they can be prevented in the future. This is especially important as we try and move forward with establishing closure criteria for other mines. Other important outcomes include, what remediation needs to be done to improve the existing

site and through this what mechanisms can be identified to ensure successful remediation can be achieved here and elsewhere.

Rehabilitation

Aerial photos taken in 1980 and 2000 [Figure 1a and Figure 1b] show differences between an active operation and a site that has had buildings decommissioned and rehabilitation started. Figure 1b highlights some of the area which were not revegetated 6 years ago, some of these areas remain clear of vegetation in 2006. Figure 1b also shows orange discolouration at the toe of the TSF, due to iron oxide precipitation. Some of the observations made at the site from the 21 September are:

- Access is still good. Vehicles can be driven easily across the mine to Deep Creek (adjacent to portal road). Tracks south of Deep Creek are still open to foot traffic.
- The revegetation is variable; some areas have diverse, healthy and stable vegetation, while other areas are sparse, with little sign that that revegetation actually commenced. Photo 1 (in Attachment 1), depicts the diverse vegetation community that has established in areas of the site, in this case on top of the TSF. Stability is inferred from the moss cover and the build up of organic litter. Photo 2 (in Attachment 1) depicts the unfinished rehabilitation near to the former mill site. Iron oxide precipitation and cementation are evident at this site, showing the effect from weathering. Photo 4 (in Attachment 1) is taken near to Photo 2 and shows a sparse cover of wattle species, which has become established at this site; the amount of exposed soil indicates it is still unfavourable for some of the pioneering species.
- The TSFs were closed as a dry cover system. The drainage from the top of the TSF appears to be directed to the north of the disturbed area, past the transmission lines. The effectiveness of this drainage system is not known. The former settling pond, adjacent to the transmission line remains boggy and requires further investigation.
- Erosion is active in places due to lack of suitable revegetation or unstable soil. The soil in the area was friable, and many exposed areas remained unpopulated with moss. Photo 3 (in Attachment 1) depicts erosion of the TSF wall, due to failure of a contour drain combined with the unstable nature of the gravel and soil on the TSF wall.

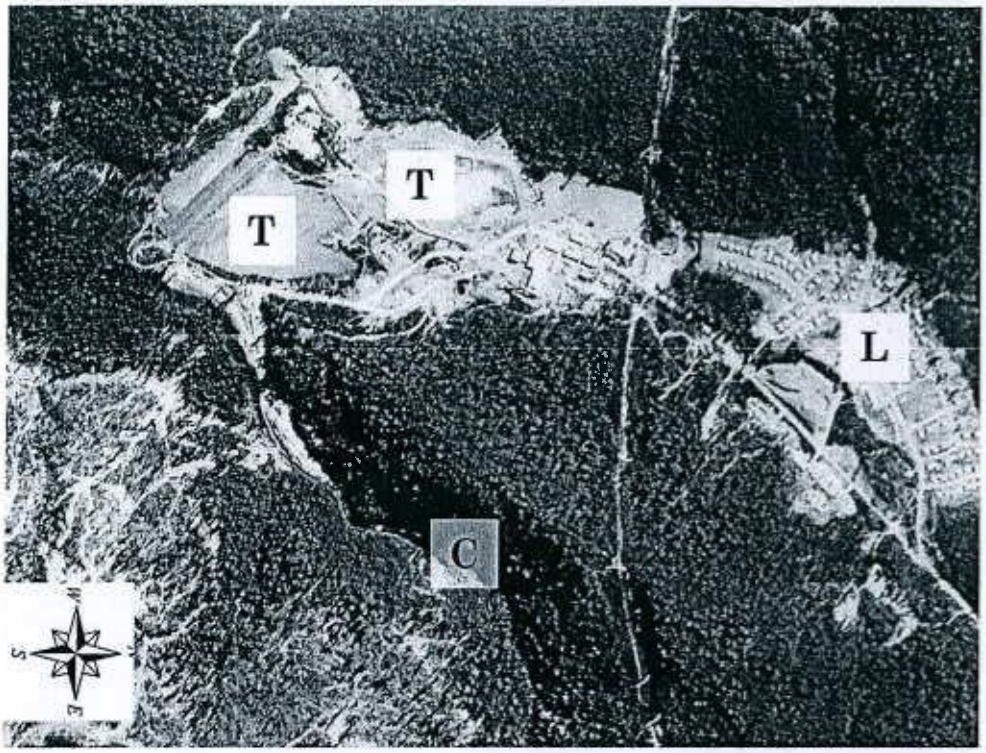


Figure 1a. Photo of Lunia (L) and the Tailings Dams (T), when Cleveland Mine (C) was operating. Year 1980 (est).

Figure 1b. Photo of Lunia and Cleveland Mine, after rehabilitation. Year 2000 (est).

Water Quality

Historical water monitoring data indicates that there was reduced water quality being discharged from site and the precursors to development of ARD evident. To establish the current water quality 5 sites were sampled and analysed for a general suit of parameters. The five water sampling sites are shown in Figure 2 and the results shown in Table 1.

The details[1] of the 5 sites sampled on the 21 September 2006, are:

- Whyte River above site (WR Above), 365722mE, 5408172mN. The purpose of this sample is to show the background water quality of the Whyte River. The sample was taken approximately 20m upstream of the bridge, on the eastern bank. The water level on the gauging board, 10m upstream of the site was 0.85m. This depth of the gauging board was used to estimate the flow. The water was moving fast and moderately turbid. It is estimated this sample was taken near to where previous compliance monitoring was done, that site was called WRA.
- Transmission lines over Whyte River site (Trans). The purpose of this site is to show the impact of some site runoff on the Whyte River. The sample was taken adjacent to an old access track, used for establishing the transmission lines, but is now heavily revegetated.
- Whyte River below site (WR Below), 364637mE, 5405924mN. The purpose of this sample is to show the water quality in the Whyte River after inputs from site. The sample was taken on the eastern bank approximately 500m south of the Whyte River/Deep Creek confluence or approximately 800m south of the toe of the TSF. It is thought that previous compliance monitoring (WRB) was taken a further 300m to the south of this site.
- Sump near mill site (Sump), 364775mE, 5407306mN. The purpose of this sample is to show the water quality from surface runoff from the former mill site. The sample was taken on the eastern side of the road. The water was clear, but filamentous algae was common.
- Toe of Tailings Dam site (Toe), 364467mE, 5406570mN. The purpose of this sample is to show the water quality seeping from the toe of the TSF. The water was clear, though there was abundant flocculated material at the bottom of the 'pond'

The results of the water samples show that the inputs from seepages have increased the level of some pollutants in the Whyte River. The increase in some pollutants has occurred despite the large difference in flow rates. The evaluated sulphate and metal concentration and low pH of the Toe and Sump samples indicate that ARD has developed on site. The development of ARD on site may inhibit or decrease any further revegetation.

Another observation from the results is that TSS is elevated in several samples. Heavy rainfall the day before sampling may have elevated the TSS in the Whyte River. The high TSS result in the Sump sample is attributed to iron oxide precipitation, as it was later (after analysis) observed by laboratory staff, that other samples were starting to precipitate.

---

[1] Co-ordinates are expressed in GDA94, Zone 55. There may be some displacement error due to poor satellite coverage, though the sites did generally fit well with topographic features.

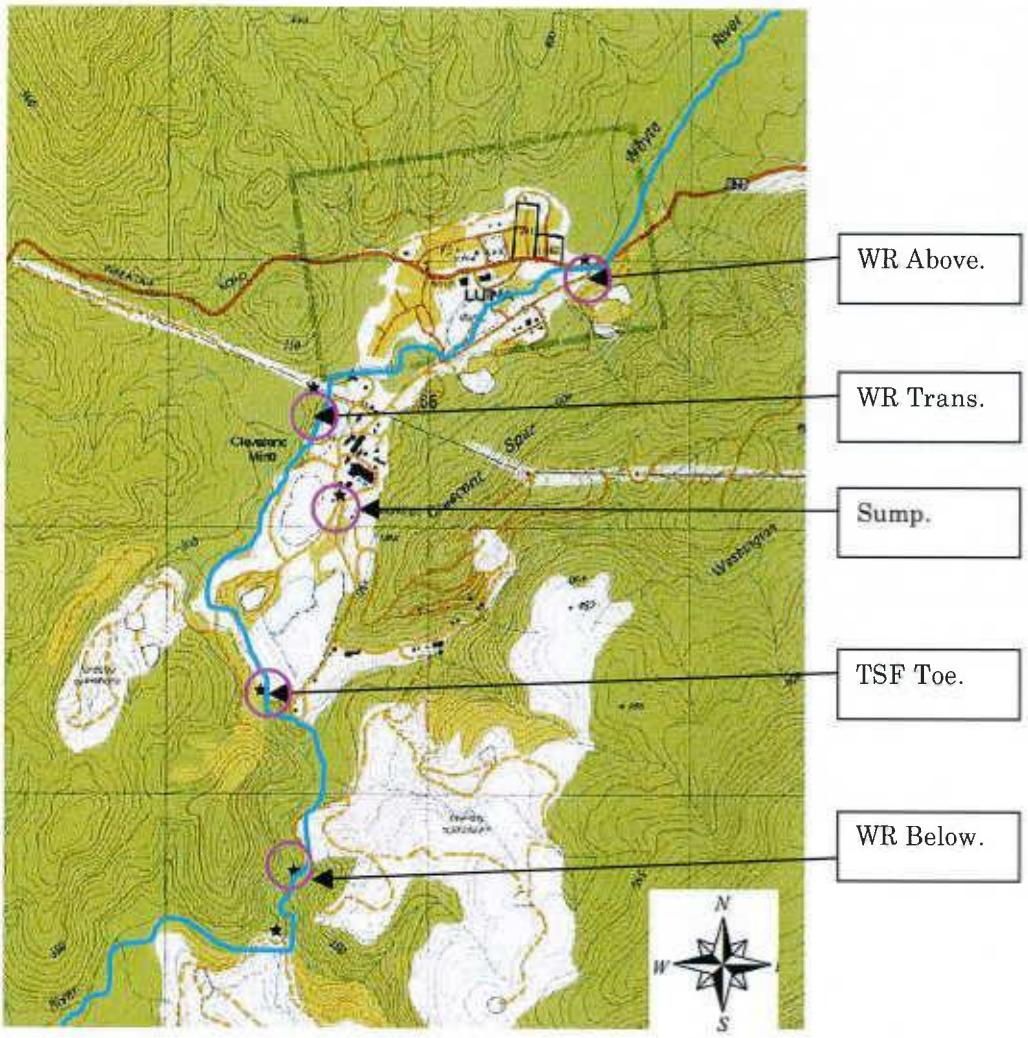


Figure 2. Plan of area with water sample sites.

	Sample Id.	WR Above	WR Trans	WR Below	TSF Toe	Sump
Field Parameters	temp (degC)	7.4	7.5	7.5	11.8	15
	est. flow L/sec	12750	12750	15000	?	2
	pH (units	6.5	6.6	6.7	5.3	2.8
	Cond (us/cm	75	85	96.8	2850	2700
Parameters analysed at AST, expressed as totals in mg/L	TSS	13	14	14	43	
	Sulphate	1.8	3.9	**11.5**	2100	1750
		1.13	1.13	1.11	16.3	74.6
	As	0.005	0.005	0.005	0.014	0.564
	Cd	0.001	0.001	0.001	0.001	0.264
	Co	0.001	0.001	0.001	0.319	0.316
	Cr	0.012	0.011	0.01	0.003	0.093
	Cu	0.002	0.005	0.004	0.001	2.35
	Fe	1.37	1.42	**3.28**	518	189
	Mn	0.387	0.789	1.57	66.8	21.7
	Ni	0.011	0.012	0.01	0.21	0.986
	Pb	0.005	0.005	0.005	0.03	0.415
	Zn	0.004	0.189	**0.101**	0.41	138

Table 1. Water sampling results.

Recommendations

The Cleveland Mine is an abandoned site and is the responsibility of the State. It should therefore be the State who ensures that the liabilities are managed appropriately. A study should be conducted to establish current liability at Luina, in particular identifying:

What remediation work were done, what forms of remediation are effective, what remediation failed and if it failed, why;

- Water quality under different flow conditions and establishing more water monitoring sites. The sample taken at WR Below, is a long distance (800m) from the source of contamination (TSF); and
- What practical and economically feasible options could be undertaken to reduce the current liabilities; including identification of possible funding sources to carry out such works.

In recent years it has been the 'Rehabilitation of Abandoned Mining Lands Trust Fund Committee' who has dealt with reducing the liability of abandoned mines such as Luina. The previously small budget of the Committee has now been reduced, so tackling this sort of project is likely too prohibitive. It is therefore recommended that an initial study be undertaken jointly by Environment Division and MRT. Further assistance could be sort from Educational Institutes (in the form of a thesis) or consultants, if the expertise is required and there was the funding available.

Despite the findings of a future study, it is important that the State Government learn from the success or failure of the rehabilitation at Luina. The learning from this site could help develop:

Closure conditions, such as quantifying the success of rehabilitation though mechanisms such as a form of land function analysis;

A further review of the bond calculation; and

- Guidelines and procedures for the mining industry.

Attachment 1. Rehabilitation

Photo 1, stable landscape on top of TSF

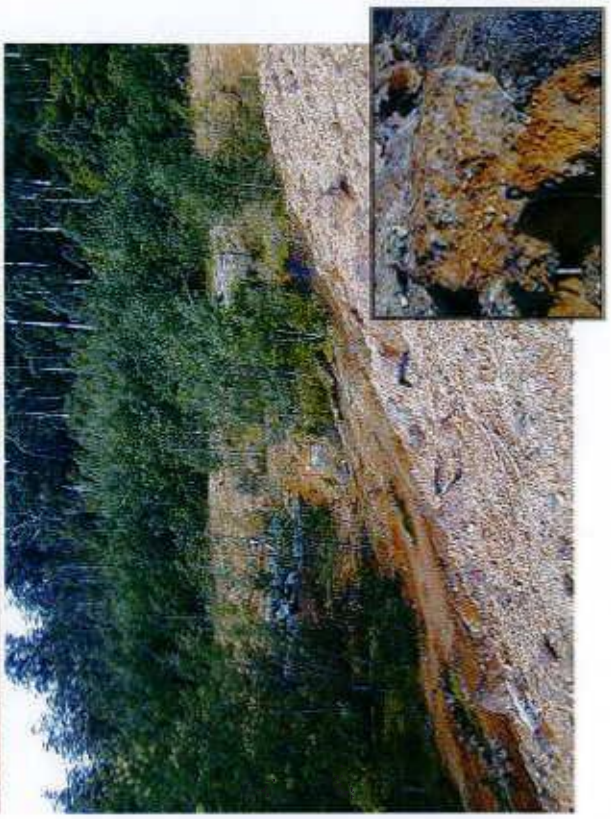


Photo 2, near the mill site, close up (insert) of cementation from iron oxide.

Photo 3, erosion on dam wall

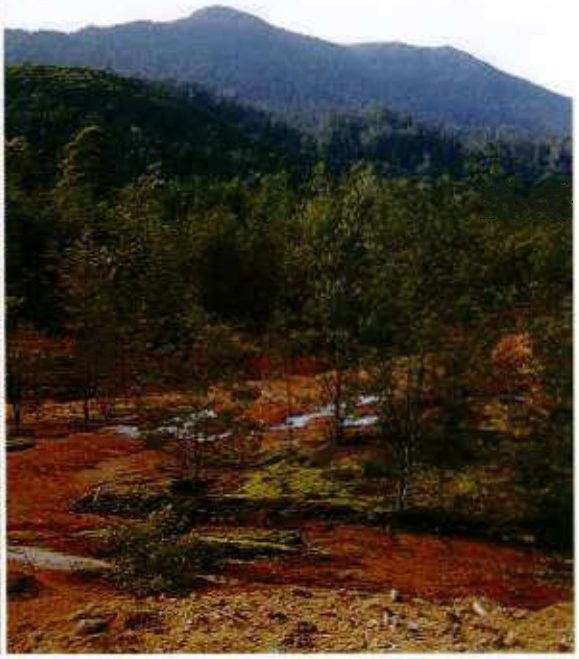


Photo 4, sparse revegetation. View from mill site to Mt Cleveland.

Attachment 2. Water Monitoring Sites

Photo 5, White River above operation

Photo 6, White River below operation

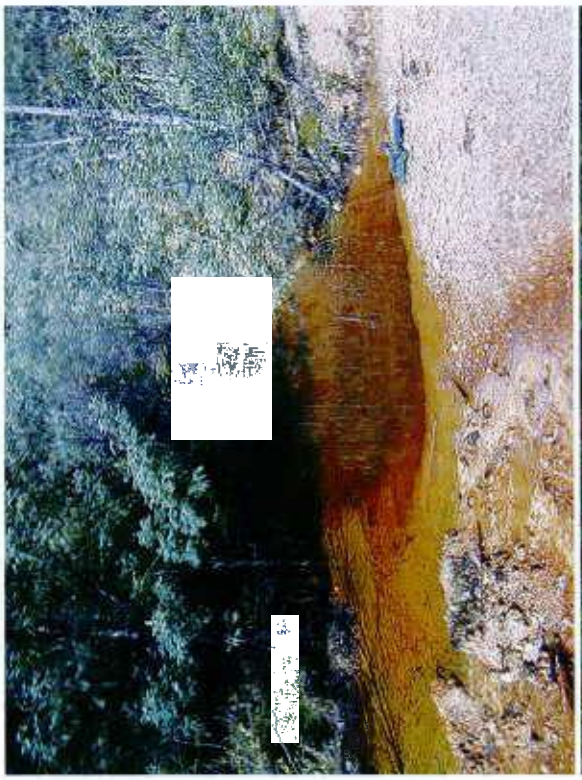
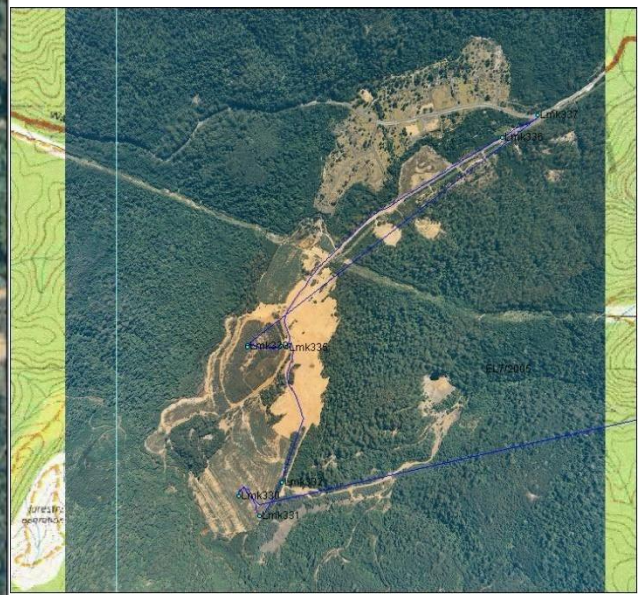


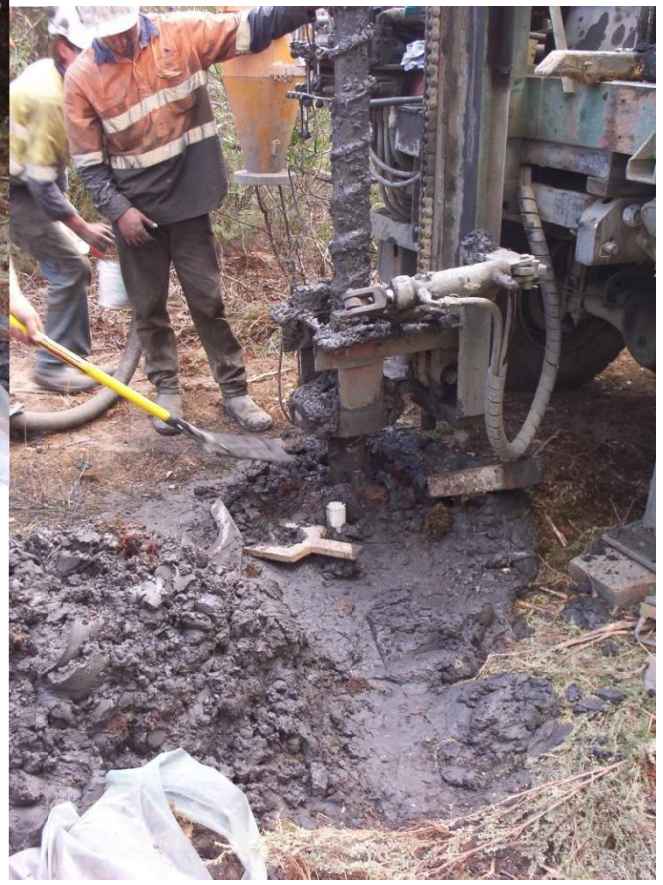
Photo 7, Sump near mill site

Photo 8, Toe of tailings dam

Luina tailings piezometer installation March 2008



Luina tailings piezometer installation March 2008



No2 dam 31.5 metres

Luina tailings piezometer installation March 2008

Luina tailings dam No1 piezometer dissolved water quality 8th October 2008

pH		6.9		Cu	ug/L	<1
Conductivity	uS/cm	2430		Fe	ug/L	18600
Alkalinity	mg CaCO3	54		K	mg/L	13.5
Acidity	mg CaCO3	9		Mg	mg/L	91.2
Sulphate	Mg/L	1590		Mn	ug/L	763
Hardness	mg CaCO3	1620		Na	mg/L	22.5
Al	ug/L	42		Ni	ug/L	<10
Ca	mg/L	498		Pb	ug/L	<7
Cd	ug/L	<1		Zn	ug/L	60
Cr	ug/L	<1		Hg	ug/L	<0.05

Luina tailings dam No2 piezometer dissolved water quality 8th October 2008

pH		6.2	6.3		Cu	ug/L	20	8
Conductivity	uS/cm	2150	2110		Fe	ug/L	304000	29400
Alkalinity	mg CaCO3	86	92		K	mg/L	3.78	3.82
Acidity	mg CaCO3	29	24		Mg	mg/L	216	219
Sulphate	Mg/L	1380	1350		Mn	ug/L	28600	28900
Hardness	mg CaCO3	1300	1320		Na	mg/L	20.2	20.4
Al	ug/L	271	172		Ni	ug/L	203	57
Ca	mg/L	165	166		Pb	ug/L	<7	<7
Cd	ug/L	<1	<1		Zn	ug/L	265	92
Cr	ug/L	2	3		Hg	ug/L	<0.05	<0.05

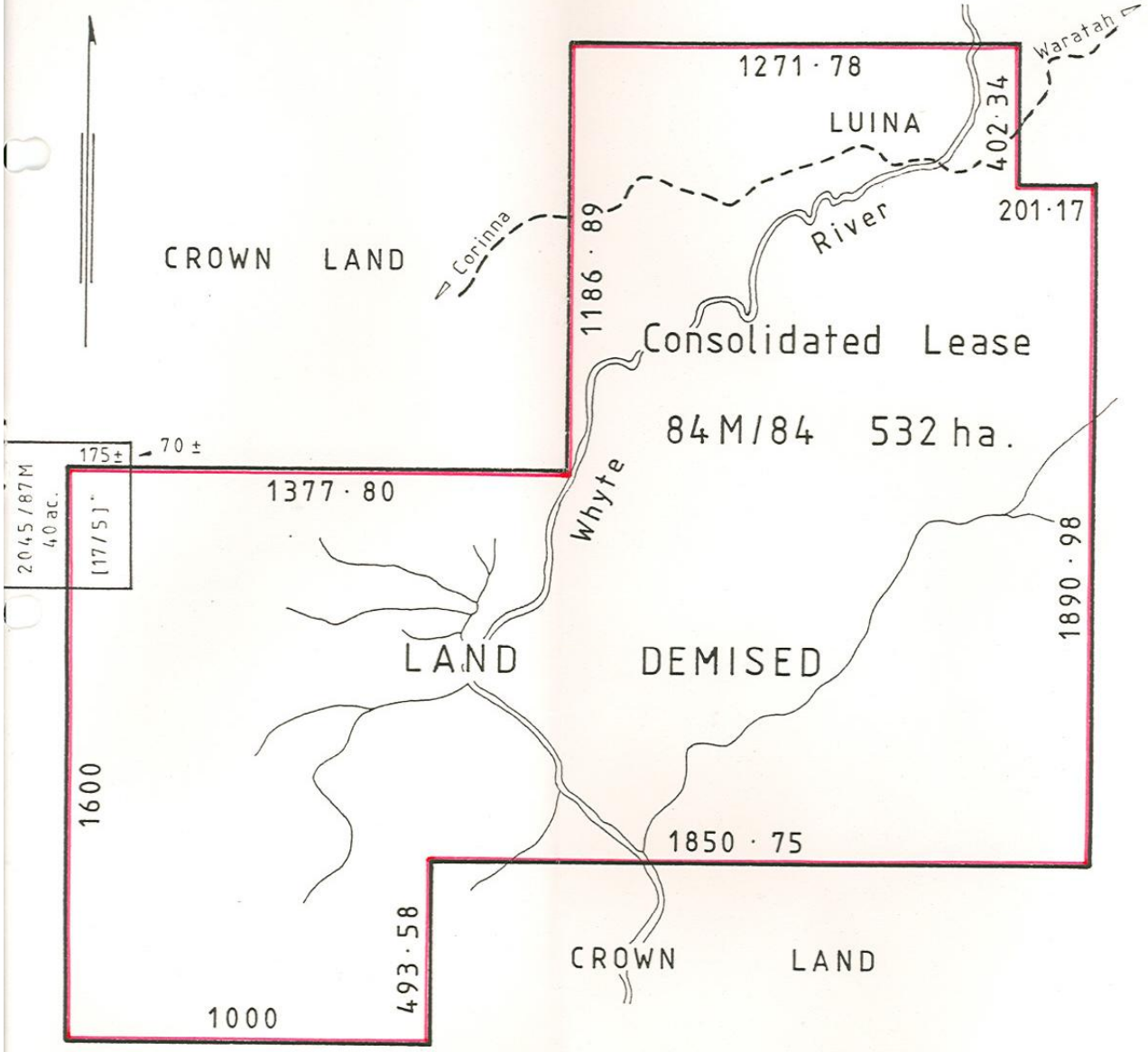
DEPARTMENT OF MINES—TASMANIA

SUBJECT TO SURVEY

LAND DISTRICT OF	RUSSELL
VICINITY OF	LUINA
APPLICATION No.:	CONSOLIDATED LEASE 84M/84 532 hectares
APPLICANT	CLEVELAND TIN LIMITED

DESCRIPTION

Subject to survey the area demised may be described as follows:—



Drawn by D.R.B. Examined G.A.T 19.7.85 Surveyed

Entered on chart D.R.B. 18·7·85 Vol.: 50 Folio 24

Chart Heazlewood .. Scale:— 1 : 15 840

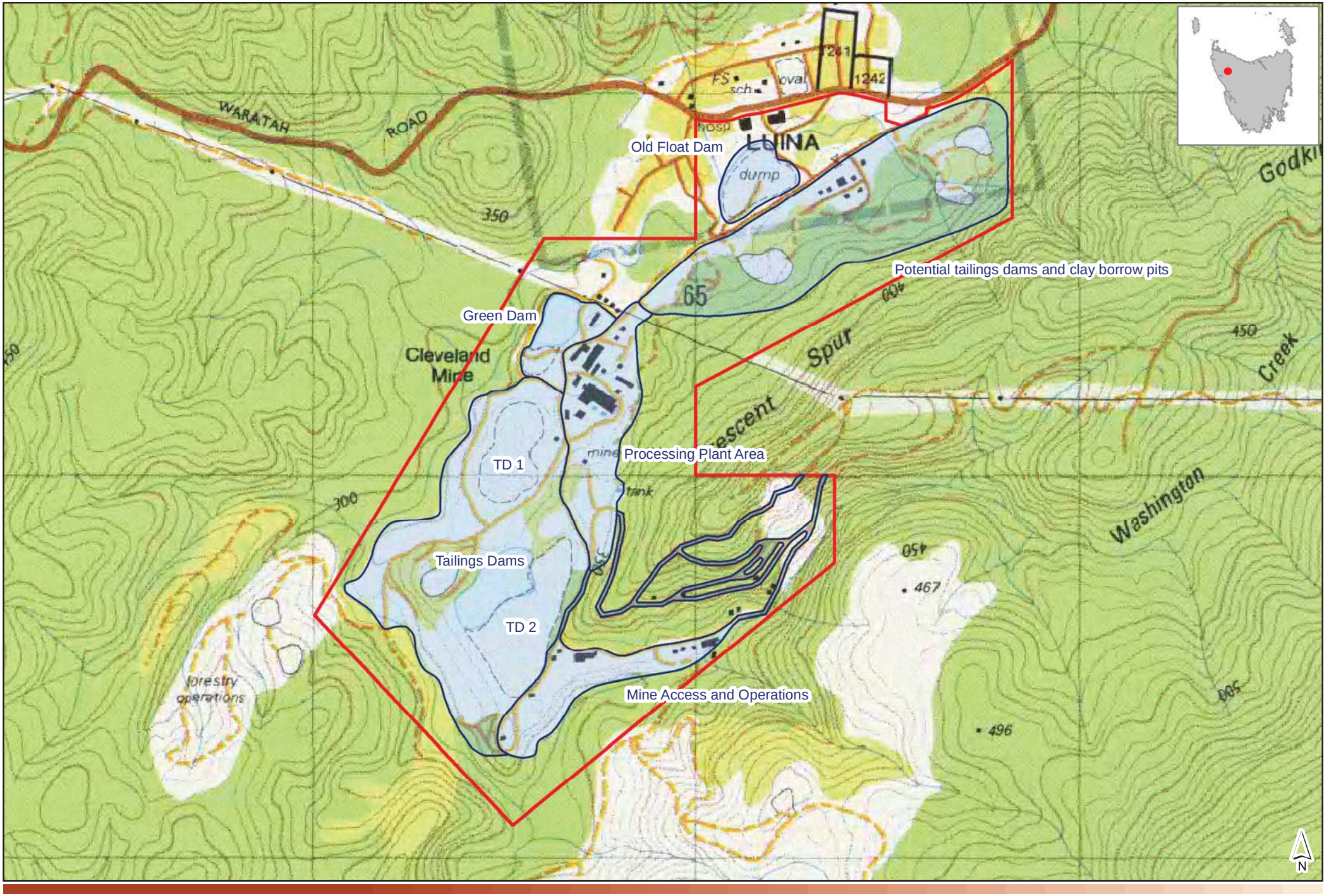
Approved

Director of Mines

19/7/85

Attachment C

Conceptual Project Layout



Map Projection:
GDA 1994 MGA Zone 55
Data sources:
Base image by TASMAP (C) State of Tasmania
Base data from theLIST (C) State of Tasmania
Map produced by pitt&sherry Date: 18/08/2011
Map ref: HB11225_H006_ConceptML_12P_RevB

pitt&sherry

Scale: 1:12,500

0 100 200 300

Metres

Legend

Proposed Project Area

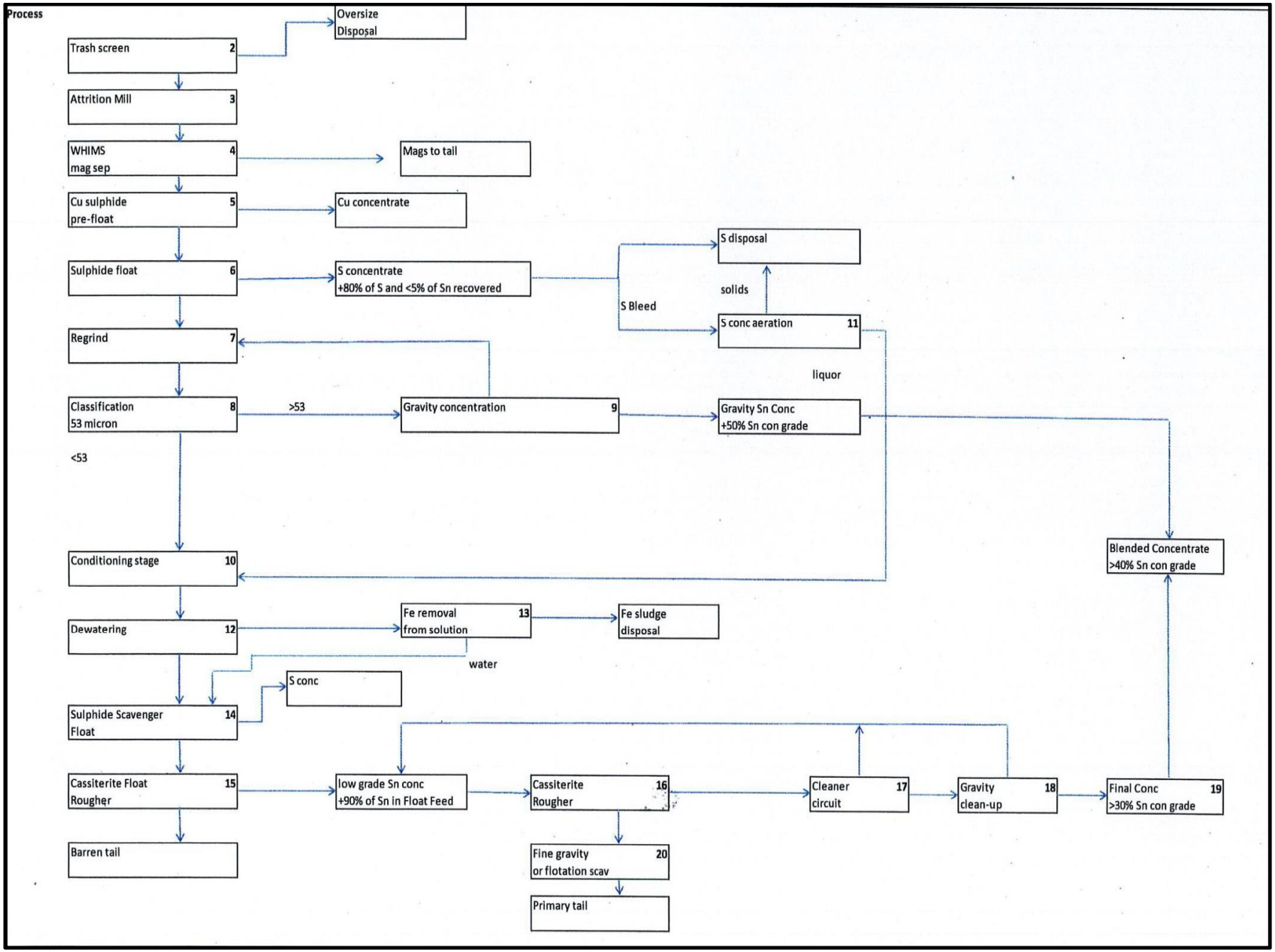
Conceptual Project Layout

Cleveland Mine

Conceptual Project Layout

Attachment D

Indicative Process Schematic Diagram


Process
Trash screen 2
Oversize Disposal
Attrition Mill 3
WHIMS mag sep 4
Mags to tail
Cu sulphide pre-float 5
Cu concentrate
Sulphide float 6
S concentrate +80% of S and <5% of Sn recovered
S disposal
solids
S Bleed
S conc aeration 11
Regrind 7
liquor
Classification 53 micron 8
>53
Gravity concentration 9
Gravity Sn Conc +50% Sn con grade
<53
Blended Concentrate >40% Sn con grade
Conditioning stage 10
Dewatering 12
Fe removal from solution 13
Fe sludge disposal
water
S conc
Sulphide Scavenger Float 14
Cassiterite Float Rougher 15
low grade Sn conc +90% of Sn in Float Feed
Cassiterite Rougher 16
Cleaner circuit 17
Gravity clean-up 18
Final Conc >30% Sn con grade 19
Barren tail
Fine gravity or flotation scav 20
Primary tail

Attachment E

Regional Setting

Map Projection:
GDA 1994 MGA Zone 55
Data sources:
Base image by TASMAP (C) State of Tasmania
Mining Lease data from MRT (C) State of Tasmania
Map produced by pitt&sherry Date: 19/08/2011
Map ref: HB11225_H007_MLA_RegionalSetting_12P_RevA

Scale: 1:400,000
0 2.5 5
Kilometres

Legend
Cleveland Tin Mine Location

Cleveland Mine
Regional Setting

Attachment F

Aboriginal Heritage Tasmania Correspondence

Attachment E

Correspondence from Aboriginal Heritage Tasmania

RE: ABORIGINAL HERITAGE DESKTOP ASSESSMENT

Notice of Intent, Cleveland Mine reopening

Dear Michael

Aboriginal Heritage Tasmania has completed a search of the Tasmanian Aboriginal Site Index (TASI) regarding the proposed Cleveland mine reopening at Luina and can advise that there are no Aboriginal heritage sites recorded within or close to the property. Due to the area being highly disturbed as a result of previous mining activities, it is believed that the area has a low probability of Aboriginal heritage being present.

Accordingly there is no requirement for an Aboriginal heritage investigation and Aboriginal Heritage Tasmania have no objection to the project proceeding as per the information provided. Should the project expand beyond the former Cleveland mine/Luina site however, an investigation may be warranted and the proponent would be advised the contact AHT again for further advice.

Please be aware that all Aboriginal heritage is protected under the *Aboriginal Relics Act 1975*. If at any time during works you suspect Aboriginal heritage, cease works immediately and contact Aboriginal Heritage Tasmania for advice.

If you have any queries please do not hesitate to contact Aboriginal Heritage Tasmania.

Kind Regards,

Emily Smith
Archaeologist
Aboriginal Heritage Tasmania
Department of Primary Industries, Parks, Water and Environment
5th Floor, Marine Board Building, 1 Franklin Wharf
GPO Box 771, Hobart, TAS, 7001

p 03 6233 5595 f 03 6233 2287
e emily.smith@heritage.tas.gov.au

www.aboriginalheritage.tas.gov.au

sustainable*thinking*®

Attachment G

Ecological Report

ECOLOGICAL ASSESSMENT OF PROPOSED TAILINGS REPROCESSING PROJECT, CLEVELAND MINE, LUINA, NORTHWEST TASMANIA

Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd

26 September 2011

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CITATION

This report can be cited as: ECO*tas* (2011). *Ecological Assessment of Proposed Tailings Reprocessing Project, Cleveland Mine, Luina, Northwest Tasmania*. Report by Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd, 26 September 2011.

AUTHORSHIP

Field assessment: Brian French, Mark Wapstra

Report production: Brian French, Mark Wapstra

Vegetation and habitat mapping: Brian French

Base data for mapping: TasMap, DPIPWE, GoogleEarth, Pitt & Sherry

Digital photography: Brian French

ACKNOWLEDGEMENTS

Jim Lockley (Pitt & Sherry) and Mike Adams (Bright Phase Resources Ltd) provided background information and maps on the proposal and access to the site. Emma Barker and Ronny Tyquin (Forestry Tasmania) provided information on the status of the informal reserve on State forest and the currency of aerial searches for wedge-tailed eagle nests in the vicinity of the study area. Staff of Bright Phase, Pitt & Sherry, Forestry Tasmania and Tasmanian Helicopters assisted with aerial surveys for wedge-tailed eagle nests.

COVER ILLUSTRATION

Cover image: typical regenerating forest on the old tailings areas dominated by silver wattle (*Acacia dealbata*).

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SUMMARY

General

Bright Phase Resources Ltd (via Jim Lockley, Pitt & Sherry) engaged Environmental Consulting Options Tasmania to undertake an assessment of ecological values associated with a proposal to reprocess the old mine tailings at the Cleveland Mine site, Luina, northwest Tasmania.

The proposal is to reprocess the original mine tailings from the Cleveland Mine. There is approximately 4 million tonnes of tailings on the sites which is proposed to be mined and reprocessed on the site. The processing facilities are proposed to be located on the original mill site. The tailings from the reprocessing will be returned to the mined tailings area and the area rehabilitated. The reprocessing of the tailings on the site also proposes to alleviate the problem of acid mine drainage on the site by removing the acid producing metals and sulphides as the processing occurs.

The study area was assessed on 19 July 2011.

Summary of key findings

Threatened flora

- No flora species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.

Threatened fauna

- No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
- The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and Tasmanian devil, but it is unlikely that features such as nests or dens are present within the study area itself (no such features were detected), and no special management prescriptions are recommended (noting that rehabilitation of the area will be required).
- The wider area supports potential nesting habitat for the wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) but surveys did not detect any nests within the study area or within 1 km of the study area, so no deleterious impact on the species is anticipated.

Vegetation types

- Eight mapping units were identified from the study area (Figure 4), namely:
  - "*Acacia melanoxylon* forest on rises" (TASVEG code: NAR);
  - "*Eucalyptus obliqua* dry forest and woodland" (TASVEG code: DOB);
  - "*Eucalyptus obliqua* forest with broad-leaf shrubs" (TASVEG code: WOB);
  - "*Eucalyptus obliqua* forest over rainforest" (TASVEG code: WOR);
  - "*Nothofagus-Atherosperma* rainforest" (TASVEG code: RMT);
  - "extra-urban miscellaneous" (TASVEG code: FUM);
  - "permanent easement" (TASVEG code: FPE);
  - "regenerating cleared land" (TASVEG code: FRG).

- None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Weeds

- Several species of "declared" weed species, and some other exotic species with potential to act as "environmental weeds", were detected from the study area. Inclusion of weed management prescriptions in the DPEMP is recommended.

Plant and animal disease

- No evidence of plant and animal disease was noted. Inclusion of disease management prescriptions in the DPEMP is recommended.

Reserves

- The study area is within an "Informal Reserve" managed by Forestry Tasmania – some additional planning assessment protocols will need to be applied to satisfy Forestry Tasmania's internal protocols. In our opinion, the proposed works will result in a temporary modification of some native vegetation types but these are all already regrowth facies of the various communities after previous mining activities. As such, complex offsets are not recommended, provided that the area is rehabilitated to similar vegetation types.

Recommendations

The following values should be further considered, as part of DPEMP preparation:

- undertake an analysis of the potential risk of increase in mammal roadkill as a consequence of product transportation activities;
- include weed management and disease minimisation protocols in the DPEMP;
- liaise further with Forestry Tasmania and Mineral Resources Tasmania on the required management of the informal reserve;
- adhere to the *Quarry Code of Practice June 1999* (DPIWE 1999) and other recommendations applied by planning authorities in relation to mineral extraction works, transport of product and site rehabilitation.

BACKGROUND INFORMATION

Purpose

Bright Phase Resources Ltd (via Jim Lockley, Pitt & Sherry) engaged Environmental Consulting Options Tasmania to undertake an assessment of ecological values associated with a proposal to reprocess the old mine tailings at the Cleveland Mine site, Luina, northwest Tasmania.

The present report is primarily intended to allow Bright Phase Resources Ltd to take account of any identified ecological values in land use planning decisions and to later facilitate approvals under environmental planning systems including Commonwealth, State and local government processes, should such approvals become necessary.

Scope

This report relates to:

- flora and fauna species of conservation significance, including a discussion of listed threatened species potentially present, and other species of conservation significance/interest;
- vegetation types (forest and non-forest, native and exotic) present, including a discussion of the distribution, condition, extent, composition and conservation significance of each community;
- plant disease and weed management issues; and
- an initial discussion of some of the policy and legislative implications of the identified ecological values to facilitate further land use planning decisions.

This report follows, in a general sense, the government-produced *Guidelines for Natural Values Assessments* (DPIPWE 2009) in anticipation that the report (or extracts of it) may be used as part of various approval processes that may be required for activities on the site, including by the Department of Primary Industries, Parks, Water & Environment. The report format will also be applicable to other assessment protocols as required the Commonwealth Department of Sustainability, Environment, Water, Population & Communities (for any referral/approval that may be required under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*). Note that this level of assessment should also be appropriate to meet local government planning processes in relation to ecological values. The information contained in this report can also be used to satisfy the reporting and assessment protocols of Forestry Tasmania's State Forest Activity Assessments (SFAAs).

Limitations

In the case of the present assessment, there were no limitations with respect to access to the study area. Access was from existing access roads and tracks, and through easily traversed vegetation types.

The flora survey was undertaken on the 19 July 2011. Many plant species have ephemeral or seasonal growth or flowering habits, or patchy distributions (at varying scales), and it is possible that some species were not recorded for this reason (especially late spring-summer flowering grasses, herbs and lilies). However, every effort was made to sample the range of habitats present in the survey area to maximise the opportunity of recording the majority of species present (particular those of conservation significance). The authors are satisfied that the timing of the survey is appropriate to detect the majority of threatened flora species potentially present, based on several assessments of many parts of the north west region in recent years. The survey was also limited to vascular species: species of mosses, lichens and liverworts were not recorded.

However, a consideration is made of species (vascular and non-vascular) likely to be present (based on habitat information and database records) and reasons presented for their apparent absence. The fauna survey was restricted to an assessment of potential habitat only.

Qualifications

Except where otherwise stated, the opinions and interpretations of legislation and policy expressed in this report are made by the authors and do not necessarily reflect those of the relevant agency. The client should confirm management prescriptions with the relevant agency before acting on the content of this report.

Permit

All plant material was collected under DPIPWE permit TFL 10110 (in the name of Brian French). Relevant data will be entered into DPIPWE's *Natural Values Atlas* database by the authors. Some plant material may be lodged at the Tasmanian Herbarium by the authors.

THE STUDY AREA

The study area comprises of the old Luina township, extensive roads, rehabilitation areas, regrowth forest and oldgrowth forest with the Cleveland Mine site, Luina, northwest Tasmania (Figure 1), centred on 364834mE 5407369mN (GDA94, Luina 3640 1:25000 Tasmap).

The study area is underlain by Quaternary alluvial sand, gravel and mud, Cambrian ultramafic complexes, Cambrian basalts, and Cambrian mafic volcaniclastics. Much of the original geology and ground levels have been overlain by tailings from both the Clevelend Mine and introduced from the Hellyer Mine. Elevation is approximately 290 to 480 m a.s.l.

Land tenure and other categorisations of the study area are as follows:

- State forest;
- City of Waratah-Wynyard municipality;
- West and Southwest Bioregion (according to the description of IBRA 4 boundaries in the Forest Botany Manual);
- West Bioregion (according to the IBRA 5 boundaries used by several government agencies).

THE PROPOSAL

The proposal is to reprocess the original mine tailings from the Cleveland Mine (Figure 2) as the original mining from 1969 to 1986 by Aberfoyle did not claim more than 60% of the tin. Advances in mineral processing techniques have made it viable to reprocess mine tailings to win more ore. There is approximately 4 million tonnes of tailings on the sites which is proposed to be mined and reprocessed on the site. The processing facilities are proposed to be located on the original mill site. The tailings from the reprocessing will be returned to the mined tailings area and the area rehabilitated. The reprocessing of the tailings on the site also proposes to alleviate the problem of acid mine drainage on the site by removing the acid-producing metals and sulphides as the processing occurs.

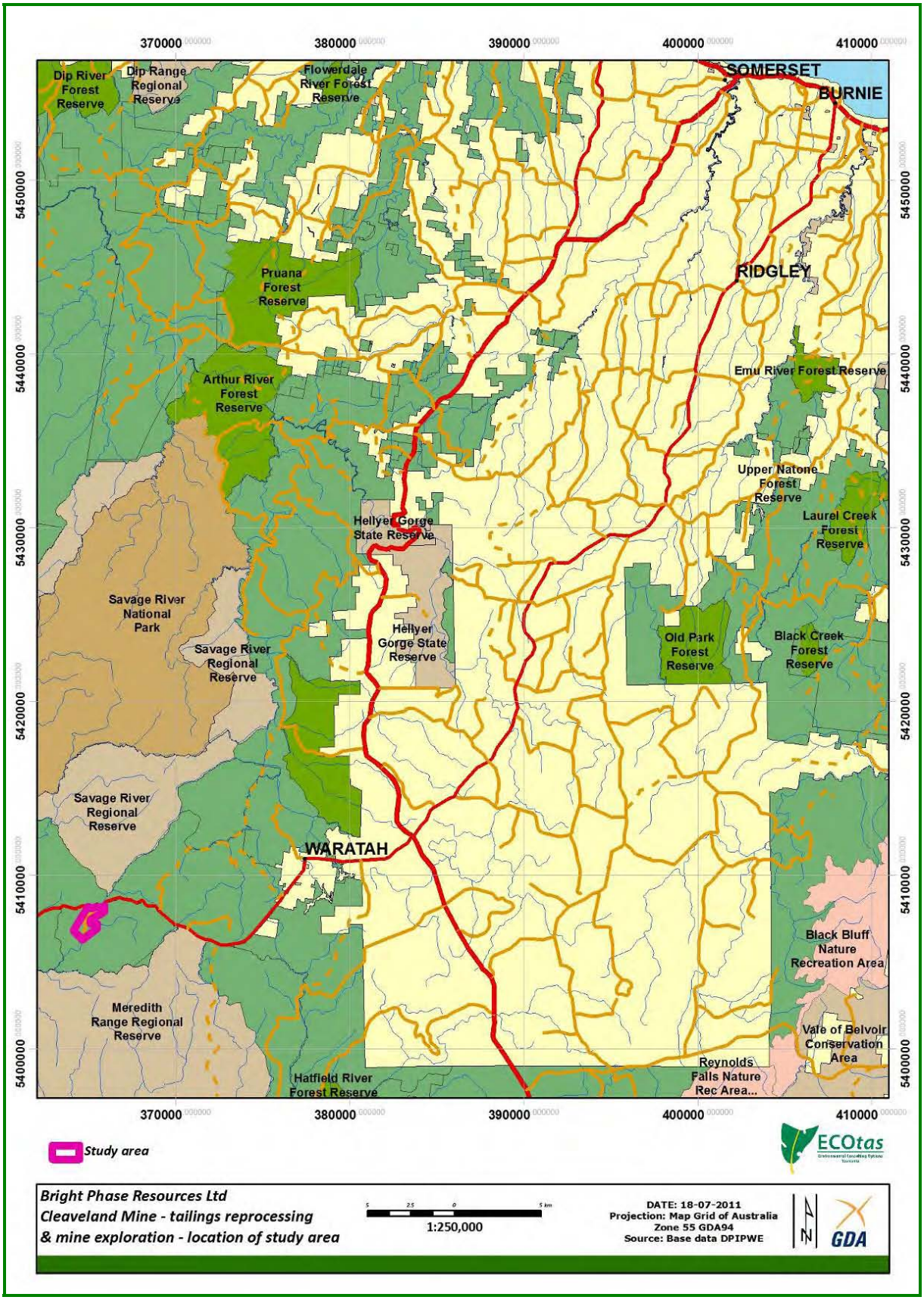


Figure 1. Location of the study area

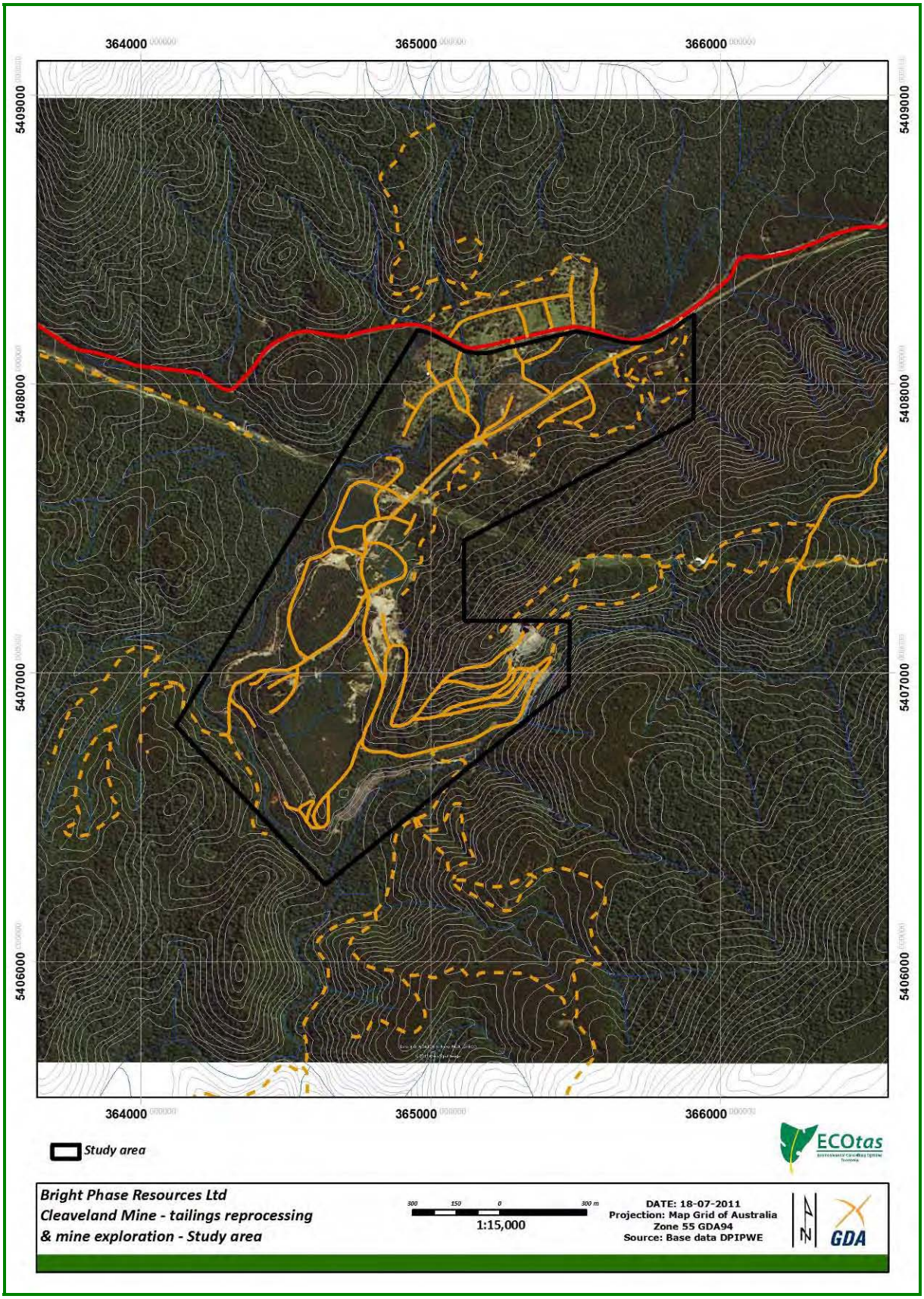


Figure 2. More detailed location of the study area

METHODS

Nomenclature

All grid references in this report are in GDA94, except where otherwise stated. Vascular species nomenclature follows Baker & Duretto (2011) for scientific names and Wapstra *et al.* (2005) for common names. Fauna species scientific and common names follow the listings in the cited *Natural Values Atlas* reports (DPIPWE 2011). Vegetation classification follows TASVEG, as described by Harris & Kitchener (2005).

Database analysis

The following sources holding ecological values information were interrogated, namely:

- the Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas*, accessed through the online Natural Values Report feature, producing a report titled *42807_ECOtas_Cleveland Mine_290711* (DPIPWE 2011; Appendix C);
- the Forest Practices Authority's online version of the *Threatened Fauna Manual* (now referred to as the *Fauna Values Database*) accessed through FPA's website (Luina 3640 1:25000 mapsheet report accessed 9 August 2011 (FPA 2011; Appendix D);
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Report* for coordinates: -41.46649,145.38134 -41.46641,145.38309 -41.46717,145.38476 -41.46717,145.38621 -41.46649,145.38887 -41.46664,145.39002 -41.46695,145.39139 -41.46679,145.39238 -41.46649,145.39352 -41.46557,145.39519 -41.46999,145.39481 -41.47288,145.38507 -41.47502,145.38491 -41.47517,145.38887 -41.47882,145.38895 -41.48461,145.37821 -41.47898,145.37212 -41.46649,145.38149 -41.46649,145.38134 dated 9 August 2011 (DEWHA 2011; Appendix E);
- the Department of Primary Industries, Parks, Water & Environment's *Conservation of Freshwater Ecosystem Values* database, accessed on 9 August 2011 (CFEV database, v1.0 2005; Appendix F);
- GoogleEarth aerial imagery (accessed by the author 19 July 2011).

Botanical survey

Botanical assessment of the study area took place on 19 July 2011 by Brian French (ECO*tas*). The primary purpose of the botanical assessment was to enable the production of a vegetation map showing the extent, condition and classification of each of the forest vegetation types present. Detection and confirmation of sites for threatened flora was also an objective of the assessment.

The survey aimed to assess the range of habitat types present in the study area (at the broad scale e.g. vegetation type, altitude variation, and at the finer scale e.g. microhabitats such as drainage depressions, disturbed sites, etc.).

Reference to topographic maps (Luina 3640 1:25000 Tasmap), vegetation maps (i.e. TASVEG) and aerial photography (GoogleEarth) established the approximate range and distribution of topographic and habitat variation present in the study area.

Detailed plots recording all vascular species, vegetation structure and site characteristics were undertaken in representative vegetation types. Running species lists, and additional species associated with specific vegetation types, habitat features or sites (e.g. drainage depressions etc.), were also recorded on the route through the study area. Plot data and species lists can be supplied on request (but note that relevant information is included in the report text).

Zoological survey

Potential habitat for threatened fauna (as listed on databases referred to above) was assessed by reference to the vegetation types and site characteristics present. The presence of mammals, birds, frogs and reptiles was determined by opportunistic discovery (e.g. sightings and calls) during the main botanical assessment, and evidence such as tracks, scats and other signs.

RESULTS

Vegetation types

Comments on TASVEG mapping

The following section, which comments on the existing TASVEG mapping for the study area, is included to highlight the differences between existing mapping and the more recent mapping from the present study to ensure that any parties assessing land use proposals (via this report) do not rely on existing mapping. Note that TASVEG mapping, which was mainly a desktop mapping exercise based on aerial photography, is often substantially different to ground-truthed vegetation mapping, especially at a local scale.

TASVEG mapping (as shown in the cited *Natural Values Atlas* report) dominantly maps the area as "*Eucalyptus obliqua* wet forest (undifferentiated)' (TASVEG code: WOU), "*Nothofagus-Phyllocladus* short rainforest" (TASVEG code: RMS) and "*Nothofagus-Atherosperma* rainforest (undifferentiated)" (TASVEG code: RMU) in the native forest areas within and adjacent to the study area west, "Extra-urban miscellaneous" (TASVEG code: FUM) and "Agricultural land" (TASVEG code: FAG) around the old mine workings and township and "Permanent easement" (TASVEG code: FPE) for power line easements at the site (Figure 3). The TASVEG mapping of the area is based on mapping from 2002 from aerial photography in 1995. "*Nothofagus-Atherosperma* rainforest undifferentiated" (RMU) is no longer listed as a TASVEG community by Harris & Kitchener (2005). The vegetation types recorded within the study area are discussed in detail below.

Vegetation types recorded as part of the present study

Vegetation types have been classified according to Harris & Kitchener (2005) *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. Conservation priorities alluded to in Table 1 are taken from Schedule 3A of the Tasmanian *Nature Conservation Act 2002* (DPIPWE 2011b). Table 1 provides information on the vegetation types identified from the study area with notes provided on condition. Further information on the vegetation types present and the vascular species composition in the different vegetation types is presented at Appendices A and B, respectively.

Figure 3 indicates the existing vegetation within the study area (as per TASVEG mapping) and Figure 4 indicates the revised vegetation mapping of the study area.

Eight mapping units were identified from the study area (Figure 4), namely:

- "*Acacia melanoxylon* forest on rises" (TASVEG code: NAR);
- "*Eucalyptus obliqua* dry forest and woodland" (TASVEG code: DOB);
- "*Eucalyptus obliqua* forest with broad-leaf shrubs" (TASVEG code: WOB);
- "*Eucalyptus obliqua* forest over rainforest" (TASVEG code: WOR);
- "*Nothofagus-Atherosperma* rainforest" (TASVEG code: RMT);
- "extra-urban miscellaneous" (TASVEG code: FUM);
- "permanent easement" (TASVEG code: FPE);
- "regenerating cleared land" (TASVEG code: FRG).

None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* (DPIPWE 2011b) or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. There are no management implications under State or Commonwealth vegetation legislation and policy.

Table 1. Vegetation communities present in study area

Areal values – top, bold (total hectares in study area); middle and bottom, italics (maximum hectares/percentage proportion likely to be disturbed – see also Figure 7)

Floristic code (FPA 2005)	**RFA Equivalent** (Anon 1997)	**TASVEG Equivalent** (Harris & Kitchener 2005)	**Conservation priority** FBM (FPA 2005) RFA (Anon 1997) TASVEG (DPIPWE 2011b)	**Area (ha)**	**Comments**
Non-forest	Non-forest	Extra-urban miscellaneous (FUM)	np N Not threatened	**17.92 ha** *6.41 ha* *35.77%*	This mapping unit is used to describe the quarry areas and old infrastructure sites, which are common across the site. Weed species were noted from a number of sites in and around the old Luina township area.
Non-forest	Non-forest	Permanent easement (FPE)	np N Not threatened	**3.71 ha** *1.63 ha* *43.97%*	FPE describes the large power transmission lines that cross the centre of the study area. The vegetation associated with the power lines is "managed" with regular fire management clearing occurring. There were no weed species noted from this mapping unit.
Non-forest	Non-forest	Regenerating cleared land (FRG)	np N Not threatened	**48.57 ha** *43.20 ha* *88.94%*	FRG is the dominant mapping unit across the study area. FRG in this case is used to describe the actively rehabilitated tailings dump areas, old quarry sites and workshop areas which are being "recolonised" by native plant species or have had native seed sown to encourage rehabilitation.
SWAMP-D4	*Acacia melanoxylon* forest on rises (BR)	*Acacia melanoxylon* forest on rises (NAR)	np N Not threatened	**8.36 ha** *1.25 ha* *14.96%*	NAR occurs on the slopes around Washington Creek in the south of the study area and along the Whyte River in the north of the study area.
DRY-shOB	Dry *Eucalyptus obliqua* forest (O)	*Eucalyptus obliqua* dry forest (DOB)	np N Not threatened	**4.29 ha** *3.86 ha* *89.78%*	DOB is a localised small remnant of forest in the south of the study area. DOB occupies the relatively dry northern slopes of the hill above an old quarry area. No weed species were noted at this site.

Floristic code (FPA 2005)	**RFA Equivalent** (Anon 1997)	**TASVEG Equivalent** (Harris & Kitchener 2005)	**Conservation priority** FBM (FPA 2005) RFA (Anon 1997) TASVEG (DPIPWE 2011b)	**Area (ha)**	**Comments**
WET-OB2	Tall *Eucalyptus obliqua* forest (OT)	*Eucalyptus obliqua* forest with broad-leaf shrubs (WOB)	np N Not threatened	**49.31 ha** *23.7 ha* *48.06%*	WOB is common on the relatively dry northern slopes of Crescent Spur and also as a transitional community between the rainforest (RMT) and mixed forest (WOR) communities across the study area (see below). This community is in good condition with no weeds recorded.
WET-OB1000	Tall *Eucalyptus obliqua* forest (OT)	*Eucalyptus obliqua* forest over rainforest (WOR)	np N Not threatened	**27.71 ha** *1.26 ha* *4.55%*	WOR occurs in the moist and fertile lower slopes on the southern end of Crescent Spur and adjacent to the Whyte River and Washington Creek in the south. This community is gradational with WOB as moisture availability decreases and RMT in moist, fertile and undisturbed sites. This community is in good condition with no weeds recorded.
RAIN-C1.1	Callidendrous & thamnic rainforest on fertile sites (M+)	*Nothofagus-Atherosperma* rainforest (RMT)	np N Not threatened	**1.90 ha** *0.04 ha* *2.10%*	RMT occurs in small areas in the west of the study area, adjacent to the Whyte River. This community occurs on the moist and fertile lower slopes where disturbance has not occurred for a very long time period. This community is in good condition and no weeds species were recorded.

Plant species

General observations

A total of 86 vascular plant species were recorded from the study area, comprising 53 dicotyledons (including 12 endemic and 5 exotic species), 14 monocotyledons (including 0 endemic and 1 exotic species), 1 gymnosperm (endemic), and 18 pteridophytes (all native).

Priority species recorded from the study area

No species, listed as threatened on the Tasmanian *Threatened Species Protection Act* 1995 or the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, were recorded from the study area. The vegetation types identified from the study area (Table 1, Figure 4) are not usually strongly associated with threatened flora, especially disturbed and disclimax facies of the vegetation types present.

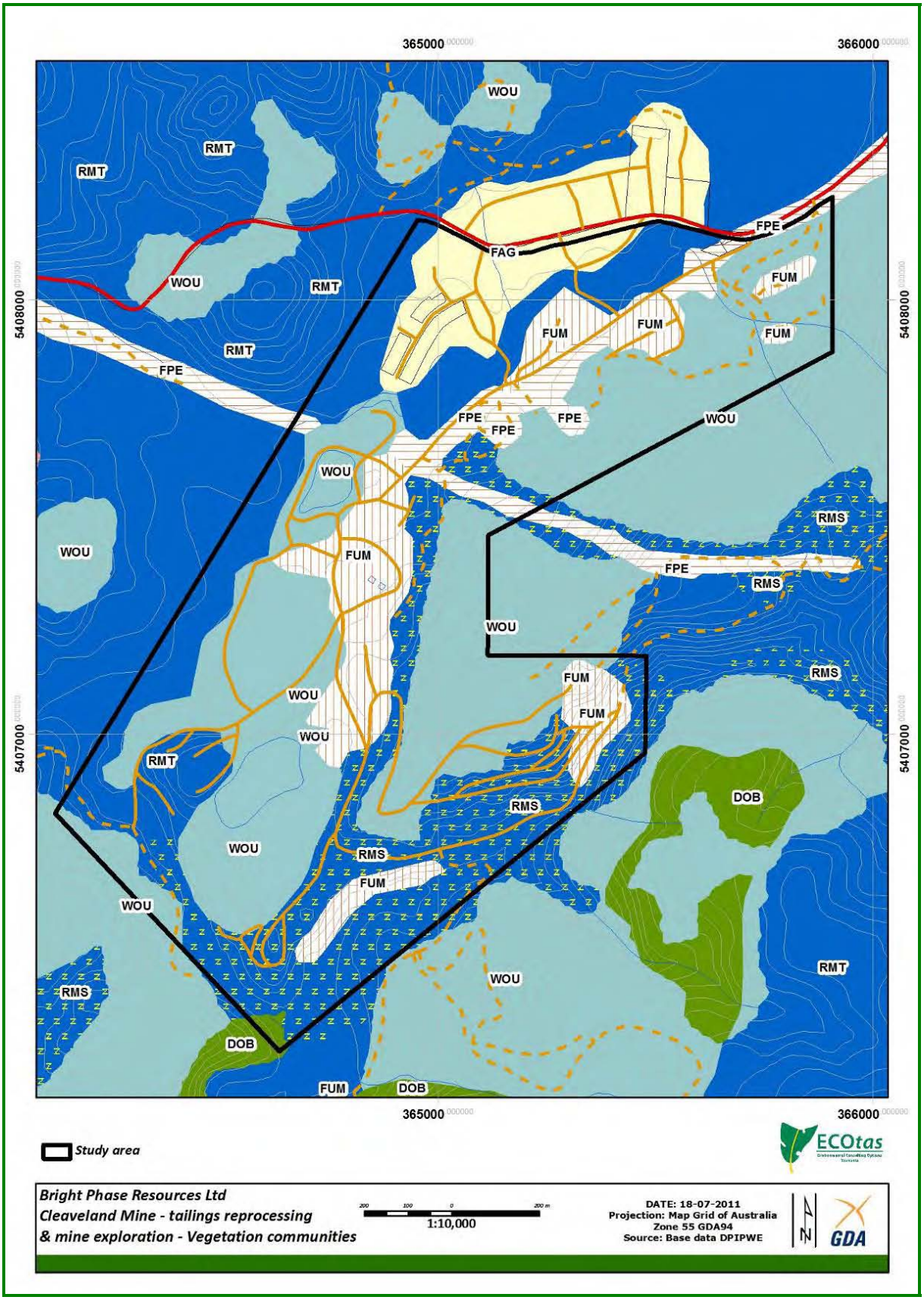


Figure 3. Existing TASVEG vegetation mapping of the broader study area

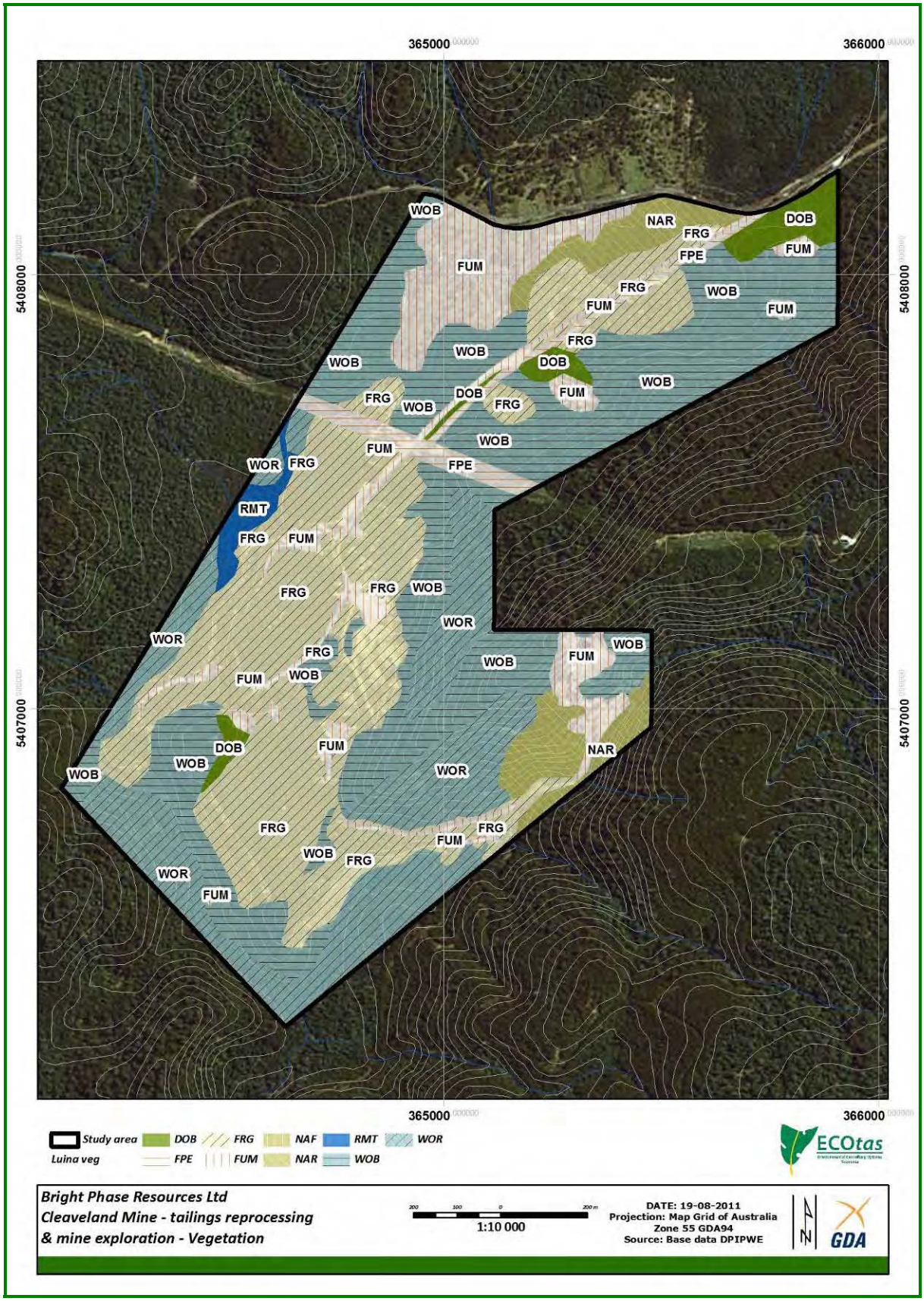


Figure 4. Revised vegetation mapping of the study area

Priority flora recorded from databases

Table 2 provides a listing of priority flora from within 500 m and 5000 m of the study area, with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded. Note that the survey was not restricted to the species listed in Table 2 but considered the potential presence of any threatened flora.

Table 2. Priority flora records from within 5000 m of boundary of study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas* (DPIPWE 2011a) and other sources where indicated. Habitat descriptions are taken from TSU (2003), except where otherwise indicated.

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
Records within the study area			
There are no records within the study area.			
Records within 500 m of the study area			
There are no records within 500 m of the study area.			
Records within 5000 m of study area			
Comesperma defoliatum (leafless milkwort)	r -	1 record alongside the Heazlewood River to the west of the study area	The preferred habitat of this species (heathy forests, heathlands and moorlands) is absent from the study area. This record is very old (c. 1930) and where the record is located is not the preferred habitat of this species. There are no other records for this species in the area. This species was not detected.
Epacris glabella (smooth heath)	e EN	Numerous records in the Caudrys Hill/Heazlewood River area to the west of the study area	This endemic species is only known from the ultramafic serpentinite substrates to the west of the study area in heathy moorlands, scrub and heathy *Eucalyptus nitida* woodlands. These habitat types are entirely absent from the study area. This species was not detected.
Hypolepis muelleri (harsh groundfern)	r -	1 record on the northern slopes of Mt Cleveland in O'Bones Creek	This species has the potential to occur in any of the wet forest types that occur within the study area. This distinct fern species was not detected..
Micrantheum serpentinum (western tridentbush)	r -	Numerous records in the Caudrys Hill/Heazlewood River area to the west of the study area	This endemic species is only known from the ultramafic serpentinite substrates to the west of the study area in heathy moorlands, scrub and heathy *Eucalyptus nitida* woodlands. These habitat types are entirely absent from the study area. This species was not detected.
Viola cunninghamii (alpine violet)	r -	1 record on the plains to the west of Waratah	This species is under taxonomic revision due to a large number of misidentifications in the past. The main known habitat for this species is subalpine meadows and grassy woodlands, habitat types entirely absent from or near the study area. The common *Viola hederacea* was recorded from within the study area.

Priority fauna

Priority species recorded from the study area

No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were recorded from within the study area. The area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil, but it is unlikely that features such as nests or dens are present (see discussion in Table 3 for more details).

Priority fauna recorded from databases

Table 3 lists threatened fauna species recorded from within 5 km of the study area and discusses the potential of these species to be present on the site, based on the predicted vegetation types, site characteristics derived from the information provided, ecological assessment of nearby areas, and the author's knowledge of the species and the wider area.

Table 3. Priority fauna records from within 5000 m of boundary of study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the DPIPWE's *Natural Values Atlas* (DPIPWE 2011a) and FPA (2011).

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
Records within the study area			
There are no records within the study area.			
Records within 500 m of the study area			
There are no records within 500 m of the study area.			
Records within 5000 m of the study area			
Sarcophilus harrisii (tasmanian devil)	e EN	1 database record	Potential habitat (which is virtually any vegetation type) is present within the study area. The study area is likely to form part of the home range of one or more individuals or pairs. No evidence of the species (including sightings, scats, dens and latrine sites) was detected from the study area. See discussion below table for further information on this species.
Potential habitat within 5000 m of the study area			
Accipiter novaehollandiae (grey goshawk)	e -	No database records	FPA (2011) and DPIPWE (2011a) indicate the potential for this species to occur in the area. FPA (2011) describes potential habitat as "wet eucalypt forest with blackwood/myrtle

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
			understorey, blackwood swamp, *E. brookeriana* wet forest, melaleuca and leptospermum forest". Based on the field assessment, some of these habitat elements are present in the study area. No nest sites were detected during the course of the field assessment. It is unlikely that the proposed development will result in a significant impact on potential foraging and nesting habitat at a local scale because the majority of works will be restricted to previously disturbed areas.
Aquila audax subsp. *fleayi* (wedge-tailed eagle)	e EN	No records within 5000 m of the study area.	Potential habitat is described as "large tracts (more than 10 ha) of eucalypt or mixed forest" (FPA 2011). This habitat is extensive surrounding the study area. No nest sites were detected during the course of the field assessment. It is likely that the area is used as foraging habitat. See discussion below table for recommendations on additional search requirements.
Beddomeia bellii (hydrobiid snail – Rapid River)	r -	No database records	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2011). The study area is within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Beddomeia hullii (hydrobiid snail - Heazlewood River)	r -	6 database records	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2010a). The study area is 2 km from the known locality of this species (Thirteen Mile Creek) and is not within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Dasyurus maculatus subsp. *maculatus* (spotted-tailed quoll)	r VU	5 database records	Potential habitat is described (for both the eastern and spotted-tailed quolls) as "all wetter forest types, coastal heath and bush-pasture interfaces" (FPA 2011). The study area meets this broad habitat description and is likely to form part of the home range of one or more individuals or pairs. However, at a local scale, the proposed tailings mining and the loss of potential habitat is small relative to the large expanses of habitat in the wider area. The works would not result in a "significant impact" on the habitat of the species, as defined by the guidelines (CofA 2009) related to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Lathamus discolor (swift parrot)	e EN	1 database record	Potential habitat is described as "Breeding range (comprising foraging and nesting habitat) is within 10 km of the coastline (nearest coast including shores, bays, inlets or peninsulas). Foraging habitat: all *Eucalyptus ovata – E. viminalis* shrubby forest (OV), grassy *E. globulus* forest (GG) and *E. globulus* wet forest floristic communities

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
			(subsumed into R) or any forest type with >10% *E. globulus* canopy cover. Nesting habitat: *Eucalyptus* trees present > 70 cm dbh, with hollows present" (FPA 2011). The database record most likely represents a sighting of a migrating/dispersing/vagrant individual. The study area is outside the predicted range of the species (FPA 2011). The proposed development will have no impact on this species.
Oreixenica ptunarra (ptunarra brown butterfly)	v -	No database records	Potential habitat, which is described as "native grasslands or grassy woodlands with tussock grass (*Poa*) cover of more than 15%" (FPA 2011), is absent from within or adjacent to the study area.
Phrantela annamurrayae (hydrobiid snail – Heazlewood River)	r -	1 record	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2011). The study area is 6.5 km from the known locality of this species (Heazlewood River) and is not within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Phrantela marginata (hydrobiid snail – Heazlewood River)	r -	2 database records	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2010a). The study area is 5 km from the known locality of this species (Heazlewood River) and is not within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Sarcophilus harrisii (tasmanian devil)	e EN	5 database records	See comments in section below table.
Thylacinus cynocephalus (thylacine)	x EX	2 database records	Species presumed extinct – no further comments.
Tyto novaehollandiae subsp. *castanops* (Tasmanian masked owl)	e VU	No database records	Potential habitat is described as "lowland dry sclerophyll forest with old growth components" (FPA 2011), although the species can extend into wetter forest types. The forests surrounding the study area are wetter forest types with old-growth components present. The study area may form part of the home range of one or more pairs, and provide foraging, nesting and/or roosting habitat. However, the proposed development will not result in the substantial removal of potential foraging, roosting or nesting habitat.
Additional species from* Protected Matters Report *(DSEWPC 2011), and not considered in above sections			
Apus pacificus (fork-tailed swift)	Migratory Marine Species	No database records	Aerial foraging bird that rarely lands – proposed development will have no significant impact.
Ardea alba (great egret)	Migratory Wetland & Marine Species	No database records	Potential habitat absent – proposed development will have no significant impact.

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
Ardea ibis (cattle egret)	Migratory Wetland & Marine Species	No database records	Potential habitat absent – proposed development will have no significant impact.
Botaurus poiciloptilus (australian bittern)	- EN	No database records	Potential habitat absent – proposed development will have no significant impact.
Ceyx azureus subsp. *diemensis* (Tasmanian azure kingfisher)	e EN	No database records	Potential habitat (tree-lined major river systems) marginally present adjacent to the study area but the stream stretches are unsuitable for both foraging and nesting by the species due to the existing levels of disturbance and combination of habitat characteristics (Wapstra et al. 2010).
Gallinago hardwickii (lathams snipe)	Migratory Wetland Species	No database records	Potential habitat absent – proposed development will have no significant impact.
Hirundapus caudacutus (white-throated needletail)	Migratory Terrestrial Species	No database records	Aerial foraging bird that rarely lands – proposed development will have no significant impact.
Prototroctes maraena (australian grayling)	v VU	No database records	Potential habitat absent (lower to middle reaches of rivers and streams, FPA 2011) – proposed development will have no significant impact.

Wedge-tailed eagle

The forests surrounding the study area support suitable potential nesting habitat for the wedge-tailed eagle. Generally, the forests on the steeper slopes are dominated by *Eucalyptus obliqua* with an old-growth element present consisting of very old senescent trees with suitable nesting sites present. A ground-based survey was conducted of suitable habitat surrounding the study area, which consisted of a visual assessment from open ground in the Luina/Cleveland mine site area using binoculars and walking to more inaccessible gullies that had suitable nesting habitat. No nests were located, however, it should be noted that visibility was impeded in some areas due to the thick understorey of the forest communities present.

Figure 5 indicates the area of forest recommended for aerial searching for the possible presence of wedge-tailed eagle nests. The area is based on an interpretation of PI (photo-interpretation) forest types, vegetation maps, topography maps, aerial imagery and experience of the veracity of such sources at the local scale (based on the recent vegetation mapping undertaken as part of the present assessment). A 1 km buffer was employed because the proposed mine site is a long-term feature in the landscape rather than a short-term disturbance, and there is potential for nest sites within 1 km that may be in line-of-sight (one of the important management considerations). Ground-based searches in dense wet forests is not recommended (FPA 2006). Aerial (helicopter) searching is the most appropriate means of maximising the opportunity of nest detection. It should be noted that Forestry Tasmania have not conducted searches for nests within the last 3 years in the areas indicated in Figure 5 (E. Barker, Forestry Tasmania, pers. comm. August 2011).

Two opportunities to undertake aerial searches were presented because (1) suitably qualified personnel were able to accompany a pre-planned flight by Helicopters Tasmania to the west coast for other reasons, and (2) Bright Phase personnel were undertaking aerial reconnaissance of the lease area. As part of these flights, the lease area was assessed from the air (primarily for project appreciation and exploration lease investigation including assessing acid mine drainage extent down river systems and context of lease area relative to land tenure and roads, etc.), which provided the opportunity to survey the recommended forest patches for nests (based on Figure 5 but adapted in the air according to actual suitability for supporting nests). No nests were detected as a consequence of these surveys, which are reported in Figure 5 and Table 4.

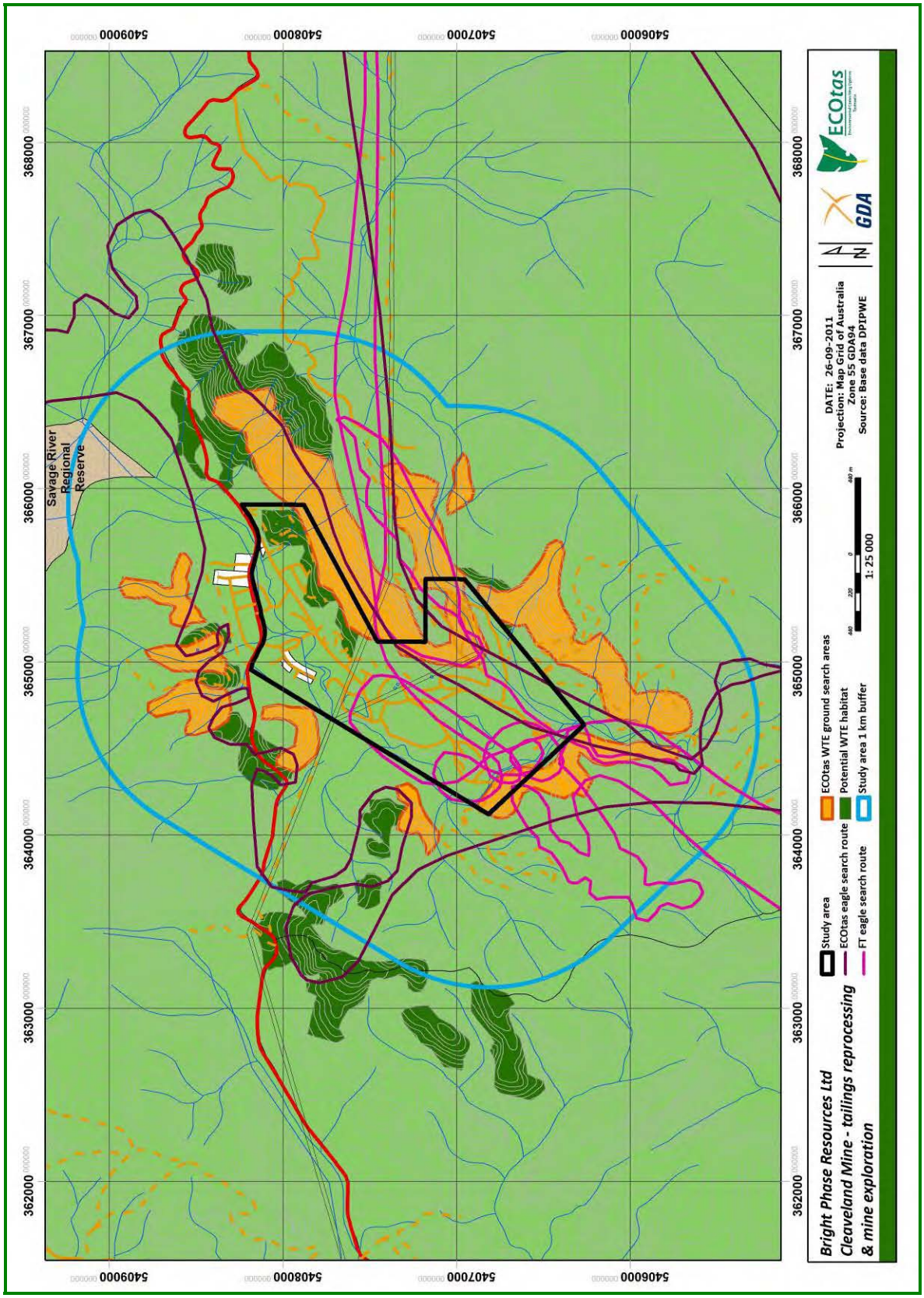


Figure 5. Maximum recommended search areas for wedge-tailed eagle nests indicating actual search area – the map should be read in conjunction with Table 4, which describes the survey area in more detail (buffers indicating sightability distance on the aerial routes not shown for readability reasons)

Table 4. Summary of surveys for wedge-tailed eagle nests within and adjacent to the study area

Action	*Date*	*Personnel*	*Findings*
Previous searches of study area			
Liaison between ECO*tas* and Forestry Tasmania	N/A	N/A	Correspondence between Mark Wapstra and Emma Barker (Forestry Tasmania, Murchison District) established that Forestry Tasmania have not undertaken aerial or ground-based searches for wedge-tailed eagle nests from any part of the recommended search area in the last 3 years
Potential nesting habitat assessment			
Map-based habitat assessment supplemented with field knowledge	15/08/2011	Brian French (ECO*tas*)	See Figure 5 and explanatory notes above – map produced is conservative and targets all areas of forest cover apparently supporting patches of more mature eucalypt forest, virtually irrespective of topographic (shelter) features
Map-based habitat assessment	27/08/2011	Simon McNamara (Forestry Tasmania)	Utilised Forestry Tasmania's PI (photo-interpretation) maps pf forest structure and composition to delineate potential nesting habitat (this map produced a smaller recommended search area that that shown in Figure 5 because it targeted definitive old-growth patches rather than the broader more conservative map of mature eucalypt patches shown in Figure 5) – both methods of pre-assessment are appropriate
Search of potential nesting habitat			
Ground-based	19/07/2011	Brian French (ECO*tas*)	Entire lease area searched for nests during routine ecological assessment – majority of vegetation within lease area highly unsuitable (disturbed regrowth forest) – **no nests detected** Limited searching of forest patches visible with binoculars from Waratah Road, township of Luina and powerline easement but visibility into dense forest patches hampered by density of vegetation and topography – aerial survey indicated as necessary – **no nests detected**
Ground-based	27/08/2011 31/08/2011	Mike Adams, Will Goodall (Bright Phase)	Ground-based search of forested slopes along c. 500 m of Waratah Road east of the old Luina township – **no nests detected**
Aerial search	26/08/2011	Simon McNamara (Forestry Tasmania) Mike Adams, Will Goodall (Bright Phase) Darryl Taylor (Tasmanian Helicopters – pilot)	Helicopter-based search of potential nesting habitat: • **no nests detected** • search path shown in Figure 5 • search time c. 45 minutes • weather suitable for most of survey with visibility of several hundred metres either side of flight path; closed in near end limiting visibility and flight safety indicating further searching required
Aerial search	22/09/2011	Mark Wapstra (ECO*tas*) Mike Adams, Will Goodall (Bright Phase) Bruce Colwell (Tasmanian Helicopters – pilot)	Helicopter-based search of potential nesting habitat: • **no nests detected** • search path shown in Figure 5 • search time c. 45 minutes • weather ideal for detecting nests, visibility several hundred metres on either side of flight path

Tasmanian devil

The Tasmanian devil has a widespread distribution, occurring in a range of vegetation types. FPA (2011) describes potential habitat as including "dry to damp forest, woodlands and grassy woodlands, coastal scrub, and riparian areas". Some of these habitat elements are present within and surrounding the study area, although it is noted that the majority of the study area and surrounds are dominated by anthropogenically created vegetation types and wet eucalypt and rainforest vegetation types.

No evidence of the species was detected from the study area. This evidence includes sightings (e.g. live animals, roadkill, skulls, etc.), scats (which, if present, would have been easily detected along the numerous old tracks and open areas), latrine sites (as for scats), and dens. Dens can be difficult to detect because they can be cryptic (e.g. old wombat burrows, underneath piles of logs, etc.) but no likely sites were observed. It is possible that surrounding areas support dens but the predominance of dense wet sclerophyll, mixed forest and rainforest types is suggestive that surrounding areas are unlikely to be prime habitat for the species.

The Commonwealth Department of Sustainability, Environment, Water, Population & Communities provides a *Significant Impact Guidelines* policy statement (CofA 2006) to determine if referral to the department is required in relation to the Tasmanian devil for development proposals, as follows (noting that the guidelines were developed in 2006 when the species was listed as Vulnerable – it is now listed as Endangered):

Significant impact criteria – vulnerable species

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- introduce disease that may cause the species to decline
- lead to a long-term decrease in the size of an important population of the species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of the species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat *or*
- interfere substantially with the recovery of the species.

Examples of activities that *may require* referral under the EPBC Act in relation to the Tasmanian Devil include any actions that may assist or accelerate the spread of DFTD (such as the moving of diseased individuals into an area which is currently disease-free), the construction of new roads or substantial upgrades to existing roads in sensitive locations, and any actions that involve the loss or intensified use of large or important areas of Tasmanian Devil habitat such as clearing for urban development, flooding associated with dam building, or the intensifying or changing of agricultural land use.

In relation to the Tasmanian Devil, the EPBC Act is unlikely to apply to the death of individuals along existing roads – see *What about Tasmanian Devils being killed on roads?* for further details. The EPBC Act is also unlikely to apply to minor new works that will only affect a small number of Tasmanian Devils in areas that are disease-free. However, in areas affected by DFTD where only a few breeding females may remain, an action that will have or is likely to have an impact on even a small number of Tasmanian Devils may be significant, and therefore the EPBC Act may apply.

Actions undertaken as part of official disease suppression programmes, such as removing diseased individuals from wild populations and establishing disease-free captive populations, are not regarded by the Department of the Environment and Heritage to be likely to have a major adverse impact on Tasmanian Devil populations.

Individuals and organisations should consider the particular facts and circumstances of their activities in deciding whether there is a need to make a referral under the EPBC Act. You must make a referral for an activity if you think it may be likely to have a significant impact on a listed threatened species.

The current development proposal will essentially re-work and rehabilitate old mine workings, and no specific evidence of occupation by the Tasmanian devil has been detected. The current proposal will not: (1) introduce disease that may cause the species to decline; (2) lead to a long-term decrease in the size of an important population of the species (no evidence of the species within the study area); (3) reduce the area of occupancy of an important population (as for 2, and in the long-term the extent of potential habitat will not be reduced – potential habitat likely to be increased through rehabilitation activities); (4) fragment an existing important population into two or more populations (as for 2, and proposed works will not actually fragment habitat in the short or long term); (5) adversely affect habitat critical to the survival of the species (as for 2, 3 and 4); (5) disrupt the breeding cycle of an important population (no evidence of a breeding population being present); (6) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline (as for 2, 3, 4, 5); (6) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat (the proposed works will not alter the access to the study area and will effectively only re-work old mine workings); (7) interfere substantially with the recovery of the species (the study area does not form part of a specific element of the recovery program of the species).

Weed species

Four species classified as "declared weeds" within the meaning of the Tasmanian *Weed Management Act 1999* were recorded:

- *Erica lusitanica* (spanish heath);
- *Cytisus scoparius* (english broom);
- *Rubus fruticosus* .agg (blackberry); and
- *Salix* sp. (willow).

All of the weeds generally occur in and around the old Luina township. It is likely that *Erica lusitanica* (spanish heath) is a garden escapee with a widespread occurrence in the old town area (Figure 6). *Rubus fruticosus* .agg (blackberry) is scattered and is not considered a management problem at the present and *Salix* sp. (willow) is isolated to one small tree in a wet area on the northern area of the mine workings (Figure 6).

Other potentially invasive species recorded include:

- *Chasmanthe floribunda* (african cornflag);
- *Cirsium vulgare* (scotch thistle);
- *Cotoneaster* sp. (cotoneaster); and
- *Digitalis purpurea* (foxglove).

These species were also confined to the old Luina town site. These species are not listed on the Tasmanian *Weed Management Act 1999*. Currently, these species do not pose a management threat. However, long term management should be considered for all the species whilst they are confined to a small area within the Luina township and are easily accessible.

The study area falls within the Waratah-Wynyard municipality, for which the following criteria apply to the detected species:

- *Erica lusitanica* (spanish heath): Zone A ("localised infestations");
- *Cytisus scoparius* (english broom): Zone B ("widespread infestations");
- *Rubus fruticosus* (blackberry): Zone B ("widespread infestations"); and
- *Salix* spp. (willows): Zone B ("widespread infestations").

Figure 6. Weed locations within the study area

In relation to "Zone A" species, "eradication", within the meaning of the *Weed Management Act 1999*, is the most appropriate management objective for municipalities who have localised and moderate infestations and where effective management is feasible. The management outcome for these municipalities is ongoing eradication and prevention of the spread of declared weeds from existing infestations to areas free or in the process of becoming free of these weeds.

In relation to "Zone B" species, "containment", within the meaning of the *Weed Management Act 1999*, is the most appropriate management objective for municipalities who have problematic infestations but no plan and/or resources to undertake control actions at a level required for eradication. The management outcome for these municipalities is ongoing prevention of the spread of declared weeds from existing infestations to areas free or in the process of becoming free of these weeds.

The main concern is to minimise the risk of invasive exotic species becoming more widely established in the municipality. Follow up management (e.g. hand-spraying of weed outbreaks) should be considered for these species to inhibit invasion to surrounding forest areas. A more complex site-specific weed management plan is not considered warranted at this stage but should form part of the DPEMP.

Disease management

Phytophthora cinnamomi

The *Forest Botany Manual* (FPA 2005) and Rudman (2005) indicate that "*Eucalyptus obliqua* dry forest" (DOB) is moderately susceptible to the root-rot pathogen *Phytophthora cinnamomi.* No evidence of the pathogen was noted. Due to the disturbed nature of the vegetation and the lack of susceptible plant species to the pathogen, no special management prescriptions are considered warranted.

Myrtle wilt

Myrtle wilt, caused by a wind-borne fungus (*Chalara australis*), occurs naturally in rainforest where myrtle (*Nothofagus cunninghamii*) is present. The fungus enters wounds in the tree, usually caused by damage from wood-boring insects, wind damage and forest clearing. The incidence of myrtle wilt often increases forest clearing events.

No evidence of myrtle wilt was recorded from within the study area. The proposed mining activities have the potential to increase the susceptibility of the surrounding rainforest areas to become infected with myrtle wilt, although given that the majority of works will be undertaken in heavily disturbed forest (e.g. old tailings sites), no special management prescriptions are considered warranted.

Chytrid fungus and other freshwater pathogens

Native freshwater species and habitat are under threat from freshwater pests and pathogens including *Phytophthora cinnamomi* (root rot), *Batrachochytrium dendrobatidis* (Chytrid frog disease), *Mucor amphibiorum* (platypus Mucor disease) and the freshwater algal pest *Didymosphenia geminata* (Didymo) (Allan & Gartenstein 2010). Freshwater pests and pathogens are spread to new areas when contaminated water, mud, gravel, soil and plant material or infected animals are moved between sites. Contaminated materials and animals are commonly transported on boots, equipment, vehicles tyres and during road construction and maintenance activities. Once a pest pathogen is present in a water system it is usually impossible to eradicate. The manual *Keeping it Clean - A Tasmanian Field Hygiene Manual to Prevent the Spread of*

Freshwater Pests and Pathogens (Allan & Gartenstein 2010) provides information on how to prevent the spread of freshwater pests and pathogens in Tasmanian waterways wetlands, swamps and boggy areas. At present there are no specific guidelines for mineral extraction works but minimising the spread of soil, gravel and water between catchments is strongly recommended. It is noted that the study area does not support, and is not likely to support, threatened frog species.

Other matters of potential ecological significance

Matters of National Environmental Significance – threatened ecological communities

The EPBCA *Protected Matters Area* report (DSEWPC 2011) indicates that "Alpine Sphagnum Bogs and Associated fens" (classified as Endangered under the EPBCA) may occur within the area. No such vegetation types were identified from within or close to the study area.

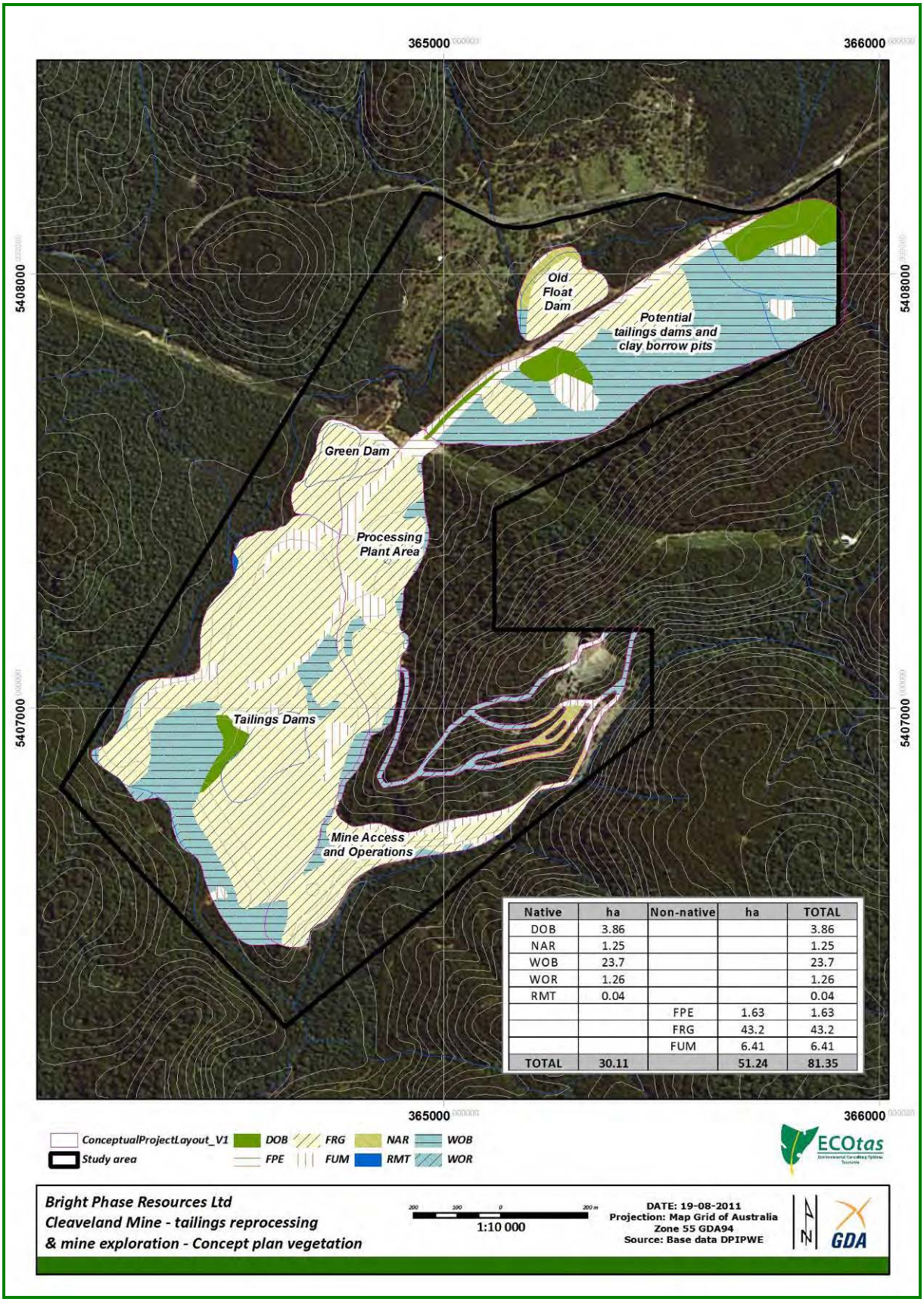
Matters of National Environmental Significance – places on the Register of the National Estate

The EPBCA *Protected Matters Area* report (DSEWPC 2011) indicates that the "Tarkine TAS" (indicative place) and "Tarkine Wilderness Area TAS" (registered) are potentially within the vicinity of the study area. While the Luina township area is embedded within the "Tarkine Might Have Values Area", the entirety if the study area is actually excluded from the MHV area (see http://www.environment.gov.au/heritage/ahc/national-assessments/tarkine/pubs/tarkine-map-2011.pdf).

Informal reserve on State Forest

The entirety of the study area is indicated as being part of an "Informal Reserve on State Forest". Advice received from Forestry Tasmania (email from Ronny Tyquin to Pitt & Sherry, and also confirmed from an email from Emma Barker to Mark Wapstra) indicated that the area has been dedicated as an "Informal Reserve" primarily for "flora values", possibly as a result of the Community Forest Agreement. Forestry Tasmania have internal planning processes for assessing non-wood production activities within reserved managed by that agency. Bright Phase Resources Ltd (either direct or through Pitt & Sherry) will need to liaise further with Forestry Tasmania through Mineral Resources Tasmania. A possible "offset" for loss of flora values has been suggested as a planning approval requirement. In this case, our report has indicated that the flora values present have low conservation significance (see Table 1 and Figure 4 for list of vegetation types – all not threatened or of regional conservation significance; and Table 2 for list of threatened flora potentially present – none actually detected). In our opinion, if mining activities are essentially restricted to disturbed areas (and mainly non-forest vegetation types, exotic mapping units, regrowth forest or disclimax forest) and re-worked areas are rehabilitated to native vegetation, formal offsetting should not be required.

Figure 7 shows the predicted maximum extent of disturbance associated with the development proposal, which was overlain with our revised vegetation mapping (Figure 4). The table on Figure 7 clearly indicates that the majority of disturbance will occur on anthropogenically created mapping units. Activities in native vegetation mapping units will be more limited. Note that no such areas are mapped as oldgrowth, and that rehabilitation works will require revegetation to a similar vegetation type (i.e. replacing one age of regrowth forest with a younger age). The extent of clearing in native vegetation units is slightly less than indicated because we did not separate most old tracks from the broader vegetation unit (simply because of the practicality of the scale of mapping required to do this).



Native	ha	Non-native	ha	TOTAL
DOB	3.86			3.86
NAR	1.25			1.25
WOB	23.7			23.7
WOR	1.26			1.26
RMT	0.04			0.04
		FPE	1.63	1.63
		FRG	43.2	43.2
		FUM	6.41	6.41
TOTAL	30.11		51.24	81.35

Figure 7. Possible maximum extent of disturbance to each vegetation mapping unit within the study area

DISCUSSION & RECOMMENDATIONS

Summary of key findings

Threatened flora

- No flora species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.

Threatened fauna

- No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
- The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and Tasmanian devil, but it is unlikely that features such as nests or dens are present within the study area itself (no such features were detected), and no special management prescriptions are recommended (noting that rehabilitation of the area will be required).
- The wider area supports potential nesting habitat for the wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) but surveys did not detect any nests within the study area or within 1 km of the study area, so no deleterious impact on the species is anticipated.

Vegetation types

- Eight mapping units were identified from the study area (Figure 4), namely:
  - "*Acacia melanoxylon* forest on rises" (TASVEG code: NAR);
  - "*Eucalyptus obliqua* dry forest and woodland" (TASVEG code: DOB);
  - "*Eucalyptus obliqua* forest with broad-leaf shrubs" (TASVEG code: WOB);
  - "*Eucalyptus obliqua* forest over rainforest" (TASVEG code: WOR);
  - "*Nothofagus-Atherosperma* rainforest" (TASVEG code: RMT);
  - "extra-urban miscellaneous" (TASVEG code: FUM);
  - "permanent easement" (TASVEG code: FPE);
  - "regenerating cleared land" (TASVEG code: FRG).
- None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Weeds

- Several species of "declared" weed species, and some other exotic species with potential to act as "environmental weeds", were detected from the study area. Inclusion of weed management prescriptions in the DPEMP is recommended.

Plant and animal disease

- No evidence of plant and animal disease was noted. Inclusion of disease management prescriptions in the DPEMP is recommended.

Reserves

- The study area is within an "Informal Reserve" managed by Forestry Tasmania – some additional planning assessment protocols will need to be applied to satisfy Forestry Tasmania's internal protocols. In our opinion, the proposed works will result in a temporary modification of some native vegetation types but these are all already regrowth facies of the various communities after previous mining activities. As such, complex offsets are not recommended, provided that the area is rehabilitated to similar vegetation types.

Legislative and policy implications

Some commentary is provided below with respect to the key threatened species and vegetation management legislation and polices. Note that there may be other relevant policy instruments in addition to those discussed. It is assumed that the proposed mine site will comply with the relevant provisions of legislation and policy instruments related to mineral exploration and mining activities and these are not discussed herein.

Tasmanian *Threatened Species Protection Act 1995*

A permit will not be required under Section 51 of this Act because no threatened species listed on the Act will be disturbed.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth Department of Sustainability, Environment, Water, Population & Communities provides a *Significant Impact Guidelines* policy statement (CofA 2009) to determine if referral to the department is required. In our opinion, with respect to the Tasmanian devil, spotted-tailed quoll and masked owl, the proposed development will not constitute a "significant impact" because while there will be a loss (more correctly a temporary disturbance) of some potential habitat of these species (modified already), the loss is not such that it is likely to lead to a long-term decrease in the size of an important population of a species, reduce the area of occupancy of an important population, fragment an existing important population into two or more populations, adversely affect habitat critical to the survival of a species, disrupt the breeding cycle of an important population, modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat, introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. The proponent may need to demonstrate that the proposed works will not result in a significant alteration to the potential incidence of roadkill on public roads between Luina and Burnie, especially with respect to the Tasmanian devil and spotted-tailed quoll. Referral to the DSEWPC map be required if a significant increase in roadkill of these species is anticipated.

Tasmanian *Nature Conservation Act 2002*

The study area does not support any vegetation types classified as threatened under Schedule 3A of this Act. There are no constraints under this Act on the proposed activities.

Tasmanian *Wildlife Regulations 2010*

No species, or products (e.g. nests, dens, etc.) of species, listed on schedules of the Regulations (i.e. "specially protected wildlife", "protected wildlife", "partly protected wildlife"), will be knowingly disturbed. There are no constraints under this Act on the proposed activities

Tasmanian *Forest Practices Act 1985* and associated regulations

A Forest Practices Plan (FPP) is required for most "clearing" activities in areas of forest and woodland (and for some activities within threatened non-forest native vegetation). However, changes to the Act (25 November 2009), as stated below, indicate additional circumstances in which an FPP is not required, including mining activities.

> 4. Circumstances in which forest practices plan, &c., not required
>
> For the purpose of section 17(6) of the Act, the following circumstances are prescribed:
>
> (i) [Regulation 4 Amended by S.R. 2009, No. 135, Applied:25 Nov 2009] the harvesting of timber or the clearing of trees on any land, or the clearance and conversion of a threatened native vegetation community on any land, in the course of mineral exploration activities, or mining activities, that are authorised under –
>
> (i) a permit granted under the *Land Use Planning and Approvals Act 1993*; or
>
> (ii) an exploration licence within the meaning of the *Mineral Resources Development Act 1995*; or
>
> (iii) a retention licence within the meaning of the *Mineral Resources Development Act 1995*; or
>
> (iv) a mining lease within the meaning of the *Mineral Resources Development Act 1995*.

Recommendations

The following values should be further considered, as part of DPEMP preparation:

- undertake an analysis of the potential risk of increase in mammal roadkill as a consequence of product transportation activities;
- include weed management and disease minimisation protocols in the DPEMP;
- liaise further with Forestry Tasmania and Mineral Resources Tasmania on the required management of the informal reserve;
- adhere to the *Quarry Code of Practice June 1999* (DPIWE 1999) and other recommendations applied by planning authorities in relation to mineral extraction works, transport of product and site rehabilitation.

REFERENCES

Allan, K. & Gartenstein, S. (2010). *Keeping It Clean: A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens.* NRM South, Hobart.

Anon. (1997). *Tasmanian Regional Forest Agreement between the Commonwealth of Australia and the State of Tasmania*. Commonwealth of Australia and the State of Tasmania, Canberra.

Baker, M.L. & Duretto, M.F. (2011). *A Census of the Vascular Plants of Tasmania and Index to* The Student's Flora of Tasmania. Tasmanian Herbarium, Hobart. (2011 web edition as downloaded from http://www.tmag.tas.gov.au/Herbarium/TasVascPlants.pdf).

CFEV (2005). *Conservation of Freshwater Ecosystem Values Project, CFEV database, v1.0*. Water Resources Division, Department of Primary Industries & Water, Tasmania.

Department of Sustainability, Environment, Water, Population & Communities (DSEWPC) (2011). Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Report* for - Coordinates: -41.46649,145.38134 -41.46641,145.38309 -41.46717,145.38476 -41.46717,145.38621 -41.46649,145.38887 -41.46664,145.39002 -41.46695,145.39139 -41.46679,145.39238 -41.46649,145.39352 -41.46557,145.39519 -41.46999,145.39481 -41.47288,145.38507 -41.47502,145.38491 -41.47517,145.38887 -41.47882,145.38895 -41.48461,145.37821 -41.47898,145.37212 -41.46649,145.38149 -41.46649,145.38134 dated 9 August 2011. [appended for reference]

Commonwealth of Australia (CofA) (2009). *Matters of National Environmental Significance. Significant Impact Guidelines 1.1* Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment, Water, Heritage and the Arts, Canberra.

Department of Primary Industries, Parks, Water & Environment (DPIPWE) (2011a). *Natural Values Report No* 42807_ECOtas_Cleveland Mine_290711. [appended for reference]

Department of Primary Industries, Parks, Water & Environment (DPIPWE) (2011b) *Threatened Native Vegetation Communities List April 2007* as per Schedule 3A of the *Nature Conservation Act 2002.* http://www.dpiw.tas.gov.au/inter.nsf/WebPages/AWAH-6547ZL?open

Department of Primary Industries, Parks, Water & Environment (DPIPWE) (2009). *Guidelines for Natural Values Assessments, Reporting on the Impact of Proposed Activities on the Natural Values and Providing Recommendations for Mitigating Impacts on these Values*. Development and Conservation Assessment Branch, Department of Primary Industries, Parks, Water and Environment.

Department of Primary Industries, Water and Environment (DPIWE) (1999). *Quarry Code of Practice June 1999*. Department of Primary Industries, Water & Environment in association with Mineral Resources Tasmania, Hobart.

Duretto, M.F. (Ed.) (2009+) *Flora of Tasmania Online*. Tasmanian Herbarium, Tasmanian Museum & Art Gallery: Hobart. www.tmag.tas.gov.au/floratasmania.

Forest Practices Authority (FPA) (2011). *Threatened Fauna Manual Mapsheet Display Luina 3640 current as at 9 August 2011,* and hyperlinked species profiles and range boundary maps. http://www.fpa.tas.gov.au/index.php?id=20. [appended for reference]

Forest Practices Authority (FPA) (2006). *Eagle Nest Searching, Activity Checking and Nest Management. Fauna Technical Note No. 1.* Forest Practices Authority, Hobart. (FPA reference FPA/07/307/002 Record 2009/39250)

Forest Practices Authority (FPA) (2005). *Forest Botany Manual: Module 8 – West and Southwest Region*. Forest Practices Authority, Tasmania.

Harris, S. & Kitchener, A. (editors) (2005). *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. Department of Primary Industries, Water and Environment, Hobart.

Rudman T. (2005). *Interim* Phytophthora cinnamomi *Management Guidelines*. Nature Conservation Report 05/7, Biodiversity Conservation Branch, Department of Primary Industries, Water & Environment, Hobart.

Threatened Species Unit (TSU) (2003). *Notesheets for* various threatened species listed in Table 2. DPIPWE, Hobart.

Wapstra, H., Wapstra, A., Wapstra, M. & Gilfedder, L. (2005, updated annually online). *The Little Book of Common Names for Tasmanian Plants*. Department of Primary Industries, Water & Environment, Hobart.

APPENDIX A. Vegetation community structure and composition

Note: The table below indicates the species that were the dominants within the community recorded. Refer to Appendix B for a full list of vascular species recorded from the vegetation type. A description of the non-forest "artificial" mapping unit "extra –urban miscellaneous" (FUM) is not provided.

Regenerating cleared land (TASVEG code: FRG)

Regenerating cleared land (FRG) is the dominant vegetation type across the study area. The mapping unit is either native species re-colonising disturbed sites such as quarries or rehabilitation species which have been introduced to the site via hydro mulching. Silver wattle (Acacia dealbata) is the dominant species across the areas (see images below) with only sparse scattered shrubs and grasses present in the understorey.

FRG is characterised by a sparse, shrubby understorey with scattered trees of *Acacia dealbata* (both images). In some areas, the regeneration has been poor (LHS) due to high levels of disturbance in the past and toxic soils from acid mine drainage.

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	8-15 m 20%	*Acacia dealbata* – note that this layer can be absent on the poor sites as indicated in the left hand image above.
Tall shrubs	4-6 (<8) m 30%	*Acacia dealbata*, *Acacia mucronata*, *Acacia melanoxylon*, *Leptospermum scoparium*
Shrubs	<2 m 20%	*Acacia mucronata*, *Leptospermum nitida*, *Leptospermum scoparium*
Grasses/graminoids	1-2 (<3) <5%	*Gahnia grandis*, *Baloskion tetraphyllum* (in wet areas and acid mine drainage sites)

Acacia melanoxylon forest on rises (TASVEG code NAR)
Floristic code: SWAMP-D4

Acacia melanoxylon forest on rises (NAR) is common on the slopes above Washington Creek and in the Whyte River in the north of the study area. This community is likely to be a disturbance related community that will gradually change into rainforest over time.

NAR on the dominating the slopes to the south of Washington Creek

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	18-25 m 25%	*Acacia melanoxylon*
Trees	8-10 m 30%	*Acacia melanoxylon, Nothofagus cunninghamii, Atherosperma moschatum, Nematolepis squamea*
Tall shrubs	~6 m 50 %	*Pomaderris apetala, Olearia argophylla, Nothofagus cunninghamii*
Ferns	<2 m 30%	*Dicksonia antarctica, Polystichum proliferum, Blechnum nudum*

Eucalyptus obliqua dry forest and woodland (TASVEG code: DOB)
Floristic code: DRY-shOB

Eucalyptus obliqua dry forest and woodland (DOB) was localised to a relatively dry north-facing slope in the south of the study area. This community is a remnant in an area that is surrounded by rehabilitation areas over the old mine tailings dumps. This community is in good condition with no weed species recorded. It is likely that DOB is a result of fire and other disturbance in the past as the dominant tree layer is a regrowth structure. It is likely that DOB would successionally change into a wet forest community without disturbance.

DOB above an old quarry in the south of the study area – this localised community is characterised by a shrubby understorey with thin soils

Stratum	**Height (m)** **Cover (%)**	**Species** (underline = dominant, parentheses = sparse)
Trees	22 m 15%	*Eucalyptus obliqua*
Trees	8-14 m 20%	*Eucalyptus obliqua, (Eucalyptus delegatensis)*
Tall shrubs	4-5 (<8) m 15%	*Acacia mucronata, Monotoca glauca, Leptospermum scoparium, Banksia marginata*
Shrubs	<2 m 10%	*Lomatia tinctoria, Pomaderris elliptica, Bauera rubioides*
Grasses/graminoids	1 m 25%	*Dianella tasmanica*
Ferns	<1 m 15%	*Pteridium esculentum*

Eucalyptus obliqua forest with broad-leaf shrubs (TASVEG code: WOB)
Floristic codes: WET-OB2

Eucalyptus obliqua forest with broad-leaf shrubs (WOB) is common on the periphery of the disturbed tailings and mining areas. Generally, WOB occurs as a factor as past disturbance from fire and mining activities and is regenerating from these events. This community is characterised by a regrowth layer of *E. obliqua* in the most disturbed sites with a shrubby understorey and old-growth *E. obliqua* in the relatively undisturbed areas. WOB is gradational with WOR on more sheltered, moist, fertile and undisturbed sites.

WOB to the south of the Glory Hole

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	30-35 m 20%	<u>*Eucalyptus obliqua*</u> – occurring as a dominant layer over undisturbed sites. This layer is absent in the more disturbed areas around the mine/tailings areas.
Trees	16-18 m 20%	<u>*Eucalyptus obliqua*</u>, *Acacia melanoxylon*
Trees/tall shrubs	6-10(<8) m 45%	<u>*Nematolepis squamea*</u>, *Acacia melanoxylon, Acacia dealbata, Monotoca glauca, (Nothofagus cunninghamii), Zieria arborescens, Cassinia aculeata*
Shrubs	<2 m <5%	*Coprosma quadrifida, Pimelea drupacea*
Grasses/graminoids	<2.5 m 25%	*Dianella tasmanica, Gahnia grandis, Libertia pulchella* var. *pulchella*
Ferns	<1 m 30%	*Blechnum nudum, Polystichum proliferum, (Pteridium esculentum)*

Eucalyptus obliqua forest over rainforest (TASVEG code: WOR)
Floristic codes: WET-OB1000

Eucalyptus obliqua forest over rainforest (WOR) is common as a gradational community between WOB (see above) and RMT on undisturbed sites (see below). This community is characterised by the dominance of *E. obliqua* old-growth trees over a rainforest layer dominated by *Nothofagus cunninghamii*. This community has some mild disturbance in the past (mining tracks in the Crescent Spur area), but is in good condition with no weeds recorded.

WOR on the south-facing slopes of Crescent Spur

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	30-35 m 20%	<u>*Eucalyptus obliqua*</u> – occurring as a dominant layer over undisturbed sites. This layer is absent in the more disturbed areas around the mine/tailings areas.
Trees	16-18 m 20%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, Acacia melanoxylon, (Acacia dealbata* – on disturbed margins)
Trees/tall shrubs	8-13(<15) m 50%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, Acacia melanoxylon, Phyllocladus aspleniifolius, Monotoca glauca*
Shrubs	<2 m <5%	*Coprosma quadrifida, Pimelea drupacea*
Grasses/graminoids	<2.5 m 25%	*Dianella tasmanica, Gahnia grandis, Libertia pulchella* var. *pulchella*
Ferns	<1 m 15%	*Blechnum nudum, Polystichum proliferum, Histiopteris incisa*

Nothofagus-Atherosperma rainforest (TASVEG code: RMT)
Floristic codes: RAIN-C1.1

Nothofagus-Atherosperma rainforest (WOR) is localised to the western side of the Whyte River in the west of the study area. This community is characterised by the dominance of *Nothofagus cunninghamii* with no eucalypt species present. RMT has not been disturbed in the recent past and is in good condition with no weeds recorded.

RMT on the western side of the Whyte River

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	22-30 m 35%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum*
Trees	16-18 m 50%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, (Acacia melanoxylon* – on disturbed margins)
Tall shrubs	8-13(<15) m 50%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, Acacia melanoxylon, Phyllocladus aspleniifolius*
Grasses/graminoids	<2.5 m 25%	*Libertia pulchella* var. *pulchella, (Gahnia grandis)*
Ferns	<1 m 25%	*Blechnum nudum, Polystichum proliferum, Histiopteris incisa*

APPENDIX B. Vascular plant species recorded from study area

Botanical nomenclature follows *A Census of the Vascular Plants of Tasmania* (Baker & Duretto 2011), updated to reflect the nomenclatural changes recognised in the *Flora of Tasmania Online* (Duretto 2009+); common nomenclature follows Wapstra et al. (2005).

Total species = 86; dicotyledons = 53 (including 12 endemic, 5 exotic); monocotyledons = 214 (including 0 endemic, 1 exotic);gymnosperms = 1 (native); pteridophytes = 18 (all native)

i = introduced/naturalised; e = endemic; t = in Australia, present only in Tasmania

DICOTYLEDONAE		
	ARALIACEAE	
	Hydrocotyle hirta	hairy pennywort
	Hydrocotyle sibthorpioides	shining pennywort
	ASTERACEAE	
	Cassinia aculeata subsp. *aculeata*	common dollybush
i	*Cirsium vulgare*	spear thistle
	Euchiton collinus	common cottonleaf
	Olearia argophylla	musk daisybush
	Olearia stellulata	sawleaf daisybush
	ATHEROSPERMATACEAE	
	Atherosperma moschatum subsp. *moschatum*	sassafras
	CUNONIACEAE	
	Bauera rubioides	wiry bauera
e	*Eucryphia lucida*	leatherwood
	ELAEOCARPACEAE	
e	*Aristotelia peduncularis*	heartberry
	ERICACEAE	
	Epacris gunnii	coral heath
	Epacris impressa	common heath
i	*Erica lusitanica*	spanish heath
	Gaultheria hispida	copperleaf snowberry
t	*Leptecophylla juniperina* subsp. *juniperina*	common pinkberry
	Monotoca glauca	goldey wood
e	*Trochocarpa gunnii*	fragrant purpleberry
	FABACEAE	
	Acacia dealbata subsp. *dealbata*	silver wattle
	Acacia melanoxylon	blackwood
e	*Acacia mucronata* subsp. *dependens*	blunt caterpillar wattle
	Acacia mucronata subsp. *mucronata*	erect caterpillar wattle
	Acacia verticillata subsp. *verticillata*	prickly moses
i	*Cytisus scoparius*	english broom
	Pultenaea juniperina	prickly beauty
	LAMIACEAE	
	Prostanthera lasianthos var. *lasianthos*	christmas mintbush
	MYRTACEAE	
e	*Eucalyptus delegatensis* subsp. *tasmaniensis*	gumtopped stringybark
e	*Eucalyptus nitida*	western peppermint
	Eucalyptus obliqua	stringybark
e	*Leptospermum glaucescens*	smoky teatree
	Leptospermum lanigerum	woolly teatree
e	*Leptospermum nitidum*	shiny teatree
	Leptospermum scoparium var. *scoparium*	common teatree
	Melaleuca squamea	swamp honeymyrtle
	Melaleuca squarrosa	scented paperbark
	NOTHOFAGACEAE	
	Nothofagus cunninghamii	myrtle beech

	PITTOSPORACEAE	
	Pittosporum bicolor	cheesewood
	PLANTAGINACEAE	
i	*Digitalis purpurea*	foxglove
	PROTEACEAE	
	Banksia marginata	silver banksia
e	*Hakea epiglottis subsp. epiglottis*	beaked needlebush
e	*Lomatia tinctoria*	guitarplant
e	*Telopea truncata*	tasmanian waratah
	RANUNCULACEAE	
	Clematis aristata	mountain clematis
	RHAMNACEAE	
	Pomaderris apetala subsp. *apetala*	common dogwood
	Pomaderris elliptica var. *elliptica*	yellow dogwood
	ROSACEAE	
	Acaena novae-zelandiae	common buzzy
i	*Cotoneaster franchetii*	grey cotoneaster
	Rubus fruticosus .agg	blackberry
	RUBIACEAE	
	Coprosma quadrifida	native currant
	RUTACEAE	
	Nematolepis squamea subsp. *squamea*	satinwood
	Zieria arborescens subsp. *arborescens*	stinkwood
	THYMELAEACEAE	
	Pimelea drupacea	cherry riceflower
	VIOLACEAE	
	Viola hederacea subsp. *hederacea*	ivyleaf violet
	WINTERACEAE	
	Tasmannia lanceolata	mountain pepper
	GYMNOSPERMAE	
	PODOCARPACEAE	
e	*Phyllocladus aspleniifolius*	celerytop pine
	MONOCOTYLEDONAE	
	CYPERACEAE	
	Gahnia grandis	cutting grass
	Gymnoschoenus sphaerocephalus	buttongrass
	HEMEROCALLIDACEAE	
	Dianella tasmanica	forest flaxlily
	IRIDACEAE	
i	*Chasmanthe floribunda*	african cornflag
	Libertia pulchella var. *pulchella*	pretty grassflag
	JUNCACEAE	
	Juncus bassianus	forest rush
	Juncus pallidus	pale rush
	Juncus pauciflorus	looseflower rush
	POACEAE	
i	*Agrostis stolonifera*	creeping bent
i	*Holcus lanatus*	yorkshire fog
	Microlaena stipoides var. *stipoides*	weeping grass
	Poa gunnii	gunns snowgrass
	Poa labillardierei var. *labillardierei*	silver tussockgrass
	RESTIONACEAE	
	Baloskion tetraphyllum subsp. *tetraphyllum*	tassel cordrush
	PTERIDOPHYTA	
	BLECHNACEAE	
	Blechnum fluviatile	ray waterfern
	Blechnum minus	soft waterfern
	Blechnum nudum	fishbone waterfern
	Blechnum penna-marina subsp. *alpina*	alpine waterfern

Blechnum wattsii	hard waterfern
DENNSTAEDTIACEAE	
Histiopteris incisa	batswing fern
Pteridium esculentum	bracken
DICKSONIACEAE	
Dicksonia antarctica	soft treefern
DRYOPTERIDACEAE	
Polystichum proliferum	mother shieldfern
GLEICHENIACEAE	
Gleichenia microphylla	scrambling coralfern
Sticherus tener	silky fanfern
GRAMMITIDACEAE	
Grammitis billardierei	common fingerfern
HYMENOPHYLLACEAE	
Hymenophyllum australe	southern filmyfern
Hymenophyllum cupressiforme	common filmyfern
Hymenophyllum flabellatum	shiny filmyfern
Hymenophyllum rarum	narrow filmyfern
POLYPODIACEAE	
Microsorum pustulatum subsp. *pustulatum*	kangaroo fern

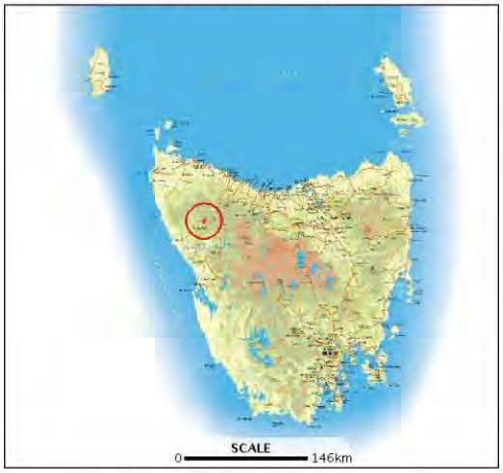
APPENDIX C. DPIPWE's *Natural Values Atlas* report for study area

Natural Values Atlas Report

Authoritative, comprehensive information on Tasmania's natural values.

Report number: 42807
Reference: ECOtas_Cleveland Mine_290711
Requested For: Brian French
Timestamp: 02:44:51 PM Friday 29 July 2011

Threatened Flora: buffers 500m and 5000m
Threatened Fauna: buffers 500m and 5000m
Conservation Significance Flora: Not requested
Conservation Significance Fauna: Not requested
Weeds: buffers 500m and 5000m
TasVeg: buffer 1000m
Threatened Communities: buffer 1000m
Geoconservation: buffer 1000m
Tasmanian Reserve Estate: buffer 1000m



The centroid for this query **GDA94 364958,5407301** falls within:
1:25000 Map: 3640 LUINA
Property: 7004215 CORINNA ROAD, LUINA TAS 7321

Department of Primary Industries, Parks, Water *and* Environment

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Tasmania
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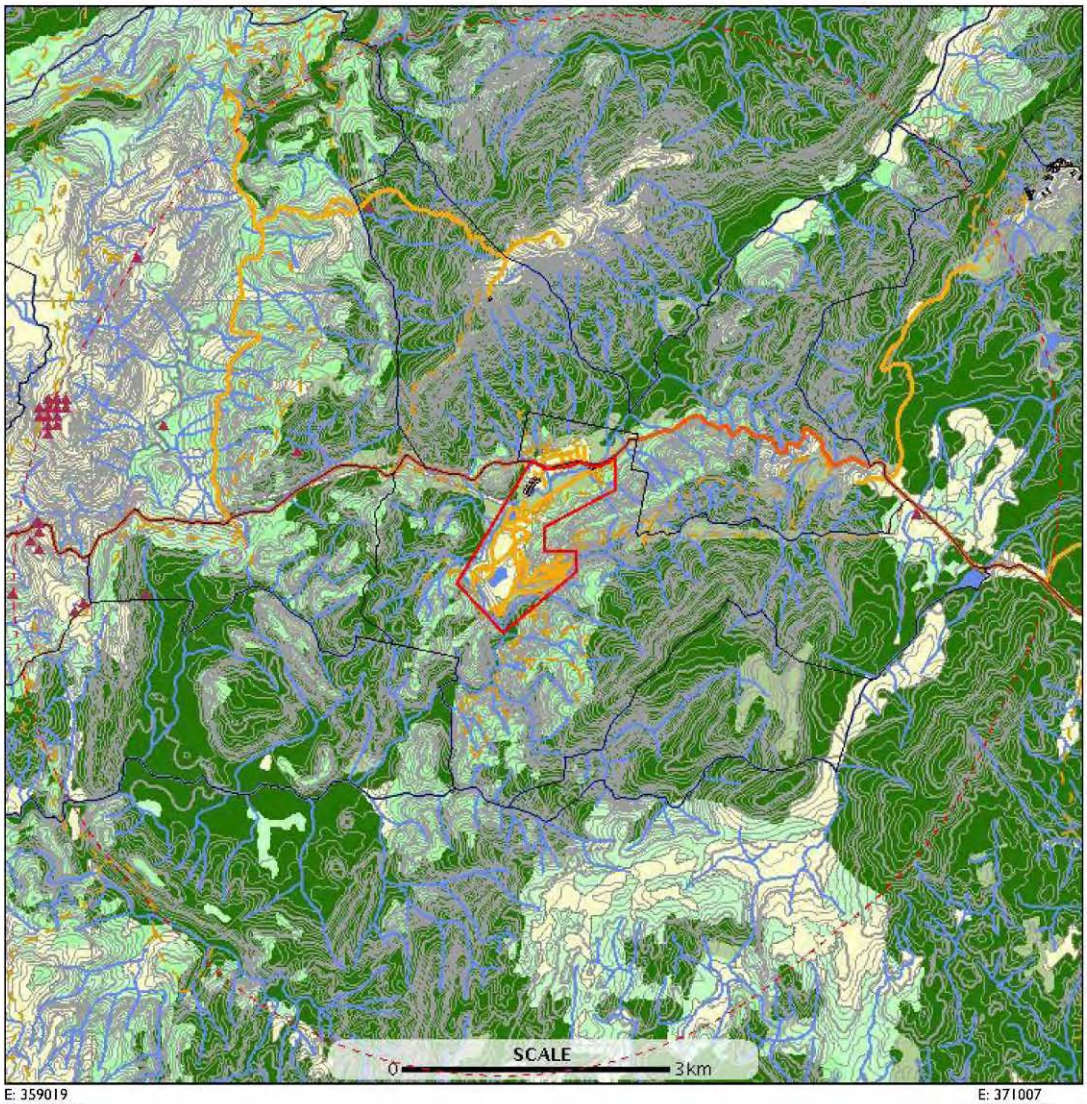
Threatened flora within 500 metres

***** No threatened flora found within 500 metres. *****

Threatened flora within 5000 metres

E: 359019
N: 5413338

E: 371007
N: 5413338



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N: 5401167

E: 371007
N: 5401167

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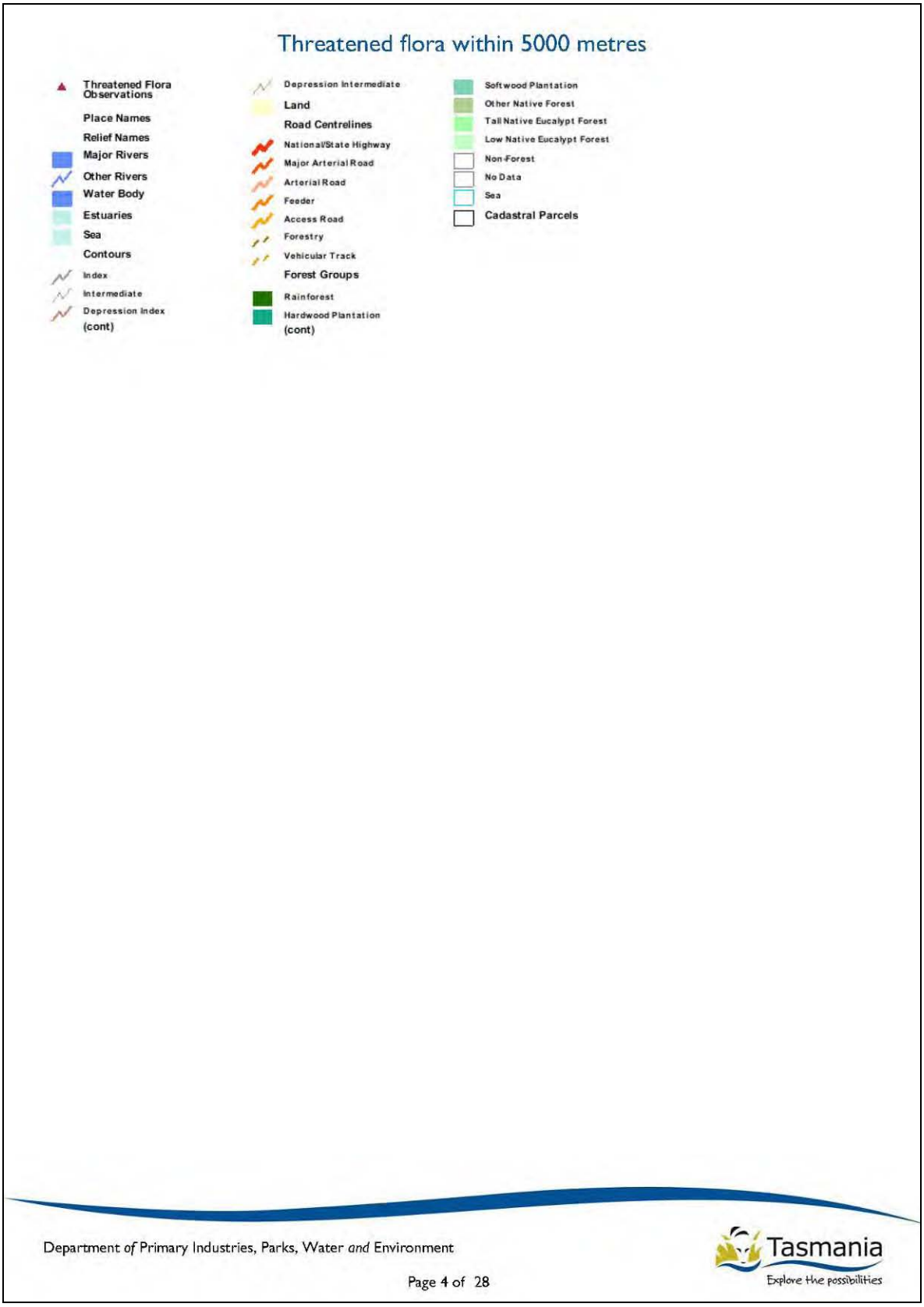
Tasmania
Explore the possibilities


Threatened flora within 5000 metres
Threatened Flora Observations
Place Names
Relief Names
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
Contours
Index
Intermediate
Depression Index
(cont)
Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
Feeder
Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
Hardwood Plantation
(cont)
Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
Cadastral Parcels
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Tasmania
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Threatened flora within 5000 metres

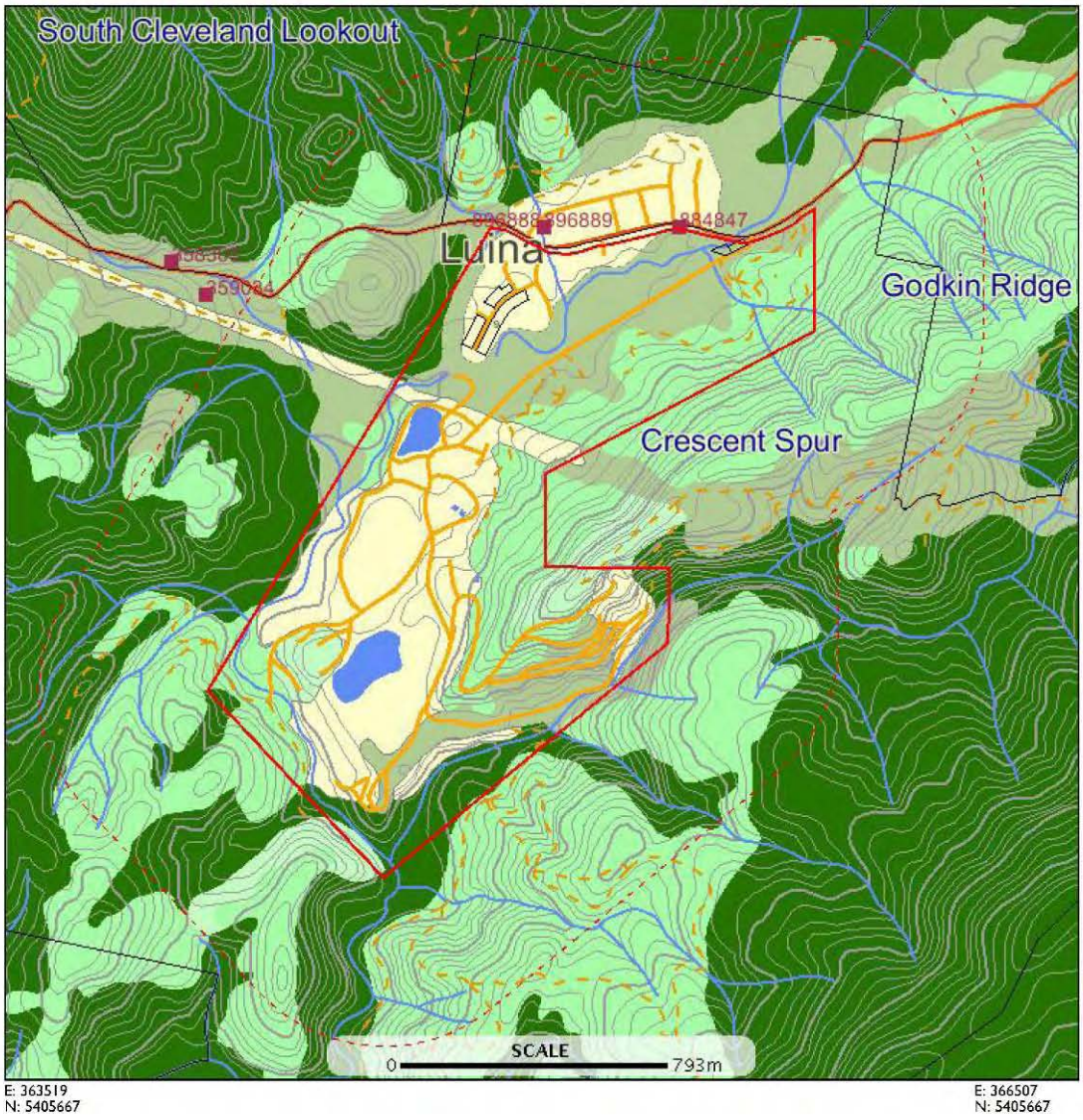
Id	Species	Common name	Ss	Ns	Observers	Date	Obs type	Location (gda94)
228770	Comesperma defoliatum	leafless milkwort	r		H.F. Comber (4408)	Mar-1930	sight	Point (360812,5408583) +/- 12500m.
348562	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359712,5408883) +/- 50m.
349958	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408883) +/- 50m.
349960	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408783) +/- 50m.
348566	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359512,5408583) +/- 50m.
348565	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408683) +/- 50m.
229294	Epacris glabella	smooth heath	e	EN	A.M. Buchanan (3758)	25-Jan-1990	sight	Point (359612,5408783) +/- 100m.
348567	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359512,5408483) +/- 50m.
229441	Epacris glabella	smooth heath	e	EN	A.M. Buchanan (3758)	26-Jan-1990	sight	Point (360512,5410483) +/- 100m.
348564	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359512,5408683) +/- 50m.
349976	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359712,5408783) +/- 50m.
349978	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408583) +/- 50m.
1233190	Hypolepis muelleri	harsh groundfern	r		Nic McCaffrey (22428),Doug Frood (22429),Joy MacDonald (22430)	22-Sep-2010	sight	Point (363135,5411042) +/- 25m.
228574	Micrantheum serpentinum	western tridentbush	r		S.J. Jarman & G. Kantvilas (5583)	23-Nov-1989	sight	Point (359412,5407483) +/- 100m.
169144	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435)	24-May-1995?	sight	Point (359412,5407383) +/- 100m.
168714	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435)	24-May-1995?	sight	Point (359812,5406483) +/- 100m.
228601	Micrantheum serpentinum	western tridentbush	r		A.M. Buchanan (3758)	26-Jan-1990	sight	Point (359612,5408783) +/- 100m.
228672	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435),A North (2500)	24-May-1995	sight	Point (359912,5406583) +/- 100m.
252685	Micrantheum serpentinum	western tridentbush	r		- Unknown (21598)	01-Jan-1600?	sight	Point (360612,5406683) +/- 1000m.
228762	Micrantheum serpentinum	western tridentbush	r		A.M. Buchanan (3758)	26-Jan-1990	sight	Point (360512,5410483) +/- 100m.
169108	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435)	24-May-1995?	sight	Point (359312,5407283) +/- 100m.
946701	Micrantheum serpentinum	western tridentbush	r		H.F. Comber (4408)	03-Mar-1930	sight	Point (362325,5408289) +/- 3500m.
228567	Micrantheum serpentinum	western tridentbush	r		S.J. Jarman & G. Kantvilas (5583)	23-Nov-1989	sight	Point (359412,5407483) +/- 100m.
1100842	Micrantheum serpentinum	western tridentbush	r		Micah Visoiu (5870)	17-Jan-2010	sight	Point (359381,5407495) +/- 100m.
345525	Micrantheum serpentinum	western tridentbush	r		- Unknown (21598)	01-Jan-1600?	sight	Point (359412,5407183) +/- 1000m.
393828	Viola cunninghamii	alpine violet	r		Jamie Kirkpatrick (1315)	1984	sight	Point (369312,5407583) +/- 100m.

For more information about threatened species, please contact the Manager, Threatened Species Section.

Telephone: (03) 6233 8759

Email: ThreatenedSpecies.Enquiries@dpipwe.tas.gov.au

Threatened fauna within 500 metres



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Tasmania
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Threatened fauna within 500 metres

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Tasmania
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Threatened fauna within 500 metres

Id	Species	Common name	Ss	Ns	Observers	Date	Obs type	Location (gda94)
884847	Sarcophilus harrisii	tasmanian devil	e	EN	Nick Mooney (16443)	01-Aug-1986?	sight	Point (365512,5408183) +/- 200m.
896888	Thylacinus cynocephalus	thylacine	x	EX	G Modry (7530)	23-Jun-1972?	sight	Point (365112,5408183) +/- 18500m.
896889	Thylacinus cynocephalus	thylacine	x	EX	G Mading (7526)	01-Jan-1970?	sight	Point (365112,5408183) +/- 18500m.

Threatened fauna within 500 metres

(based on Habitat Mapping)

Species	Common name	Ss	Ns	Potential	Known	Core
Aquila audax subsp. fleayi	wedge-tailed eagle	e	EN	1	0	0
Aquila audax	wedge-tailed eagle	pe	PEN	1	0	0
Lathamus discolor	swift parrot	e	EN	1	0	0
Tyto novaehollandiae	masked owl	pe	PVU	1	0	0
Accipiter novaehollandiae	grey goshawk	e		1	0	1

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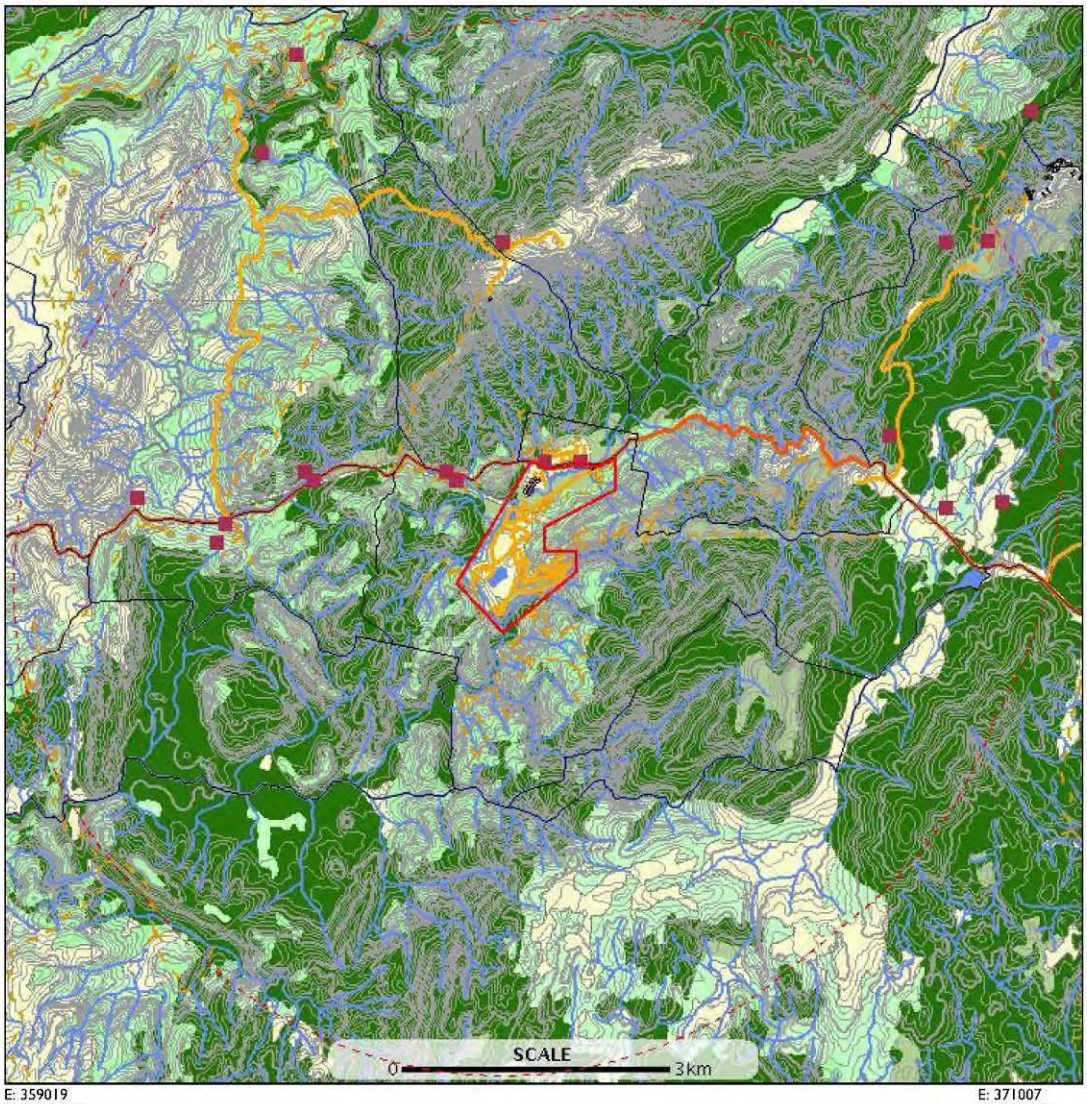
Email: ThreatenedSpecies.Enquiries@dpipwe.tas.gov.au

Threatened fauna within 5000 metres

E: 359019
N: 5413338

E: 371007
N: 5413338



E: 359019
N: 5401167

E: 371007
N: 5401167

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Tasmania
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Threatened fauna within 5000 metres

Threatened fauna within 5000 metres

Id	Species	Common name	Ss	Ns	Observers	Date	Obs type	Location (gda94)
856528	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		W Ponder (2524)	24-Jan-1982?	sight	Point (361412,5407283) +/- 200m.
847984	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		W Ponder (2524)	07-Feb-1989?	sight	Point (361412,5407283) +/- 200m.
1200647	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		Shannon Clark (6699)	07-Feb-1989	sight	Point (362512,5407983) +/- 100m.
856529	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		W Ponder (2524)	07-Feb-1989?	sight	Point (362412,5408083) +/- 200m.
1200648	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	24-Jan-1982	sight	Point (361512,5407483) +/- 100m.
532771	Beddomeia hullii	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1982?	sight	Point (361512,5407483) +/- 100m.
998694	Dasyurus maculatus	spotted-tailed quoll	r	VU	Clare Hawkins (8562)	17-Jun-2003	sight	Point (370280,5407740) +/- 10m.
358226	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	21-Jun-1996?	sight	Point (369012,5408483) +/- 25m.
359034	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	21-Jun-1996?	sight	Point (364112,5407983) +/- 25m.
359033	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	21-Jun-1996?	sight	Point (370112,5410683) +/- 25m.
358758	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	01-Apr-1996?	sight	Point (361512,5407483) +/- 25m.
877348	Lathamus discolor	swift parrot	e	EN	R Charles (2101)	27-Dec-1995?	sight	Point (360512,5407783) +/- 50m.
533848	Phrantela annamurrayae	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1982?	sight	Point (361912,5411683) +/- 1000m.
523172	Phrantela marginata	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1982?	sight	Point (361512,5407483) +/- 1000m.
523173	Phrantela marginata	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1989?	sight	Point (362512,5407983) +/- 1000m.
1160312	Sarcophilus harrisii	tasmanian devil	e	EN	Shannon Troy (12201)	Aug-2010	sight	Point (364647,5410671) +/- 5m.
1160313	Sarcophilus harrisii	tasmanian devil	e	EN	Shannon Troy (12201)	Jul-2010	sight	Point (369647,5410671) +/- 5m.
884847	Sarcophilus harrisii	tasmanian devil	e	EN	Nick Mooney (16443)	01-Aug-1986?	sight	Point (365512,5408183) +/- 200m.
358305	Sarcophilus harrisii	tasmanian devil	e	EN	Menna Jones (8901)	21-Jun-1996?	sight	Point (364012,5408083) +/- 100m.
1160306	Sarcophilus harrisii	tasmanian devil	e	EN	Shannon Troy (12201)	Aug-2010	sight	Point (369647,5407671) +/- 5m.
896889	Thylacinus cynocephalus	thylacine	x	EX	G Mading (7526)	01-Jan-1970?	sight	Point (365112,5408183) +/- 18500m.
896888	Thylacinus cynocephalus	thylacine	x	EX	G Modry (7530)	23-Jun-1972?	sight	Point (365112,5408183) +/- 18500m.

Threatened fauna within 5000 metres

(based on Habitat Mapping)

Species	Common name	Ss	Ns	Potential	Known	Core
Aquila audax subsp. fleayi	wedge-tailed eagle	e	EN	3	0	0
Aquila audax	wedge-tailed eagle	pe	PEN	3	0	0
Lathamus discolor	swift parrot	e	EN	3	0	0
Tyto novaehollandiae	masked owl	pe	PVU	3	0	0
Accipiter novaehollandiae	grey goshawk	e		3	0	3

For more information about threatened species, please contact the Manager, Threatened Species Section.

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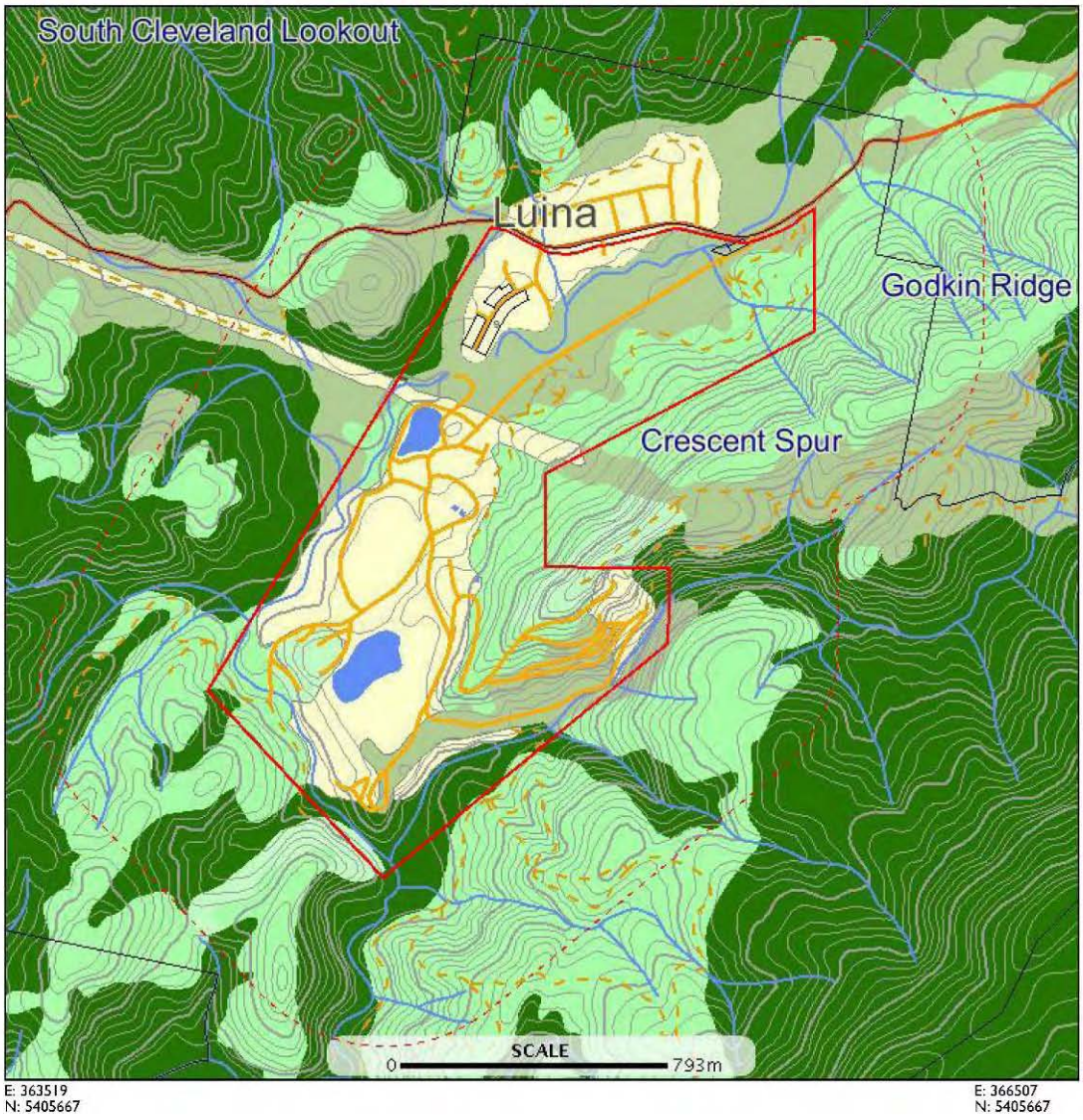
Email: ThreatenedSpecies.Enquiries@dpipwe.tas.gov.au



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Tas Management Act Weeds within 500 m

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Tasmania
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Tas Management Act Weeds within 500 m

Id	Species	Common name	Observers	Date	Geometry	Location	Obs state	Wma	Wons density	Data source
1226265	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		
1226153	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		

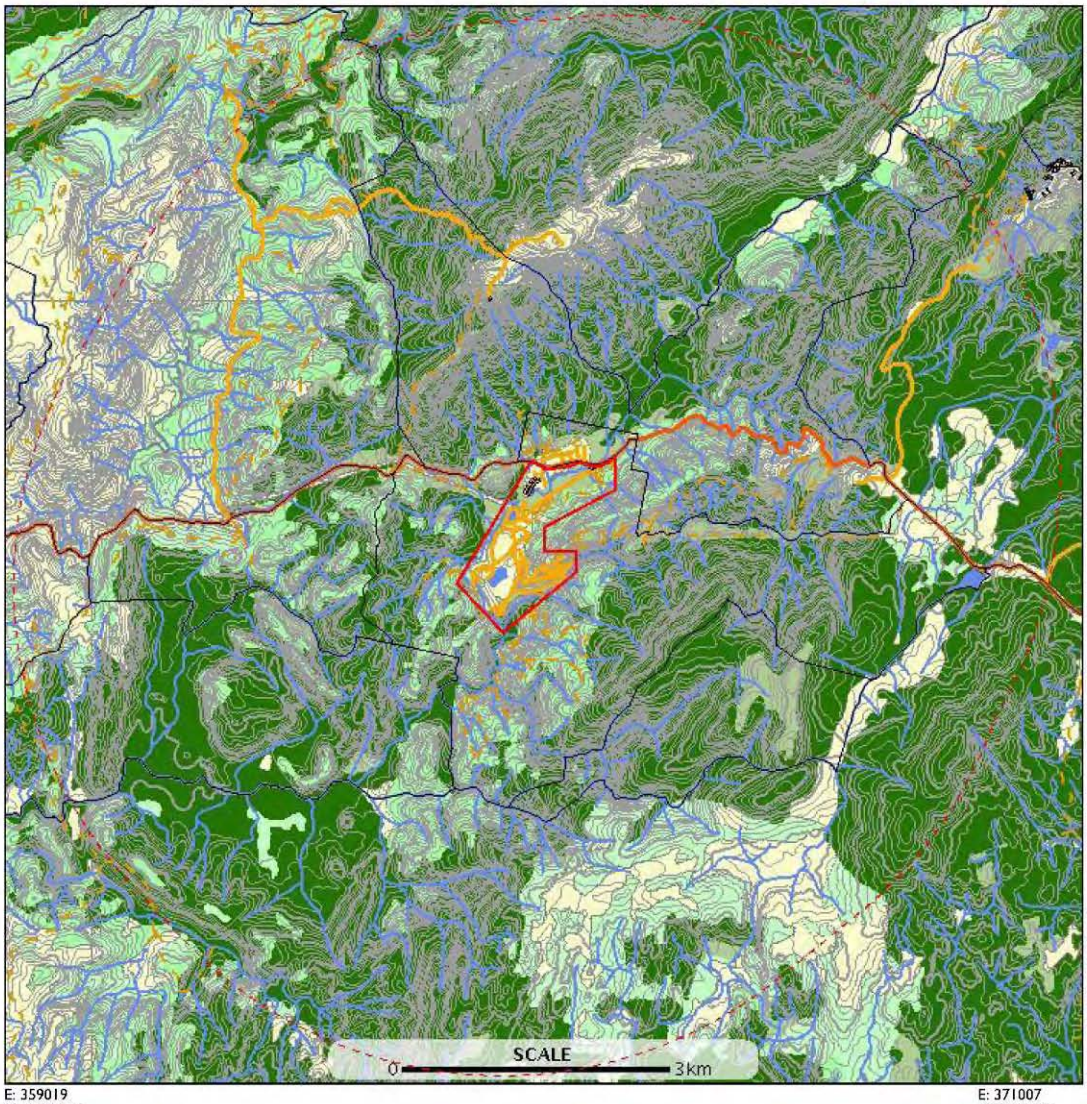
For more information about introduced weed species, please visit the following URL for contact details in your area.

http://www.dpipwe.tas.gov.au/inter.nsf/WebPages/TPRY-52J8Z3?open

Tas Management Act Weeds within 5000 m

E: 359019
N: 5413338

E: 371007
N: 5413338



E: 359019
N: 5401167

E: 371007
N: 5401167

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Tasmania
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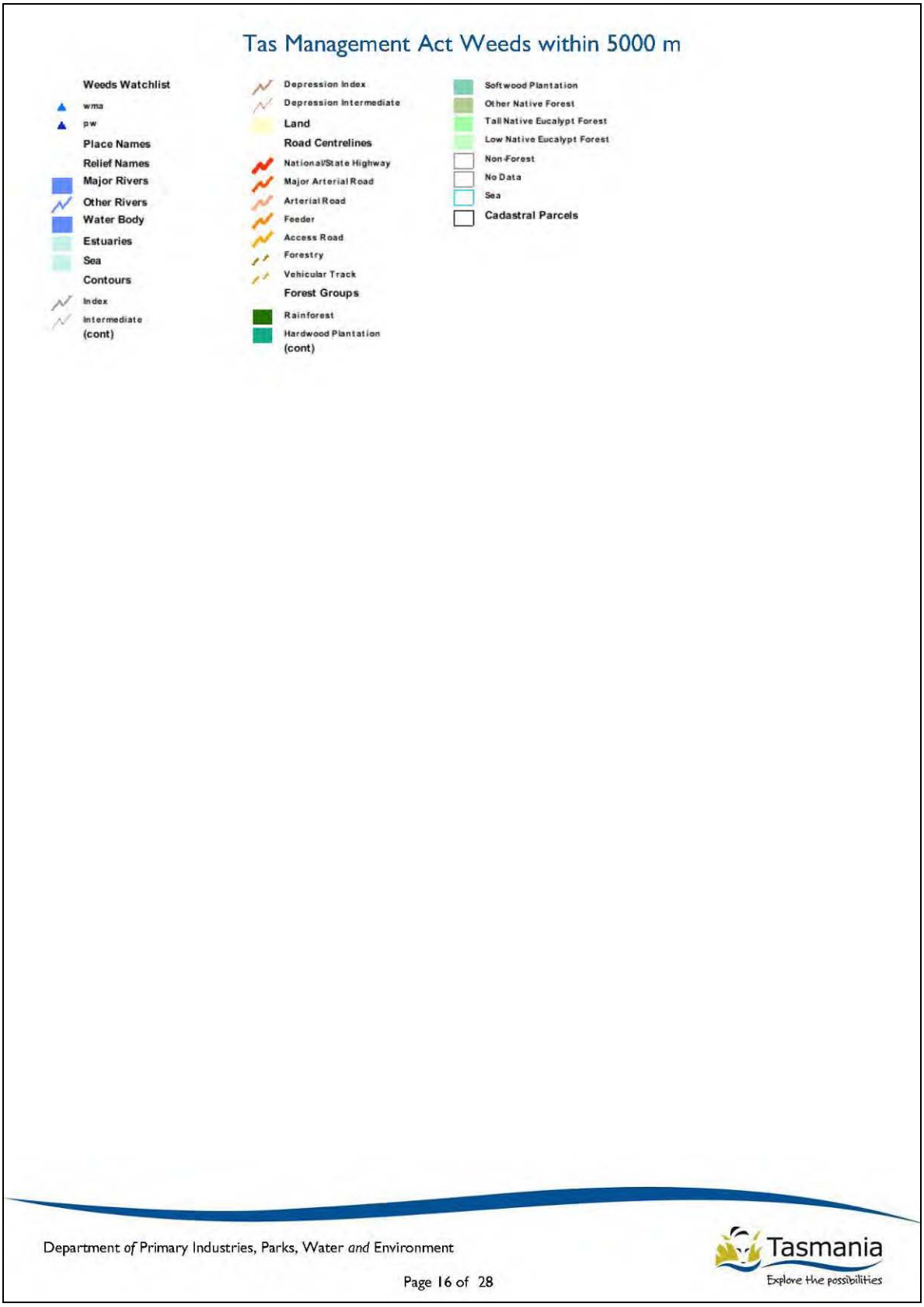
Tas Management Act Weeds within 5000 m
Weeds Watchlist
wma
pw
Place Names
Relief Names
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
Contours
Index
Intermediate
(cont)
Depression Index
Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
Feeder
Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
Hardwood Plantation
(cont)
Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
Cadastral Parcels
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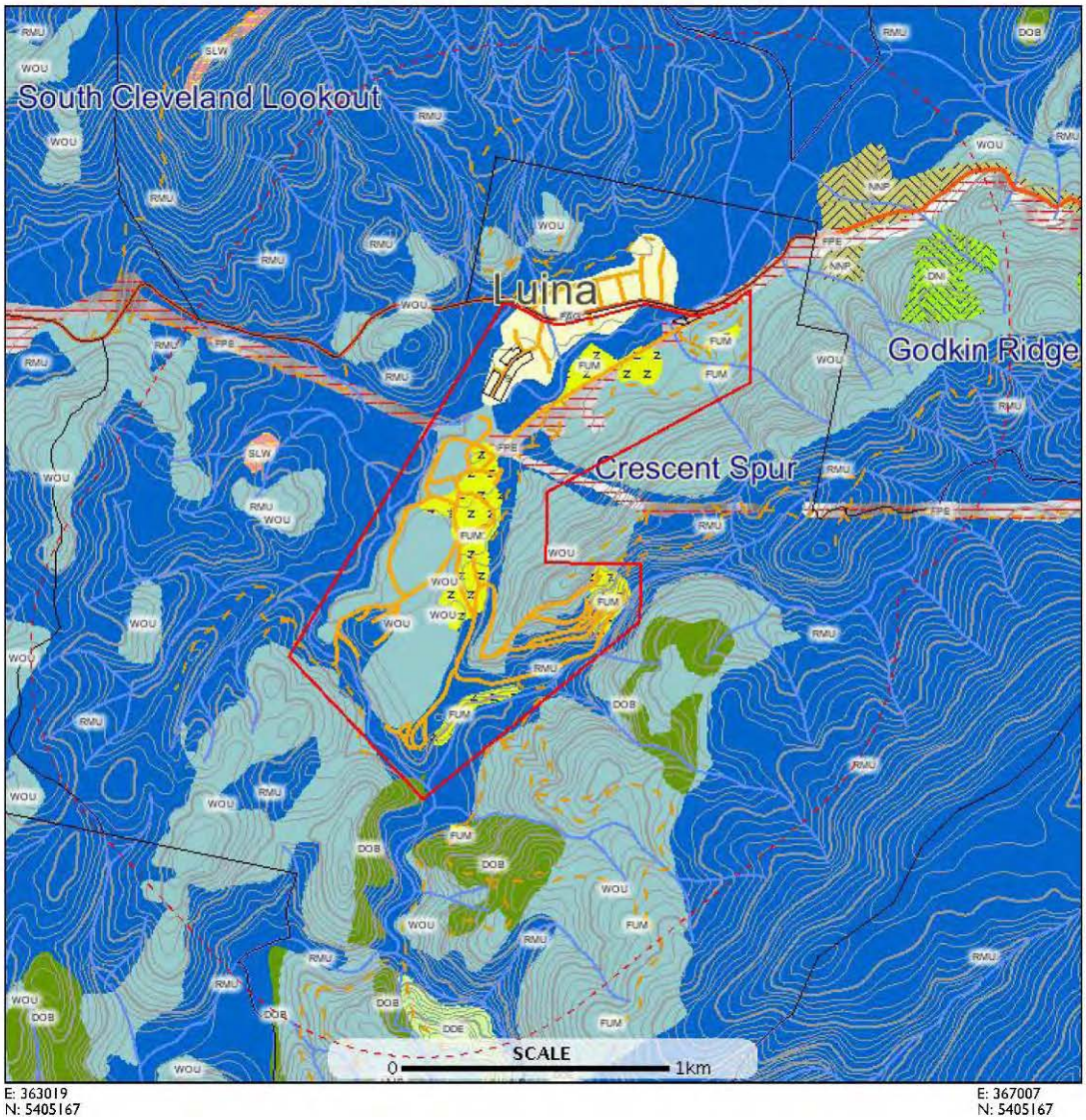
Tas Management Act Weeds within 5000 m

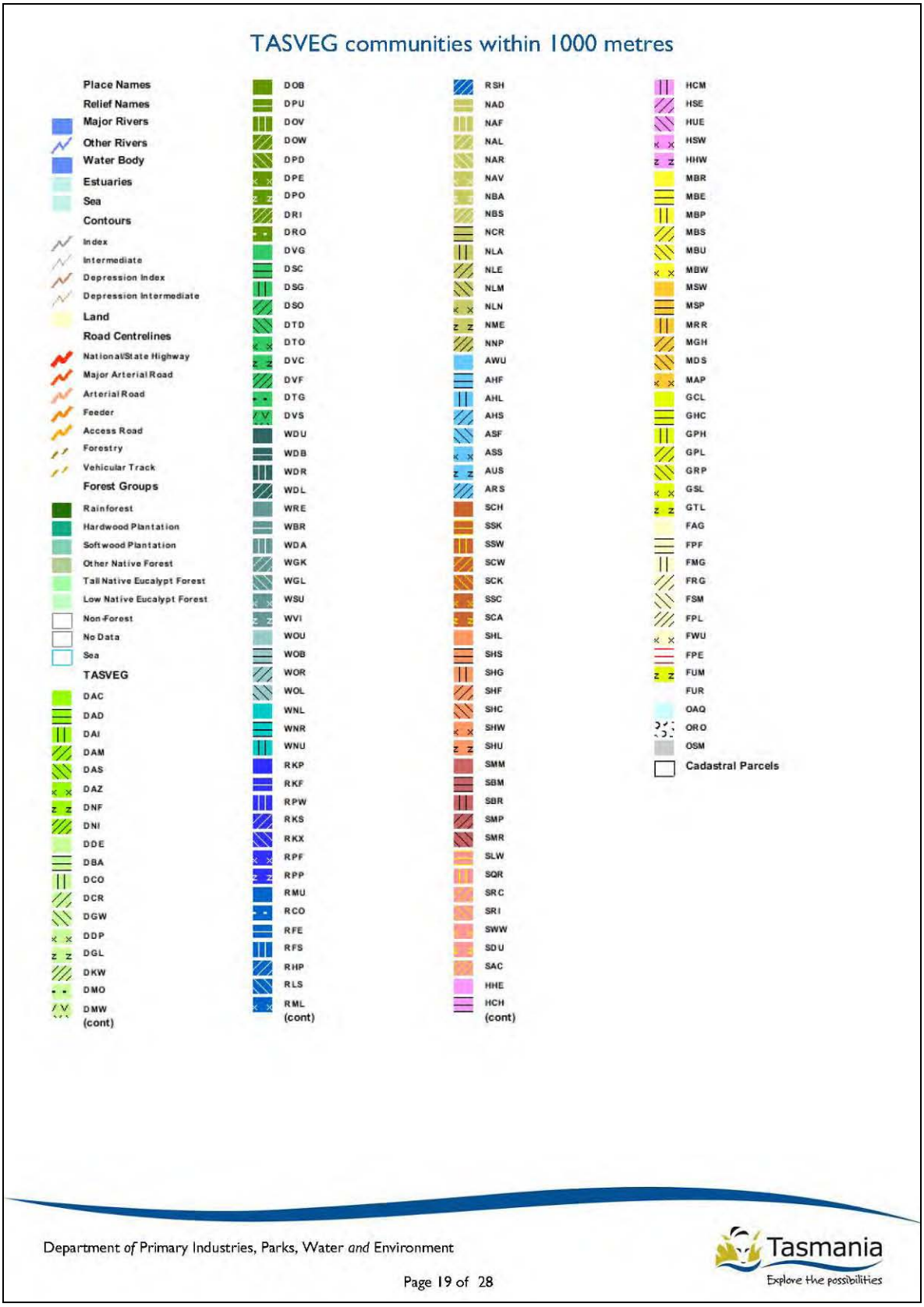
Id	Species	Common name	Observers	Date	Geometry	Location	Obs state	Wma	Wons density	Data source
1226173	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		
1226265	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		
1226153	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		

For more information about introduced weed species, please visit the following URL for contact details in your area.

http://www.dpipwe.tas.gov.au/inter.nsf/WebPages/TPRY-52J8Z3?open

TASVEG communities within 1000 metres




TASVEG communities within 1000 metres
Place Names
Relief Names
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
Contours
Index
Intermediate
Depression Index
Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
Feeder
Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
Hardwood Plantation
Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
TASVEG
DAC
DAD
DAI
DAM
DAS
DAZ
DNF
DNI
DDE
DBA
DCO
DCR
DGW
DDP
DGL
DKW
DMO
DMW
(cont)
DOB
DPU
DOV
DOW
DPD
DPE
DPO
DRI
DRO
DVG
DSC
DSG
DSO
DTD
DTO
DVC
DVF
DTG
DVS
WDU
WDB
WDR
WDL
WRE
WBR
WDA
WGK
WGL
WSU
WVI
WOU
WOB
WOR
WOL
WNL
WNR
WNU
RKP
RKF
RPW
RKS
RKX
RPF
RPP
RMU
RCO
RFE
RFS
RHP
RLS
RML
(cont)
RSH
NAD
NAF
NAL
NAR
NAV
NBA
NBS
NCR
NLA
NLE
NLM
NLN
NME
NNP
AWU
AHF
AHL
AHS
ASF
ASS
AUS
ARS
SCH
SSK
SSW
SCW
SCK
SSC
SCA
SHL
SHS
SHG
SHF
SHC
SHW
SHU
SMM
SBM
SBR
SMP
SMR
SLW
SQR
SRC
SRI
SWW
SDU
SAC
HHE
HCH
(cont)
HCM
HSE
HUE
HSW
HHW
MBR
MBE
MBP
MBS
MBU
MBW
MSW
MSP
MRR
MGH
MDS
MAP
GCL
GHC
GPH
GPL
GRP
GSL
GTL
FAG
FPF
FMG
FRG
FSM
FPL
FWU
FPE
FUM
FUR
OAQ
ORO
OSM
Cadastral Parcels
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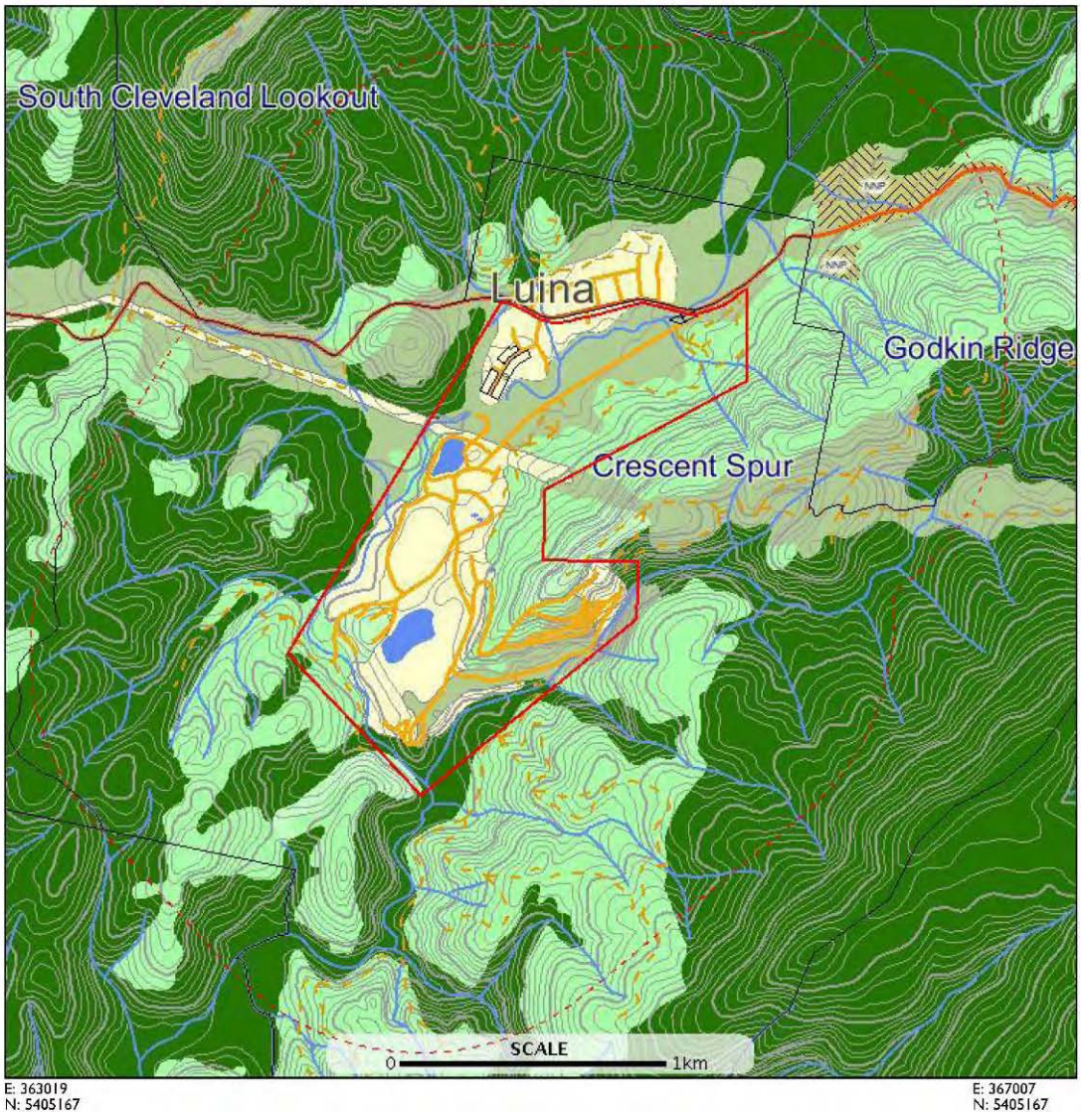
TASVEG communities within 1000 metres

Id	Code	Community	Emergent species
101297396	RMS	Nothofagus / Phyllocladus short rainforest	
101294998	RMT	Nothofagus - Atherosperma rainforest	
101294997	FPE	Permanent easements	
101297407	RMT	Nothofagus - Atherosperma rainforest	
101297409	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297386	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101298613	RMT	Nothofagus - Atherosperma rainforest	
101297444	RMT	Nothofagus - Atherosperma rainforest	
101294996	RMS	Nothofagus / Phyllocladus short rainforest	
101297461	DNI	Eucalyptus nitida dry forest and woodland	
101297459	FUM	Extra-urban miscellaneous	
101297449	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296026	FUM	Extra-urban miscellaneous	
101296618	RMS	Nothofagus / Phyllocladus short rainforest	
101297399	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296028	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296025	FUM	Extra-urban miscellaneous	
101297401	SLW	Leptospermum scrub	
101297417	DOB	Eucalyptus obliqua dry forest and woodland	
101295363	FPE	Permanent easements	
101297424	RMT	Nothofagus - Atherosperma rainforest	
101297458	FPE	Permanent easements	
101296029	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296032	FUM	Extra-urban miscellaneous	
101294994	DOB	Eucalyptus obliqua dry forest and woodland	
101297384	RMS	Nothofagus / Phyllocladus short rainforest	
101296030	FUM	Extra-urban miscellaneous	
101297460	NNP	Notelaea - Pomaderris - Beyeria forest	
101297457	FUM	Extra-urban miscellaneous	
101294995	RMS	Nothofagus / Phyllocladus short rainforest	
101297400	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297447	FAG	Agricultural land	
101297311	FPE	Permanent easements	
101297397	RMT	Nothofagus - Atherosperma rainforest	
101297406	DDE	Eucalyptus delegatensis dry forest and woodland	
101294993	FUM	Extra-urban miscellaneous	
101297446	RMT	Nothofagus - Atherosperma rainforest	
101297448	FUM	Extra-urban miscellaneous	
101297463	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296033	RMS	Nothofagus / Phyllocladus short rainforest	
101296031	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297398	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297445	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297305	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101294992	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296024	RMS	Nothofagus / Phyllocladus short rainforest	
101296027	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297421	RMS	Nothofagus / Phyllocladus short rainforest	
101297395	RMT	Nothofagus - Atherosperma rainforest	
101297387	DOB	Eucalyptus obliqua dry forest and woodland	
101297405	DOB	Eucalyptus obliqua dry forest and woodland	
101296023	DOB	Eucalyptus obliqua dry forest and woodland	
101297462	NNP	Notelaea - Pomaderris - Beyeria forest	
101297408	WOU	Eucalyptus obliqua wet forest (undifferentiated)	

For more information about TASVEG maps, please contact the Coordinator, Tasmanian Vegetation Monitoring and Mapping Program.
Telephone: (03) 6233 4501
Email: TASVEG@dpipwe.tas.gov.au

TASVEG communities within 1000 metres



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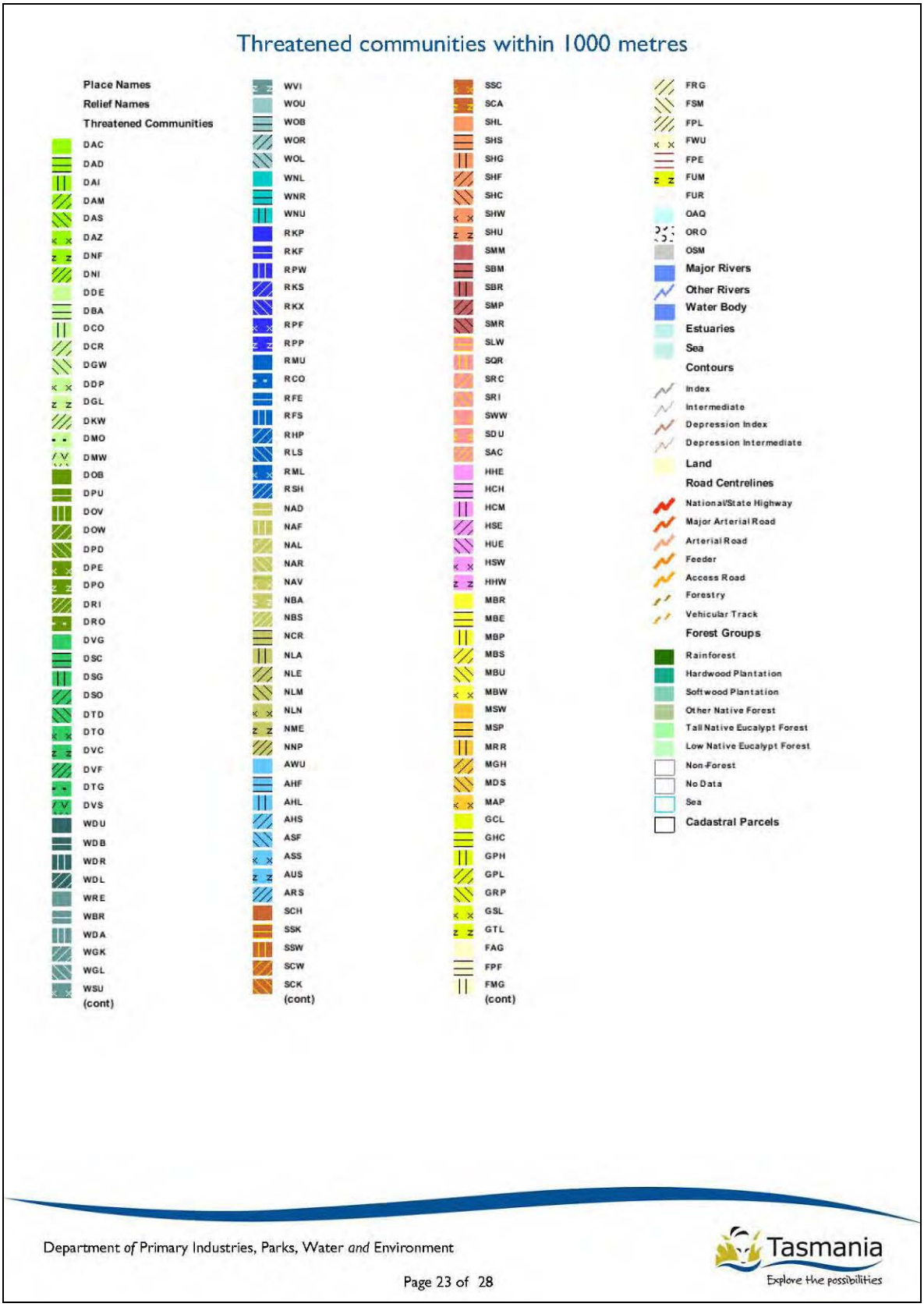
Threatened communities within 1000 metres
Place Names
Relief Names
Threatened Communities
DAC
DAD
DAI
DAM
DAS
DAZ
DNF
DNI
DDE
DBA
DCO
DCR
DGW
DDP
DGL
DKW
DMO
DMW
DOB
DPU
DOV
DOW
DPD
DPE
DPO
DRI
DRO
DVG
DSC
DSG
DSO
DTD
DTO
DVC
DVF
DTG
DVS
WDU
WDB
WDR
WDL
WRE
WBR
WDA
WGK
WGL
WSU
(cont)
WVI
WOU
WOB
WOR
WOL
WNL
WNR
WNU
RKP
RKF
RPW
RKS
RKX
RPF
RPP
RMU
RCO
RFE
RFS
RHP
RLS
RML
RSH
NAD
NAF
NAL
NAR
NAV
NBA
NBS
NCR
NLA
NLE
NLM
NLN
NME
NNP
AWU
AHF
AHL
AHS
ASF
ASS
AUS
ARS
SCH
SSK
SSW
SCW
SCK
(cont)
SSC
SCA
SHL
SHS
SHG
SHF
SHC
SHW
SHU
SMM
SBM
SBR
SMP
SMR
SLW
SQR
SRC
SRI
SWW
SDU
SAC
HHE
HCH
HCM
HSE
HUE
HSW
HHW
MBR
MBE
MBP
MBS
MBU
MBW
MSW
MSP
MRR
MGH
MDS
MAP
GCL
GHC
GPH
GPL
GRP
GSL
GTL
FAG
FPF
FMG
(cont)
FRG
FSM
FPL
FWU
FPE
FUM
FUR
OAQ
ORO
OSM
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
Contours
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Intermediate
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Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
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Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
Hardwood Plantation
Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
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Threatened communities within 1000 metres

Code	Title	Status
NNP	Notelaea - Pomaderris - Beyeria forest	R,E
NNP	Notelaea - Pomaderris - Beyeria forest	R,E

For more information about threatened vegetation communities, please contact Resource Management and Conservation.

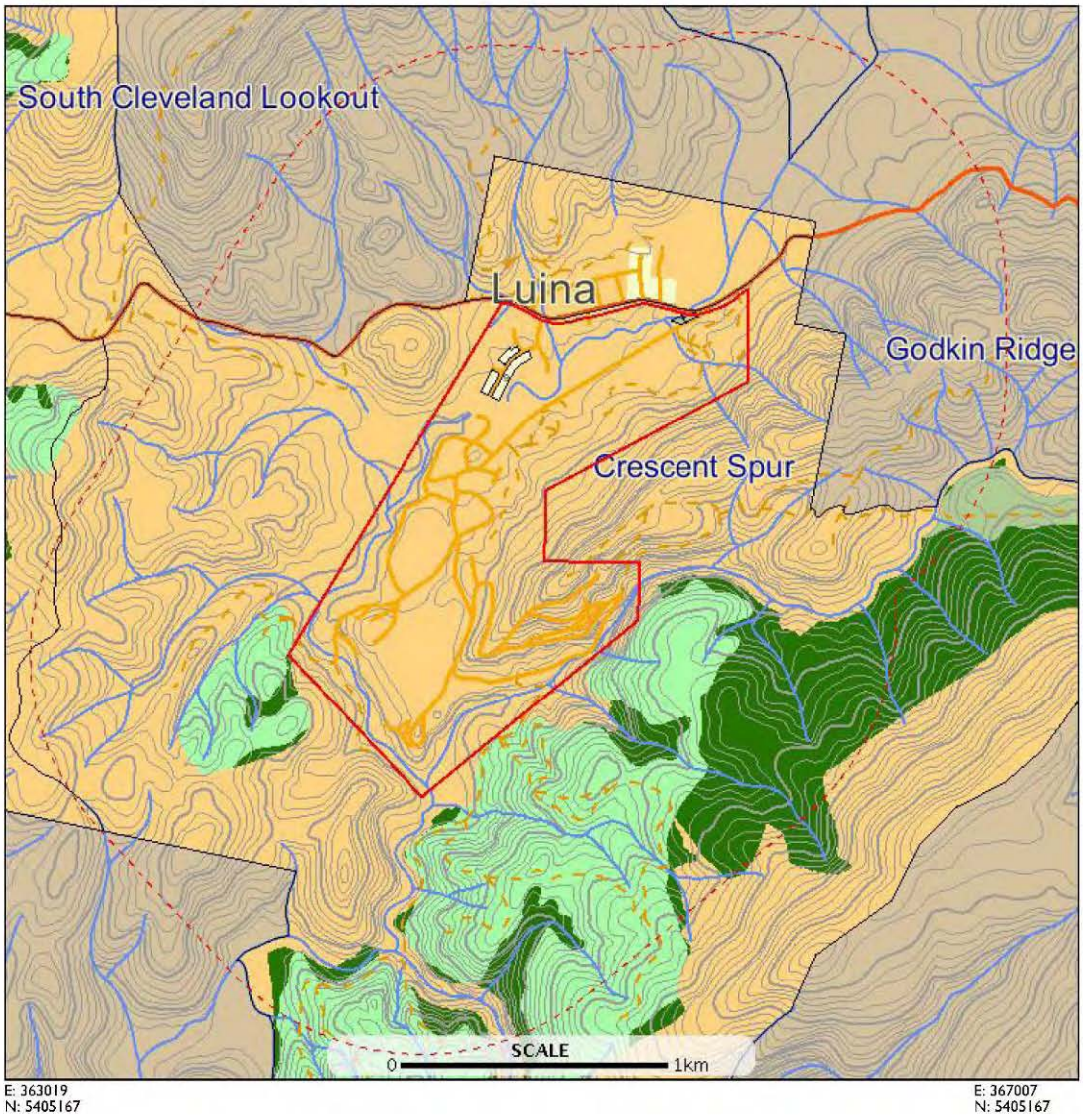
Ph: (03) 6233 4501,

Fax: (03) 6233 3186

Address: GPO Box 44, Hobart TAS 7000 Australia

Geoconservation sites within 1000 metres

***** No Geoconservation sites found within 1000 metres. *****



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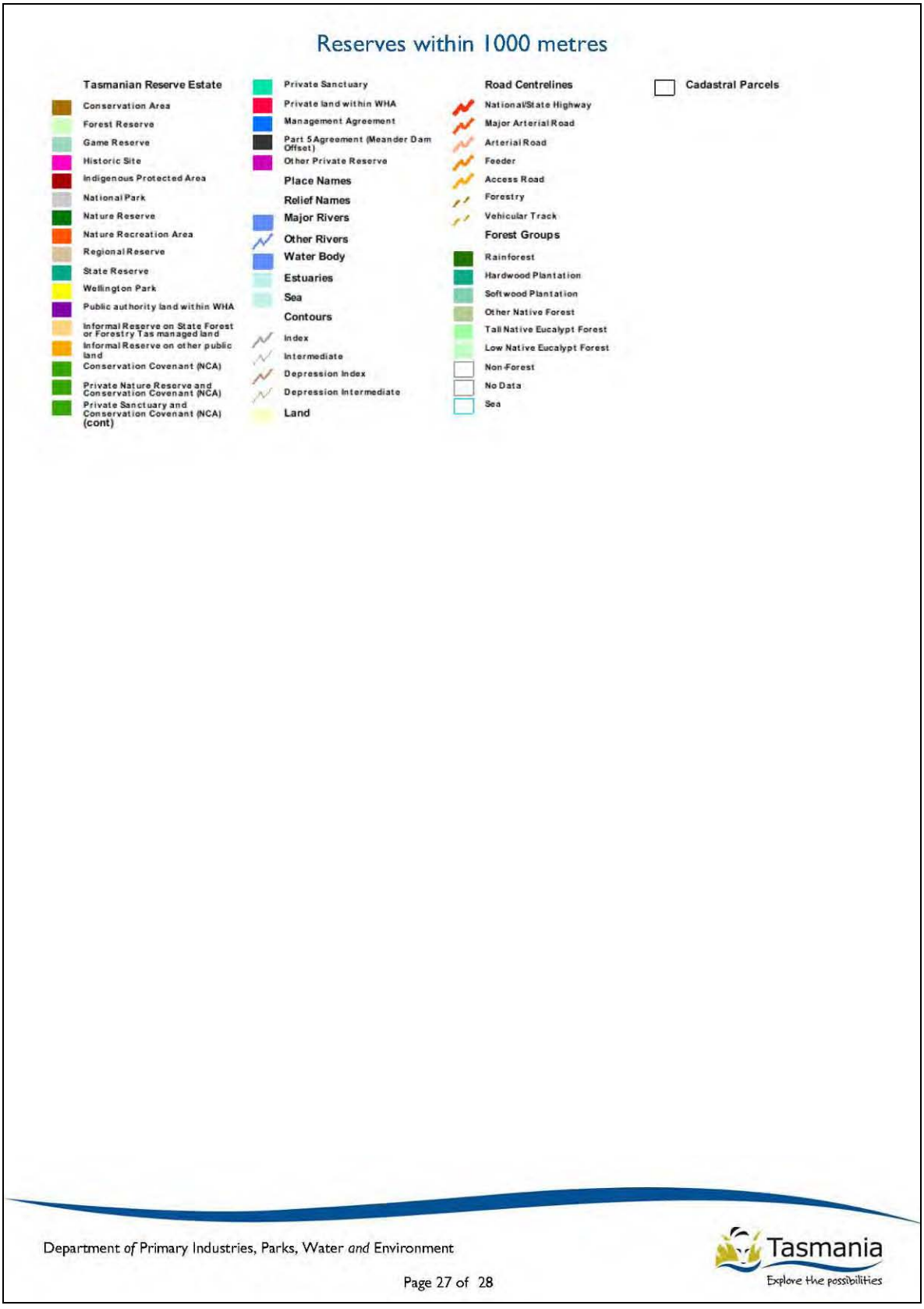
Reserves within 1000 metres
Tasmanian Reserve Estate
Conservation Area
Forest Reserve
Game Reserve
Historic Site
Indigenous Protected Area
National Park
Nature Reserve
Nature Recreation Area
Regional Reserve
State Reserve
Wellington Park
Public authority land within WHA
Informal Reserve on State Forest or Forestry Tas managed land
Informal Reserve on other public land
Conservation Covenant (NCA)
Private Nature Reserve and Conservation Covenant (NCA)
Private Sanctuary and Conservation Covenant (NCA) (cont)
Private Sanctuary
Private land within WHA
Management Agreement
Part 5 Agreement (Meander Dam Offset)
Other Private Reserve
Place Names
Relief Names
Major Rivers
Other Rivers
Water Body
Estuaries
Sea
Contours
Index
Intermediate
Depression Index
Depression Intermediate
Land
Road Centrelines
National/State Highway
Major Arterial Road
Arterial Road
Feeder
Access Road
Forestry
Vehicular Track
Forest Groups
Rainforest
Hardwood Plantation
Softwood Plantation
Other Native Forest
Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
Sea
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Reserves within 1000 metres

Name	Classification	Status
Meredith Range Regional Reserve	Regional Reserve	Other Formal Reserve
	Informal Reserve on State Forest or Forestry Tas managed land	Informal Reserve
Savage River Regional Reserve	Regional Reserve	Other Formal Reserve

For more information about the Tasmanian Reserve Estate, please contact the Policy & Conservation Assessment Branch DPIPWE.

Ph: (03) 6216 4457

Fax (03) 6223 8603

Address: GPO Box 44 Hobart TAS 7000

APPENDIX D. Forest Practices Authority's *Fauna Values Database* report for study area

THREATENED FAUNA MAPSHEET DISPLAY

LUINA 3640

Current as at 09/Aug/2011

Please note, coordinates use map datum GDA94

Known localities

Species	Tenure	Locality		Notes
hydrobiid snail (B. bellii)	CL	361512 5407483	Thirteen Mile Creek, junction Mt Cleveland and Corinna Roads	
hydrobiid snail (B. bellii)	CL	362512 5407983	Thirteen Mile Creek 0.8 km u/s Mt Cleveland-Corinna Roads junction	
hydrobiid snail (B. hullii)	CL	361512 5407483	Thirteen Mile Creek, junction Mt Cleveland and Corinna Roads	
hydrobiid snail (P. marginata)	CL	361512 5407483	Thirteen Mile Creek, junction Mt Cleveland and Corinna Roads	
hydrobiid snail (P. marginata)	CL	362512 5407983	Thirteen Mile Creek 0.8 km u/s Mt Cleveland-Corinna Roads junction	
wedge-tailed eagle		374462 5405483	Four Mile Rd, Waratah	nest (#962)
wedge-tailed eagle	SF	376592 5406223	Waratah 3 km S	nest near (#542)
wedge-tailed eagle	SF	376762 5406558	Champion Heath N	nest (#741)

Habitat which may contain threatened species

Species	Habitat
grey goshawk	Wet eucalypt forest with blackwood/myrtle understorey, blackwood swamp, E. brookeriana wet forest, melaleuca and leptospermum forest.
hydrobiid snail	Immediate catchment of the stream in which known locality occurs
ptunarra brown butterfly	Native grasslands or grassy woodlands with tussock grass (*Poa*) cover of more than 15%
quoll (spotted-tailed, eastern)	All wetter forest types, coastal heath and bush-pasture interfaces
Tasmanian devil	Potential habitat includes dry to damp forest, woodlands and grassy woodlands, coastal scrub, and riparian areas.
wedge-tailed eagle	Large tracts (more than 10 ha) of eucalypt or mixed forest

APPENDIX E. DSEWPC's *Protected Matters* report for study area

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

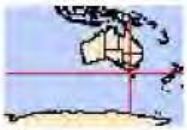
EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Report created: 09/08/11 16:22:49



Summary
Details
Matters of NES
Other matters protected by the EPBC Act
Extra Information
Caveat
Acknowledgements

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 1.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communitites:	1
Threatened Species:	8
Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	7
Whales and Other Cetaceans:	None

Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	2
State and Territory Reserves:	2
Regional Forest Agreements:	1
Invasive Species:	5
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community may occur within area

Threatened Species [Resource Information]

Name	Status	Type of Presence
BIRDS		
Aquila audax fleayi		
Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Species or species habitat may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Ceyx azureus diemenensis		
Tasmanian Azure Kingfisher [25977]	Endangered	Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae castanops		
Masked Owl (Tasmanian) [67051]	Vulnerable	Species or species habitat may occur within area
FISH		
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
MAMMALS		
Dasyurus maculatus maculatus (Tasmanian population)		
Spotted-tail Quoll, Spot-tailed	Vulnerable	Species or species habitat likely to occur within area

Quoll, Tiger Quoll (Tasmanian population) [75183]		
Sarcophilus harrisii		
Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area

Migratory Species		[Resource Information]
Name	Status	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor		

Swift Parrot [744]	Endangered	Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	Status
Natural	
Tarkine TAS	Indicative Place
Tarkine Wilderness Area TAS	Registered

State and Territory Reserves [Resource Information]

Meredith Range, TAS
Savage River, TAS

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.
Tasmania RFA, Tasmania

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Plants		
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtjii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and

marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-41.46649 145.38134,-41.46641 145.38309,-41.46717 145.38476,-41.46717 145.38621,-41.46649 145.38887,-41.46664 145.39002,-41.46695 145.39139,-41.46679 145.39238,-41.46649 145.39352,-41.46557 145.39519,-41.46999 145.39481,-41.47288 145.38507,-41.47502 145.38491,-41.47517 145.38887,-41.47882 145.38895,-41.48461 145.37821,-41.47898 145.37212,-41.46649 145.38149,-41.46649 145.38134

Acknowledgements

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-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia

-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Last updated: Thursday, 16-Sep-2010 09:13:25 EST

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| Australian Government |

APPENDIX F. DPIPWE's *Conservation of Freshwater Ecosystem Values* report for study area

Conservation of Freshwater Ecosystem Values (CFEV) Database

Corporate Interface Report

https://cfev.dpiw.tas.gov.au

Data in this report should be cited as:

CFEV database, v1.0 (2005), Conservation of Freshwater Ecosystem Values Project, Water Resources Division, Department of Primary Industries and Water, Tasmania

All maps in this report should be cited as:

Base data by CFEV, © State of Tasmania.

Rivers, estuaries and waterbodies - base data by the LIST, © State of Tasmania.

For interpretive information visit:

http://www.dpiw.tas.gov.au/cfev

The CFEV Program is an initiative of the Water Resources Division, Department of Primary Industries and Water.

1 Legend

Karst

Wetlands

River Sections

Waterbodies

Data confidence and CFEV

The strength of the CFEV data lies with its comprehensive coverage of the state, which allows broad scale comparisons, generalised summaries, and the combination of complicated data sets into readily interpreted indices.

It should be acknowledged that CFEV data uses a variety of data sources as input and that some of these are modelled and are not ground-truthed. As a result care should be taken when using specific variables at specific locations.

Disclaimer

This web resource has been developed by the State of Tasmania to provide public access to some State, Commonwealth and local government information, including text, maps and various forms of data and to information obtained from non-government sources.

It also provides on-line access to some government services and transactions. All of the material published on this website is together referred to hereafter as "the information".

In those circumstances, no responsibility is accepted for the accuracy, completeness, or relevance to the user's purpose, of the information and those using it for whatever purpose are advised to verify it with the relevant Commonwealth or State government department, local government body or other source and to obtain any appropriate professional advice.

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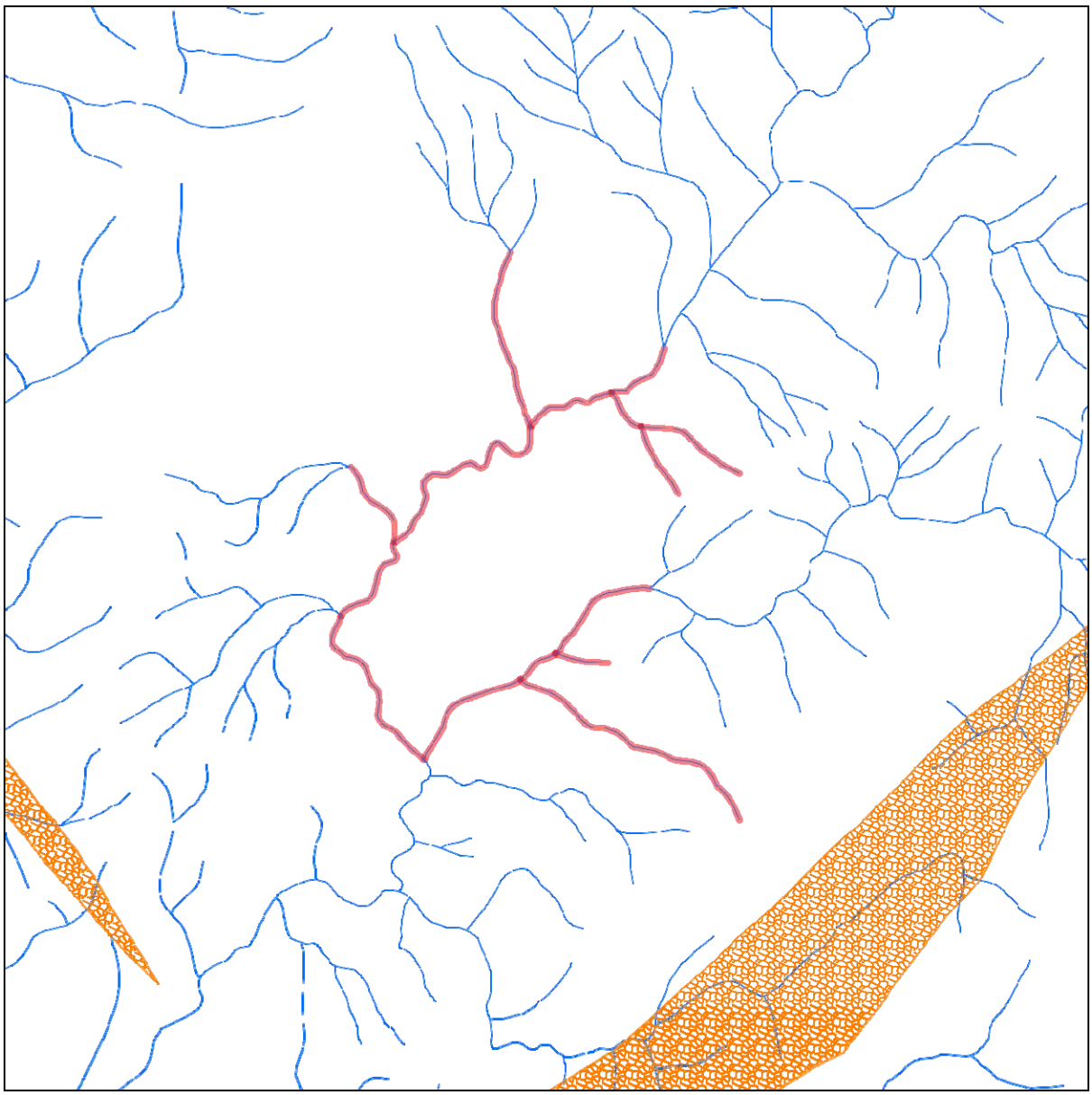
Any links to other websites that have been included on this website are provided for your convenience only. The Crown in its role as manager of this website does not accept any responsibility for the accuracy, availability, or appropriateness to the user's purposes, of any information or services on any other website. The Crown, its officers, employees and agents do not accept liability however arising, including liability for negligence, for any loss resulting from the use of or reliance upon the information and/or reliance on its availability at any time.

Any results with important management implications should be supported by on-ground surveys

2 River Sections : 143217,143209,143231,143236,143272,143266,143207,143205,143172,143230,143233,143237,143271,143274,143276



Centre point - E: 365260m N: 5407352m Scale (map width): 5332m

GDA94 Zone 55

2.1 Biophysical Classes

2.1.1 Crayfish Class

Code	Description	% Units	Count	Total Units
C6	All first order streams (for rivers) and areas greater than 400 m AHD; Crayfish absent or naturally in low abundance or low probability of occurrence (mainland Tasmania)	28.08%	4	2548.47 m
C1	Areas below 400 m AHD and excluding first order streams (for rivers); Astacopsis gouldi present.	71.92%	11	6525.90 m

2.1.2 Fish Class

Code	Description	% Units	Count	Total Units
F49	Extensive assemblage in river sections and waterbodies covering most of the western part of the state (west of Tyler corridor), including the southern part of King Island and also within a few river sections inland in the east.	64.22%	9	5827.40 m
F0	Fish absent or low probability of occurrence and/or at very low densities (note: headwater streams for rivers). Assemblage a reduced form of that found immediately downstream.	35.78%	6	3246.96 m

2.1.3 Fluvial Geomorphic River Type

Code	Description	% Units	Count	Total Units
G43	Karst in western Savage; Lower catchments dominated by low relief relict surfaces	100.00%	15	9074.36 m

2.1.4 Hydrological Class

Code	Description	% Units	Count	Total Units
H3	The state¿s most perennial, high volume and least variable streams (in annual and monthly flows). High baseflows; High peak runoff with relatively low variability.	100.00%	15	9074.36 m

2.1.5 Macroinvertebrate Class

Code	Description	% Units	Count	Total Units
BC9f	Headwater first order streams, depauperate form of assemblage C9 and located in same areas. Indicator taxa (EPTC groups):	28.08%	4	2548.47 m
BC9	Assemblage of mid to lower altitude (< 800 m AHD) streams throughout much of the inland western region of the state, falling along the western edge of the Tyler line/corridor, encompassing part of	71.92%	11	6525.90 m

Code	Description	% Units	Count	Total Units
	the World Heritage Area, includes upper Franklin and Gordon catchments, middle to lower Huon-Weld-Picton catchments (excluding main-stem Huon and Picton - see R11). Indicator taxa (EPTC groups):			

2.1.6 Macrophyte Class

Code	Description	% Units	Count	Total Units
M1	Low probability of macrophyte assemblage occurrence, absent/very sparse	35.78%	6	3246.96 m
M3	Depauperate macrophyte assemblages characteristic west of Tyler line; Moderate probability of macrophyte assemblage occurrence, Sparse/locally patchy (Depauperate, see Hughes (1987) - Group 5) Dominants:	64.22%	9	5827.40 m

2.1.7 Tree Class

Code	Description	% Units	Count	Total Units
T17	Upland mosaics of moorland, scrub and wet eucalypt forests dominated by E. delegatensis on the eastern side of Lakes Gordon and Pedder and more extensively in inland north-western Tasmania.	45.40%	8	4119.90 m
T50	Lowland scrub and moorland mosaic with implicate rainforest and Huon pine rainforest. Contains communities similar to 21, 38, 43.	54.60%	7	4954.47 m

2.2 Conservation Management Priority

2.2.1 Land Tenure Security

Code	Description	Count	% Count	% Units	Total Units
Medium	This river section lies within a catchment that has predominantly medium security of land tenure. There are some restrictions in place to ensure that the land within this catchment is managed to conserve or protect the landscape from potential negative impacts. This includes informal reserves and State forests.	15	100.00%	100.00%	9074.36 m

2.2.1.1 Land tenure security composition map

Code	Description	Count	% Count	% Units	Total Units
Mixed	The river section lies within a catchment that has mixed security of land tenure. Management restrictions may vary across the	5	33.33%	37.71%	3421.82 m

Code	Description	Count	% Count	% Units	Total Units
	landscape depending on the land tenure.				
Medium	100% of the river section catchment has low moderate tenure security.	10	66.67%	62.29%	5652.54 m

2.2.2 CMPI2

Code	Description	Count	% Count	% Units	Total Units
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the improvement of current conservation management is a lower priority. This CMP was derived by considering both its Integrated Conservation Value and land management security (by tenure).	15	100.00%	100.00%	9074.36 m

2.2.2.1 CMPI1

Code	Description	Count	% Count	% Units	Total Units
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the improvement of current conservation management is a lower priority. This CMP was derived by considering both its Representative Conservation Value and land management security (by tenure).	15	100.00%	100.00%	9074.36 m

2.2.3 CMPP2

Code	Description	Count	% Count	% Units	Total Units
M	Moderate Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a moderate priority when development is proposed or occurs. This applies in the situation where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Integrated Conservation Value and land management security (by tenure).	14	93.33%	97.41%	8839.73 m
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a lower priority when development is proposed or occurs. This applies in the situation	1	6.67%	2.59%	234.63 m

Code	Description	Count	% Count	% Units	Total Units
	where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Integrated Conservation Value and land management security (by tenure).				

2.2.3.1 CMPP1

Code	Description	Count	% Count	% Units	Total Units
M	Moderate Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a moderate priority when development is proposed or occurs. This applies in the situation where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Representative Conservation Value and land management security (by tenure).	14	93.33%	97.41%	8839.73 m
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a lower priority when development is proposed or occurs. This applies in the situation where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Representative Conservation Value and land management security (by tenure).	1	6.67%	2.59%	234.63 m

2.3 Conservation Value

2.3.1 ICV

Code	Description	Count
L	Lower to lowest Integrated Conservation Value (ICV). ICV integrates the Representative Conservation Value with known Special Values (eg. threatened and priority species and communities, and priority sites).	15

2.3.1.1 Special Values

Name	Scientific Name	Status	Type
Platypus	Ornithorynchus anatinus	Non-outstanding	Phylogenetically Distinct Fauna Species

2.3.2 NR class

Code	Description	Count	% Count	% Units	Total Units
C1	C1 class of Representativeness and Naturalness. This river section is within the last group of sites selected for rivers and is in excellent condition. Selection is based on representativeness, rarity of classification units and naturalness score.	9	60.00%	60.61%	5499.65 m
C2	C2 class of Representativeness and Naturalness. This river section is within the last group of sites selected for rivers and is in moderate condition. Selection is based on representativeness, rarity of classification units and naturalness score.	5	33.33%	36.81%	3340.08 m
C3	C3 class of Representativeness and Naturalness. This river section is within the last group of sites selected for rivers and is in poor condition. Selection is based on representativeness, rarity of classification units and naturalness score.	1	6.67%	2.59%	234.63 m

2.3.3 RCV

Code	Description	Count
C	C class Representative Conservation Value (RCV). This river section is within the last group of sites selected for rivers. Selection is based on representativeness, rarity of classification units and naturalness.	15

2.3.3.1 Important biophysical class

Code	Description	% Units	Count	Total Units
T17	Upland mosaics of moorland, scrub and wet eucalypt forests dominated by E. delegatensis on the eastern side of Lakes Gordon and Pedder and more extensively in inland north-western Tasmania.	45.40%	8	4119.90 m
T50	Lowland scrub and moorland mosaic with implicate rainforest and Huon pine rainforest. Contains communities similar to 21, 38, 43.	54.60%	7	4954.47 m

2.4 Location

2.4.1 Easting

Maximum	Minimum	Mean	Count
365982.63 m	364415.82 m	365217.78 m	15

2.4.2 Mapsheet

Description	Count
LUINA	15

2.4.3 Northing

Maximum	Minimum	Mean	Count
5408376.50 m	5406375.33 m	5407408.70 m	15

2.5 Name

Description	Count
Prouse Creek	1
Whyte River	5
Washington Creek	3

2.6 Naturalness

Code	Description	Count	% Count	% Units	Total Units
Low	River section severely altered from natural condition.	1	6.67%	2.59%	234.63 m
High	River section in near-natural condition.	9	60.00%	60.61%	5499.65 m
Medium	River section significantly altered from natural condition.	5	33.33%	36.81%	3340.08 m

2.6.1 Biological Condition Score

Code	Description	Count	% Count	% Units	Total Units
4	Near natural biological condition for the river section.	7	46.67%	51.74%	4695.31 m
3	Significantly impaired biological condition for the river section.	4	26.67%	20.17%	1830.58 m
5	Unimpaired biological condition for the river section.	4	26.67%	28.08%	2548.47 m

2.6.1.1 Exotic Fish Condition

Code	Description	Count	% Count	% Units	Total Units
0	Exotic fish present and abundant; proportion of biomass as native fish approx. 0.	11	73.33%	71.92%	6525.90 m
1	Exotic fish absent or very low probability of occurrence.	4	26.67%	28.08%	2548.47 m

2.6.1.2 Macroinvertebrate Condition

Code	Description	Count	% Count	% Units	Total Units
5	Natural total density levels and natural assemblage composition of benthic macroinvertebrates for the river section.	15	100.00%	100.00%	9074.36 m

2.6.1.2.1 River Abstraction Index

Code	Description	Count	% Count	% Units	Total Units
5	Small to no decreases in long-term mean annual volume of flow, and moderate decreases in summer baseflows in rural areas due to net abstraction (removal out of the channel) of water.	15	100.00%	100.00%	9074.36 m

2.6.1.2.2 Flow Variability Index

Code	Description	Count	% Count	% Units	Total Units
4	The degree of change in flow	15	100.00%	100.00%	9074.36 m

Code	Description	Count	% Count	% Units	Total Units
	regime variability as a result of human flow manipulation (associated with large storages) is zero or very low; no major dam or structure present).				

2.6.1.2.3 Macroinvertebrate Observed/Expected

Code	Description	Count	% Count	% Units	Total Units
1	AUSRIVAS O/E ranked index falls within the A impairment band, O/E rank range approx. 0.8 to 1.3, with mean of approx. 1.0; Equivalent to natural; No impact on presence or relative abundance of approx. dominant families.	4	26.67%	25.07%	2275.10 m
0.8	AUSRIVAS O/E ranked index falls within the AB impairment band region, O/E rank range approx. 0.6 to 1.0, with mean of approx. 0.8; Close to natural or moderately impaired; Minimal to some impact on presence or relative abundance of approx. dominant families.	11	73.33%	74.93%	6799.26 m

2.6.1.3 Fish Condition

Code	Description	Count	% Count	% Units	Total Units
-9	Native fish absent or low probability of occurrence	6	40.00%	35.78%	3246.96 m
0.5	Moderate impact of large dams, changes in flow regime, or acid drainage on native fish populations	1	6.67%	7.34%	666.15 m
1	No impact of large dams, changes in flow regime, or acid drainage on native fish populations	8	53.33%	56.88%	5161.25 m

2.6.1.4 Accumulated Native Riparian Vegetation

Maximum	Minimum	Mean	Count
1.00	0.66	0.87	15

2.6.1.4.1 Native Riparian Vegetation

Code	Description	Count	% Count	% Units	Total Units
3	Moderate to high proportional area of native vegetation occurring within the riparian zone (50m width strip each side of the river section) (20 - 80% of total riparian buffer zone as native vegetation)	6	40.00%	41.73%	3786.93 m
4	Very to extremely high proportional area of native vegetation occurring within the riparian zone (50m width strip each side of river section) (>80% of total riparian buffer zone as native vegetation)	9	60.00%	58.27%	5287.43 m

2.6.1.4.2 Willows

Code	Description	Count	% Count	% Units	Total Units
1	Dense willow infestations (Salix sp.) absent within the riparian zone, willows sparse or absent.	15	100.00%	100.00%	9074.36 m

2.6.1.5 Platypus Condition

Code	Description	Count	% Count	% Units	Total Units
1	Platypus population in essentially natural condition; Not in known Mucor infestation area (in 2004); Riparian vegetation mostly or entirely native.	11	73.33%	78.17%	7093.31 m
0.8	Platypus population in close to natrual condition; Either: a: (Not in known Mucor infestation area in 2004; Mixed native and cultural riparian vegetation; First order stream) or b: (Not in known Mucor infestation area in 2004; Mixed native and cultural riparian vegetation; Stream of order > 1).	4	26.67%	21.83%	1981.05 m

2.6.2 Geomorphic Condition Score

Code	Description	Count	% Count	% Units	Total Units
3	High geomorphic condition score for the river section.	8	53.33%	57.74%	5239.47 m
2	Medium geomorphic condition score for the river section.	7	46.67%	42.26%	3834.89 m

2.6.2.1 Flow change

Code	Description	Count	% Count	% Units	Total Units
5	Minimal to no change to flow regime for the river section.	15	100.00%	100.00%	9074.36 m

2.6.2.1.1 River Abstraction Index

Code	Description	Count	% Count	% Units	Total Units
5	Small to no decreases in long-term mean annual volume of flow, and moderate decreases in summer baseflows in rural areas due to net abstraction (removal out of the channel) of water.	15	100.00%	100.00%	9074.36 m

2.6.2.1.2 Flow Variability Index

Code	Description	Count	% Count	% Units	Total Units
4	The degree of change in flow regime variability as a result of human flow manipulation (associated with large storages) is zero or very low; no major dam or structure present).	15	100.00%	100.00%	9074.36 m

2.6.2.1.3 Regulation Index

Code	Description	Count	% Count	% Units	Total Units
1	The amount of regulation of the	15	100.00%	100.00%	9074.36 m

Code	Description	Count	% Count	% Units	Total Units
	natural flow regime due to cumulative effect of water storage upstream is low. Geomorphic and biological impacts weak or absent.				

2.6.2.2 Geomorphic responsiveness

Code	Description	Count	% Count	% Units	Total Units
0	Responsiveness of channel form to anthropogenic changes in flow and/or sediment regime is low (eg. a bedrock controlled system).	15	100.00%	100.00%	9074.36 m

2.6.2.3 Sediment capture

Code	Description	Count	% Count	% Units	Total Units
3	Low to very low proportion of fluvial sediment captured (stored) in dams upstream of river section.	15	100.00%	100.00%	9074.36 m

2.6.2.4 Sediment Input

Code	Description	Count	% Count	% Units	Total Units
2	Large anthropogenic change to sediment input for the river section.	5	33.33%	32.05%	2908.57 m
1	Very large anthropogenic change to sediment input for the river section.	1	6.67%	7.34%	666.15 m
3	Moderate anthropogenic change to sediment input for the river section.	1	6.67%	2.87%	260.17 m
5	Minimal to no anthropogenic change to sediment input for the river section.	7	46.67%	42.85%	3888.21 m
4	Small anthropogenic change to sediment input for the river section.	1	6.67%	14.89%	1351.26 m

2.6.2.4.1 Catchment Disturbance

Code	Description	Count	% Count	% Units	Total Units
4	Low level of catchment disturbance affecting stream channel and sediments; some disturbance affecting stream channel and sediments with the catchment subject to selective clearance and/or rough grazing.	1	6.67%	14.89%	1351.26 m
5	Minimal level of catchment disturbance affecting stream channel and sediments; minimal or no clearance and/or disturbance.	13	86.67%	82.24%	7462.92 m
2	High level of catchment disturbance affecting stream channel and sediments; catchment heavily cleared and/or used intensively, such as agriculture and urban areas.	1	6.67%	2.87%	260.17 m

2.6.2.4.2 Mining Sedimentation

Code	Description	Count	% Count	% Units	Total Units
1	Absence of major long-term and/or historical mining sedimentation	14	93.33%	92.66%	8408.22 m

Code	Description	Count	% Count	% Units	Total Units
	deposits in channel.				
0	Presence of major long-term and/or historical mining sedimentation deposits in channel; substantial geomorphological and/or biological impacts present or likely.	1	6.67%	7.34%	666.15 m

2.6.2.4.2.1 River Acid Drainage

Code	Description	Count	% Count	% Units	Total Units
0	Significant acid drainage absent	15	100.00%	100.00%	9074.36 m

2.6.2.4.3 Urbanisation

Code	Description	Count	% Count	% Units	Total Units
1	Local channel impacts from urbanisation absent or limited. Fluvial geomorphological impacts absent or not significant.	9	60.00%	60.61%	5499.65 m
0	Local channel impacts from urbanisation present, and significant. Fluvial geomorphological impacts significant.	6	40.00%	39.39%	3574.72 m

2.7 Topographic Variables

2.7.1 Accumulated Mean Annual Runoff

Maximum	Minimum	Mean	Count
40729.08 ML/year	44.37 ML/year	14173.67 ML/year	15

2.7.2 Accumulated Mean Annual Runoff - pre-European

Maximum	Minimum	Mean	Count
40729.08 ML/year	44.37 ML/year	14173.67 ML/year	15

2.7.3 Accumulated Catchment Area

Maximum	Minimum	Mean	Count
28077343.41 m²	30676.56 m²	9729262.42 m²	15

2.7.4 Accumulated Length

Maximum	Minimum	Mean	Count
31725.98 m	3690.77 m	19671.38 m	15

2.7.5 Local Catchment Area

Maximum	Minimum	Mean	Count
1413353.96 m²	30676.56 m²	369624.42 m²	15

2.7.6 Elevation Max

Maximum	Minimum	Mean	Count
569.00 m AHD	293.00 m AHD	371.40 m AHD	15

2.7.7 Elevation Min

Maximum	Minimum	Mean	Count
330.00 m AHD	283.00 m AHD	306.93 m AHD	15

2.7.8 Length

Maximum	Minimum	Mean	Count
1351.26 m	224.69 m	604.96 m	15

2.7.9 Mean Annual Runoff

Maximum	Minimum	Mean	Count
2001.04 ML/year	44.37 ML/year	529.16 ML/year	15

2.7.10 Strahler stream order

Maximum	Minimum	Mean	Count
5.00	1.00	3.20	15

2.7.11 Slope

Maximum	Minimum	Mean	Count
0.461230 rise/run	0.007489 rise/run	0.122111 rise/run	15

Attachment H

Transport Route

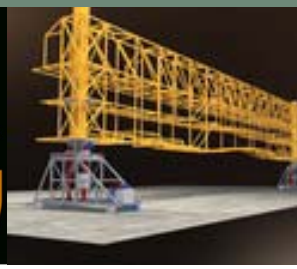
Map Projection:
GDA 1994 MGA Zone 55
Data sources:
Base image by TASMAP (C) State of Tasmania
Map produced by pitt&sherry Date: 7/09/2011
Map ref: HB11225_H009_TransportRoute_12P_RevA

pitt&sherry

Cleveland Luina

Proposed Transport Route

transport infrastructure | community infrastructure | industrial infrastructure | climate change



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ECOLOGICAL ASSESSMENT OF PROPOSED TAILINGS REPROCESSING PROJECT, CLEVELAND MINE, LUINA, NORTHWEST TASMANIA

Environmental Consulting Options Tasmania (ECO*tas*) for Bright Phase Resources Ltd

26 September 2011

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COVER ILLUSTRATION

Cover image: typical regenerating forest on the old tailings areas dominated by silver wattle (*Acacia dealbata*).

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SUMMARY

General

Bright Phase Resources Ltd (via Jim Lockley, Pitt & Sherry) engaged Environmental Consulting Options Tasmania to undertake an assessment of ecological values associated with a proposal to reprocess the old mine tailings at the Cleveland Mine site, Luina, northwest Tasmania.

The proposal is to reprocess the original mine tailings from the Cleveland Mine. There is approximately 4 million tonnes of tailings on the sites which is proposed to be mined and reprocessed on the site. The processing facilities are proposed to be located on the original mill site. The tailings from the reprocessing will be returned to the mined tailings area and the area rehabilitated. The reprocessing of the tailings on the site also proposes to alleviate the problem of acid mine drainage on the site by removing the acid producing metals and sulphides as the processing occurs.

The study area was assessed on 19 July 2011.

Summary of key findings

Threatened flora

- No flora species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.

Threatened fauna

- No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
- The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and Tasmanian devil, but it is unlikely that features such as nests or dens are present within the study area itself (no such features were detected), and no special management prescriptions are recommended (noting that rehabilitation of the area will be required).
- The wider area supports potential nesting habitat for the wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) but surveys did not detect any nests within the study area or within 1 km of the study area, so no deleterious impact on the species is anticipated.

Vegetation types

- Eight mapping units were identified from the study area (Figure 4), namely:
  - "*Acacia melanoxylon* forest on rises" (TASVEG code: NAR);
  - "*Eucalyptus obliqua* dry forest and woodland" (TASVEG code: DOB);
  - "*Eucalyptus obliqua* forest with broad-leaf shrubs" (TASVEG code: WOB);
  - "*Eucalyptus obliqua* forest over rainforest" (TASVEG code: WOR);
  - "*Nothofagus-Atherosperma* rainforest" (TASVEG code: RMT);
  - "extra-urban miscellaneous" (TASVEG code: FUM);
  - "permanent easement" (TASVEG code: FPE);
  - "regenerating cleared land" (TASVEG code: FRG).

- None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Weeds

- Several species of "declared" weed species, and some other exotic species with potential to act as "environmental weeds", were detected from the study area. Inclusion of weed management prescriptions in the DPEMP is recommended.

Plant and animal disease

- No evidence of plant and animal disease was noted. Inclusion of disease management prescriptions in the DPEMP is recommended.

Reserves

- The study area is within an "Informal Reserve" managed by Forestry Tasmania – some additional planning assessment protocols will need to be applied to satisfy Forestry Tasmania's internal protocols. In our opinion, the proposed works will result in a temporary modification of some native vegetation types but these are all already regrowth facies of the various communities after previous mining activities. As such, complex offsets are not recommended, provided that the area is rehabilitated to similar vegetation types.

Recommendations

The following values should be further considered, as part of DPEMP preparation:

- undertake an analysis of the potential risk of increase in mammal roadkill as a consequence of product transportation activities;
- include weed management and disease minimisation protocols in the DPEMP;
- liaise further with Forestry Tasmania and Mineral Resources Tasmania on the required management of the informal reserve;
- adhere to the *Quarry Code of Practice June 1999* (DPIWE 1999) and other recommendations applied by planning authorities in relation to mineral extraction works, transport of product and site rehabilitation.

BACKGROUND INFORMATION

Purpose

Bright Phase Resources Ltd (via Jim Lockley, Pitt & Sherry) engaged Environmental Consulting Options Tasmania to undertake an assessment of ecological values associated with a proposal to reprocess the old mine tailings at the Cleveland Mine site, Luina, northwest Tasmania.

The present report is primarily intended to allow Bright Phase Resources Ltd to take account of any identified ecological values in land use planning decisions and to later facilitate approvals under environmental planning systems including Commonwealth, State and local government processes, should such approvals become necessary.

Scope

This report relates to:

- flora and fauna species of conservation significance, including a discussion of listed threatened species potentially present, and other species of conservation significance/interest;
- vegetation types (forest and non-forest, native and exotic) present, including a discussion of the distribution, condition, extent, composition and conservation significance of each community;
- plant disease and weed management issues; and
- an initial discussion of some of the policy and legislative implications of the identified ecological values to facilitate further land use planning decisions.

This report follows, in a general sense, the government-produced *Guidelines for Natural Values Assessments* (DPIPWE 2009) in anticipation that the report (or extracts of it) may be used as part of various approval processes that may be required for activities on the site, including by the Department of Primary Industries, Parks, Water & Environment. The report format will also be applicable to other assessment protocols as required the Commonwealth Department of Sustainability, Environment, Water, Population & Communities (for any referral/approval that may be required under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*). Note that this level of assessment should also be appropriate to meet local government planning processes in relation to ecological values. The information contained in this report can also be used to satisfy the reporting and assessment protocols of Forestry Tasmania's State Forest Activity Assessments (SFAAs).

Limitations

In the case of the present assessment, there were no limitations with respect to access to the study area. Access was from existing access roads and tracks, and through easily traversed vegetation types.

The flora survey was undertaken on the 19 July 2011. Many plant species have ephemeral or seasonal growth or flowering habits, or patchy distributions (at varying scales), and it is possible that some species were not recorded for this reason (especially late spring-summer flowering grasses, herbs and lilies). However, every effort was made to sample the range of habitats present in the survey area to maximise the opportunity of recording the majority of species present (particular those of conservation significance). The authors are satisfied that the timing of the survey is appropriate to detect the majority of threatened flora species potentially present, based on several assessments of many parts of the north west region in recent years. The survey was also limited to vascular species: species of mosses, lichens and liverworts were not recorded.

However, a consideration is made of species (vascular and non-vascular) likely to be present (based on habitat information and database records) and reasons presented for their apparent absence. The fauna survey was restricted to an assessment of potential habitat only.

Qualifications

Except where otherwise stated, the opinions and interpretations of legislation and policy expressed in this report are made by the authors and do not necessarily reflect those of the relevant agency. The client should confirm management prescriptions with the relevant agency before acting on the content of this report.

Permit

All plant material was collected under DPIPWE permit TFL 10110 (in the name of Brian French). Relevant data will be entered into DPIPWE's *Natural Values Atlas* database by the authors. Some plant material may be lodged at the Tasmanian Herbarium by the authors.

THE STUDY AREA

The study area comprises of the old Luina township, extensive roads, rehabilitation areas, regrowth forest and oldgrowth forest with the Cleveland Mine site, Luina, northwest Tasmania (Figure 1), centred on 364834mE 5407369mN (GDA94, Luina 3640 1:25000 Tasmap).

The study area is underlain by Quaternary alluvial sand, gravel and mud, Cambrian ultramafic complexes, Cambrian basalts, and Cambrian mafic volcaniclastics. Much of the original geology and ground levels have been overlain by tailings from both the Clevelend Mine and introduced from the Hellyer Mine. Elevation is approximately 290 to 480 m a.s.l.

Land tenure and other categorisations of the study area are as follows:

- State forest;
- City of Waratah-Wynyard municipality;
- West and Southwest Bioregion (according to the description of IBRA 4 boundaries in the Forest Botany Manual);
- West Bioregion (according to the IBRA 5 boundaries used by several government agencies).

THE PROPOSAL

The proposal is to reprocess the original mine tailings from the Cleveland Mine (Figure 2) as the original mining from 1969 to 1986 by Aberfoyle did not claim more than 60% of the tin. Advances in mineral processing techniques have made it viable to reprocess mine tailings to win more ore. There is approximately 4 million tonnes of tailings on the sites which is proposed to be mined and reprocessed on the site. The processing facilities are proposed to be located on the original mill site. The tailings from the reprocessing will be returned to the mined tailings area and the area rehabilitated. The reprocessing of the tailings on the site also proposes to alleviate the problem of acid mine drainage on the site by removing the acid-producing metals and sulphides as the processing occurs.

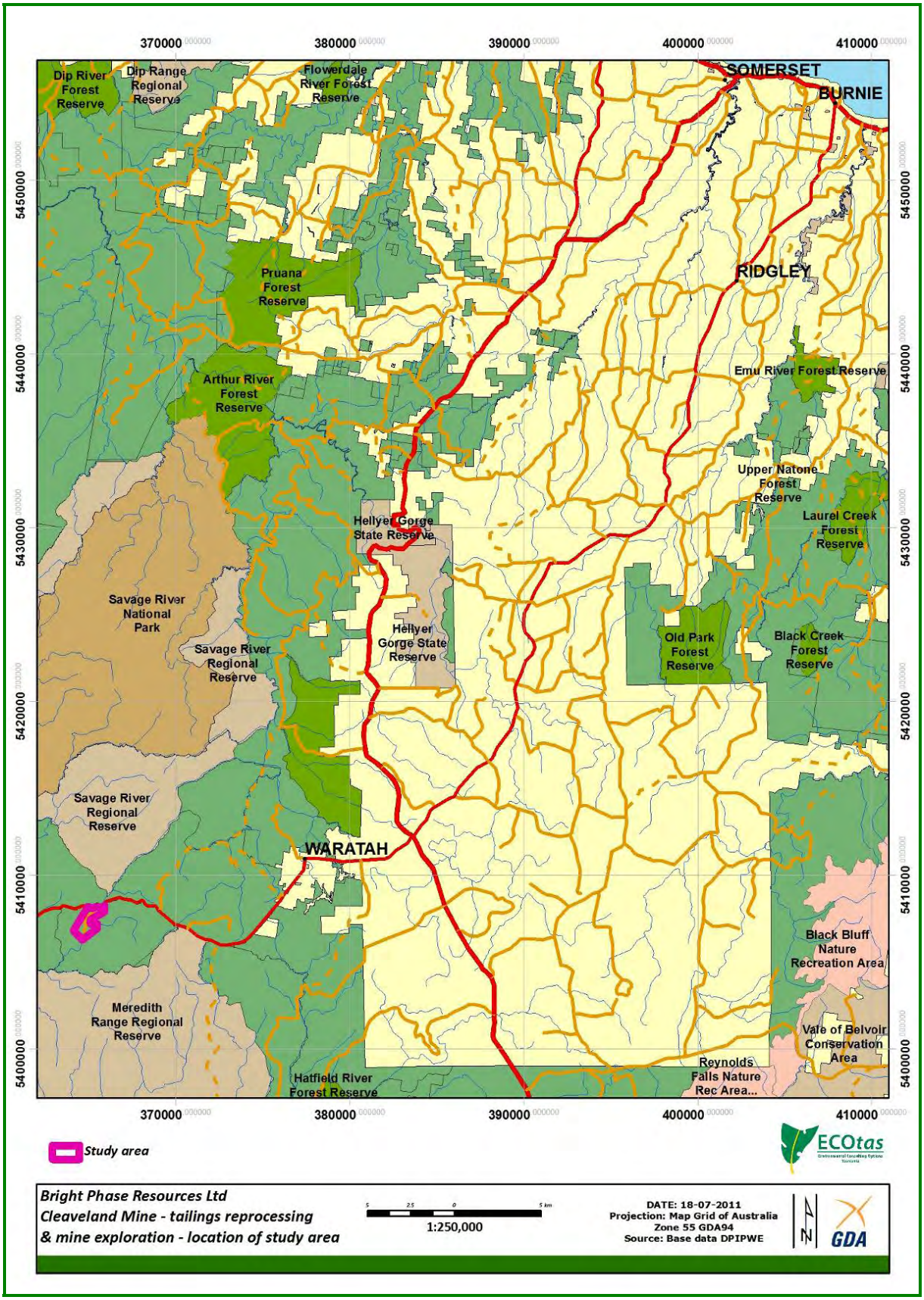


Figure 1. Location of the study area

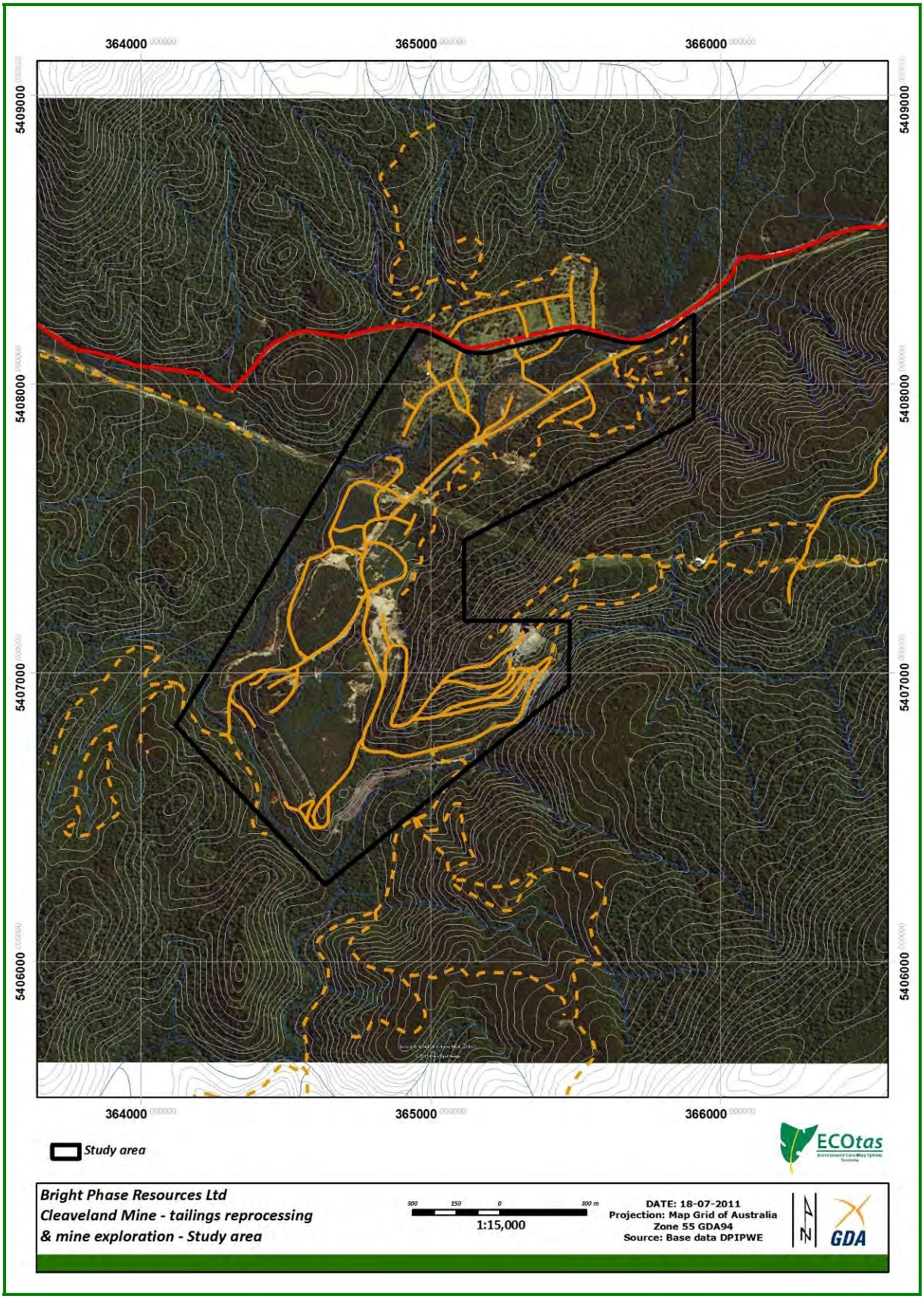


Figure 2. More detailed location of the study area

METHODS

Nomenclature

All grid references in this report are in GDA94, except where otherwise stated. Vascular species nomenclature follows Baker & Duretto (2011) for scientific names and Wapstra *et al.* (2005) for common names. Fauna species scientific and common names follow the listings in the cited *Natural Values Atlas* reports (DPIPWE 2011). Vegetation classification follows TASVEG, as described by Harris & Kitchener (2005).

Database analysis

The following sources holding ecological values information were interrogated, namely:

- the Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas*, accessed through the online Natural Values Report feature, producing a report titled *42807_ECOtas_Cleveland Mine_290711* (DPIPWE 2011; Appendix C);
- the Forest Practices Authority's online version of the *Threatened Fauna Manual* (now referred to as the *Fauna Values Database*) accessed through FPA's website (Luina 3640 1:25000 mapsheet report accessed 9 August 2011 (FPA 2011; Appendix D);
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Report* for coordinates: -41.46649,145.38134 -41.46641,145.38309 -41.46717,145.38476 -41.46717,145.38621 -41.46649,145.38887 -41.46664,145.39002 -41.46695,145.39139 -41.46679,145.39238 -41.46649,145.39352 -41.46557,145.39519 -41.46999,145.39481 -41.47288,145.38507 -41.47502,145.38491 -41.47517,145.38887 -41.47882,145.38895 -41.48461,145.37821 -41.47898,145.37212 -41.46649,145.38149 -41.46649,145.38134 dated 9 August 2011 (DEWHA 2011; Appendix E);
- the Department of Primary Industries, Parks, Water & Environment's *Conservation of Freshwater Ecosystem Values* database, accessed on 9 August 2011 (CFEV database, v1.0 2005; Appendix F);
- GoogleEarth aerial imagery (accessed by the author 19 July 2011).

Botanical survey

Botanical assessment of the study area took place on 19 July 2011 by Brian French (ECO*tas*). The primary purpose of the botanical assessment was to enable the production of a vegetation map showing the extent, condition and classification of each of the forest vegetation types present. Detection and confirmation of sites for threatened flora was also an objective of the assessment.

The survey aimed to assess the range of habitat types present in the study area (at the broad scale e.g. vegetation type, altitude variation, and at the finer scale e.g. microhabitats such as drainage depressions, disturbed sites, etc.).

Reference to topographic maps (Luina 3640 1:25000 Tasmap), vegetation maps (i.e. TASVEG) and aerial photography (GoogleEarth) established the approximate range and distribution of topographic and habitat variation present in the study area.

Detailed plots recording all vascular species, vegetation structure and site characteristics were undertaken in representative vegetation types. Running species lists, and additional species associated with specific vegetation types, habitat features or sites (e.g. drainage depressions etc.), were also recorded on the route through the study area. Plot data and species lists can be supplied on request (but note that relevant information is included in the report text).

Zoological survey

Potential habitat for threatened fauna (as listed on databases referred to above) was assessed by reference to the vegetation types and site characteristics present. The presence of mammals, birds, frogs and reptiles was determined by opportunistic discovery (e.g. sightings and calls) during the main botanical assessment, and evidence such as tracks, scats and other signs.

RESULTS

Vegetation types

Comments on TASVEG mapping

The following section, which comments on the existing TASVEG mapping for the study area, is included to highlight the differences between existing mapping and the more recent mapping from the present study to ensure that any parties assessing land use proposals (via this report) do not rely on existing mapping. Note that TASVEG mapping, which was mainly a desktop mapping exercise based on aerial photography, is often substantially different to ground-truthed vegetation mapping, especially at a local scale.

TASVEG mapping (as shown in the cited *Natural Values Atlas* report) dominantly maps the area as "*Eucalyptus obliqua* wet forest (undifferentiated)' (TASVEG code: WOU), "*Nothofagus-Phyllocladus* short rainforest" (TASVEG code: RMS) and "*Nothofagus-Atherosperma* rainforest (undifferentiated)" (TASVEG code: RMU) in the native forest areas within and adjacent to the study area west, "Extra-urban miscellaneous" (TASVEG code: FUM) and "Agricultural land" (TASVEG code: FAG) around the old mine workings and township and "Permanent easement" (TASVEG code: FPE) for power line easements at the site (Figure 3). The TASVEG mapping of the area is based on mapping from 2002 from aerial photography in 1995. "*Nothofagus-Atherosperma* rainforest undifferentiated" (RMU) is no longer listed as a TASVEG community by Harris & Kitchener (2005). The vegetation types recorded within the study area are discussed in detail below.

Vegetation types recorded as part of the present study

Vegetation types have been classified according to Harris & Kitchener (2005) *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. Conservation priorities alluded to in Table 1 are taken from Schedule 3A of the Tasmanian *Nature Conservation Act 2002* (DPIPWE 2011b). Table 1 provides information on the vegetation types identified from the study area with notes provided on condition. Further information on the vegetation types present and the vascular species composition in the different vegetation types is presented at Appendices A and B, respectively.

Figure 3 indicates the existing vegetation within the study area (as per TASVEG mapping) and Figure 4 indicates the revised vegetation mapping of the study area.

Eight mapping units were identified from the study area (Figure 4), namely:

- "*Acacia melanoxylon* forest on rises" (TASVEG code: NAR);
- "*Eucalyptus obliqua* dry forest and woodland" (TASVEG code: DOB);
- "*Eucalyptus obliqua* forest with broad-leaf shrubs" (TASVEG code: WOB);
- "*Eucalyptus obliqua* forest over rainforest" (TASVEG code: WOR);
- "*Nothofagus-Atherosperma* rainforest" (TASVEG code: RMT);
- "extra-urban miscellaneous" (TASVEG code: FUM);
- "permanent easement" (TASVEG code: FPE);
- "regenerating cleared land" (TASVEG code: FRG).

None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* (DPIPWE 2011b) or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. There are no management implications under State or Commonwealth vegetation legislation and policy.

Table 1. Vegetation communities present in study area

Areal values – top, bold (total hectares in study area); middle and bottom, italics (maximum hectares/percentage proportion likely to be disturbed – see also Figure 7)

Floristic code (FPA 2005)	**RFA Equivalent** (Anon 1997)	**TASVEG Equivalent** (Harris & Kitchener 2005)	**Conservation priority** FBM (FPA 2005) RFA (Anon 1997) TASVEG (DPIPWE 2011b)	**Area (ha)**	**Comments**
Non-forest	Non-forest	Extra-urban miscellaneous (FUM)	np N Not threatened	**17.92 ha** *6.41 ha* *35.77%*	This mapping unit is used to describe the quarry areas and old infrastructure sites, which are common across the site. Weed species were noted from a number of sites in and around the old Luina township area.
Non-forest	Non-forest	Permanent easement (FPE)	np N Not threatened	**3.71 ha** *1.63 ha* *43.97%*	FPE describes the large power transmission lines that cross the centre of the study area. The vegetation associated with the power lines is "managed" with regular fire management clearing occurring. There were no weed species noted from this mapping unit.
Non-forest	Non-forest	Regenerating cleared land (FRG)	np N Not threatened	**48.57 ha** *43.20 ha* *88.94%*	FRG is the dominant mapping unit across the study area. FRG in this case is used to describe the actively rehabilitated tailings dump areas, old quarry sites and workshop areas which are being "recolonised" by native plant species or have had native seed sown to encourage rehabilitation.
SWAMP-D4	*Acacia melanoxylon* forest on rises (BR)	*Acacia melanoxylon* forest on rises (NAR)	np N Not threatened	**8.36 ha** *1.25 ha* *14.96%*	NAR occurs on the slopes around Washington Creek in the south of the study area and along the Whyte River in the north of the study area.
DRY-shOB	Dry *Eucalyptus obliqua* forest (O)	*Eucalyptus obliqua* dry forest (DOB)	np N Not threatened	**4.29 ha** *3.86 ha* *89.78%*	DOB is a localised small remnant of forest in the south of the study area. DOB occupies the relatively dry northern slopes of the hill above an old quarry area. No weed species were noted at this site.

Floristic code (FPA 2005)	**RFA Equivalent** (Anon 1997)	**TASVEG Equivalent** (Harris & Kitchener 2005)	**Conservation priority** FBM (FPA 2005) RFA (Anon 1997) TASVEG (DPIPWE 2011b)	**Area (ha)**	**Comments**
WET-OB2	Tall *Eucalyptus obliqua* forest (OT)	*Eucalyptus obliqua* forest with broad-leaf shrubs (WOB)	np N Not threatened	**49.31 ha** *23.7 ha* *48.06%*	WOB is common on the relatively dry northern slopes of Crescent Spur and also as a transitional community between the rainforest (RMT) and mixed forest (WOR) communities across the study area (see below). This community is in good condition with no weeds recorded.
WET-OB1000	Tall *Eucalyptus obliqua* forest (OT)	*Eucalyptus obliqua* forest over rainforest (WOR)	np N Not threatened	**27.71 ha** *1.26 ha* *4.55%*	WOR occurs in the moist and fertile lower slopes on the southern end of Crescent Spur and adjacent to the Whyte River and Washington Creek in the south. This community is gradational with WOB as moisture availability decreases and RMT in moist, fertile and undisturbed sites. This community is in good condition with no weeds recorded.
RAIN-C1.1	Callidendrous & thamnic rainforest on fertile sites (M+)	*Nothofagus-Atherosperma* rainforest (RMT)	np N Not threatened	**1.90 ha** *0.04 ha* *2.10%*	RMT occurs in small areas in the west of the study area, adjacent to the Whyte River. This community occurs on the moist and fertile lower slopes where disturbance has not occurred for a very long time period. This community is in good condition and no weeds species were recorded.

Plant species

General observations

A total of 86 vascular plant species were recorded from the study area, comprising 53 dicotyledons (including 12 endemic and 5 exotic species), 14 monocotyledons (including 0 endemic and 1 exotic species), 1 gymnosperm (endemic), and 18 pteridophytes (all native).

Priority species recorded from the study area

No species, listed as threatened on the Tasmanian *Threatened Species Protection Act* 1995 or the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, were recorded from the study area. The vegetation types identified from the study area (Table 1, Figure 4) are not usually strongly associated with threatened flora, especially disturbed and disclimax facies of the vegetation types present.

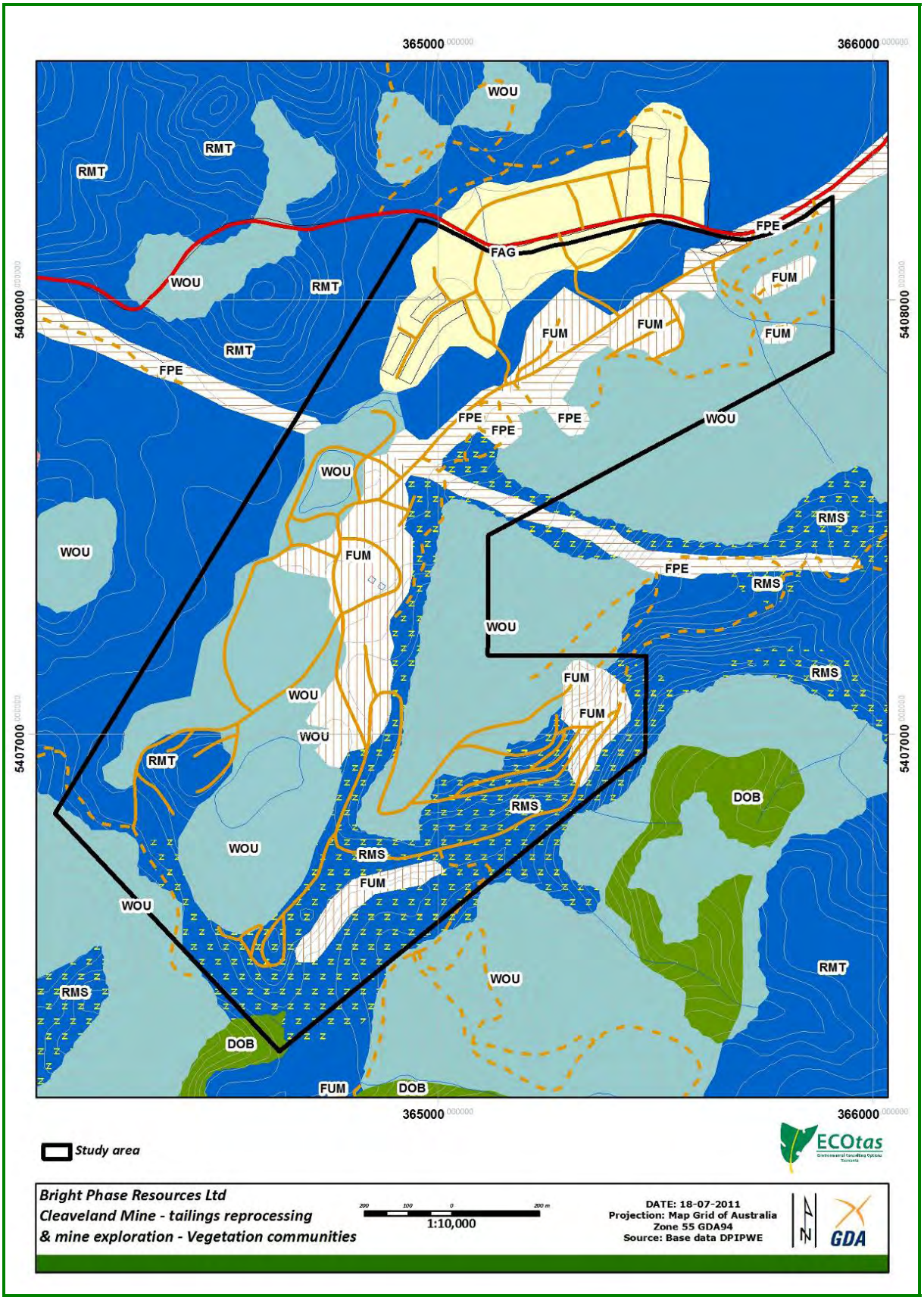


Figure 3. Existing TASVEG vegetation mapping of the broader study area

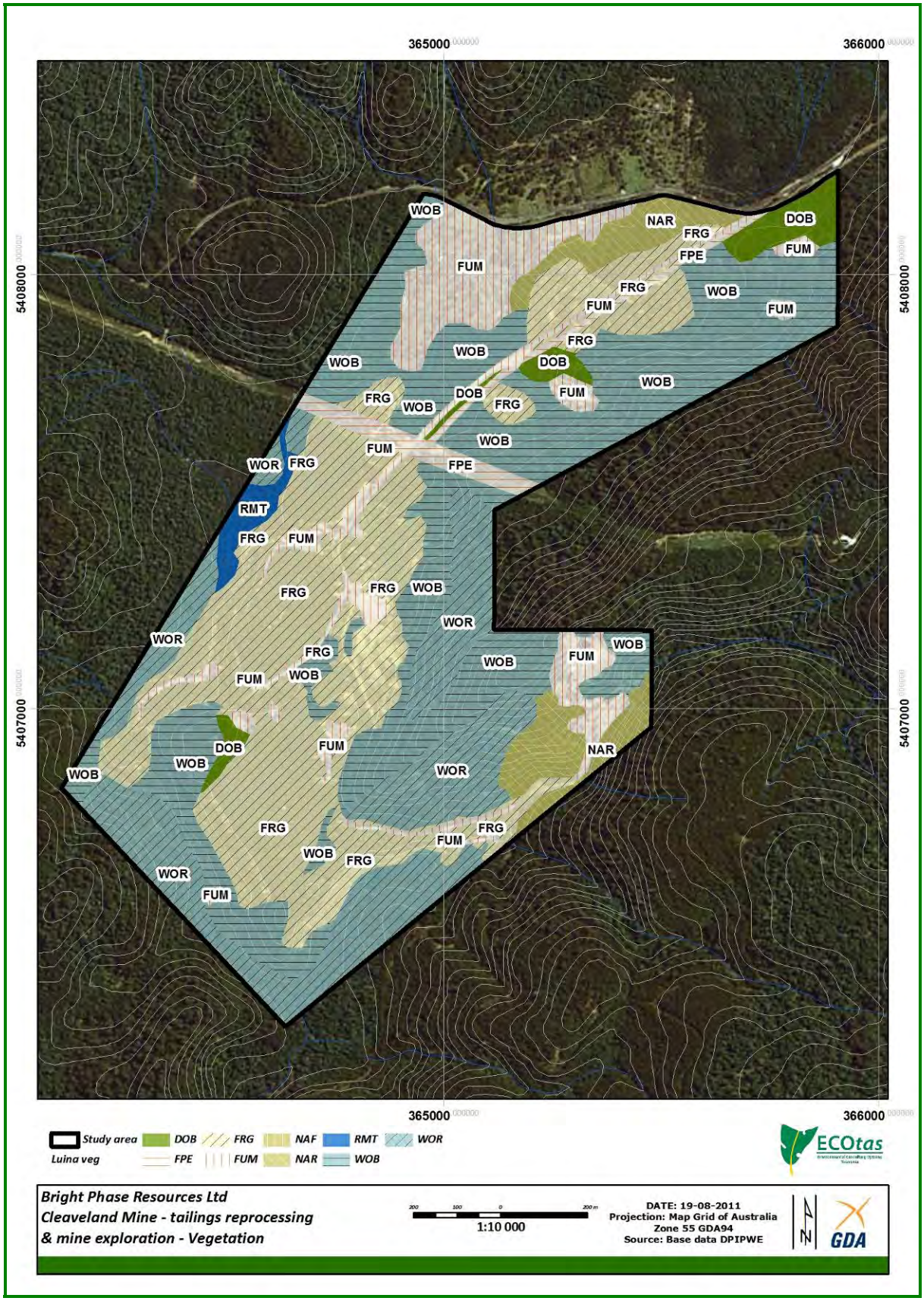


Figure 4. Revised vegetation mapping of the study area

Priority flora recorded from databases

Table 2 provides a listing of priority flora from within 500 m and 5000 m of the study area, with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded. Note that the survey was not restricted to the species listed in Table 2 but considered the potential presence of any threatened flora.

Table 2. Priority flora records from within 5000 m of boundary of study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas* (DPIPWE 2011a) and other sources where indicated. Habitat descriptions are taken from TSU (2003), except where otherwise indicated.

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
Records within the study area			
There are no records within the study area.			
Records within 500 m of the study area			
There are no records within 500 m of the study area.			
Records within 5000 m of study area			
Comesperma defoliatum (leafless milkwort)	r -	1 record alongside the Heazlewood River to the west of the study area	The preferred habitat of this species (heathy forests, heathlands and moorlands) is absent from the study area. This record is very old (c. 1930) and where the record is located is not the preferred habitat of this species. There are no other records for this species in the area. This species was not detected.
Epacris glabella (smooth heath)	e EN	Numerous records in the Caudrys Hill/Heazlewood River area to the west of the study area	This endemic species is only known from the ultramafic serpentinite substrates to the west of the study area in heathy moorlands, scrub and heathy *Eucalyptus nitida* woodlands. These habitat types are entirely absent from the study area. This species was not detected.
Hypolepis muelleri (harsh groundfern)	r -	1 record on the northern slopes of Mt Cleveland in O'Bones Creek	This species has the potential to occur in any of the wet forest types that occur within the study area. This distinct fern species was not detected..
Micrantheum serpentinum (western tridentbush)	r -	Numerous records in the Caudrys Hill/Heazlewood River area to the west of the study area	This endemic species is only known from the ultramafic serpentinite substrates to the west of the study area in heathy moorlands, scrub and heathy *Eucalyptus nitida* woodlands. These habitat types are entirely absent from the study area. This species was not detected.
Viola cunninghamii (alpine violet)	r -	1 record on the plains to the west of Waratah	This species is under taxonomic revision due to a large number of misidentifications in the past. The main known habitat for this species is subalpine meadows and grassy woodlands, habitat types entirely absent from or near the study area. The common *Viola hederacea* was recorded from within the study area.

Priority fauna

Priority species recorded from the study area

No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were recorded from within the study area. The area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and tasmanian devil, but it is unlikely that features such as nests or dens are present (see discussion in Table 3 for more details).

Priority fauna recorded from databases

Table 3 lists threatened fauna species recorded from within 5 km of the study area and discusses the potential of these species to be present on the site, based on the predicted vegetation types, site characteristics derived from the information provided, ecological assessment of nearby areas, and the author's knowledge of the species and the wider area.

Table 3. Priority fauna records from within 5000 m of boundary of study area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the DPIPWE's *Natural Values Atlas* (DPIPWE 2011a) and FPA (2011).

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
Records within the study area			
There are no records within the study area.			
Records within 500 m of the study area			
There are no records within 500 m of the study area.			
Records within 5000 m of the study area			
Sarcophilus harrisii (tasmanian devil)	e EN	1 database record	Potential habitat (which is virtually any vegetation type) is present within the study area. The study area is likely to form part of the home range of one or more individuals or pairs. No evidence of the species (including sightings, scats, dens and latrine sites) was detected from the study area. See discussion below table for further information on this species.
Potential habitat within 5000 m of the study area			
Accipiter novaehollandiae (grey goshawk)	e -	No database records	FPA (2011) and DPIPWE (2011a) indicate the potential for this species to occur in the area. FPA (2011) describes potential habitat as "wet eucalypt forest with blackwood/myrtle

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
			understorey, blackwood swamp, *E. brookeriana* wet forest, melaleuca and leptospermum forest". Based on the field assessment, some of these habitat elements are present in the study area. No nest sites were detected during the course of the field assessment. It is unlikely that the proposed development will result in a significant impact on potential foraging and nesting habitat at a local scale because the majority of works will be restricted to previously disturbed areas.
Aquila audax subsp. *fleayi* (wedge-tailed eagle)	e EN	No records within 5000 m of the study area.	Potential habitat is described as "large tracts (more than 10 ha) of eucalypt or mixed forest" (FPA 2011). This habitat is extensive surrounding the study area. No nest sites were detected during the course of the field assessment. It is likely that the area is used as foraging habitat. See discussion below table for recommendations on additional search requirements.
Beddomeia bellii (hydrobiid snail – Rapid River)	r -	No database records	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2011). The study area is within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Beddomeia hullii (hydrobiid snail - Heazlewood River)	r -	6 database records	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2010a). The study area is 2 km from the known locality of this species (Thirteen Mile Creek) and is not within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Dasyurus maculatus subsp. *maculatus* (spotted-tailed quoll)	r VU	5 database records	Potential habitat is described (for both the eastern and spotted-tailed quolls) as "all wetter forest types, coastal heath and bush-pasture interfaces" (FPA 2011). The study area meets this broad habitat description and is likely to form part of the home range of one or more individuals or pairs. However, at a local scale, the proposed tailings mining and the loss of potential habitat is small relative to the large expanses of habitat in the wider area. The works would not result in a "significant impact" on the habitat of the species, as defined by the guidelines (CofA 2009) related to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Lathamus discolor (swift parrot)	e EN	1 database record	Potential habitat is described as "Breeding range (comprising foraging and nesting habitat) is within 10 km of the coastline (nearest coast including shores, bays, inlets or peninsulas). Foraging habitat: all *Eucalyptus ovata – E. viminalis* shrubby forest (OV), grassy *E. globulus* forest (GG) and *E. globulus* wet forest floristic communities

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
			(subsumed into R) or any forest type with >10% *E. globulus* canopy cover. Nesting habitat: *Eucalyptus* trees present > 70 cm dbh, with hollows present" (FPA 2011). The database record most likely represents a sighting of a migrating/dispersing/vagrant individual. The study area is outside the predicted range of the species (FPA 2011). The proposed development will have no impact on this species.
Oreixenica ptunarra (ptunarra brown butterfly)	v -	No database records	Potential habitat, which is described as "native grasslands or grassy woodlands with tussock grass (*Poa*) cover of more than 15%" (FPA 2011), is absent from within or adjacent to the study area.
Phrantela annamurrayae (hydrobiid snail – Heazlewood River)	r -	1 record	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2011). The study area is 6.5 km from the known locality of this species (Heazlewood River) and is not within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Phrantela marginata (hydrobiid snail – Heazlewood River)	r -	2 database records	Potential habitat is described as "immediate catchment of the stream in which the known locality occurs" (FPA 2010a). The study area is 5 km from the known locality of this species (Heazlewood River) and is not within a catchment supporting or likely to support the species (based on a predicted range boundary map provided to M. Wapstra from the Forest Practices Authority).
Sarcophilus harrisii (tasmanian devil)	e EN	5 database records	See comments in section below table.
Thylacinus cynocephalus (thylacine)	x EX	2 database records	Species presumed extinct – no further comments.
Tyto novaehollandiae subsp. *castanops* (Tasmanian masked owl)	e VU	No database records	Potential habitat is described as "lowland dry sclerophyll forest with old growth components" (FPA 2011), although the species can extend into wetter forest types. The forests surrounding the study area are wetter forest types with old-growth components present. The study area may form part of the home range of one or more pairs, and provide foraging, nesting and/or roosting habitat. However, the proposed development will not result in the substantial removal of potential foraging, roosting or nesting habitat.
Additional species from* Protected Matters Report *(DSEWPC 2011), and not considered in above sections			
Apus pacificus (fork-tailed swift)	Migratory Marine Species	No database records	Aerial foraging bird that rarely lands – proposed development will have no significant impact.
Ardea alba (great egret)	Migratory Wetland & Marine Species	No database records	Potential habitat absent – proposed development will have no significant impact.

Species	***Status*** *TSPA* *EPBCA*	***Observations***	***Comments***
Ardea ibis (cattle egret)	Migratory Wetland & Marine Species	No database records	Potential habitat absent – proposed development will have no significant impact.
Botaurus poiciloptilus (australian bittern)	- EN	No database records	Potential habitat absent – proposed development will have no significant impact.
Ceyx azureus subsp. *diemensis* (Tasmanian azure kingfisher)	e EN	No database records	Potential habitat (tree-lined major river systems) marginally present adjacent to the study area but the stream stretches are unsuitable for both foraging and nesting by the species due to the existing levels of disturbance and combination of habitat characteristics (Wapstra et al. 2010).
Gallinago hardwickii (lathams snipe)	Migratory Wetland Species	No database records	Potential habitat absent – proposed development will have no significant impact.
Hirundapus caudacutus (white-throated needletail)	Migratory Terrestrial Species	No database records	Aerial foraging bird that rarely lands – proposed development will have no significant impact.
Prototroctes maraena (australian grayling)	v VU	No database records	Potential habitat absent (lower to middle reaches of rivers and streams, FPA 2011) – proposed development will have no significant impact.

Wedge-tailed eagle

The forests surrounding the study area support suitable potential nesting habitat for the wedge-tailed eagle. Generally, the forests on the steeper slopes are dominated by *Eucalyptus obliqua* with an old-growth element present consisting of very old senescent trees with suitable nesting sites present. A ground-based survey was conducted of suitable habitat surrounding the study area, which consisted of a visual assessment from open ground in the Luina/Cleveland mine site area using binoculars and walking to more inaccessible gullies that had suitable nesting habitat. No nests were located, however, it should be noted that visibility was impeded in some areas due to the thick understorey of the forest communities present.

Figure 5 indicates the area of forest recommended for aerial searching for the possible presence of wedge-tailed eagle nests. The area is based on an interpretation of PI (photo-interpretation) forest types, vegetation maps, topography maps, aerial imagery and experience of the veracity of such sources at the local scale (based on the recent vegetation mapping undertaken as part of the present assessment). A 1 km buffer was employed because the proposed mine site is a long-term feature in the landscape rather than a short-term disturbance, and there is potential for nest sites within 1 km that may be in line-of-sight (one of the important management considerations). Ground-based searches in dense wet forests is not recommended (FPA 2006). Aerial (helicopter) searching is the most appropriate means of maximising the opportunity of nest detection. It should be noted that Forestry Tasmania have not conducted searches for nests within the last 3 years in the areas indicated in Figure 5 (E. Barker, Forestry Tasmania, pers. comm. August 2011).

Two opportunities to undertake aerial searches were presented because (1) suitably qualified personnel were able to accompany a pre-planned flight by Helicopters Tasmania to the west coast for other reasons, and (2) Bright Phase personnel were undertaking aerial reconnaissance of the lease area. As part of these flights, the lease area was assessed from the air (primarily for project appreciation and exploration lease investigation including assessing acid mine drainage extent down river systems and context of lease area relative to land tenure and roads, etc.), which provided the opportunity to survey the recommended forest patches for nests (based on Figure 5 but adapted in the air according to actual suitability for supporting nests). No nests were detected as a consequence of these surveys, which are reported in Figure 5 and Table 4.

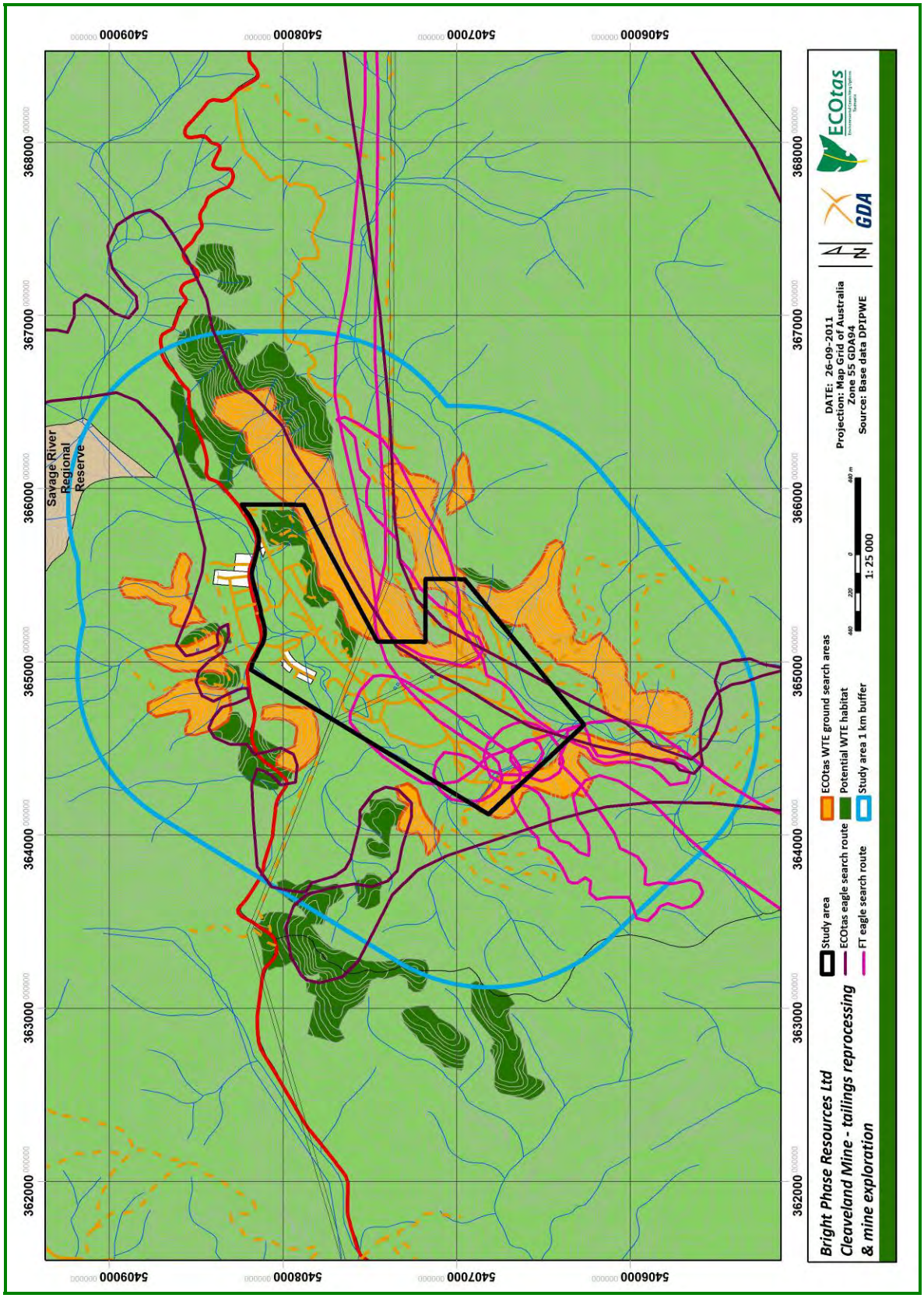


Figure 5. Maximum recommended search areas for wedge-tailed eagle nests indicating actual search area – the map should be read in conjunction with Table 4, which describes the survey area in more detail (buffers indicating sightability distance on the aerial routes not shown for readability reasons)

Table 4. Summary of surveys for wedge-tailed eagle nests within and adjacent to the study area

Action	*Date*	*Personnel*	*Findings*
Previous searches of study area			
Liaison between ECO*tas* and Forestry Tasmania	N/A	N/A	Correspondence between Mark Wapstra and Emma Barker (Forestry Tasmania, Murchison District) established that Forestry Tasmania have not undertaken aerial or ground-based searches for wedge-tailed eagle nests from any part of the recommended search area in the last 3 years
Potential nesting habitat assessment			
Map-based habitat assessment supplemented with field knowledge	15/08/2011	Brian French (ECO*tas*)	See Figure 5 and explanatory notes above – map produced is conservative and targets all areas of forest cover apparently supporting patches of more mature eucalypt forest, virtually irrespective of topographic (shelter) features
Map-based habitat assessment	27/08/2011	Simon McNamara (Forestry Tasmania)	Utilised Forestry Tasmania's PI (photo-interpretation) maps pf forest structure and composition to delineate potential nesting habitat (this map produced a smaller recommended search area that that shown in Figure 5 because it targeted definitive old-growth patches rather than the broader more conservative map of mature eucalypt patches shown in Figure 5) – both methods of pre-assessment are appropriate
Search of potential nesting habitat			
Ground-based	19/07/2011	Brian French (ECO*tas*)	Entire lease area searched for nests during routine ecological assessment – majority of vegetation within lease area highly unsuitable (disturbed regrowth forest) – **no nests detected** Limited searching of forest patches visible with binoculars from Waratah Road, township of Luina and powerline easement but visibility into dense forest patches hampered by density of vegetation and topography – aerial survey indicated as necessary – **no nests detected**
Ground-based	27/08/2011 31/08/2011	Mike Adams, Will Goodall (Bright Phase)	Ground-based search of forested slopes along c. 500 m of Waratah Road east of the old Luina township – **no nests detected**
Aerial search	26/08/2011	Simon McNamara (Forestry Tasmania) Mike Adams, Will Goodall (Bright Phase) Darryl Taylor (Tasmanian Helicopters – pilot)	Helicopter-based search of potential nesting habitat: • **no nests detected** • search path shown in Figure 5 • search time c. 45 minutes • weather suitable for most of survey with visibility of several hundred metres either side of flight path; closed in near end limiting visibility and flight safety indicating further searching required
Aerial search	22/09/2011	Mark Wapstra (ECO*tas*) Mike Adams, Will Goodall (Bright Phase) Bruce Colwell (Tasmanian Helicopters – pilot)	Helicopter-based search of potential nesting habitat: • **no nests detected** • search path shown in Figure 5 • search time c. 45 minutes • weather ideal for detecting nests, visibility several hundred metres on either side of flight path

Tasmanian devil

The Tasmanian devil has a widespread distribution, occurring in a range of vegetation types. FPA (2011) describes potential habitat as including "dry to damp forest, woodlands and grassy woodlands, coastal scrub, and riparian areas". Some of these habitat elements are present within and surrounding the study area, although it is noted that the majority of the study area and surrounds are dominated by anthropogenically created vegetation types and wet eucalypt and rainforest vegetation types.

No evidence of the species was detected from the study area. This evidence includes sightings (e.g. live animals, roadkill, skulls, etc.), scats (which, if present, would have been easily detected along the numerous old tracks and open areas), latrine sites (as for scats), and dens. Dens can be difficult to detect because they can be cryptic (e.g. old wombat burrows, underneath piles of logs, etc.) but no likely sites were observed. It is possible that surrounding areas support dens but the predominance of dense wet sclerophyll, mixed forest and rainforest types is suggestive that surrounding areas are unlikely to be prime habitat for the species.

The Commonwealth Department of Sustainability, Environment, Water, Population & Communities provides a *Significant Impact Guidelines* policy statement (CofA 2006) to determine if referral to the department is required in relation to the Tasmanian devil for development proposals, as follows (noting that the guidelines were developed in 2006 when the species was listed as Vulnerable – it is now listed as Endangered):

Significant impact criteria – vulnerable species

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- introduce disease that may cause the species to decline
- lead to a long-term decrease in the size of an important population of the species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of the species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat *or*
- interfere substantially with the recovery of the species.

Examples of activities that *may require* referral under the EPBC Act in relation to the Tasmanian Devil include any actions that may assist or accelerate the spread of DFTD (such as the moving of diseased individuals into an area which is currently disease-free), the construction of new roads or substantial upgrades to existing roads in sensitive locations, and any actions that involve the loss or intensified use of large or important areas of Tasmanian Devil habitat such as clearing for urban development, flooding associated with dam building, or the intensifying or changing of agricultural land use.

In relation to the Tasmanian Devil, the EPBC Act is unlikely to apply to the death of individuals along existing roads – see *What about Tasmanian Devils being killed on roads?* for further details. The EPBC Act is also unlikely to apply to minor new works that will only affect a small number of Tasmanian Devils in areas that are disease-free. However, in areas affected by DFTD where only a few breeding females may remain, an action that will have or is likely to have an impact on even a small number of Tasmanian Devils may be significant, and therefore the EPBC Act may apply.

Actions undertaken as part of official disease suppression programmes, such as removing diseased individuals from wild populations and establishing disease-free captive populations, are not regarded by the Department of the Environment and Heritage to be likely to have a major adverse impact on Tasmanian Devil populations.

Individuals and organisations should consider the particular facts and circumstances of their activities in deciding whether there is a need to make a referral under the EPBC Act. You must make a referral for an activity if you think it may be likely to have a significant impact on a listed threatened species.

The current development proposal will essentially re-work and rehabilitate old mine workings, and no specific evidence of occupation by the Tasmanian devil has been detected. The current proposal will not: (1) introduce disease that may cause the species to decline; (2) lead to a long-term decrease in the size of an important population of the species (no evidence of the species within the study area); (3) reduce the area of occupancy of an important population (as for 2, and in the long-term the extent of potential habitat will not be reduced – potential habitat likely to be increased through rehabilitation activities); (4) fragment an existing important population into two or more populations (as for 2, and proposed works will not actually fragment habitat in the short or long term); (5) adversely affect habitat critical to the survival of the species (as for 2, 3 and 4); (5) disrupt the breeding cycle of an important population (no evidence of a breeding population being present); (6) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline (as for 2, 3, 4, 5); (6) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat (the proposed works will not alter the access to the study area and will effectively only re-work old mine workings); (7) interfere substantially with the recovery of the species (the study area does not form part of a specific element of the recovery program of the species).

Weed species

Four species classified as "declared weeds" within the meaning of the Tasmanian *Weed Management Act 1999* were recorded:

- *Erica lusitanica* (spanish heath);
- *Cytisus scoparius* (english broom);
- *Rubus fruticosus* .agg (blackberry); and
- *Salix* sp. (willow).

All of the weeds generally occur in and around the old Luina township. It is likely that *Erica lusitanica* (spanish heath) is a garden escapee with a widespread occurrence in the old town area (Figure 6). *Rubus fruticosus* .agg (blackberry) is scattered and is not considered a management problem at the present and *Salix* sp. (willow) is isolated to one small tree in a wet area on the northern area of the mine workings (Figure 6).

Other potentially invasive species recorded include:

- *Chasmanthe floribunda* (african cornflag);
- *Cirsium vulgare* (scotch thistle);
- *Cotoneaster* sp. (cotoneaster); and
- *Digitalis purpurea* (foxglove).

These species were also confined to the old Luina town site. These species are not listed on the Tasmanian *Weed Management Act 1999*. Currently, these species do not pose a management threat. However, long term management should be considered for all the species whilst they are confined to a small area within the Luina township and are easily accessible.

The study area falls within the Waratah-Wynyard municipality, for which the following criteria apply to the detected species:

- *Erica lusitanica* (spanish heath): Zone A ("localised infestations");
- *Cytisus scoparius* (english broom): Zone B ("widespread infestations");
- *Rubus fruticosus* (blackberry): Zone B ("widespread infestations"); and
- *Salix* spp. (willows): Zone B ("widespread infestations").

Figure 6. Weed locations within the study area

In relation to "Zone A" species, "eradication", within the meaning of the *Weed Management Act 1999*, is the most appropriate management objective for municipalities who have localised and moderate infestations and where effective management is feasible. The management outcome for these municipalities is ongoing eradication and prevention of the spread of declared weeds from existing infestations to areas free or in the process of becoming free of these weeds.

In relation to "Zone B" species, "containment", within the meaning of the *Weed Management Act 1999*, is the most appropriate management objective for municipalities who have problematic infestations but no plan and/or resources to undertake control actions at a level required for eradication. The management outcome for these municipalities is ongoing prevention of the spread of declared weeds from existing infestations to areas free or in the process of becoming free of these weeds.

The main concern is to minimise the risk of invasive exotic species becoming more widely established in the municipality. Follow up management (e.g. hand-spraying of weed outbreaks) should be considered for these species to inhibit invasion to surrounding forest areas. A more complex site-specific weed management plan is not considered warranted at this stage but should form part of the DPEMP.

Disease management

Phytophthora cinnamomi

The *Forest Botany Manual* (FPA 2005) and Rudman (2005) indicate that "*Eucalyptus obliqua* dry forest" (DOB) is moderately susceptible to the root-rot pathogen *Phytophthora cinnamomi.* No evidence of the pathogen was noted. Due to the disturbed nature of the vegetation and the lack of susceptible plant species to the pathogen, no special management prescriptions are considered warranted.

Myrtle wilt

Myrtle wilt, caused by a wind-borne fungus (*Chalara australis*), occurs naturally in rainforest where myrtle (*Nothofagus cunninghamii*) is present. The fungus enters wounds in the tree, usually caused by damage from wood-boring insects, wind damage and forest clearing. The incidence of myrtle wilt often increases forest clearing events.

No evidence of myrtle wilt was recorded from within the study area. The proposed mining activities have the potential to increase the susceptibility of the surrounding rainforest areas to become infected with myrtle wilt, although given that the majority of works will be undertaken in heavily disturbed forest (e.g. old tailings sites), no special management prescriptions are considered warranted.

Chytrid fungus and other freshwater pathogens

Native freshwater species and habitat are under threat from freshwater pests and pathogens including *Phytophthora cinnamomi* (root rot), *Batrachochytrium dendrobatidis* (Chytrid frog disease), *Mucor amphibiorum* (platypus Mucor disease) and the freshwater algal pest *Didymosphenia geminata* (Didymo) (Allan & Gartenstein 2010). Freshwater pests and pathogens are spread to new areas when contaminated water, mud, gravel, soil and plant material or infected animals are moved between sites. Contaminated materials and animals are commonly transported on boots, equipment, vehicles tyres and during road construction and maintenance activities. Once a pest pathogen is present in a water system it is usually impossible to eradicate. The manual *Keeping it Clean - A Tasmanian Field Hygiene Manual to Prevent the Spread of*

Freshwater Pests and Pathogens (Allan & Gartenstein 2010) provides information on how to prevent the spread of freshwater pests and pathogens in Tasmanian waterways wetlands, swamps and boggy areas. At present there are no specific guidelines for mineral extraction works but minimising the spread of soil, gravel and water between catchments is strongly recommended. It is noted that the study area does not support, and is not likely to support, threatened frog species.

Other matters of potential ecological significance

Matters of National Environmental Significance – threatened ecological communities

The EPBCA *Protected Matters Area* report (DSEWPC 2011) indicates that "Alpine Sphagnum Bogs and Associated fens" (classified as Endangered under the EPBCA) may occur within the area. No such vegetation types were identified from within or close to the study area.

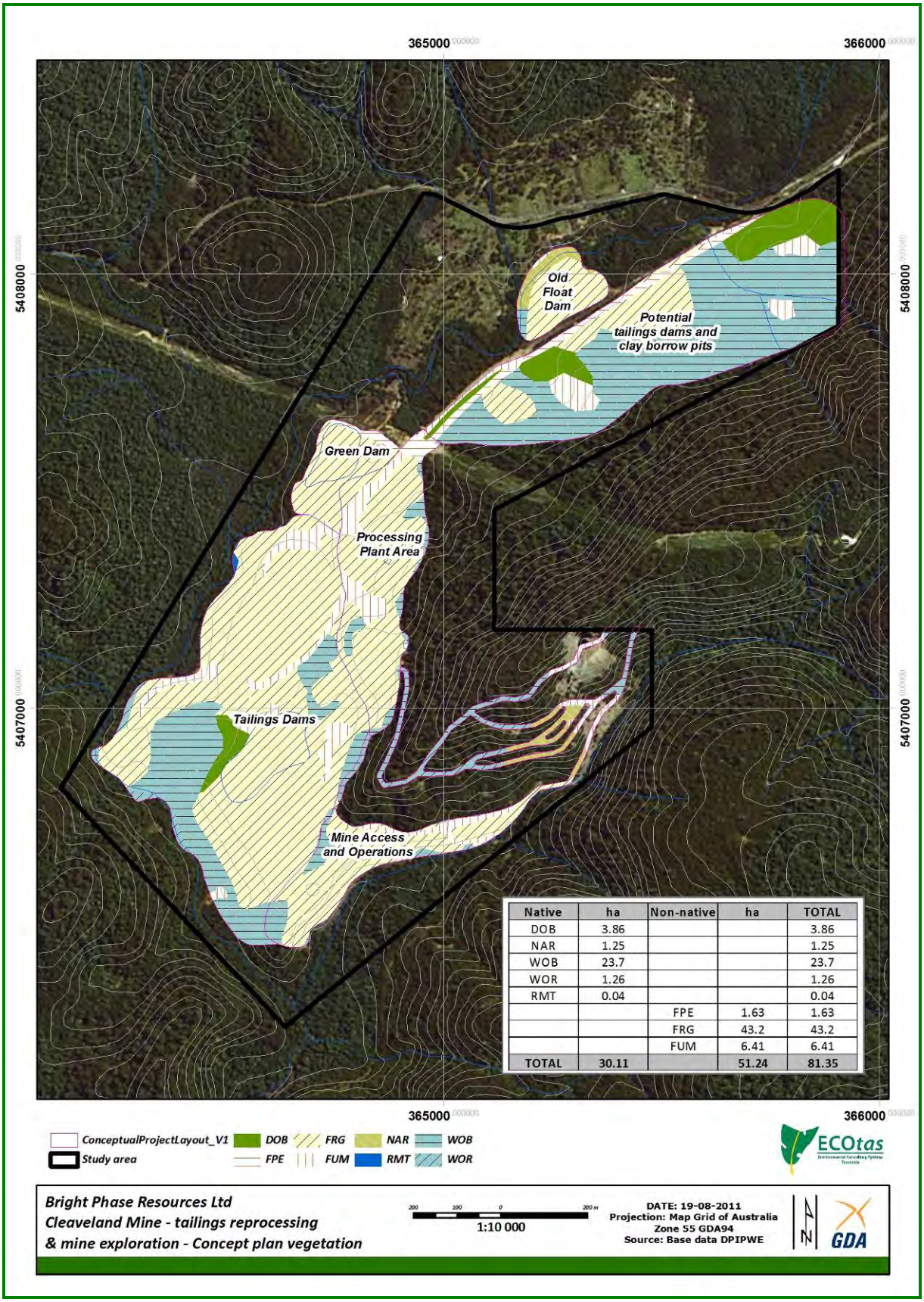
Matters of National Environmental Significance – places on the Register of the National Estate

The EPBCA *Protected Matters Area* report (DSEWPC 2011) indicates that the "Tarkine TAS" (indicative place) and "Tarkine Wilderness Area TAS" (registered) are potentially within the vicinity of the study area. While the Luina township area is embedded within the "Tarkine Might Have Values Area", the entirety if the study area is actually excluded from the MHV area (see http://www.environment.gov.au/heritage/ahc/national-assessments/tarkine/pubs/tarkine-map-2011.pdf).

Informal reserve on State Forest

The entirety of the study area is indicated as being part of an "Informal Reserve on State Forest". Advice received from Forestry Tasmania (email from Ronny Tyquin to Pitt & Sherry, and also confirmed from an email from Emma Barker to Mark Wapstra) indicated that the area has been dedicated as an "Informal Reserve" primarily for "flora values", possibly as a result of the Community Forest Agreement. Forestry Tasmania have internal planning processes for assessing non-wood production activities within reserved managed by that agency. Bright Phase Resources Ltd (either direct or through Pitt & Sherry) will need to liaise further with Forestry Tasmania through Mineral Resources Tasmania. A possible "offset" for loss of flora values has been suggested as a planning approval requirement. In this case, our report has indicated that the flora values present have low conservation significance (see Table 1 and Figure 4 for list of vegetation types – all not threatened or of regional conservation significance; and Table 2 for list of threatened flora potentially present – none actually detected). In our opinion, if mining activities are essentially restricted to disturbed areas (and mainly non-forest vegetation types, exotic mapping units, regrowth forest or disclimax forest) and re-worked areas are rehabilitated to native vegetation, formal offsetting should not be required.

Figure 7 shows the predicted maximum extent of disturbance associated with the development proposal, which was overlain with our revised vegetation mapping (Figure 4). The table on Figure 7 clearly indicates that the majority of disturbance will occur on anthropogenically created mapping units. Activities in native vegetation mapping units will be more limited. Note that no such areas are mapped as oldgrowth, and that rehabilitation works will require revegetation to a similar vegetation type (i.e. replacing one age of regrowth forest with a younger age). The extent of clearing in native vegetation units is slightly less than indicated because we did not separate most old tracks from the broader vegetation unit (simply because of the practicality of the scale of mapping required to do this).



Native	ha	Non-native	ha	TOTAL
DOB	3.86			3.86
NAR	1.25			1.25
WOB	23.7			23.7
WOR	1.26			1.26
RMT	0.04			0.04
		FPE	1.63	1.63
		FRG	43.2	43.2
		FUM	6.41	6.41
TOTAL	30.11		51.24	81.35

Figure 7. Possible maximum extent of disturbance to each vegetation mapping unit within the study area

DISCUSSION & RECOMMENDATIONS

Summary of key findings

Threatened flora

- No flora species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.

Threatened fauna

- No fauna species, listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, were detected from the study area.
- The study area may form part of the home range of species such as the masked owl, grey goshawk, wedge-tailed eagle, spotted-tailed quoll and Tasmanian devil, but it is unlikely that features such as nests or dens are present within the study area itself (no such features were detected), and no special management prescriptions are recommended (noting that rehabilitation of the area will be required).
- The wider area supports potential nesting habitat for the wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) but surveys did not detect any nests within the study area or within 1 km of the study area, so no deleterious impact on the species is anticipated.

Vegetation types

- Eight mapping units were identified from the study area (Figure 4), namely:
  - "*Acacia melanoxylon* forest on rises" (TASVEG code: NAR);
  - "*Eucalyptus obliqua* dry forest and woodland" (TASVEG code: DOB);
  - "*Eucalyptus obliqua* forest with broad-leaf shrubs" (TASVEG code: WOB);
  - "*Eucalyptus obliqua* forest over rainforest" (TASVEG code: WOR);
  - "*Nothofagus-Atherosperma* rainforest" (TASVEG code: RMT);
  - "extra-urban miscellaneous" (TASVEG code: FUM);
  - "permanent easement" (TASVEG code: FPE);
  - "regenerating cleared land" (TASVEG code: FRG).
- None of the mapping units identified from the study area are classified as threatened under Schedule 3A of the *Nature Conservation Act 2002* or under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Weeds

- Several species of "declared" weed species, and some other exotic species with potential to act as "environmental weeds", were detected from the study area. Inclusion of weed management prescriptions in the DPEMP is recommended.

Plant and animal disease

- No evidence of plant and animal disease was noted. Inclusion of disease management prescriptions in the DPEMP is recommended.

Reserves

- The study area is within an "Informal Reserve" managed by Forestry Tasmania – some additional planning assessment protocols will need to be applied to satisfy Forestry Tasmania's internal protocols. In our opinion, the proposed works will result in a temporary modification of some native vegetation types but these are all already regrowth facies of the various communities after previous mining activities. As such, complex offsets are not recommended, provided that the area is rehabilitated to similar vegetation types.

Legislative and policy implications

Some commentary is provided below with respect to the key threatened species and vegetation management legislation and polices. Note that there may be other relevant policy instruments in addition to those discussed. It is assumed that the proposed mine site will comply with the relevant provisions of legislation and policy instruments related to mineral exploration and mining activities and these are not discussed herein.

Tasmanian *Threatened Species Protection Act 1995*

A permit will not be required under Section 51 of this Act because no threatened species listed on the Act will be disturbed.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth Department of Sustainability, Environment, Water, Population & Communities provides a *Significant Impact Guidelines* policy statement (CofA 2009) to determine if referral to the department is required. In our opinion, with respect to the Tasmanian devil, spotted-tailed quoll and masked owl, the proposed development will not constitute a "significant impact" because while there will be a loss (more correctly a temporary disturbance) of some potential habitat of these species (modified already), the loss is not such that it is likely to lead to a long-term decrease in the size of an important population of a species, reduce the area of occupancy of an important population, fragment an existing important population into two or more populations, adversely affect habitat critical to the survival of a species, disrupt the breeding cycle of an important population, modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, result in invasive species that are harmful to a threatened species becoming established in the threatened species' habitat, introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. The proponent may need to demonstrate that the proposed works will not result in a significant alteration to the potential incidence of roadkill on public roads between Luina and Burnie, especially with respect to the Tasmanian devil and spotted-tailed quoll. Referral to the DSEWPC map be required if a significant increase in roadkill of these species is anticipated.

Tasmanian *Nature Conservation Act 2002*

The study area does not support any vegetation types classified as threatened under Schedule 3A of this Act. There are no constraints under this Act on the proposed activities.

Tasmanian *Wildlife Regulations 2010*

No species, or products (e.g. nests, dens, etc.) of species, listed on schedules of the Regulations (i.e. "specially protected wildlife", "protected wildlife", "partly protected wildlife"), will be knowingly disturbed. There are no constraints under this Act on the proposed activities

Tasmanian *Forest Practices Act 1985* and associated regulations

A Forest Practices Plan (FPP) is required for most "clearing" activities in areas of forest and woodland (and for some activities within threatened non-forest native vegetation). However, changes to the Act (25 November 2009), as stated below, indicate additional circumstances in which an FPP is not required, including mining activities.

> 4. Circumstances in which forest practices plan, &c., not required
>
> For the purpose of section 17(6) of the Act, the following circumstances are prescribed:
>
> (i) [Regulation 4 Amended by S.R. 2009, No. 135, Applied:25 Nov 2009] the harvesting of timber or the clearing of trees on any land, or the clearance and conversion of a threatened native vegetation community on any land, in the course of mineral exploration activities, or mining activities, that are authorised under –
>
> (i) a permit granted under the *Land Use Planning and Approvals Act 1993*; or
>
> (ii) an exploration licence within the meaning of the *Mineral Resources Development Act 1995*; or
>
> (iii) a retention licence within the meaning of the *Mineral Resources Development Act 1995*; or
>
> (iv) a mining lease within the meaning of the *Mineral Resources Development Act 1995*.

Recommendations

The following values should be further considered, as part of DPEMP preparation:

- undertake an analysis of the potential risk of increase in mammal roadkill as a consequence of product transportation activities;
- include weed management and disease minimisation protocols in the DPEMP;
- liaise further with Forestry Tasmania and Mineral Resources Tasmania on the required management of the informal reserve;
- adhere to the *Quarry Code of Practice June 1999* (DPIWE 1999) and other recommendations applied by planning authorities in relation to mineral extraction works, transport of product and site rehabilitation.

REFERENCES

Allan, K. & Gartenstein, S. (2010). *Keeping It Clean: A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens.* NRM South, Hobart.

Anon. (1997). *Tasmanian Regional Forest Agreement between the Commonwealth of Australia and the State of Tasmania*. Commonwealth of Australia and the State of Tasmania, Canberra.

Baker, M.L. & Duretto, M.F. (2011). *A Census of the Vascular Plants of Tasmania and Index to* The Student's Flora of Tasmania. Tasmanian Herbarium, Hobart. (2011 web edition as downloaded from http://www.tmag.tas.gov.au/Herbarium/TasVascPlants.pdf).

CFEV (2005). *Conservation of Freshwater Ecosystem Values Project, CFEV database, v1.0*. Water Resources Division, Department of Primary Industries & Water, Tasmania.

Department of Sustainability, Environment, Water, Population & Communities (DSEWPC) (2011). Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Report* for - Coordinates: -41.46649,145.38134 -41.46641,145.38309 -41.46717,145.38476 -41.46717,145.38621 -41.46649,145.38887 -41.46664,145.39002 -41.46695,145.39139 -41.46679,145.39238 -41.46649,145.39352 -41.46557,145.39519 -41.46999,145.39481 -41.47288,145.38507 -41.47502,145.38491 -41.47517,145.38887 -41.47882,145.38895 -41.48461,145.37821 -41.47898,145.37212 -41.46649,145.38149 -41.46649,145.38134 dated 9 August 2011. [appended for reference]

Commonwealth of Australia (CofA) (2009). *Matters of National Environmental Significance. Significant Impact Guidelines 1.1* Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment, Water, Heritage and the Arts, Canberra.

Department of Primary Industries, Parks, Water & Environment (DPIPWE) (2011a). *Natural Values Report No* 42807_ECOtas_Cleveland Mine_290711. [appended for reference]

Department of Primary Industries, Parks, Water & Environment (DPIPWE) (2011b) *Threatened Native Vegetation Communities List April 2007* as per Schedule 3A of the *Nature Conservation Act 2002.* http://www.dpiw.tas.gov.au/inter.nsf/WebPages/AWAH-6547ZL?open

Department of Primary Industries, Parks, Water & Environment (DPIPWE) (2009). *Guidelines for Natural Values Assessments, Reporting on the Impact of Proposed Activities on the Natural Values and Providing Recommendations for Mitigating Impacts on these Values*. Development and Conservation Assessment Branch, Department of Primary Industries, Parks, Water and Environment.

Department of Primary Industries, Water and Environment (DPIWE) (1999). *Quarry Code of Practice June 1999*. Department of Primary Industries, Water & Environment in association with Mineral Resources Tasmania, Hobart.

Duretto, M.F. (Ed.) (2009+) *Flora of Tasmania Online*. Tasmanian Herbarium, Tasmanian Museum & Art Gallery: Hobart. www.tmag.tas.gov.au/floratasmania.

Forest Practices Authority (FPA) (2011). *Threatened Fauna Manual Mapsheet Display Luina 3640 current as at 9 August 2011,* and hyperlinked species profiles and range boundary maps. http://www.fpa.tas.gov.au/index.php?id=20. [appended for reference]

Forest Practices Authority (FPA) (2006). *Eagle Nest Searching, Activity Checking and Nest Management. Fauna Technical Note No. 1.* Forest Practices Authority, Hobart. (FPA reference FPA/07/307/002 Record 2009/39250)

Forest Practices Authority (FPA) (2005). *Forest Botany Manual: Module 8 – West and Southwest Region*. Forest Practices Authority, Tasmania.

Harris, S. & Kitchener, A. (editors) (2005). *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation*. Department of Primary Industries, Water and Environment, Hobart.

Rudman T. (2005). *Interim* Phytophthora cinnamomi *Management Guidelines*. Nature Conservation Report 05/7, Biodiversity Conservation Branch, Department of Primary Industries, Water & Environment, Hobart.

Threatened Species Unit (TSU) (2003). *Notesheets for* various threatened species listed in Table 2. DPIPWE, Hobart.

Wapstra, H., Wapstra, A., Wapstra, M. & Gilfedder, L. (2005, updated annually online). *The Little Book of Common Names for Tasmanian Plants*. Department of Primary Industries, Water & Environment, Hobart.

APPENDIX A. Vegetation community structure and composition

Note: The table below indicates the species that were the dominants within the community recorded. Refer to Appendix B for a full list of vascular species recorded from the vegetation type. A description of the non-forest "artificial" mapping unit "extra –urban miscellaneous" (FUM) is not provided.

Regenerating cleared land (TASVEG code: FRG)

Regenerating cleared land (FRG) is the dominant vegetation type across the study area. The mapping unit is either native species re-colonising disturbed sites such as quarries or rehabilitation species which have been introduced to the site via hydro mulching. Silver wattle (Acacia dealbata) is the dominant species across the areas (see images below) with only sparse scattered shrubs and grasses present in the understorey.

FRG is characterised by a sparse, shrubby understorey with scattered trees of *Acacia dealbata* (both images). In some areas, the regeneration has been poor (LHS) due to high levels of disturbance in the past and toxic soils from acid mine drainage.

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	8-15 m 20%	*Acacia dealbata* – note that this layer can be absent on the poor sites as indicated in the left hand image above.
Tall shrubs	4-6 (<8) m 30%	*Acacia dealbata*, *Acacia mucronata*, *Acacia melanoxylon*, *Leptospermum scoparium*
Shrubs	<2 m 20%	*Acacia mucronata*, *Leptospermum nitida*, *Leptospermum scoparium*
Grasses/graminoids	1-2 (<3) <5%	*Gahnia grandis*, *Baloskion tetraphyllum* (in wet areas and acid mine drainage sites)

Acacia melanoxylon forest on rises (TASVEG code NAR)
Floristic code: SWAMP-D4

Acacia melanoxylon forest on rises (NAR) is common on the slopes above Washington Creek and in the Whyte River in the north of the study area. This community is likely to be a disturbance related community that will gradually change into rainforest over time.

NAR on the dominating the slopes to the south of Washington Creek

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	18-25 m 25%	*Acacia melanoxylon*
Trees	8-10 m 30%	*Acacia melanoxylon, Nothofagus cunninghamii, Atherosperma moschatum, Nematolepis squamea*
Tall shrubs	~6 m 50 %	*Pomaderris apetala, Olearia argophylla, Nothofagus cunninghamii*
Ferns	<2 m 30%	*Dicksonia antarctica, Polystichum proliferum, Blechnum nudum*

Eucalyptus obliqua dry forest and woodland (TASVEG code: DOB)
Floristic code: DRY-shOB

Eucalyptus obliqua dry forest and woodland (DOB) was localised to a relatively dry north-facing slope in the south of the study area. This community is a remnant in an area that is surrounded by rehabilitation areas over the old mine tailings dumps. This community is in good condition with no weed species recorded. It is likely that DOB is a result of fire and other disturbance in the past as the dominant tree layer is a regrowth structure. It is likely that DOB would successionally change into a wet forest community without disturbance.

DOB above an old quarry in the south of the study area – this localised community is characterised by a shrubby understorey with thin soils

Stratum	**Height (m)** **Cover (%)**	**Species** (underline = dominant, parentheses = sparse)
Trees	22 m 15%	*Eucalyptus obliqua*
Trees	8-14 m 20%	*Eucalyptus obliqua, (Eucalyptus delegatensis)*
Tall shrubs	4-5 (<8) m 15%	*Acacia mucronata, Monotoca glauca, Leptospermum scoparium, Banksia marginata*
Shrubs	<2 m 10%	*Lomatia tinctoria, Pomaderris elliptica, Bauera rubioides*
Grasses/graminoids	1 m 25%	*Dianella tasmanica*
Ferns	<1 m 15%	*Pteridium esculentum*

Eucalyptus obliqua forest with broad-leaf shrubs (TASVEG code: WOB)
Floristic codes: WET-OB2

Eucalyptus obliqua forest with broad-leaf shrubs (WOB) is common on the periphery of the disturbed tailings and mining areas. Generally, WOB occurs as a factor as past disturbance from fire and mining activities and is regenerating from these events. This community is characterised by a regrowth layer of *E. obliqua* in the most disturbed sites with a shrubby understorey and old-growth *E. obliqua* in the relatively undisturbed areas. WOB is gradational with WOR on more sheltered, moist, fertile and undisturbed sites.

WOB to the south of the Glory Hole

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	30-35 m 20%	<u>*Eucalyptus obliqua*</u> – occurring as a dominant layer over undisturbed sites. This layer is absent in the more disturbed areas around the mine/tailings areas.
Trees	16-18 m 20%	<u>*Eucalyptus obliqua*</u>, *Acacia melanoxylon*
Trees/tall shrubs	6-10(<8) m 45%	<u>*Nematolepis squamea*</u>, *Acacia melanoxylon, Acacia dealbata, Monotoca glauca, (Nothofagus cunninghamii), Zieria arborescens, Cassinia aculeata*
Shrubs	<2 m <5%	*Coprosma quadrifida, Pimelea drupacea*
Grasses/graminoids	<2.5 m 25%	*Dianella tasmanica, Gahnia grandis, Libertia pulchella* var. *pulchella*
Ferns	<1 m 30%	*Blechnum nudum, Polystichum proliferum, (Pteridium esculentum)*

Eucalyptus obliqua forest over rainforest (TASVEG code: WOR)
Floristic codes: WET-OB1000

Eucalyptus obliqua forest over rainforest (WOR) is common as a gradational community between WOB (see above) and RMT on undisturbed sites (see below). This community is characterised by the dominance of *E. obliqua* old-growth trees over a rainforest layer dominated by *Nothofagus cunninghamii*. This community has some mild disturbance in the past (mining tracks in the Crescent Spur area), but is in good condition with no weeds recorded.

WOR on the south-facing slopes of Crescent Spur

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	30-35 m 20%	<u>*Eucalyptus obliqua*</u> – occurring as a dominant layer over undisturbed sites. This layer is absent in the more disturbed areas around the mine/tailings areas.
Trees	16-18 m 20%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, Acacia melanoxylon, (Acacia dealbata* – on disturbed margins)
Trees/tall shrubs	8-13(<15) m 50%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, Acacia melanoxylon, Phyllocladus aspleniifolius, Monotoca glauca*
Shrubs	<2 m <5%	*Coprosma quadrifida, Pimelea drupacea*
Grasses/graminoids	<2.5 m 25%	*Dianella tasmanica, Gahnia grandis, Libertia pulchella* var. *pulchella*
Ferns	<1 m 15%	*Blechnum nudum, Polystichum proliferum, Histiopteris incisa*

Nothofagus-Atherosperma rainforest (TASVEG code: RMT)
Floristic codes: RAIN-C1.1

Nothofagus-Atherosperma rainforest (WOR) is localised to the western side of the Whyte River in the west of the study area. This community is characterised by the dominance of *Nothofagus cunninghamii* with no eucalypt species present. RMT has not been disturbed in the recent past and is in good condition with no weeds recorded.

RMT on the western side of the Whyte River

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse)
Trees	22-30 m 35%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum*
Trees	16-18 m 50%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, (Acacia melanoxylon* – on disturbed margins)
Tall shrubs	8-13(<15) m 50%	<u>*Nothofagus cunninghamii*</u>*, Atherosperma moschatum, Acacia melanoxylon, Phyllocladus aspleniifolius*
Grasses/graminoids	<2.5 m 25%	*Libertia pulchella* var. *pulchella, (Gahnia grandis)*
Ferns	<1 m 25%	*Blechnum nudum, Polystichum proliferum, Histiopteris incisa*

APPENDIX B. Vascular plant species recorded from study area

Botanical nomenclature follows *A Census of the Vascular Plants of Tasmania* (Baker & Duretto 2011), updated to reflect the nomenclatural changes recognised in the *Flora of Tasmania Online* (Duretto 2009+); common nomenclature follows Wapstra et al. (2005).

Total species = 86; dicotyledons = 53 (including 12 endemic, 5 exotic); monocotyledons = 214 (including 0 endemic, 1 exotic);gymnosperms = 1 (native); pteridophytes = 18 (all native)

i = introduced/naturalised; e = endemic; t = in Australia, present only in Tasmania

DICOTYLEDONAE		
	ARALIACEAE	
	Hydrocotyle hirta	hairy pennywort
	Hydrocotyle sibthorpioides	shining pennywort
	ASTERACEAE	
	Cassinia aculeata subsp. *aculeata*	common dollybush
i	*Cirsium vulgare*	spear thistle
	Euchiton collinus	common cottonleaf
	Olearia argophylla	musk daisybush
	Olearia stellulata	sawleaf daisybush
	ATHEROSPERMATACEAE	
	Atherosperma moschatum subsp. *moschatum*	sassafras
	CUNONIACEAE	
	Bauera rubioides	wiry bauera
e	*Eucryphia lucida*	leatherwood
	ELAEOCARPACEAE	
e	*Aristotelia peduncularis*	heartberry
	ERICACEAE	
	Epacris gunnii	coral heath
	Epacris impressa	common heath
i	*Erica lusitanica*	spanish heath
	Gaultheria hispida	copperleaf snowberry
t	*Leptecophylla juniperina* subsp. *juniperina*	common pinkberry
	Monotoca glauca	goldey wood
e	*Trochocarpa gunnii*	fragrant purpleberry
	FABACEAE	
	Acacia dealbata subsp. *dealbata*	silver wattle
	Acacia melanoxylon	blackwood
e	*Acacia mucronata* subsp. *dependens*	blunt caterpillar wattle
	Acacia mucronata subsp. *mucronata*	erect caterpillar wattle
	Acacia verticillata subsp. *verticillata*	prickly moses
i	*Cytisus scoparius*	english broom
	Pultenaea juniperina	prickly beauty
	LAMIACEAE	
	Prostanthera lasianthos var. *lasianthos*	christmas mintbush
	MYRTACEAE	
e	*Eucalyptus delegatensis* subsp. *tasmaniensis*	gumtopped stringybark
e	*Eucalyptus nitida*	western peppermint
	Eucalyptus obliqua	stringybark
e	*Leptospermum glaucescens*	smoky teatree
	Leptospermum lanigerum	woolly teatree
e	*Leptospermum nitidum*	shiny teatree
	Leptospermum scoparium var. *scoparium*	common teatree
	Melaleuca squamea	swamp honeymyrtle
	Melaleuca squarrosa	scented paperbark
	NOTHOFAGACEAE	
	Nothofagus cunninghamii	myrtle beech

	PITTOSPORACEAE	
	Pittosporum bicolor	cheesewood
	PLANTAGINACEAE	
i	*Digitalis purpurea*	foxglove
	PROTEACEAE	
	Banksia marginata	silver banksia
e	*Hakea epiglottis subsp. epiglottis*	beaked needlebush
e	*Lomatia tinctoria*	guitarplant
e	*Telopea truncata*	tasmanian waratah
	RANUNCULACEAE	
	Clematis aristata	mountain clematis
	RHAMNACEAE	
	Pomaderris apetala subsp. *apetala*	common dogwood
	Pomaderris elliptica var. *elliptica*	yellow dogwood
	ROSACEAE	
	Acaena novae-zelandiae	common buzzy
i	*Cotoneaster franchetii*	grey cotoneaster
	Rubus fruticosus .agg	blackberry
	RUBIACEAE	
	Coprosma quadrifida	native currant
	RUTACEAE	
	Nematolepis squamea subsp. *squamea*	satinwood
	Zieria arborescens subsp. *arborescens*	stinkwood
	THYMELAEACEAE	
	Pimelea drupacea	cherry riceflower
	VIOLACEAE	
	Viola hederacea subsp. *hederacea*	ivyleaf violet
	WINTERACEAE	
	Tasmannia lanceolata	mountain pepper
	GYMNOSPERMAE	
	PODOCARPACEAE	
e	*Phyllocladus aspleniifolius*	celerytop pine
	MONOCOTYLEDONAE	
	CYPERACEAE	
	Gahnia grandis	cutting grass
	Gymnoschoenus sphaerocephalus	buttongrass
	HEMEROCALLIDACEAE	
	Dianella tasmanica	forest flaxlily
	IRIDACEAE	
i	*Chasmanthe floribunda*	african cornflag
	Libertia pulchella var. *pulchella*	pretty grassflag
	JUNCACEAE	
	Juncus bassianus	forest rush
	Juncus pallidus	pale rush
	Juncus pauciflorus	looseflower rush
	POACEAE	
i	*Agrostis stolonifera*	creeping bent
i	*Holcus lanatus*	yorkshire fog
	Microlaena stipoides var. *stipoides*	weeping grass
	Poa gunnii	gunns snowgrass
	Poa labillardierei var. *labillardierei*	silver tussockgrass
	RESTIONACEAE	
	Baloskion tetraphyllum subsp. *tetraphyllum*	tassel cordrush
	PTERIDOPHYTA	
	BLECHNACEAE	
	Blechnum fluviatile	ray waterfern
	Blechnum minus	soft waterfern
	Blechnum nudum	fishbone waterfern
	Blechnum penna-marina subsp. *alpina*	alpine waterfern

Blechnum wattsii	hard waterfern
DENNSTAEDTIACEAE	
Histiopteris incisa	batswing fern
Pteridium esculentum	bracken
DICKSONIACEAE	
Dicksonia antarctica	soft treefern
DRYOPTERIDACEAE	
Polystichum proliferum	mother shieldfern
GLEICHENIACEAE	
Gleichenia microphylla	scrambling coralfern
Sticherus tener	silky fanfern
GRAMMITIDACEAE	
Grammitis billardierei	common fingerfern
HYMENOPHYLLACEAE	
Hymenophyllum australe	southern filmyfern
Hymenophyllum cupressiforme	common filmyfern
Hymenophyllum flabellatum	shiny filmyfern
Hymenophyllum rarum	narrow filmyfern
POLYPODIACEAE	
Microsorum pustulatum subsp. *pustulatum*	kangaroo fern

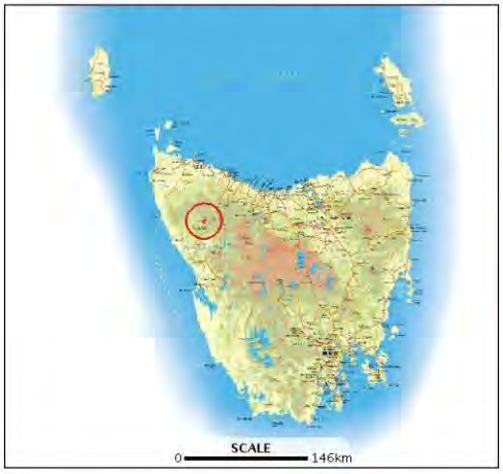
APPENDIX C. DPIPWE's *Natural Values Atlas* report for study area

Natural Values Atlas Report

Authoritative, comprehensive information on Tasmania's natural values.

Report number: 42807
Reference: ECOtas_Cleveland Mine_290711
Requested For: Brian French
Timestamp: 02:44:51 PM Friday 29 July 2011

Threatened Flora: buffers 500m and 5000m
Threatened Fauna: buffers 500m and 5000m
Conservation Significance Flora: Not requested
Conservation Significance Fauna: Not requested
Weeds: buffers 500m and 5000m
TasVeg: buffer 1000m
Threatened Communities: buffer 1000m
Geoconservation: buffer 1000m
Tasmanian Reserve Estate: buffer 1000m



The centroid for this query **GDA94 364958,5407301** falls within:

1:25000 Map: 3640 LUINA
Property: 7004215 CORINNA ROAD, LUINA TAS 7321

Department of Primary Industries, Parks, Water *and* Environment

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Tasmania
Explore the possibilities

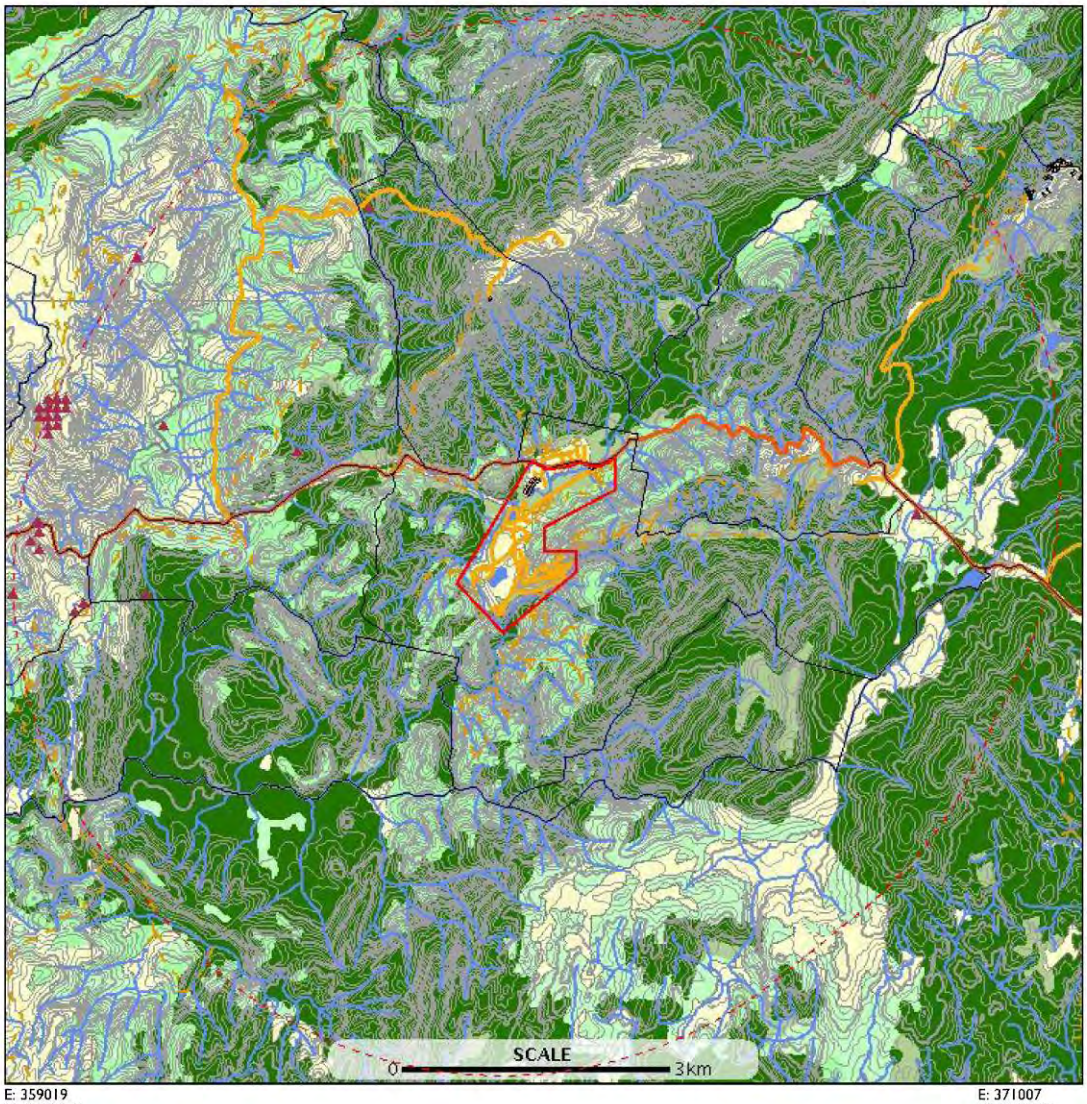
Threatened flora within 500 metres

***** No threatened flora found within 500 metres. *****

Threatened flora within 5000 metres

E: 359019
N: 5413338

E: 371007
N: 5413338



E: 359019
N: 5401167

E: 371007
N: 5401167

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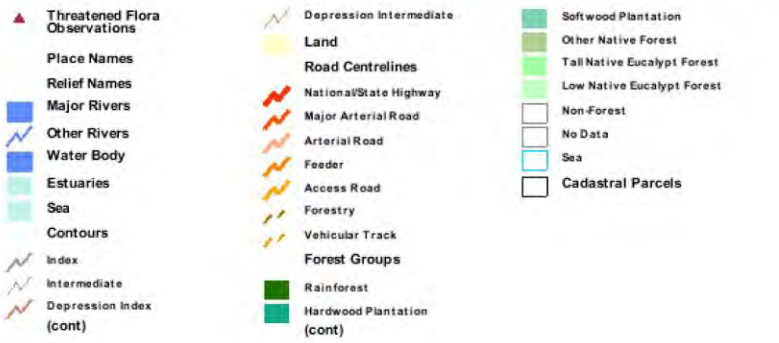
Tasmania
Explore the possibilities

Threatened flora within 5000 metres



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Tasmania
Explore the possibilities

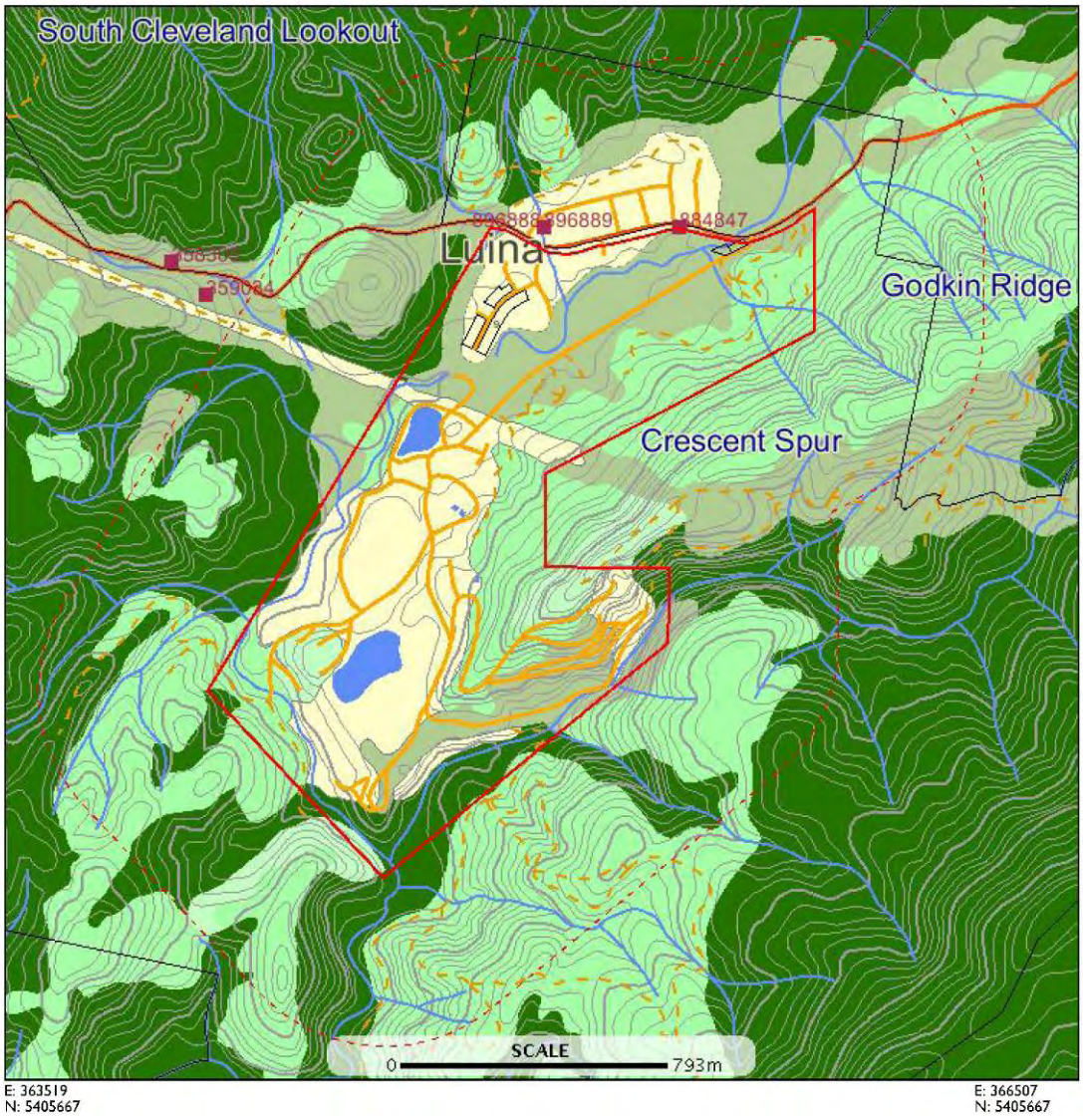
Threatened flora within 5000 metres

Id	Species	Common name	Ss	Ns	Observers	Date	Obs type	Location (gda94)
228770	Comesperma defoliatum	leafless milkwort	r		H.F. Comber (4408)	Mar-1930	sight	Point (360812,5408583) +/- 12500m.
348562	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359712,5408883) +/- 50m.
349958	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408883) +/- 50m.
349960	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408783) +/- 50m.
348566	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359512,5408583) +/- 50m.
348565	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408683) +/- 50m.
229294	Epacris glabella	smooth heath	e	EN	A.M. Buchanan (3758)	25-Jan-1990	sight	Point (359612,5408783) +/- 100m.
348567	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359512,5408483) +/- 50m.
229441	Epacris glabella	smooth heath	e	EN	A.M. Buchanan (3758)	26-Jan-1990	sight	Point (360512,5410483) +/- 100m.
348564	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359512,5408683) +/- 50m.
349976	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359712,5408783) +/- 50m.
349978	Epacris glabella	smooth heath	e	EN	D.A. Keith (4104)	13-Sep-1996?	sight	Point (359612,5408583) +/- 50m.
1233190	Hypolepis muelleri	harsh groundfern	r		Nic McCaffrey (22428),Doug Frood (22429),Joy MacDonald (22430)	22-Sep-2010	sight	Point (363135,5411042) +/- 25m.
228574	Micrantheum serpentinum	western tridentbush	r		S.J. Jarman & G. Kantvilas (5583)	23-Nov-1989	sight	Point (359412,5407483) +/- 100m.
169144	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435)	24-May-1995?	sight	Point (359412,5407383) +/- 100m.
168714	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435)	24-May-1995?	sight	Point (359812,5406483) +/- 100m.
228601	Micrantheum serpentinum	western tridentbush	r		A.M. Buchanan (3758)	26-Jan-1990	sight	Point (359612,5408783) +/- 100m.
228672	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435),A North (2500)	24-May-1995	sight	Point (359912,5406583) +/- 100m.
252685	Micrantheum serpentinum	western tridentbush	r		- Unknown (21598)	01-Jan-1600?	sight	Point (360612,5406683) +/- 1000m.
228762	Micrantheum serpentinum	western tridentbush	r		A.M. Buchanan (3758)	26-Jan-1990	sight	Point (360512,5410483) +/- 100m.
169108	Micrantheum serpentinum	western tridentbush	r		Karen Johnson (1435)	24-May-1995?	sight	Point (359312,5407283) +/- 100m.
946701	Micrantheum serpentinum	western tridentbush	r		H.F. Comber (4408)	03-Mar-1930	sight	Point (362325,5408289) +/- 3500m.
228567	Micrantheum serpentinum	western tridentbush	r		S.J. Jarman & G. Kantvilas (5583)	23-Nov-1989	sight	Point (359412,5407483) +/- 100m.
1100842	Micrantheum serpentinum	western tridentbush	r		Micah Visoiu (5870)	17-Jan-2010	sight	Point (359381,5407495) +/- 100m.
345525	Micrantheum serpentinum	western tridentbush	r		- Unknown (21598)	01-Jan-1600?	sight	Point (359412,5407183) +/- 1000m.
393828	Viola cunninghamii	alpine violet	r		Jamie Kirkpatrick (1315)	1984	sight	Point (369312,5407583) +/- 100m.

For more information about threatened species, please contact the Manager, Threatened Species Section.

Telephone: (03) 6233 8759

Email: ThreatenedSpecies.Enquiries@dpipwe.tas.gov.au



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Threatened fauna within 500 metres

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Threatened fauna within 500 metres

Id	Species	Common name	Ss	Ns	Observers	Date	Obs type	Location (gda94)
884847	Sarcophilus harrisii	tasmanian devil	e	EN	Nick Mooney (16443)	01-Aug-1986?	sight	Point (365512,5408183) +/- 200m.
896888	Thylacinus cynocephalus	thylacine	x	EX	G Modry (7530)	23-Jun-1972?	sight	Point (365112,5408183) +/- 18500m.
896889	Thylacinus cynocephalus	thylacine	x	EX	G Mading (7526)	01-Jan-1970?	sight	Point (365112,5408183) +/- 18500m.

Threatened fauna within 500 metres

(based on Habitat Mapping)

Species	Common name	Ss	Ns	Potential	Known	Core
Aquila audax subsp. fleayi	wedge-tailed eagle	e	EN	1	0	0
Aquila audax	wedge-tailed eagle	pe	PEN	1	0	0
Lathamus discolor	swift parrot	e	EN	1	0	0
Tyto novaehollandiae	masked owl	pe	PVU	1	0	0
Accipiter novaehollandiae	grey goshawk	e		1	0	1

For more information about threatened species, please contact the Manager, Threatened Species Section.

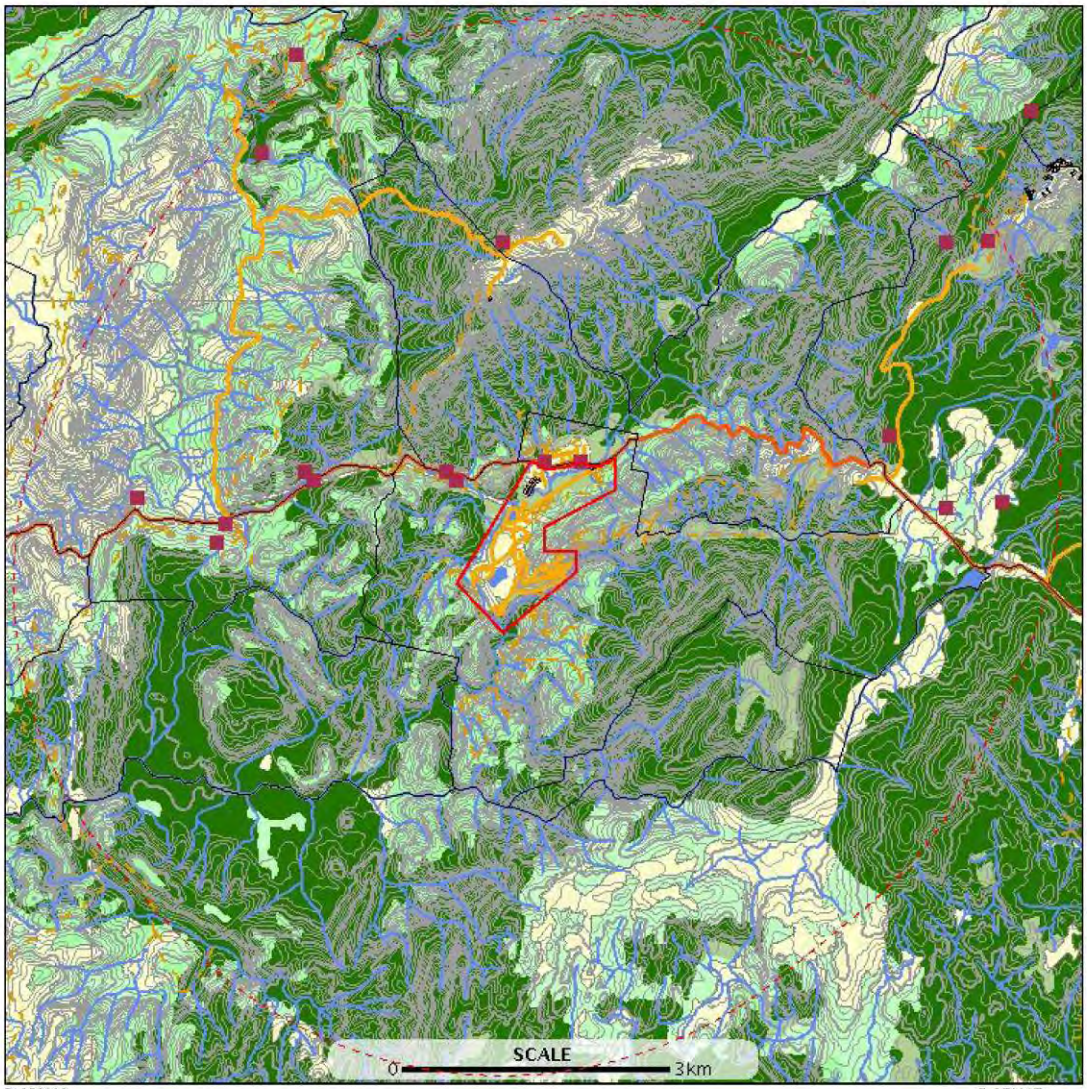
Telephone: (03) 6233 8759

Email: ThreatenedSpecies.Enquiries@dpipwe.tas.gov.au

Threatened fauna within 5000 metres

E: 359019
N: 5413338

E: 371007
N: 5413338



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N: 5401167

E: 371007
N: 5401167

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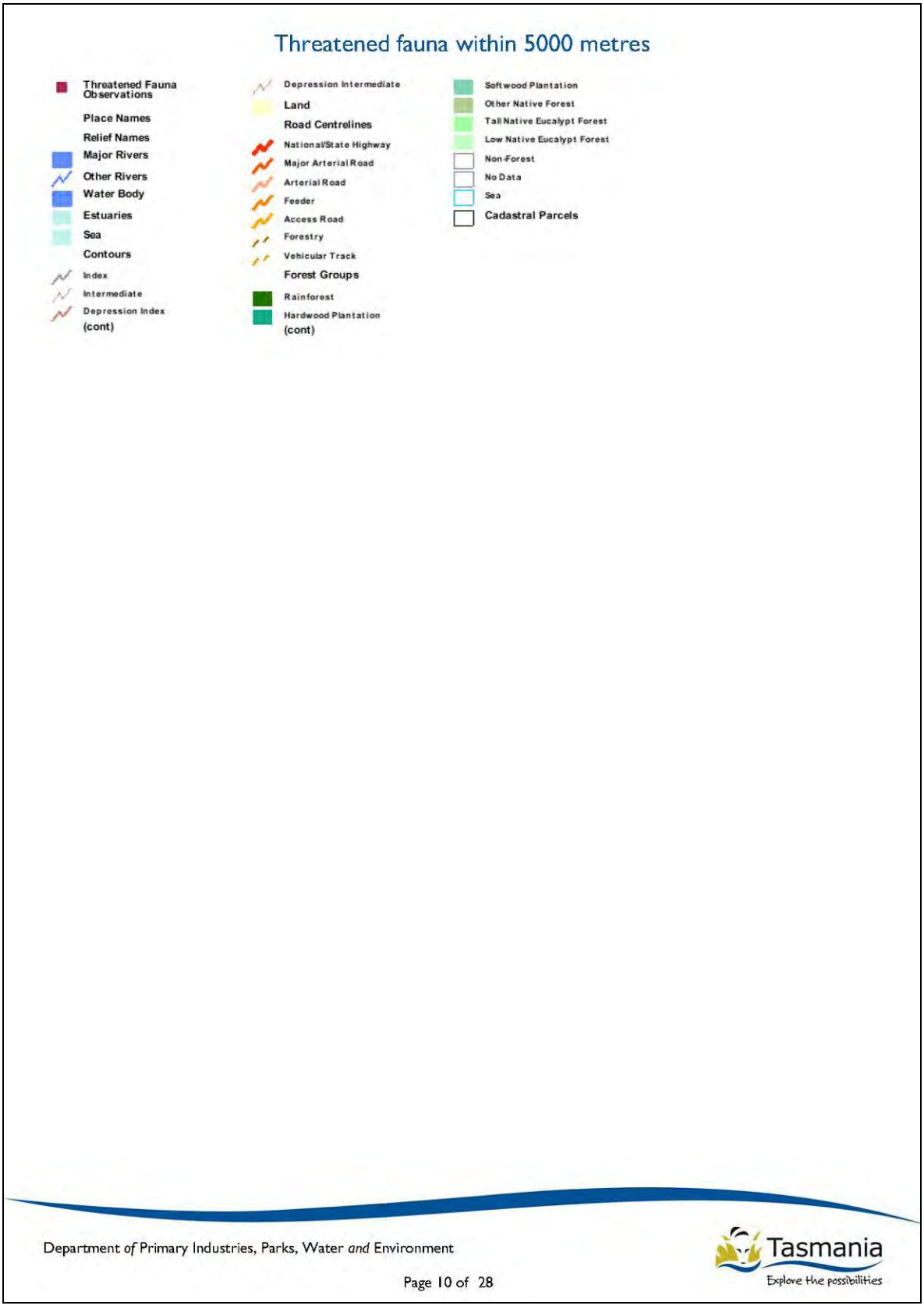
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Threatened fauna within 5000 metres

Id	Species	Common name	Ss	Ns	Observers	Date	Obs type	Location (gda94)
856528	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		W Ponder (2524)	24-Jan-1982?	sight	Point (361412,5407283) +/- 200m.
847984	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		W Ponder (2524)	07-Feb-1989?	sight	Point (361412,5407283) +/- 200m.
1200647	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		Shannon Clark (6699)	07-Feb-1989	sight	Point (362512,5407983) +/- 100m.
856529	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		W Ponder (2524)	07-Feb-1989?	sight	Point (362412,5408083) +/- 200m.
1200648	Beddomeia bellii	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	24-Jan-1982	sight	Point (361512,5407483) +/- 100m.
532771	Beddomeia hullii	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1982?	sight	Point (361512,5407483) +/- 100m.
998694	Dasyurus maculatus	spotted-tailed quoll	r	VU	Clare Hawkins (8562)	17-Jun-2003	sight	Point (370280,5407740) +/- 10m.
358226	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	21-Jun-1996?	sight	Point (369012,5408483) +/- 25m.
359034	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	21-Jun-1996?	sight	Point (364112,5407983) +/- 25m.
359033	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	21-Jun-1996?	sight	Point (370112,5410683) +/- 25m.
358758	Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	Menna Jones (8901)	01-Apr-1996?	sight	Point (361512,5407483) +/- 25m.
877348	Lathamus discolor	swift parrot	e	EN	R Charles (2101)	27-Dec-1995?	sight	Point (360512,5407783) +/- 50m.
533848	Phrantela annamurrayae	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1982?	sight	Point (361912,5411683) +/- 1000m.
523172	Phrantela marginata	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1982?	sight	Point (361512,5407483) +/- 1000m.
523173	Phrantela marginata	hydrobiid snail (heazlewood river)	r		Winston Ponder (3479)	01-Jan-1989?	sight	Point (362512,5407983) +/- 1000m.
1160312	Sarcophilus harrisii	tasmanian devil	e	EN	Shannon Troy (12201)	Aug-2010	sight	Point (364647,5410671) +/- 5m.
1160313	Sarcophilus harrisii	tasmanian devil	e	EN	Shannon Troy (12201)	Jul-2010	sight	Point (369647,5410671) +/- 5m.
884847	Sarcophilus harrisii	tasmanian devil	e	EN	Nick Mooney (16443)	01-Aug-1986?	sight	Point (365512,5408183) +/- 200m.
358305	Sarcophilus harrisii	tasmanian devil	e	EN	Menna Jones (8901)	21-Jun-1996?	sight	Point (364012,5408083) +/- 100m.
1160306	Sarcophilus harrisii	tasmanian devil	e	EN	Shannon Troy (12201)	Aug-2010	sight	Point (369647,5407671) +/- 5m.
896889	Thylacinus cynocephalus	thylacine	x	EX	G Mading (7526)	01-Jan-1970?	sight	Point (365112,5408183) +/- 18500m.
896888	Thylacinus cynocephalus	thylacine	x	EX	G Modry (7530)	23-Jun-1972?	sight	Point (365112,5408183) +/- 18500m.

Threatened fauna within 5000 metres

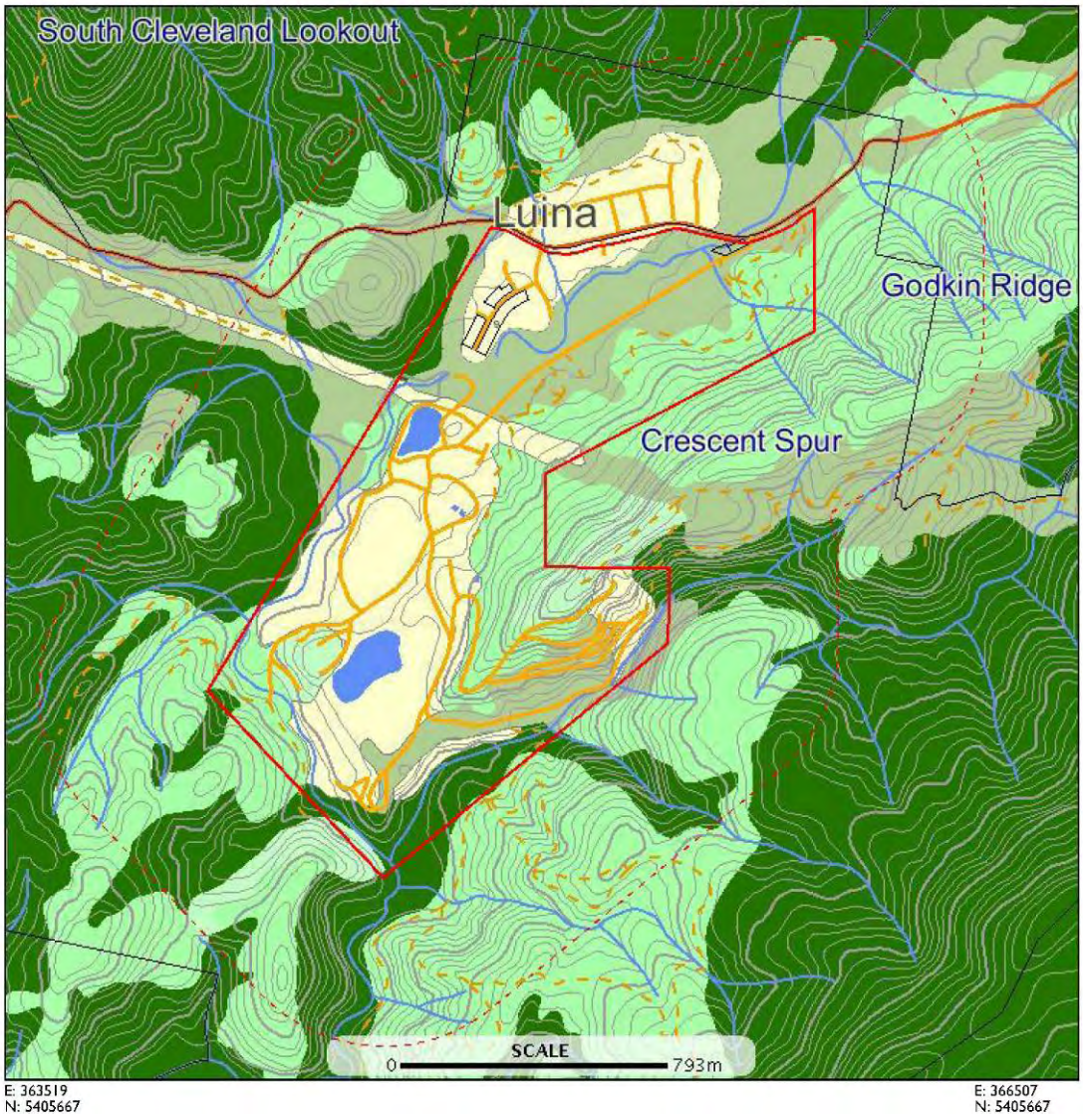
(based on Habitat Mapping)

Species	Common name	Ss	Ns	Potential	Known	Core
Aquila audax subsp. fleayi	wedge-tailed eagle	e	EN	3	0	0
Aquila audax	wedge-tailed eagle	pe	PEN	3	0	0
Lathamus discolor	swift parrot	e	EN	3	0	0
Tyto novaehollandiae	masked owl	pe	PVU	3	0	0
Accipiter novaehollandiae	grey goshawk	e		3	0	3

For more information about threatened species, please contact the Manager, Threatened Species Section.

Telephone: (03) 6233 8759

Email: ThreatenedSpecies.Enquiries@dpipwe.tas.gov.au



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Tas Management Act Weeds within 500 m

Tas Management Act Weeds within 500 m

Id	Species	Common name	Observers	Date	Geometry	Location	Obs state	Wma	Wons density	Data source
1226265	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		
1226153	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		

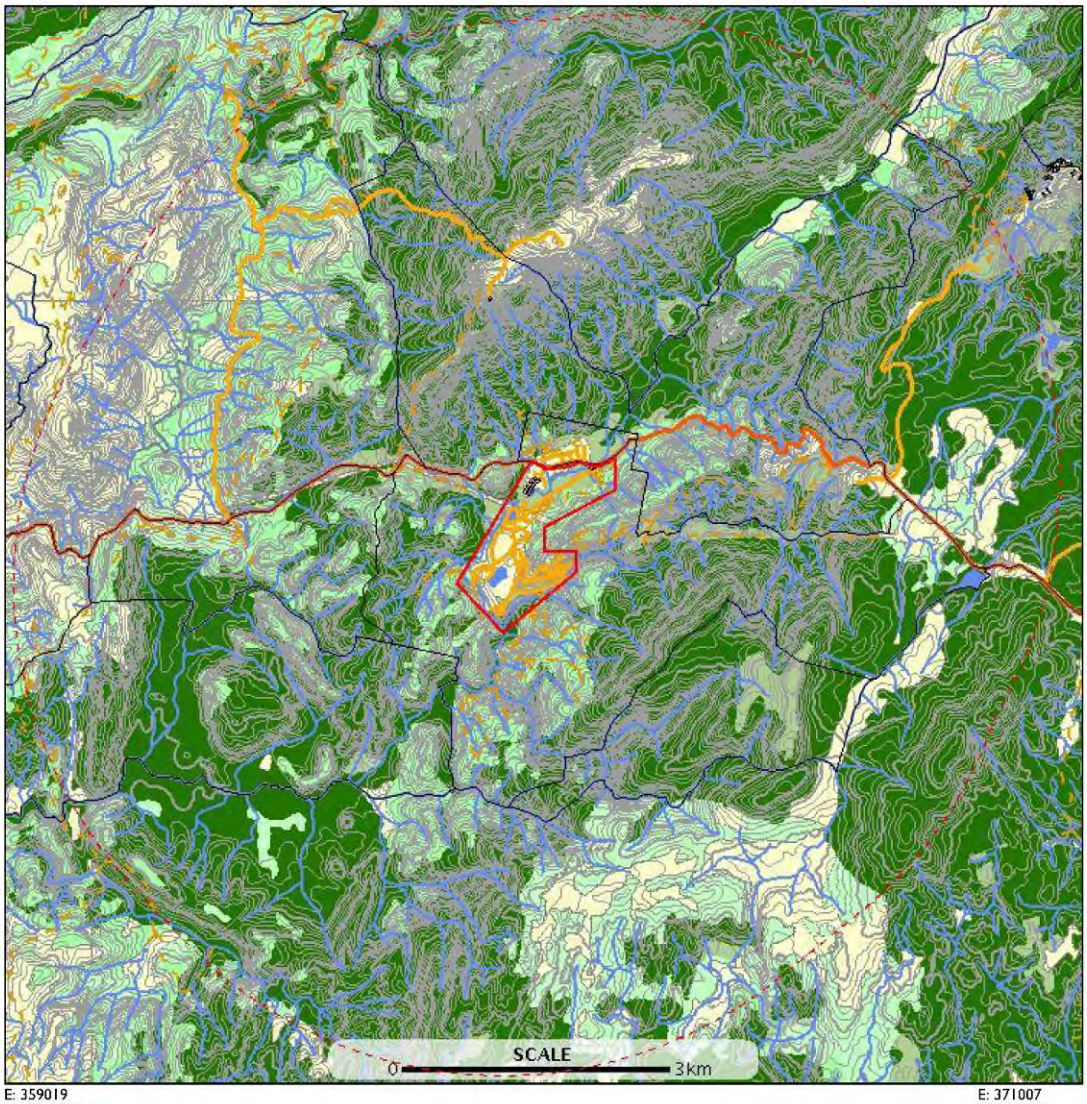
For more information about introduced weed species, please visit the following URL for contact details in your area.

http://www.dpipwe.tas.gov.au/inter.nsf/WebPages/TPRY-52J8Z3?open

Tas Management Act Weeds within 5000 m

E: 359019
N: 5413338

E: 371007
N: 5413338



E: 359019
N: 5401167

E: 371007
N: 5401167

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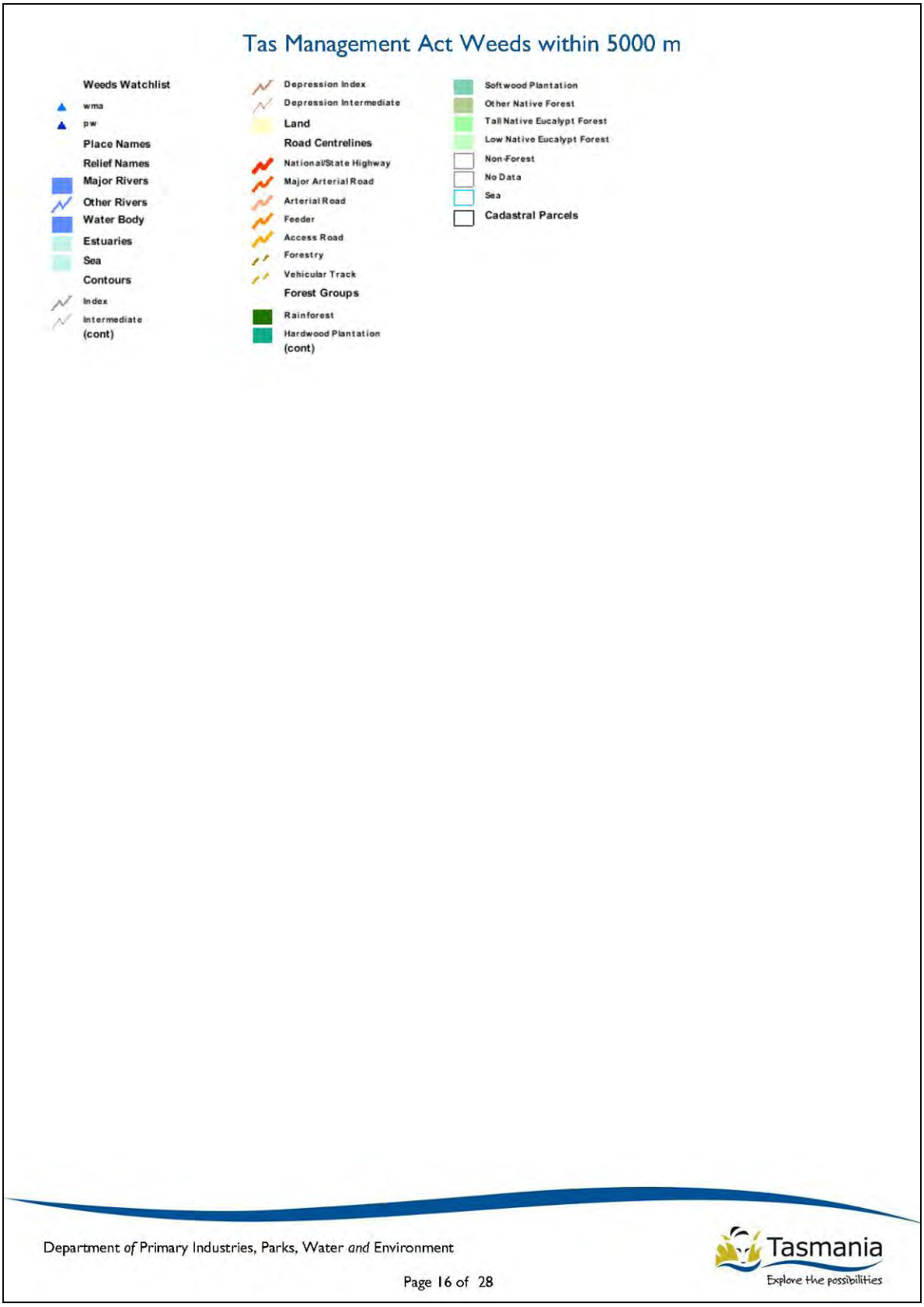
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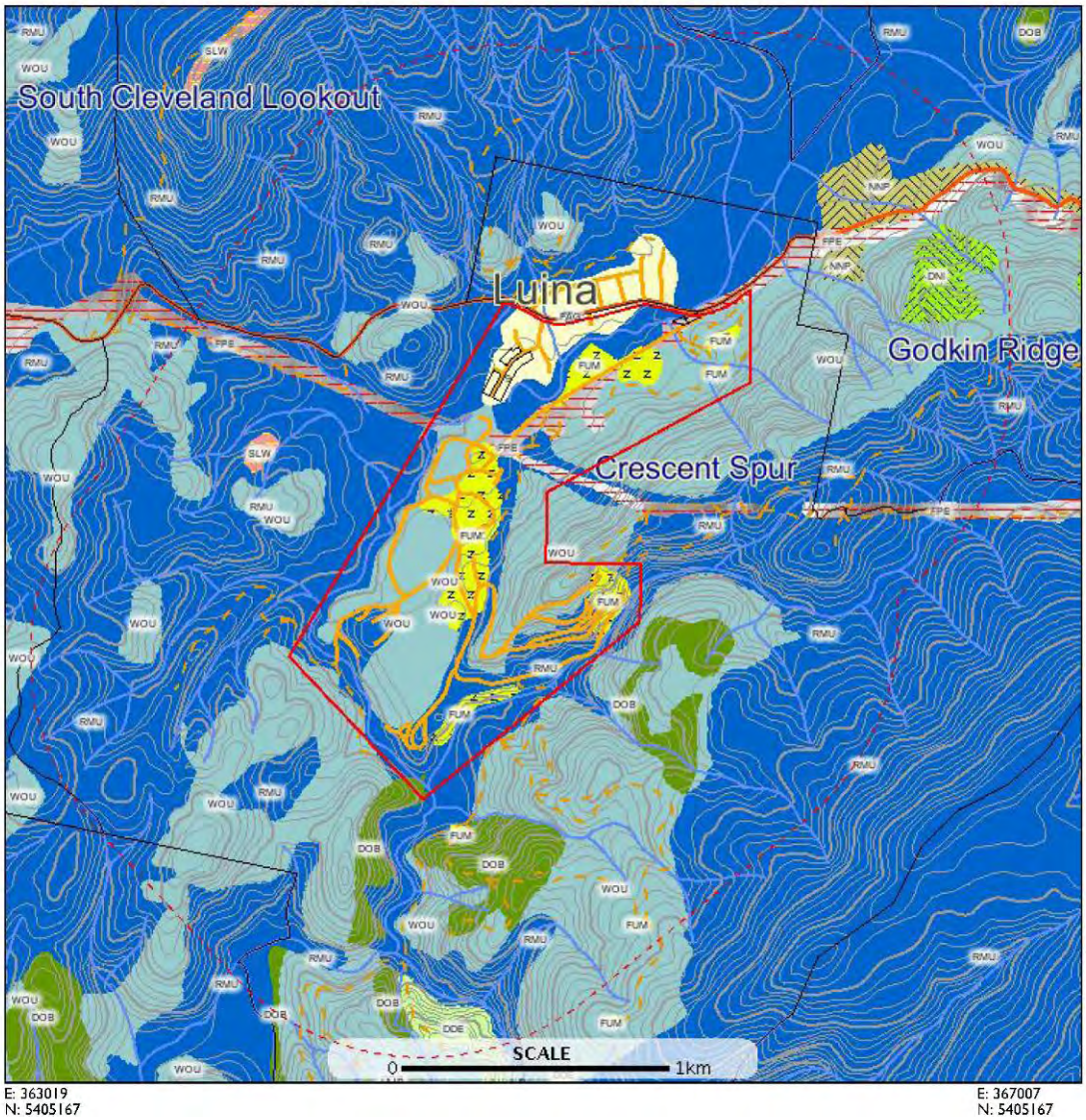
Tas Management Act Weeds within 5000 m

Id	Species	Common name	Observers	Date	Geometry	Location	Obs state	Wma	Wons density	Data source
1226173	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		
1226265	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		
1226153	Rubus fruticosus	blackberry	- Unknown (21598)	08-Jan-1995	Line +/- 0m.		Present	Yes		

For more information about introduced weed species, please visit the following URL for contact details in your area.

http://www.dpipwe.tas.gov.au/inter.nsf/WebPages/TPRY-52J8Z3?open

TASVEG communities within 1000 metres



Department of Primary Industries, Parks, Water and Environment

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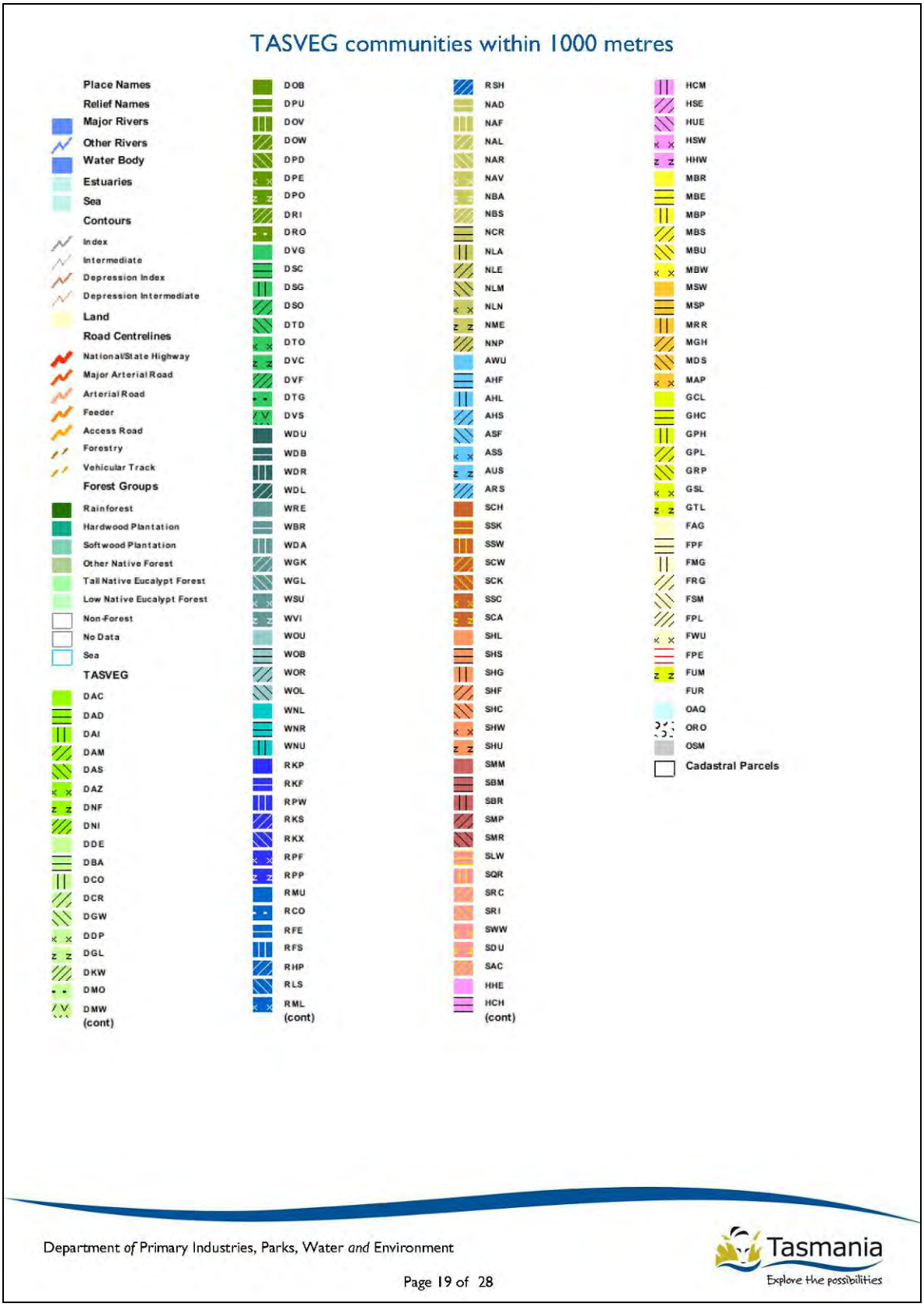
TASVEG communities within 1000 metres
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Softwood Plantation
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Tall Native Eucalypt Forest
Low Native Eucalypt Forest
Non-Forest
No Data
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DAD
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DAM
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DDE
DBA
DCO
DCR
DGW
DDP
DGL
DKW
DMO
DMW
(cont)
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DOV
DOW
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DPE
DPO
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DVG
DSC
DSG
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DTD
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DVC
DVF
DTG
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WDU
WDB
WDR
WDL
WRE
WBR
WDA
WGK
WGL
WSU
WVI
WOU
WOB
WOR
WOL
WNL
WNR
WNU
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RKS
RKX
RPF
RPP
RMU
RCO
RFE
RFS
RHP
RLS
RML
(cont)
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NAF
NAL
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NAV
NBA
NBS
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NLE
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NLN
NME
NNP
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AHF
AHL
AHS
ASF
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SCA
SHL
SHS
SHG
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SHC
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SQR
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HHW
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MBP
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MBW
MSW
MSP
MRR
MGH
MDS
MAP
GCL
GHC
GPH
GPL
GRP
GSL
GTL
FAG
FPF
FMG
FRG
FSM
FPL
FWU
FPE
FUM
FUR
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ORO
OSM
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TASVEG communities within 1000 metres

Id	Code	Community	Emergent species
101297396	RMS	Nothofagus / Phyllocladus short rainforest	
101294998	RMT	Nothofagus - Atherosperma rainforest	
101294997	FPE	Permanent easements	
101297407	RMT	Nothofagus - Atherosperma rainforest	
101297409	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297386	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101298613	RMT	Nothofagus - Atherosperma rainforest	
101297444	RMT	Nothofagus - Atherosperma rainforest	
101294996	RMS	Nothofagus / Phyllocladus short rainforest	
101297461	DNI	Eucalyptus nitida dry forest and woodland	
101297459	FUM	Extra-urban miscellaneous	
101297449	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296026	FUM	Extra-urban miscellaneous	
101296618	RMS	Nothofagus / Phyllocladus short rainforest	
101297399	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296028	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296025	FUM	Extra-urban miscellaneous	
101297401	SLW	Leptospermum scrub	
101297417	DOB	Eucalyptus obliqua dry forest and woodland	
101295363	FPE	Permanent easements	
101297424	RMT	Nothofagus - Atherosperma rainforest	
101297458	FPE	Permanent easements	
101296029	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296032	FUM	Extra-urban miscellaneous	
101294994	DOB	Eucalyptus obliqua dry forest and woodland	
101297384	RMS	Nothofagus / Phyllocladus short rainforest	
101296030	FUM	Extra-urban miscellaneous	
101297460	NNP	Notelaea - Pomaderris - Beyeria forest	
101297457	FUM	Extra-urban miscellaneous	
101294995	RMS	Nothofagus / Phyllocladus short rainforest	
101297400	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297447	FAG	Agricultural land	
101297311	FPE	Permanent easements	
101297397	RMT	Nothofagus - Atherosperma rainforest	
101297406	DDE	Eucalyptus delegatensis dry forest and woodland	
101294993	FUM	Extra-urban miscellaneous	
101297446	RMT	Nothofagus - Atherosperma rainforest	
101297448	FUM	Extra-urban miscellaneous	
101297463	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296033	RMS	Nothofagus / Phyllocladus short rainforest	
101296031	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297398	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297445	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297305	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101294992	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101296024	RMS	Nothofagus / Phyllocladus short rainforest	
101296027	WOU	Eucalyptus obliqua wet forest (undifferentiated)	
101297421	RMS	Nothofagus / Phyllocladus short rainforest	
101297395	RMT	Nothofagus - Atherosperma rainforest	
101297387	DOB	Eucalyptus obliqua dry forest and woodland	
101297405	DOB	Eucalyptus obliqua dry forest and woodland	
101296023	DOB	Eucalyptus obliqua dry forest and woodland	
101297462	NNP	Notelaea - Pomaderris - Beyeria forest	
101297408	WOU	Eucalyptus obliqua wet forest (undifferentiated)	

For more information about TASVEG maps, please contact the Coordinator, Tasmanian Vegetation Monitoring and Mapping Program.
Telephone: (03) 6233 4501
Email: TASVEG@dpipwe.tas.gov.au

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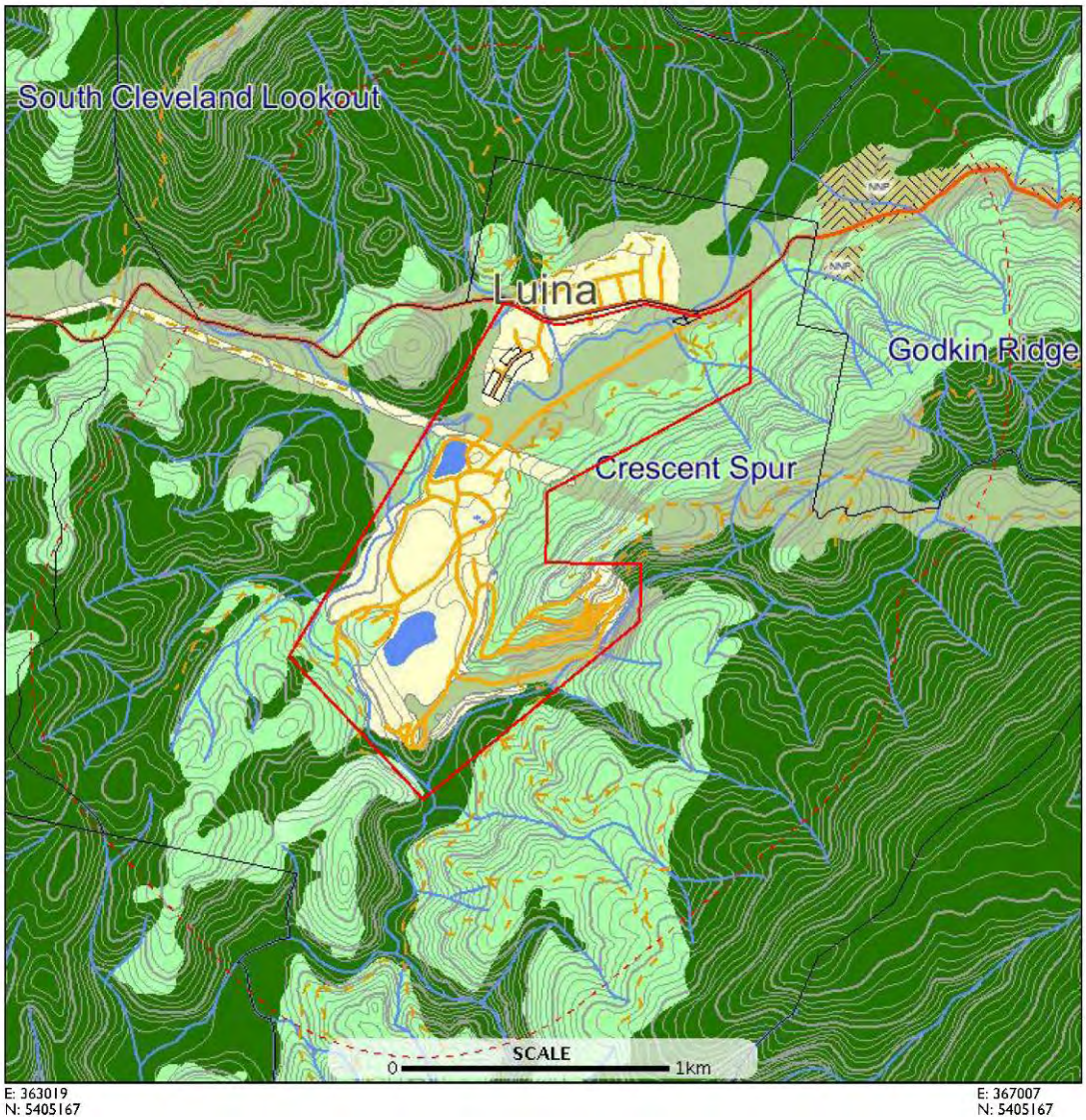
TASVEG communities within 1000 metres

Threatened communities within 1000 metres



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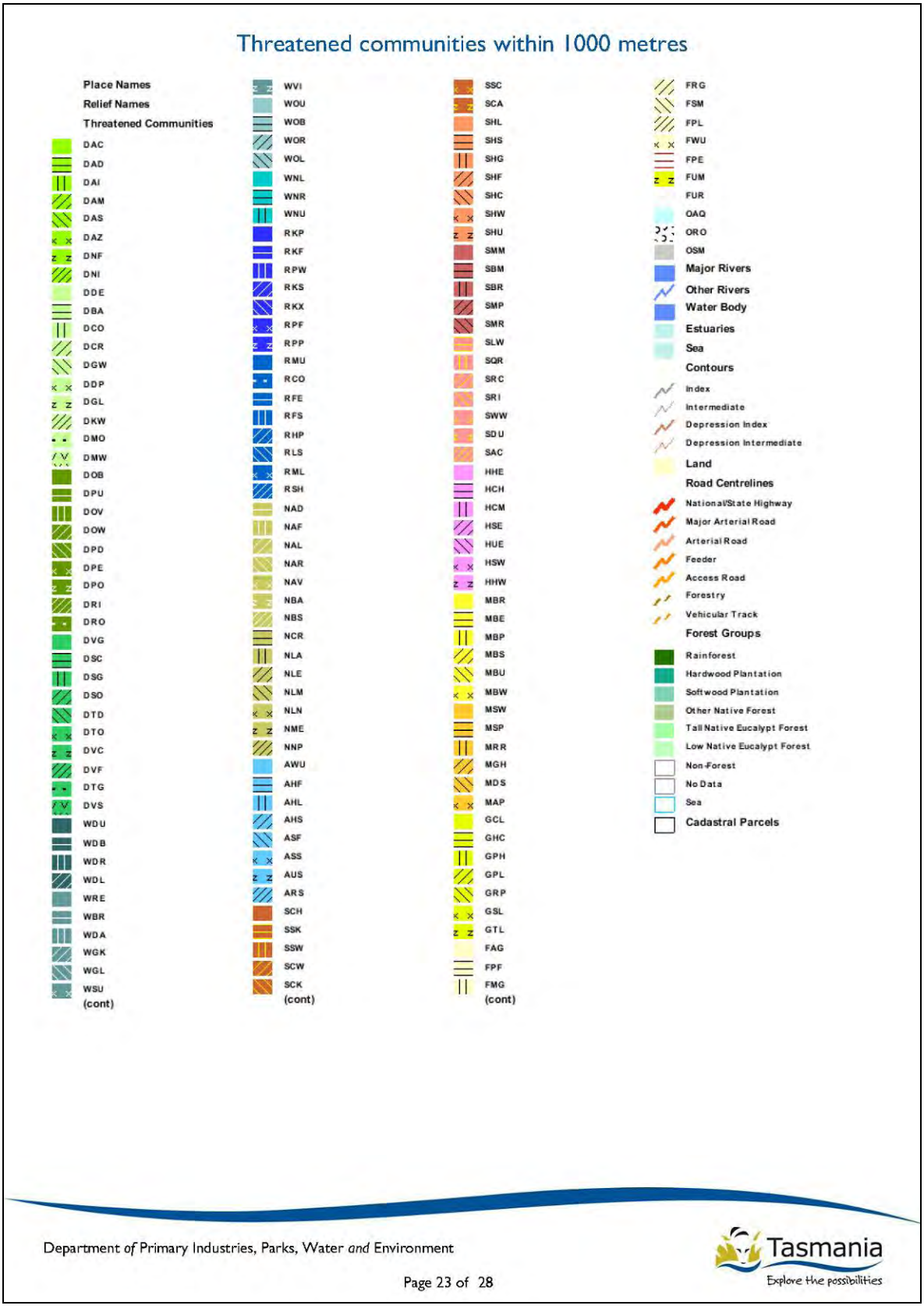
Threatened communities within 1000 metres
Place Names
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DAC
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WGL
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RCO
RFE
RFS
RHP
RLS
RML
RSH
NAD
NAF
NAL
NAR
NAV
NBA
NBS
NCR
NLA
NLE
NLM
NLN
NME
NNP
AWU
AHF
AHL
AHS
ASF
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SQR
SRC
SRI
SWW
SDU
SAC
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HCM
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HUE
HSW
HHW
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MBP
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MBW
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Threatened communities within 1000 metres

Code	Title	Status
NNP	Notelaea - Pomaderris - Beyeria forest	R,E
NNP	Notelaea - Pomaderris - Beyeria forest	R,E

For more information about threatened vegetation communities, please contact Resource Management and Conservation.

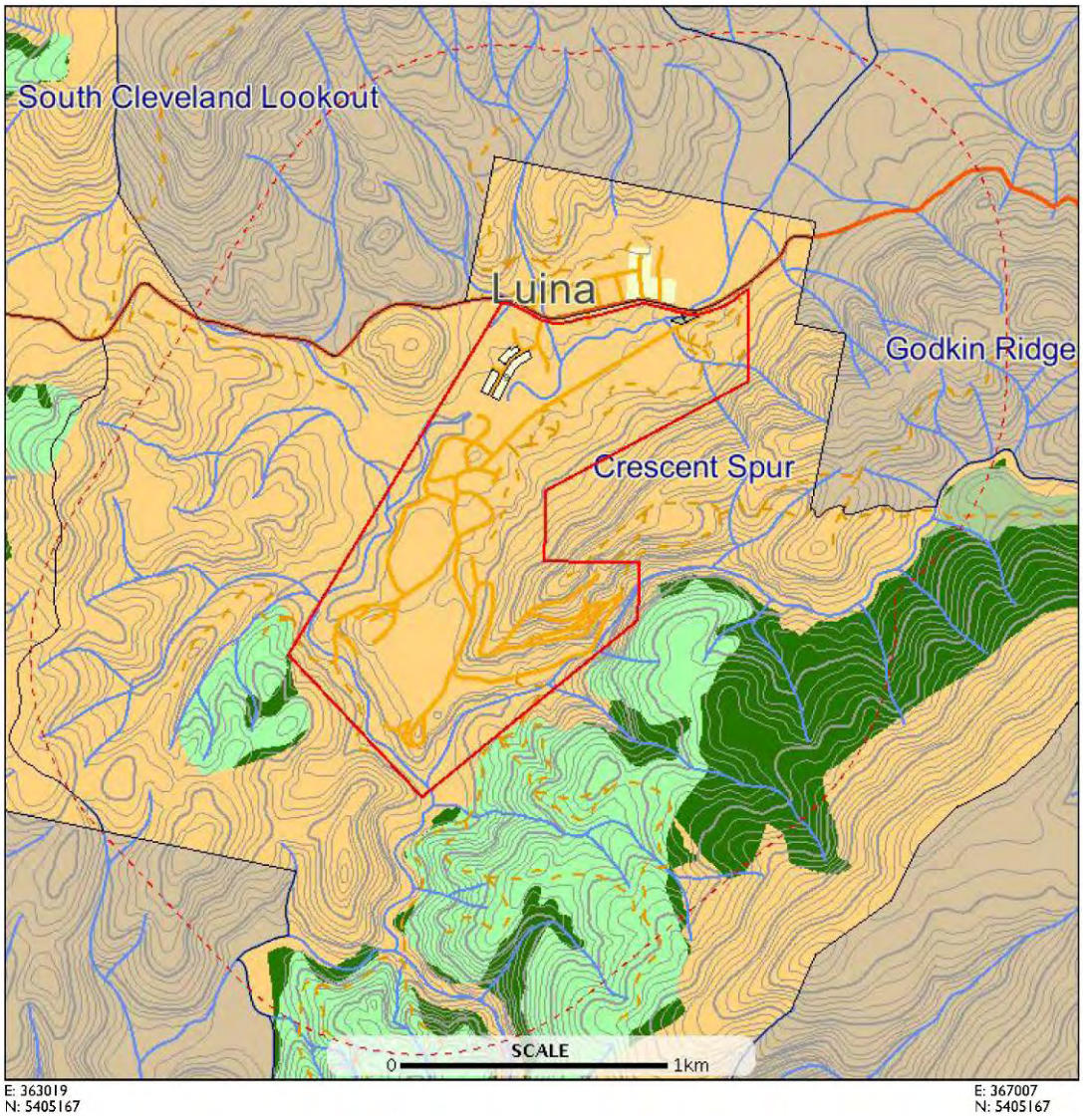
Ph: (03) 6233 4501,

Fax: (03) 6233 3186

Address: GPO Box 44, Hobart TAS 7000 Australia

Geoconservation sites within 1000 metres

***** No Geoconservation sites found within 1000 metres. *****



Department of Primary Industries, Parks, Water and Environment

Page 26 of 28

Tasmania
Explore the possibilities

Reserves within 1000 metres

Reserves within 1000 metres

Name	Classification	Status
Meredith Range Regional Reserve	Regional Reserve	Other Formal Reserve
	Informal Reserve on State Forest or Forestry Tas managed land	Informal Reserve
Savage River Regional Reserve	Regional Reserve	Other Formal Reserve

For more information about the Tasmanian Reserve Estate, please contact the Policy & Conservation Assessment Branch DPIPWE.

Ph: (03) 6216 4457

Fax (03) 6223 8603

Address: GPO Box 44 Hobart TAS 7000

APPENDIX D. Forest Practices Authority's *Fauna Values Database* report for study area

THREATENED FAUNA MAPSHEET DISPLAY

LUINA 3640

Current as at 09/Aug/2011

Please note, coordinates use map datum GDA94

Known localities

Species	Tenure	Locality		Notes
hydrobiid snail (B. bellii)	CL	361512 5407483	Thirteen Mile Creek, junction Mt Cleveland and Corinna Roads	
hydrobiid snail (B. bellii)	CL	362512 5407983	Thirteen Mile Creek 0.8 km u/s Mt Cleveland-Corinna Roads junction	
hydrobiid snail (B. hullii)	CL	361512 5407483	Thirteen Mile Creek, junction Mt Cleveland and Corinna Roads	
hydrobiid snail (P. marginata)	CL	361512 5407483	Thirteen Mile Creek, junction Mt Cleveland and Corinna Roads	
hydrobiid snail (P. marginata)	CL	362512 5407983	Thirteen Mile Creek 0.8 km u/s Mt Cleveland-Corinna Roads junction	
wedge-tailed eagle		374462 5405483	Four Mile Rd, Waratah	nest (#962)
wedge-tailed eagle	SF	376592 5406223	Waratah 3 km S	nest near (#542)
wedge-tailed eagle	SF	376762 5406558	Champion Heath N	nest (#741)

Habitat which may contain threatened species

Species	Habitat
grey goshawk	Wet eucalypt forest with blackwood/myrtle understorey, blackwood swamp, E. brookeriana wet forest, melaleuca and leptospermum forest.
hydrobiid snail	Immediate catchment of the stream in which known locality occurs
ptunarra brown butterfly	Native grasslands or grassy woodlands with tussock grass (*Poa*) cover of more than 15%
quoll (spotted-tailed, eastern)	All wetter forest types, coastal heath and bush-pasture interfaces
Tasmanian devil	Potential habitat includes dry to damp forest, woodlands and grassy woodlands, coastal scrub, and riparian areas.
wedge-tailed eagle	Large tracts (more than 10 ha) of eucalypt or mixed forest

APPENDIX E. DSEWPC's *Protected Matters* report for study area

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

EPBC Act Protected Matters Report: Coordinates

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

Report created: 09/08/11 16:22:49

Summary
Details
Matters of NES
Other matters protected by the EPBC Act
Extra Information
Caveat
Acknowledgements

This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 1.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance (Ramsar Wetlands):	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Threatened Ecological Communitites:	1
Threatened Species:	8
Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	7
Whales and Other Cetaceans:	None

Critical Habitats:	None
Commonwealth Reserves:	None

Report Summary for Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	2
State and Territory Reserves:	2
Regional Forest Agreements:	1
Invasive Species:	5
Nationally Important Wetlands:	None

Details

Matters of National Environmental Significance

Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community may occur within area

Threatened Species [Resource Information]

Name	Status	Type of Presence
BIRDS		
Aquila audax fleayi		
Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Species or species habitat may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Ceyx azureus diemenensis		
Tasmanian Azure Kingfisher [25977]	Endangered	Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae castanops		
Masked Owl (Tasmanian) [67051]	Vulnerable	Species or species habitat may occur within area
FISH		
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area
MAMMALS		
Dasyurus maculatus maculatus (Tasmanian population)		
Spotted-tail Quoll, Spot-tailed	Vulnerable	Species or species habitat likely to occur within area

Quoll, Tiger Quoll (Tasmanian population) [75183]		
Sarcophilus harrisii		
Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area

Migratory Species		[Resource Information]
Name	Status	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat may occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat may occur within area
Lathamus discolor		

Swift Parrot [744]	Endangered	Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	Status
Natural	
Tarkine TAS	Indicative Place
Tarkine Wilderness Area TAS	Registered

State and Territory Reserves [Resource Information]

Meredith Range, TAS
Savage River, TAS

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.
Tasmania RFA, Tasmania

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Plants		
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtjii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and

marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites;
- seals which have only been mapped for breeding sites near the Australian continent.

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-41.46649 145.38134,-41.46641 145.38309,-41.46717 145.38476,-41.46717 145.38621,-41.46649 145.38887,-41.46664 145.39002,-41.46695 145.39139,-41.46679 145.39238,-41.46649 145.39352,-41.46557 145.39519,-41.46999 145.39481,-41.47288 145.38507,-41.47502 145.38491,-41.47517 145.38887,-41.47882 145.38895,-41.48461 145.37821,-41.47898 145.37212,-41.46649 145.38149,-41.46649 145.38134

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia

-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Last updated: Thursday, 16-Sep-2010 09:13:25 EST

Department of Sustainability, Environment, Water, Population and Communities
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111 ABN

| Australian Government |

APPENDIX F. DPIPWE's *Conservation of Freshwater Ecosystem Values* report for study area

Conservation of Freshwater Ecosystem Values (CFEV) Database

Corporate Interface Report

https://cfev.dpiw.tas.gov.au

Data in this report should be cited as:

CFEV database, v1.0 (2005), Conservation of Freshwater Ecosystem Values Project, Water Resources Division, Department of Primary Industries and Water, Tasmania

All maps in this report should be cited as:

Base data by CFEV, © State of Tasmania.

Rivers, estuaries and waterbodies - base data by the LIST, © State of Tasmania.

For interpretive information visit:

http://www.dpiw.tas.gov.au/cfev

The CFEV Program is an initiative of the Water Resources Division, Department of Primary Industries and Water.

1 Legend

Karst

Wetlands

River Sections

Waterbodies

Data confidence and CFEV

The strength of the CFEV data lies with its comprehensive coverage of the state, which allows broad scale comparisons, generalised summaries, and the combination of complicated data sets into readily interpreted indices.

It should be acknowledged that CFEV data uses a variety of data sources as input and that some of these are modelled and are not ground-truthed. As a result care should be taken when using specific variables at specific locations.

Disclaimer

This web resource has been developed by the State of Tasmania to provide public access to some State, Commonwealth and local government information, including text, maps and various forms of data and to information obtained from non-government sources.

It also provides on-line access to some government services and transactions. All of the material published on this website is together referred to hereafter as "the information".

In those circumstances, no responsibility is accepted for the accuracy, completeness, or relevance to the user's purpose, of the information and those using it for whatever purpose are advised to verify it with the relevant Commonwealth or State government department, local government body or other source and to obtain any appropriate professional advice.

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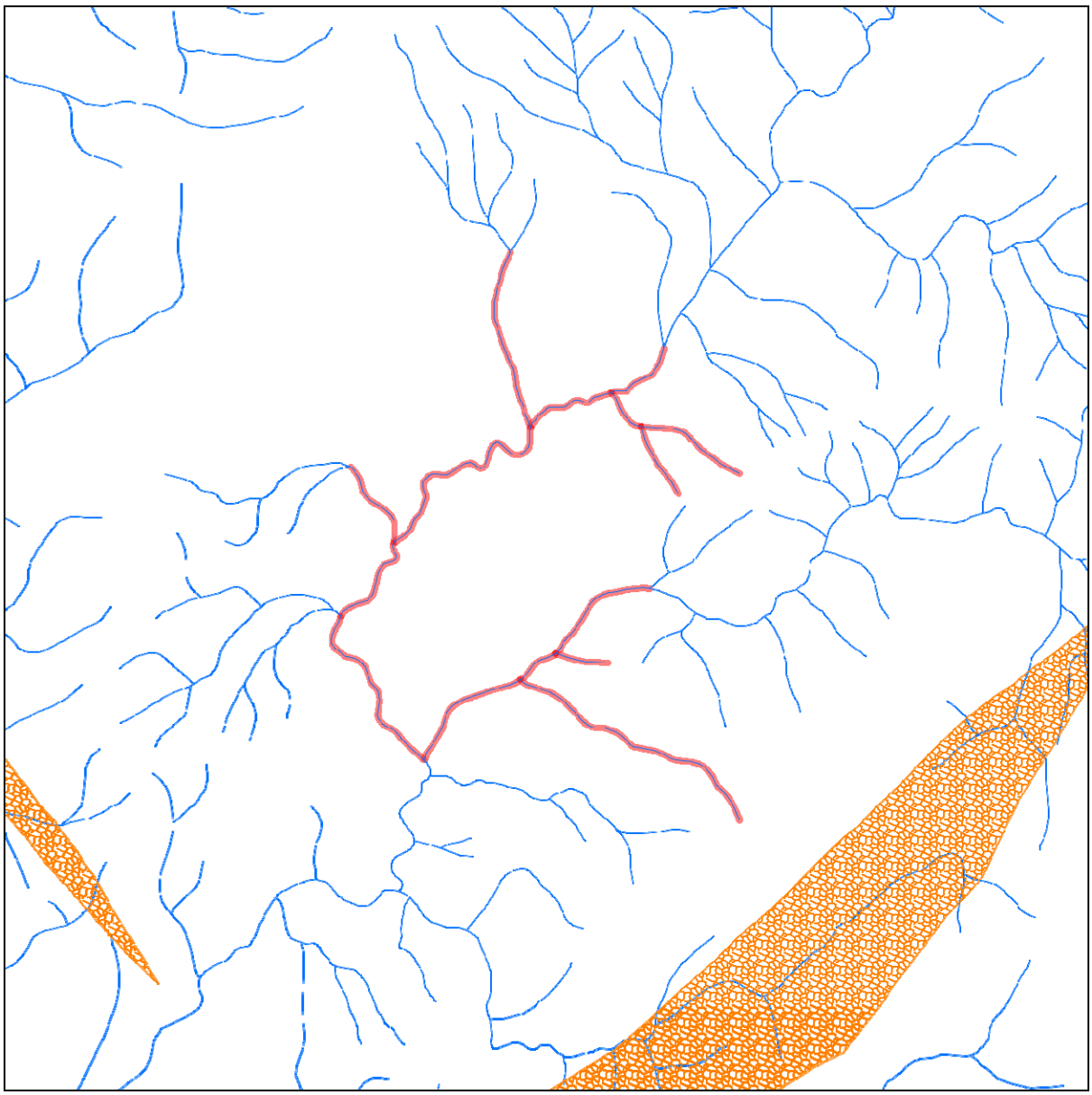
Any results with important management implications should be supported by on-ground surveys

2 River Sections : 143217,143209,143231,143236,143272,143266,143207,143205,143172,143230,143233,143237,143271,143274,143276



Centre point - E: 365260m N: 5407352m Scale (map width): 5332m

GDA94 Zone 55

2.1 Biophysical Classes

2.1.1 Crayfish Class

Code	Description	% Units	Count	Total Units
C6	All first order streams (for rivers) and areas greater than 400 m AHD; Crayfish absent or naturally in low abundance or low probability of occurrence (mainland Tasmania)	28.08%	4	2548.47 m
C1	Areas below 400 m AHD and excluding first order streams (for rivers); Astacopsis gouldi present.	71.92%	11	6525.90 m

2.1.2 Fish Class

Code	Description	% Units	Count	Total Units
F49	Extensive assemblage in river sections and waterbodies covering most of the western part of the state (west of Tyler corridor), including the southern part of King Island and also within a few river sections inland in the east.	64.22%	9	5827.40 m
F0	Fish absent or low probability of occurrence and/or at very low densities (note: headwater streams for rivers). Assemblage a reduced form of that found immediately downstream.	35.78%	6	3246.96 m

2.1.3 Fluvial Geomorphic River Type

Code	Description	% Units	Count	Total Units
G43	Karst in western Savage; Lower catchments dominated by low relief relict surfaces	100.00%	15	9074.36 m

2.1.4 Hydrological Class

Code	Description	% Units	Count	Total Units
H3	The state¿s most perennial, high volume and least variable streams (in annual and monthly flows). High baseflows; High peak runoff with relatively low variability.	100.00%	15	9074.36 m

2.1.5 Macroinvertebrate Class

Code	Description	% Units	Count	Total Units
BC9f	Headwater first order streams, depauperate form of assemblage C9 and located in same areas. Indicator taxa (EPTC groups):	28.08%	4	2548.47 m
BC9	Assemblage of mid to lower altitude (< 800 m AHD) streams throughout much of the inland western region of the state, falling along the western edge of the Tyler line/corridor, encompassing part of	71.92%	11	6525.90 m

Code	Description	% Units	Count	Total Units
	the World Heritage Area, includes upper Franklin and Gordon catchments, middle to lower Huon-Weld-Picton catchments (excluding main-stem Huon and Picton - see R11). Indicator taxa (EPTC groups):			

2.1.6 Macrophyte Class

Code	Description	% Units	Count	Total Units
M1	Low probability of macrophyte assemblage occurrence, absent/very sparse	35.78%	6	3246.96 m
M3	Depauperate macrophyte assemblages characteristic west of Tyler line; Moderate probability of macrophyte assemblage occurrence, Sparse/locally patchy (Depauperate, see Hughes (1987) - Group 5) Dominants:	64.22%	9	5827.40 m

2.1.7 Tree Class

Code	Description	% Units	Count	Total Units
T17	Upland mosaics of moorland, scrub and wet eucalypt forests dominated by E. delegatensis on the eastern side of Lakes Gordon and Pedder and more extensively in inland north-western Tasmania.	45.40%	8	4119.90 m
T50	Lowland scrub and moorland mosaic with implicate rainforest and Huon pine rainforest. Contains communities similar to 21, 38, 43.	54.60%	7	4954.47 m

2.2 Conservation Management Priority

2.2.1 Land Tenure Security

Code	Description	Count	% Count	% Units	Total Units
Medium	This river section lies within a catchment that has predominantly medium security of land tenure. There are some restrictions in place to ensure that the land within this catchment is managed to conserve or protect the landscape from potential negative impacts. This includes informal reserves and State forests.	15	100.00%	100.00%	9074.36 m

2.2.1.1 Land tenure security composition map

Code	Description	Count	% Count	% Units	Total Units
Mixed	The river section lies within a catchment that has mixed security of land tenure. Management restrictions may vary across the	5	33.33%	37.71%	3421.82 m

Code	Description	Count	% Count	% Units	Total Units
	landscape depending on the land tenure.				
Medium	100% of the river section catchment has low moderate tenure security.	10	66.67%	62.29%	5652.54 m

2.2.2 CMPI2

Code	Description	Count	% Count	% Units	Total Units
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the improvement of current conservation management is a lower priority. This CMP was derived by considering both its Integrated Conservation Value and land management security (by tenure).	15	100.00%	100.00%	9074.36 m

2.2.2.1 CMPI1

Code	Description	Count	% Count	% Units	Total Units
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the improvement of current conservation management is a lower priority. This CMP was derived by considering both its Representative Conservation Value and land management security (by tenure).	15	100.00%	100.00%	9074.36 m

2.2.3 CMPP2

Code	Description	Count	% Count	% Units	Total Units
M	Moderate Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a moderate priority when development is proposed or occurs. This applies in the situation where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Integrated Conservation Value and land management security (by tenure).	14	93.33%	97.41%	8839.73 m
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a lower priority when development is proposed or occurs. This applies in the situation	1	6.67%	2.59%	234.63 m

Code	Description	Count	% Count	% Units	Total Units
	where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Integrated Conservation Value and land management security (by tenure).				

2.2.3.1 CMPP1

Code	Description	Count	% Count	% Units	Total Units
M	Moderate Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a moderate priority when development is proposed or occurs. This applies in the situation where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Representative Conservation Value and land management security (by tenure).	14	93.33%	97.41%	8839.73 m
L	Lower to Lowest Conservation Management Priority (CMP). The river section is part of a river cluster for which the conservation management is a lower priority when development is proposed or occurs. This applies in the situation where further development occurs within the catchment which may contribute to a change in aquatic ecological condition or status. This CMP was derived by considering both its Representative Conservation Value and land management security (by tenure).	1	6.67%	2.59%	234.63 m

2.3 Conservation Value

2.3.1 ICV

Code	Description	Count
L	Lower to lowest Integrated Conservation Value (ICV). ICV integrates the Representative Conservation Value with known Special Values (eg. threatened and priority species and communities, and priority sites).	15

2.3.1.1 Special Values

Name	Scientific Name	Status	Type
Platypus	Ornithorynchus anatinus	Non-outstanding	Phylogenetically Distinct Fauna Species

2.3.2 NR class

Code	Description	Count	% Count	% Units	Total Units
C1	C1 class of Representativeness and Naturalness. This river section is within the last group of sites selected for rivers and is in excellent condition. Selection is based on representativeness, rarity of classification units and naturalness score.	9	60.00%	60.61%	5499.65 m
C2	C2 class of Representativeness and Naturalness. This river section is within the last group of sites selected for rivers and is in moderate condition. Selection is based on representativeness, rarity of classification units and naturalness score.	5	33.33%	36.81%	3340.08 m
C3	C3 class of Representativeness and Naturalness. This river section is within the last group of sites selected for rivers and is in poor condition. Selection is based on representativeness, rarity of classification units and naturalness score.	1	6.67%	2.59%	234.63 m

2.3.3 RCV

Code	Description	Count
C	C class Representative Conservation Value (RCV). This river section is within the last group of sites selected for rivers. Selection is based on representativeness, rarity of classification units and naturalness.	15

2.3.3.1 Important biophysical class

Code	Description	% Units	Count	Total Units
T17	Upland mosaics of moorland, scrub and wet eucalypt forests dominated by E. delegatensis on the eastern side of Lakes Gordon and Pedder and more extensively in inland north-western Tasmania.	45.40%	8	4119.90 m
T50	Lowland scrub and moorland mosaic with implicate rainforest and Huon pine rainforest. Contains communities similar to 21, 38, 43.	54.60%	7	4954.47 m

2.4 Location

2.4.1 Easting

Maximum	Minimum	Mean	Count
365982.63 m	364415.82 m	365217.78 m	15

2.4.2 Mapsheet

Description	Count
LUINA	15

2.4.3 Northing

Maximum	Minimum	Mean	Count
5408376.50 m	5406375.33 m	5407408.70 m	15

2.5 Name

Description	Count
Prouse Creek	1
Whyte River	5
Washington Creek	3

2.6 Naturalness

Code	Description	Count	% Count	% Units	Total Units
Low	River section severely altered from natural condition.	1	6.67%	2.59%	234.63 m
High	River section in near-natural condition.	9	60.00%	60.61%	5499.65 m
Medium	River section significantly altered from natural condition.	5	33.33%	36.81%	3340.08 m

2.6.1 Biological Condition Score

Code	Description	Count	% Count	% Units	Total Units
4	Near natural biological condition for the river section.	7	46.67%	51.74%	4695.31 m
3	Significantly impaired biological condition for the river section.	4	26.67%	20.17%	1830.58 m
5	Unimpaired biological condition for the river section.	4	26.67%	28.08%	2548.47 m

2.6.1.1 Exotic Fish Condition

Code	Description	Count	% Count	% Units	Total Units
0	Exotic fish present and abundant; proportion of biomass as native fish approx. 0.	11	73.33%	71.92%	6525.90 m
1	Exotic fish absent or very low probability of occurrence.	4	26.67%	28.08%	2548.47 m

2.6.1.2 Macroinvertebrate Condition

Code	Description	Count	% Count	% Units	Total Units
5	Natural total density levels and natural assemblage composition of benthic macroinvertebrates for the river section.	15	100.00%	100.00%	9074.36 m

2.6.1.2.1 River Abstraction Index

Code	Description	Count	% Count	% Units	Total Units
5	Small to no decreases in long-term mean annual volume of flow, and moderate decreases in summer baseflows in rural areas due to net abstraction (removal out of the channel) of water.	15	100.00%	100.00%	9074.36 m

2.6.1.2.2 Flow Variability Index

Code	Description	Count	% Count	% Units	Total Units
4	The degree of change in flow	15	100.00%	100.00%	9074.36 m

Code	Description	Count	% Count	% Units	Total Units
	regime variability as a result of human flow manipulation (associated with large storages) is zero or very low; no major dam or structure present).				

2.6.1.2.3 Macroinvertebrate Observed/Expected

Code	Description	Count	% Count	% Units	Total Units
1	AUSRIVAS O/E ranked index falls within the A impairment band, O/E rank range approx. 0.8 to 1.3, with mean of approx. 1.0; Equivalent to natural; No impact on presence or relative abundance of approx. dominant families.	4	26.67%	25.07%	2275.10 m
0.8	AUSRIVAS O/E ranked index falls within the AB impairment band region, O/E rank range approx. 0.6 to 1.0, with mean of approx. 0.8; Close to natural or moderately impaired; Minimal to some impact on presence or relative abundance of approx. dominant families.	11	73.33%	74.93%	6799.26 m

2.6.1.3 Fish Condition

Code	Description	Count	% Count	% Units	Total Units
-9	Native fish absent or low probability of occurrence	6	40.00%	35.78%	3246.96 m
0.5	Moderate impact of large dams, changes in flow regime, or acid drainage on native fish populations	1	6.67%	7.34%	666.15 m
1	No impact of large dams, changes in flow regime, or acid drainage on native fish populations	8	53.33%	56.88%	5161.25 m

2.6.1.4 Accumulated Native Riparian Vegetation

Maximum	Minimum	Mean	Count
1.00	0.66	0.87	15

2.6.1.4.1 Native Riparian Vegetation

Code	Description	Count	% Count	% Units	Total Units
3	Moderate to high proportional area of native vegetation occurring within the riparian zone (50m width strip each side of the river section) (20 - 80% of total riparian buffer zone as native vegetation)	6	40.00%	41.73%	3786.93 m
4	Very to extremely high proportional area of native vegetation occurring within the riparian zone (50m width strip each side of river section) (>80% of total riparian buffer zone as native vegetation)	9	60.00%	58.27%	5287.43 m

2.6.1.4.2 Willows

Code	Description	Count	% Count	% Units	Total Units
1	Dense willow infestations (Salix sp.) absent within the riparian zone, willows sparse or absent.	15	100.00%	100.00%	9074.36 m

2.6.1.5 Platypus Condition

Code	Description	Count	% Count	% Units	Total Units
1	Platypus population in essentially natural condition; Not in known Mucor infestation area (in 2004); Riparian vegetation mostly or entirely native.	11	73.33%	78.17%	7093.31 m
0.8	Platypus population in close to natrual condition; Either: a: (Not in known Mucor infestation area in 2004; Mixed native and cultural riparian vegetation; First order stream) or b: (Not in known Mucor infestation area in 2004; Mixed native and cultural riparian vegetation; Stream of order > 1).	4	26.67%	21.83%	1981.05 m

2.6.2 Geomorphic Condition Score

Code	Description	Count	% Count	% Units	Total Units
3	High geomorphic condition score for the river section.	8	53.33%	57.74%	5239.47 m
2	Medium geomorphic condition score for the river section.	7	46.67%	42.26%	3834.89 m

2.6.2.1 Flow change

Code	Description	Count	% Count	% Units	Total Units
5	Minimal to no change to flow regime for the river section.	15	100.00%	100.00%	9074.36 m

2.6.2.1.1 River Abstraction Index

Code	Description	Count	% Count	% Units	Total Units
5	Small to no decreases in long-term mean annual volume of flow, and moderate decreases in summer baseflows in rural areas due to net abstraction (removal out of the channel) of water.	15	100.00%	100.00%	9074.36 m

2.6.2.1.2 Flow Variability Index

Code	Description	Count	% Count	% Units	Total Units
4	The degree of change in flow regime variability as a result of human flow manipulation (associated with large storages) is zero or very low; no major dam or structure present).	15	100.00%	100.00%	9074.36 m

2.6.2.1.3 Regulation Index

Code	Description	Count	% Count	% Units	Total Units
1	The amount of regulation of the	15	100.00%	100.00%	9074.36 m

Code	Description	Count	% Count	% Units	Total Units
	natural flow regime due to cumulative effect of water storage upstream is low. Geomorphic and biological impacts weak or absent.				

2.6.2.2 Geomorphic responsiveness

Code	Description	Count	% Count	% Units	Total Units
0	Responsiveness of channel form to anthropogenic changes in flow and/or sediment regime is low (eg. a bedrock controlled system).	15	100.00%	100.00%	9074.36 m

2.6.2.3 Sediment capture

Code	Description	Count	% Count	% Units	Total Units
3	Low to very low proportion of fluvial sediment captured (stored) in dams upstream of river section.	15	100.00%	100.00%	9074.36 m

2.6.2.4 Sediment Input

Code	Description	Count	% Count	% Units	Total Units
2	Large anthropogenic change to sediment input for the river section.	5	33.33%	32.05%	2908.57 m
1	Very large anthropogenic change to sediment input for the river section.	1	6.67%	7.34%	666.15 m
3	Moderate anthropogenic change to sediment input for the river section.	1	6.67%	2.87%	260.17 m
5	Minimal to no anthropogenic change to sediment input for the river section.	7	46.67%	42.85%	3888.21 m
4	Small anthropogenic change to sediment input for the river section.	1	6.67%	14.89%	1351.26 m

2.6.2.4.1 Catchment Disturbance

Code	Description	Count	% Count	% Units	Total Units
4	Low level of catchment disturbance affecting stream channel and sediments; some disturbance affecting stream channel and sediments with the catchment subject to selective clearance and/or rough grazing.	1	6.67%	14.89%	1351.26 m
5	Minimal level of catchment disturbance affecting stream channel and sediments; minimal or no clearance and/or disturbance.	13	86.67%	82.24%	7462.92 m
2	High level of catchment disturbance affecting stream channel and sediments; catchment heavily cleared and/or used intensively, such as agriculture and urban areas.	1	6.67%	2.87%	260.17 m

2.6.2.4.2 Mining Sedimentation

Code	Description	Count	% Count	% Units	Total Units
1	Absence of major long-term and/or historical mining sedimentation	14	93.33%	92.66%	8408.22 m

Code	Description	Count	% Count	% Units	Total Units
	deposits in channel.				
0	Presence of major long-term and/or historical mining sedimentation deposits in channel; substantial geomorphological and/or biological impacts present or likely.	1	6.67%	7.34%	666.15 m

2.6.2.4.2.1 River Acid Drainage

Code	Description	Count	% Count	% Units	Total Units
0	Significant acid drainage absent	15	100.00%	100.00%	9074.36 m

2.6.2.4.3 Urbanisation

Code	Description	Count	% Count	% Units	Total Units
1	Local channel impacts from urbanisation absent or limited. Fluvial geomorphological impacts absent or not significant.	9	60.00%	60.61%	5499.65 m
0	Local channel impacts from urbanisation present, and significant. Fluvial geomorphological impacts significant.	6	40.00%	39.39%	3574.72 m

2.7 Topographic Variables

2.7.1 Accumulated Mean Annual Runoff

Maximum	Minimum	Mean	Count
40729.08 ML/year	44.37 ML/year	14173.67 ML/year	15

2.7.2 Accumulated Mean Annual Runoff - pre-European

Maximum	Minimum	Mean	Count
40729.08 ML/year	44.37 ML/year	14173.67 ML/year	15

2.7.3 Accumulated Catchment Area

Maximum	Minimum	Mean	Count
28077343.41 m²	30676.56 m²	9729262.42 m²	15

2.7.4 Accumulated Length

Maximum	Minimum	Mean	Count
31725.98 m	3690.77 m	19671.38 m	15

2.7.5 Local Catchment Area

Maximum	Minimum	Mean	Count
1413353.96 m²	30676.56 m²	369624.42 m²	15

2.7.6 Elevation Max

Maximum	Minimum	Mean	Count
569.00 m AHD	293.00 m AHD	371.40 m AHD	15

2.7.7 Elevation Min

Maximum	Minimum	Mean	Count
330.00 m AHD	283.00 m AHD	306.93 m AHD	15

2.7.8 Length

Maximum	Minimum	Mean	Count
1351.26 m	224.69 m	604.96 m	15

2.7.9 Mean Annual Runoff

Maximum	Minimum	Mean	Count
2001.04 ML/year	44.37 ML/year	529.16 ML/year	15

2.7.10 Strahler stream order

Maximum	Minimum	Mean	Count
5.00	1.00	3.20	15

2.7.11 Slope

Maximum	Minimum	Mean	Count
0.461230 rise/run	0.007489 rise/run	0.122111 rise/run	15

Australian Government
Department of Sustainability, Environment, Water, Population and Communities

Mr Chris Dunks
Managing Director
Bright Phase Pty Limited
PO Box 256
HOLLAND PARK QLD 4121

Date: 14 November 2011
EPBC Ref: 2011/6142
EPBC contact: Mark Hall
02 6274 1933
mark.hall@environment.gov.au

Dear Mr Dunks

Decision on referral

The Cleveland Tin Mine, near Luina, North West Tasmania (EPBC 2011/6142)

This proposed action, involving the mining and reprocessing of old tailings and the dewatering and exploration of the old mine workings, has now been considered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

As the delegate of the Minister for Sustainability, Environment, Water, Population and Communities, I have decided that the proposed action is a controlled action and, as such, requires assessment and approval under the EPBC Act before it can proceed.

It appears that the proposed action is likely to have a significant impact on the following matters protected by the EPBC Act:

- Listed threatened species and communities (sections 18 & 18A);

Species of interest include Wedge-Tailed Eagle, Spotted-Tail Quoll, Tasmanian Devil, Masked Owl and Australian Grayling.

Please note that this decision only relates to the potential for significant impact on the specific matters protected under Chapter 2 of the EPBC Act.

The Department has yet to make a decision on assessment approach, and has paused the timeline to make this decision pending confirmation that the project will be assessed under the bilateral agreement with the Tasmanian Government.

Yours sincerely

David Calvert
A/g Assistant Secretary
Environment Assessment Branch

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

Notification of REFERRAL DECISION AND DESIGNATED PROPONENT – controlled action

DECISION ON ASSESSMENT APPROACH

Cleveland Tin Mine (EPBC 2011/6142)

This decision is made under section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

proposed action	To mine and reprocess 4 million tonnes of old tailings contained in two large tailings facilities at the closed Cleveland Mine at Luina in Northwest Tasmania including dewatering old mine workings for exploration and geotechnical assessment of resource potential for future hard rock mining, and as described in the referral received under the EPBC Act on 6 October 2011.
decision on proposed action	The proposed action is a controlled action. The project will require assessment and approval under the EPBC Act before it can proceed.
relevant controlling provisions	• Listed threatened species and communities (sections 18 & 18A)
designated proponent	Bright Phase Pty Limited ACN: 127 819 710
assessment approach	To be advised

Decision-maker

Name and position	David Calvert Acting Assistant Secretary Environment Assessment Branch
Signature	
date of decision	14 November 2011

Level 7, 134 Macquarie Street, Hobart TAS
GPO Box 1550, Hobart, TAS 7001 Australia

ENVIRONMENT PROTECTION AUTHORITY

Enquiries: Clare Lond-Caulk
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Our Ref: 112463:eeo/eas/p/BrightPhase_Cleveland\c/C06_Guidelines

Date 19/3/2012		Recorded BB	
File HB11225/431		Doc H23312	
ATTN	Action	Initial	Date
J.C	A		19-3-12
D.L	I	Rec per	19-3-12
		I	
A. Action		Filed	
I. Information			

15 March 2012

Dr Mike Adams
Bright Phase Pty Ltd
PO Box 374
GUILDFORD WA 6935

Dear Dr Adams

BRIGHT PHASE PTY LTD – CLEVELAND MINE PROJECT
DPEMP GUIDELINES

DPEMP Guidelines

As previously advised, the environmental impact of the above proposal is being assessed by the Board of the Environment Protection Authority (the Board) as a class 2C assessment under the *Environmental Management and Pollution Control Act 1994*.

The assessment cannot proceed further until you have satisfactorily presented the case for assessment in the form of a Development Proposal and Environmental Management Plan (DPEMP) prepared in accordance with the enclosed DPEMP guidelines.

The DPEMP guidelines, prepared based on the Notice of Intent, prescribe the information requirements, as related to the proposal being assessed. Please note that if the project should change from that described in the Notice of Intent the DPEMP guidelines may need to be modified.

Close consultation with the EPA Division, Council, and Commonwealth Department of Sustainability, Environment, Water, Population and the Community (DSEWPaC) during the preparation of the DPEMP is recommended.

A draft of the DPEMP should be submitted to this office for review prior to the submission of a permit application to the local Council. It is recommended that you follow the headings and section numbering outlined in the guidelines to prepare a DPEMP for the above project.

The Assessment Process

Once a satisfactory DPEMP has been received, the application and the DPEMP will be advertised and the public invited to make representations in relation to the project. The application will also be referred to relevant State Government agencies and DSEWPaC for comment.

At the end of the public consultation period, you may be requested to provide the Board with additional supporting information, or to modify the project, in response to the public and agency comments. This will take the form of a supplement to the DPEMP.

On completion of its assessment, the Board will notify you, Council and DSEWPaC of the result of the assessment and of any conditions or restrictions which the Board requires to be contained in any permit granted by Council, or will direct Council to refuse to grant a permit.

Failure to provide a satisfactory case for assessment (DPEMP) within 12 months of your receipt of the attached guidelines may result in rejection of the application or proposal.

Please note that the Board is required to publicly disclose all information relating to the environmental impact of the proposal except where there is a legitimate commercial, national security or environmental reason for confidentiality. Please indicate where you would prefer information to remain confidential, and the basis for the request.

Fees

Also please note that in my letter of 13 January 2012, I provided advice on the likely assessment and annual permit fees for the activity. These figures were based on the activity being classified as a Mine, as per subsection (5)(c) of Schedule 2 of the EMPC Act. After further consideration the activity is now considered to be a Mineral Works (subsection (2)(e) of Schedule 2 of the EMPC Act).

As specified in the *Environmental Management and Pollution Control (General Fees) Regulations 2007*, a Mineral Works with 300,000 tonnes of raw material processed per year, will invoke the following fees: the assessment fee will be determined at an hourly rate of $115.50 per hour spent on the assessment, commencing from the receipt of the Notice of Intent (the assessment fee is capped by law at $57,850). The annual permit fee will be $40,852. An invoice for fees payable will be issued at the conclusion of the Board's assessment. Please note that the above fees are subject to indexation.

If you have any queries regarding the above, please contact the officer nominated at the head of this correspondence.

Yours sincerely

per Alex Schaap
DIRECTOR, ENVIRONMENT PROTECTION AUTHORITY

Encl.

- *Guidelines for the preparation of a Development Proposal and Environmental Management Plan for Bright Phase Pty Ltd, Cleveland Mine Project, Luina, Tasmania.*

cc Mr Greg Winton, General Manager, Waratah-Wynyard Council, PO Box 168, WYNYARD TAS 7325

Mr Jim Lockley, Pitt & Sherry, GPO Box 94, HOBART TAS 7001

Director, Environment Assessment Branch, DSEWPaC, GPO Box 787, CANBERRA ACT 2601

Guidelines for the preparation of a

Development Proposal and Environmental Management Plan

for

Bright Phase Pty Ltd
Cleveland Mine Project
Near Luina, Tasmania.

Board of the Environment Protection Authority
March 2012

ENVIRONMENT PROTECTION AUTHORITY

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GENERAL INFORMATION FOR THE PROPONENT

Commonwealth environmental approval

This proposal has been determined to be a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on the grounds that it is likely to have a significant impact on Listed Threatened Species and Communities (sections 18 and 18A), a matter protected by the EPBC Act – the "controlling provision" for assessment. Therefore, in addition to Tasmanian requirements, Australian Government approval is required under the EPBC Act.

The Australian and Tasmanian Governments have signed a bilateral agreement relating to impact assessment under section 45 of the EPBC Act which effectively accredits the State assessment process. This proposal will be assessed in accordance with the bilateral agreement.

Further information on the EPBC Act can be obtained from the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) website at www.environment.gov.au/epbc/ or by calling 1800 704 520.

General

The *Environmental Management and Pollution Control Act 1994* (EMPC Act) requires the Board of the Environment Protection Authority ('the Board') to provide guidance to the proponent about what should be included in the case for assessment.

These guidelines provide general and specific information on preparing a Development Proposal and Environmental Management Plan (DPEMP) for the proposed activity (action) being assessed by the Board under the EMPC Act and the Federal government under the EPBC Act.

Not all issues nominated in these guidelines will have the same degree of relevance to the proposed activity; some of the issues may be more relevant than others, while others will not be applicable at all. The level of detail provided on issues should be appropriate to the level of significance of that issue for the proposal.

These guidelines identify the key issues related to this proposed activity and should not be interpreted as excluding from consideration other matters that emerge as significant from environmental studies, public comments or otherwise during the course of the preparation of the DPEMP.

The DPEMP should specifically describe the implications of the proposal for the relevant matters protected under the EPBC Act in accordance with Schedule 4 of the EPBC Regulations (see Appendix 1).

This document has been prepared based on a Notice of Intent and relates to a tailings reprocessing activity with potential use of water from the underground mine, but does not include exploration or mining of the underground resource.

Objectives and content

The DPEMP should aim to provide:

a) A source of information from which individuals, governments and groups may gain an understanding of the proposed action including: the current status and background of the project, the need for the action, the alternative actions, the consequence of not proceeding with the action, the objective of the action, how the action relates to other actions in the region, the potential or actual impact the action will have on the environment and the safeguards and mitigation measures that will be implemented to minimise any relevant adverse impacts including specific management commitments (see below).

b) A basis for public consultation and informed comment on the proposal.

c) A framework against which decision makers (and in particular the Board, the local Council and federal Government) can consider the proposal and determine the conditions under which any approval would be given.

The DPEMP should provide details of the proposal, describe the existing environment in the vicinity of the proposal site, identify all significant environmental, social, health and economic impacts associated with the proposal, detail proposed measures to avoid or reduce potential adverse impacts and identify opportunities for protection and enhancement of the environment.

While it is recognised that some construction and operational details may not have been finalised at the time the DPEMP is submitted for assessment, the information presented in the document should be as up to date as possible. Where information is unavailable or details have not yet been finalised, estimates and the range of alternative options should be provided. It should be noted, however, that sufficient technical detail must be provided to enable an appropriate level of assessment to be undertaken.

The main text of the DPEMP should be written in a clear and concise style that is easily understood by the general reader. Technical terminology should be avoided as far as possible. The detailed technical data and reports necessary to support the main text should be included in appendices. All sources of information should be referenced. An indication should also be given of the currency of the information used and how the reliability of the information was tested. In particular, the degree of confidence attached to any predictions should be indicated. It is recommended that information be presented on maps, diagrams and site plans to enhance the level of understanding. In accordance with Schedule 4 of the EPBC Regulations 2000 statements must be provided regarding the following: source of information; how recent the information is; how reliability of information was tested; and what uncertainties (if any) are in the information.

Where sensitive information needs to be provided (e.g. information on production processes, areas of conservation, scientific, archaeological, heritage or other special significance) this information should be provided in a separate, confidential appendix. A comment should be provided in the DPEMP to the effect that the information has been so provided.

Specific management commitments must be clearly identified in the text and included in the commitments table referred to in Section 8 of these guidelines.

Where appropriate, refer to information provided in other sections to minimise duplication.

The DPEMP should contain a summary table showing compliance with these guidelines.

Consultation and submission of draft document

Environmental aspects of the proposal will be assessed by the Board; planning aspects of the proposal will be assessed by the Waratah-Wynyard Council (Council); while matters protected under the EPBC Act will be assessed by DSEWPaC. The Board has authorised the EPA Division to undertake the administrative tasks and establish the information base to inform its decision making on its behalf. As such, close consultation with the EPA Division, Council and DSEWPaC during the preparation of the DPEMP is therefore recommended. It is also recommended that the proponent submit a draft DPEMP to Council, the EPA Division, and DSEWPaC for review prior to its finalisation. Please note that draft documents may be rejected without detailed review if they are incomplete, contain significant formatting or typographical errors or do not comply with these guidelines. More than one draft may be necessary before the document is considered suitable for public release.

Following the public consultation phase, the DPEMP or proposal may require amendment as a result of consideration of public and government agency submissions. This generally takes the form of a supplement to the DPEMP.

Submission

The DPEMP is to be submitted in a printed format and in electronic formats suitable for use with a word processor (such as Microsoft Word), and for publishing on the internet (preferably PDF format). The Board will inform the proponent of the number of copies (and format) required.

Copies are to be made available to the public upon request at no charge or for a nominal fee, in either printed or electronic format (CD ROM). Arrangements to display the DPEMP on the internet (whether on the proponent's or the EPA's web site) will also need to be put into place.

Documents should be suitable for download over slower internet connections. Images within the document should be optimised for the internet and font choices should be restricted to those most commonly used. Being judicious about the number of images and/or design elements can avoid unnecessarily adding to the file size. Large files should be broken into multiple documents.

Structure and content

The following sections have been set out in a manner which may be adopted as the structure for the DPEMP. The proposed structure of the DPEMP must focus on the key issues for the proposal as outlined in section 4.0.

Any significant departure from the requirements and intent of the relevant sections of these general guidelines must be approved by the assessing agencies.

CONTENTS OF THE DPEMP

FOREWORD

This section should briefly outline the assessment and approvals process and explain the function of the DPEMP in this process.

TABLE OF CONTENTS

This section should contain a table of the contents of the report with reference to the relevant page numbers. It should also contain a list of figures and tables.

EXECUTIVE SUMMARY

This section should provide an executive summary of the DPEMP to give a clear and concise overview of the proposal and its environmental implications. It should contain headings corresponding to the main section headings of the DPEMP.

For larger DPEMPs, it is recommended that the executive summary be written as a stand-a-lone document, able to be provided on request to interested parties who may not wish to read or purchase the full DPEMP.

1. INTRODUCTION

This section should provide information on the following:

- Title of the proposal.
- Name and address of the proponent and general background, such as relevant development or operational experience. Where the proponent is a registered company, its Australian Company Number and Registered Office address should be included.
- Relevant background information on the proposal, including a history of the site use, the current status of the proposal, a general overview of the principal components of the proposal and the proposal location, the rationale and need for the proposal, anticipated establishment costs, likely markets for the product, and the possibilities for future expansion.
- An examination of how the proposal relates to any other proposals that have been, or are being, developed or that have been approved in the region affected by the proposal.
- Environmental legislation, standards and guidelines that will be applicable (such as policies, regulations and industry codes of practice).
- Other relevant Commonwealth, State and Local Government policies, strategies and management plans with which the proposal would be expected to comply (using separate headings for each jurisdiction).
- A description of any approval that has already been obtained from a State, Territory or Commonwealth agency or authority. If appropriate any additional approvals that may be required should be identified.

- Details of the nature and results of public consultation undertaken (if any) by the proponent during project planning and preparation of the DPEMP, as well as any proposals for further public consultation during and beyond project implementation. This should include the identification of affected parties and their views on the proposal.

2. PROPOSAL DESCRIPTION

This section should provide a full description of the proposal, including the construction, commissioning, operational and decommissioning phases, as well as any infrastructure and off-site ancillary facilities required for the proposal.

2.1 Proposal outline

This section should provide a detailed description (including precise locations) of key physical components of the proposal, including their function, composition, size, capacity, operational life, technical and performance requirements, inter-relationships and method of construction, operation and maintenance.

As a minimum the following information should be provided.

2.1.1 General

- The proposed area of the action - historically disturbed areas which are not to be included in 'the Land' should be clearly defined.
- The major items of equipment (including pollution control equipment) and on-site facilities including sanitary and sewage treatment facilities should be described. Detailed technical information on major items of equipment may be included in appendices.
- A description of any existing or proposed dams, tailings storage/water treatment facilities.
- The process should be described in a step-by-step manner using explanatory diagrams and flow charts where appropriate to augment text.
- The raw materials required for the proposal (including water and energy) should be specified. Quantities, characteristics and supply options should be listed.
- Details of production capacity and production rates for relevant processes including both peak rates and daily average rates. Include proposed annual production rates.
- The hours of operation for the proposal (hours per day and specific days per week) including any seasonal variations.
- The volume, composition, origin, destination and route for vehicle movements (including road, rail, shipping and air) likely to be generated during the operational phase, including a break-down for over-dimension and heavy road vehicles.
- A description of the mineral resource as currently understood including a brief description of historical and proposed drilling and exploration work undertaken to date to identify and characterise the resource, including metallurgical test results, particle size and saturation levels, interstitial water depth and quality, and the expected long-term prospects (eg 10 years).

- A mine plan including direction of works, transport and storage of material, mining rate, processing rate and mine life and the design parameters for aspects of the structures or elements of the action that may have relevant impacts.
- A description of drilling and blasting requirements, including compliance with relevant safety procedures including any requirement for blast monitoring: (eg. air blast overpressure and ground vibration).
- A description of underground ventilation requirements, including surface infrastructure to be installed in respect of dewatering.
- An estimation of the area of disturbance associated with all aspects of the proposal including any ventilation shaft surface infrastructure required.
- Proposed timetable for decision points and for each stage of the project including construction, tailings extraction, processing, mine dewatering, potential underground exploration and progressive rehabilitation.
- Planned land use of the site when operations are completed.

2.1.2 Construction

- A step-by-step description and timetable for significant activities during the construction phase of the proposal. Indicative timeframes for the completion of major steps, and the likely sequencing of steps.
- Estimates of the quantities of major raw materials required for construction and how these will be sourced.
- Nature, capacity and location of temporary construction equipment required on-site (such as cranes, concrete batch plants, rock crushers, construction camps);Proposed hours per day and days per week of construction activities; and
- Volume, composition, origin, destination and route for vehicle movements likely to be generated during the construction phase, including a breakdown for over-dimension and heavy vehicles.

2.1.3 Commissioning

- A step-by-step description of major commissioning activities (if any) following installation of equipment. Indicative timeframes for the completion of major steps, the likely sequencing of steps and the defining points by which commissioning will be determined to be completed.

2.2 Site plan

Site plans are required which identify the proposal site and which show the following[1] (where relevant).

- The Mining Lease(s).
- The boundary of the proposal site.

[1] When providing maps or referring to spatial databases, the coordinate reference system being used should be specified.

- The location of all major items of equipment and facilities including: site office; change rooms; workshop; crushing machinery; processing plant; borrow pits; wetlands; tailings storage/water treatment facilities (short and long term); haul roads and access tracks; portal entrance; pipelines/conveyors or similar means of transporting on-site materials; electricity transmission lines, energy and water supply; temporary and permanent storage areas for raw materials, waste rock/overburden, product, topsoil, fuels, oils, explosives and other dangerous goods or chemicals (including products, by products and wastes); and stormwater collection systems.
- Plans and description of any proposed stream diversions. Details of any screening vegetation or bund walls.
- Existing vegetation and type including locations of known listed threatened species and communities (TSPA and EPBCA) overlaid with development plans.
- The location of all point sources of atmospheric emissions and liquid emissions (including stormwater).
- The location of all major sources of noise.
- The location of all current and proposed monitoring sites.
- Plans or diagrams depicting the proposed means of access to and from the Waratah Road.
- Location of historical workings and existing infrastructure, such as transmission lines, access/cartage routes, adits or excavations, drill holes and ventilation shaft surface infrastructure locations.

2.3 General location map

A general location map (*e.g.* 1:25,000 scale) which identifies the following is required:

- The location of the proposal site.
- Topographical features, aspect and direction of drainage.
- Road access to and from the site.
- Location of waterways and drains (including ephemeral).
- The distance(s) to any nearby sensitive uses (such as residences).
- Electricity transmission lines.
- Boundaries of the property on which the proposal is located.
- Surrounding land tenure.
- Surrounding land use (identify areas of conservation or recreational significance).

2.4 Off-site infrastructure

Any new infrastructure or off-site ancillary facilities (such as pipelines, power lines etc) required to allow the proposal to proceed should be described (for example water supply, electricity supply, roads or other transport infrastructure).

2.5 Technical and management alternatives

For any part of the proposal where alternative technologies, design options or management practices with different environmental consequences may exist, the alternatives should be identified, their environmental performance evaluated and the reason for the proposed choice justified.

3. THE EXISTING ENVIRONMENT

This section should describe the proposal site location and provide an overview of the existing environment which may be affected by the construction and operation of the proposal, including areas associated with any ancillary activities and off-site infrastructure.

It should include details of salient features of the existing environment and, where appropriate, include maps, plans, photographs, diagrams or other descriptive detail.

The following details should be included.

3.1 Planning aspects

- Information on land tenure and property boundaries of the proposal site, with title details.
- Land zonings for the proposal site and surrounding areas, and any by-laws or special planning controls that may apply to the site and surrounding areas.
- Any rights of way, easements and covenants affecting the proposal site.
- Land use and planning history of the proposal site, including the potential for site contamination[2], the present use of the site and any existing buildings and significant structures.
- A description of land use and ownership in the vicinity of the proposal site and those areas which may be affected by the proposal. The location and nature of industrial facilities, the location of individual residences, schools, hospitals, caravan parks and similar sensitive uses, and the location of any tourist or recreation facilities or routes (such as camping areas, picnic areas, walking tracks, historic routes) within 1000 metres of the proposal site should be included. Any proposed or potential sensitive users within this distance of the proposal site, which have been or are likely to be granted approval under the local planning scheme, should also be considered.

3.2 Environmental aspects

- A description of the general physical characteristics of the proposal site and surrounding area, including topography (eg. as relevant to flooding, dispersion of site discharges/emissions and disturbance of particulates), geology, geomorphology, soils (including erodibility), vegetation, fauna, groundwater and surface drainage (including waterways, lakes, wetlands, coastal areas etc.).
- A description of natural processes of particular importance for the maintenance of the existing environment (e.g. fire, flooding, etc).
- Any existing conservation reserves located on or within 500 metres of the proposal site

[2] Information on potentially contaminating activities and contaminated site assessment can be found online at www.epa.tas.gov.au under 'Land Contamination'.

- Any high quality wilderness areas identified in the *Tasmanian Regional Forest Agreement* located on or within twenty kilometres of the proposal site.
- A brief description of the local climatology (eg. temperature, rainfall, wind speed and direction) and an assessment of the vulnerability of the site to natural hazards (e.g. flooding, seismic activity, fire, landslips or strong winds).
- Location of nearest residences or sensitive uses.

3.4 Alternative sites

This section should describe the site selection process, including site selection criteria, alternative sites considered and an assessment of those alternatives. The assessment should compare alternatives according to clearly defined environmental, social, economic and technical criteria, and provide a justification for the preferred site. Any community consultation undertaken and the impact it had on the selection process should be detailed. Include a discussion of the impacts of each alternative on the matters protected by the EPBC Act.

4. POTENTIAL IMPACTS AND THEIR MANAGEMENT

The key issues that have been identified for consideration in relation to the project, and which should be the principal focus of the DPEMP, are as follows:

- Impacts on surface and ground waters including from discharge of wastewater and exposure of tailings and underground materials to the atmosphere.
- Waste management including measures to prevent or mitigate the formation of acidic and metalliferous drainage (AMD).
- Impacts on natural values.
- Mine closure and rehabilitation.

Survey and study requirements in relation to key issues

The following surveys and studies will be required as part of the DPEMP in relation to the key issues identified above. It is strongly recommended that relevant EPBC Act policy guidelines are consulted and the advice of the EPA Division is sought on the acceptability of survey techniques prior to the work being undertaken.

Where previous surveys have been undertaken these may be used if it can be demonstrated that the results are still relevant.

Key Issue	Survey requirements for DPEMP	Other studies for DPEMP	Relevant section of DPEMP Guidelines
1. Water Quality	Ambient surface water quality survey of the pre-existing receiving environment (evaluation of historical sources of pollution including mass loadings at various flows). Water quality survey of water to be extracted from underground workings at various depths. Tailings (resource) geotechnical survey (acid base accounting) and assessment of interstitial water depth and quality.	Provide an assessment of the potential impact of aqueous emissions from the operation upon the receiving environment including new point source emissions and impacts on diffuse emissions eg by exposing tailings and underground materials to the atmosphere.	3.2/4.2
2. Groundwater	Ambient groundwater quality survey of the pre-existing receiving environment (evaluation of historical sources of pollution).	Provide an assessment of the potential impact on groundwater quality and quantity including intended quantities of groundwater to be used for the activity.	4.3
3. Waste Management	A geotechnical survey of the location of any new dams.	Through geochemical test work (Acid Base Accounting) and modelling - quantify the potential acid forming nature and distribution of materials within areas to be disturbed by the activity. Identify the timing and quantity of exposure of potentially acid forming materials and elements and concentrations that may be of environmental concern based on background levels.	4.2/4.5
4. Natural Values	A terrestrial and aquatic ecological survey including a targeted survey for *Beddomeia beli* (hydrobiid snail – Rapid River) in any potential habitat that will be directly or indirectly impacted by the proposal.	An assessment of the potential impacts of water extraction (if relevant) on the environmental flows and natural values of waterways. An assessment of the impact of wastewater discharge on the aquatic health of the receiving environment.	4.7
5. Mine Closure		Assess the long term acid generating potential of the activity including in the case of unexpected closure.	7

4.0 Guidance for preparation of this section

This section should identify for each of the impacts below:

a) **Existing conditions** – an outline of the existing conditions relevant to that impact (with cross referencing where appropriate to other sections).

b) **Performance requirements** – performance requirements to be achieved should be identified and evidence provided to demonstrate that these can be complied with. These may be standards or requirements specified in legislation, codes of practice, state policies, national guidelines or as determined by agreement with the assessing agencies. Industry best practice standards should be referred to where appropriate. **Unsupported assertions that performance requirements will be achieved will not be considered adequate**.

c) **Potential impacts** – potential environmental impacts of the proposal (positive and negative) should be described for all stages, including construction, operation and closure, in the absence of special control measures. Short and long term impacts plausible worst case consequences and cumulative impacts need to be addressed, in relation to the vulnerability of the affected environment, and the reversibility of the impacts. Interactions between biophysical, socio-economic and cultural impacts should be identified. The representation of the above information on maps, diagrams, site plans and photographs is recommended. Predictions and evaluations of impacts should be based on scientifically supportable data. The methodologies used or relied on should be referenced, together with the relevant research and investigations supporting them. Assumptions, simplifications and scientific judgements should be stated clearly, and the nature and magnitude of uncertainties should be clearly defined. Where relevant, the choice of a particular methodology over alternative methodologies should be explained. Where impacts are unknown, unpredictable, irreversible or not quantifiable, this should be identified and the potential impacts adequately described.

d) **Avoidance and mitigation measures** – a description and list of the measures proposed to avoid or reduce potential adverse impacts in order to achieve the environmental performance requirements. Where adverse environmental impacts are unavoidable, the proposed measures to mitigate the impacts (e.g. pollution control equipment, treatment processes, management practices) should be described in detail. The extent to which they will overcome the anticipated impacts should be specified. Where pollution control equipment and/or treatment processes are key factors in achieving satisfactory environmental performance, contingencies in the event of breakdown or malfunction of the equipment or processes should be discussed. It should be demonstrated that the maintenance of pollution control equipment can be provided for without causing performance requirements to be exceeded. Where measures to control environmental impacts are necessary, but will not be undertaken by the proponent, the means by which the proponent will ensure that the necessary measures are implemented should be identified (*e.g.* lease conditions, trade waste agreement, contractual arrangement or other binding third party commitment). In relation to controlling measures under the EPBC Act information should be provided on whether the mitigation measures suggested have any statutory or policy basis and an indication of how much they are expected to cost.

An outline of an environmental plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing must be

provided, and must note which agency will be responsible for endorsing/approving each mitigation measure or monitoring program. (Note: this could also be provided in section 8 – Commitments). **Mitigation measures over which the proponent has no control will generally not be considered adequate.**

e) **Offsetting unavoidable adverse impacts** - if adverse residual environmental impacts are considered unavoidable despite the adoption of best practice environmental management avoidance and mitigation measures, then proposals to offset such impacts should be detailed. For example, if the loss of conservation values, community assets or amenities is considered unavoidable, measures to compensate for those losses should be proposed in proportion to the loss. Any offset actions proposed must be demonstrated to be 'real' actions. All proposed offsets must comply with State and Commonwealth offset policies such as DSEWPaC's *Environmental Offsets Policy – Consultation Draft August 2011* found at *http://www.environment.gov.au/epbc/publications/consultation-draft-environmental-offsets-policy.html.*

That is, **the offset actions must have a measurable and relevant benefit which would otherwise not have occurred.**

f) **Assessment of impacts** – an assessment of the overall impacts of the development on the environment after allowing for the implementation of proposed avoidance and mitigation measures. This should include an evaluation of the significance of impacts and comparison with state, national and international regulations and standards. Any net benefits likely to result from the proposal should be identified.

g) **Consideration of alternatives-** Where there are clear, alternative avoidance or mitigation measures for a particular adverse environmental impact, the alternatives should be reviewed and the preferred option justified.

4.0.1 Sustainable development objectives

Attention should be paid to demonstrating that the proposal is consistent with objectives as required by the relevant Commonwealth and Tasmanian statutes and policies, including the National Strategy for Ecologically Sustainable Development, the Tasmanian Resource Management and Planning System, the Environmental Management and Pollution Control System and the principles of ecologically sustainable development as described in the EPBC Act.

4.1 Air emissions

This section should identify existing conditions, identify performance requirements to be achieved, identify any potential impacts of the proposal on the local, regional and global air environment, identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts on the air environment following implementation of the proposed avoidance and mitigation measures.

4.1.1 Legislative and policy requirements

Consideration should be given to the requirements of the Tasmanian *Environment Protection Policy (Air Quality)* (see www.environment.tas.gov.au/AirQualityPolicy).

4.1.2 Other issues

The following issues should be addressed (where relevant).

- The location of all emission points should be specified and mapped.
- Potential sources of fugitive emissions (including odour, dust, dry tailings and asbestos that may arise from loading, unloading and transport) should be described.
- The potential for emissions to cause environmental and health impacts should be evaluated and proposed mitigation measures should be described.

4.2 Liquid waste

This section should identify existing conditions, detail the performance requirements to be achieved, identify potential impacts of the proposal on the receiving environment (including surface water, groundwater and soil), identify measures to avoid and mitigate potential adverse impacts and assess the overall impacts on the receiving environment following the implementation of the proposed avoidance and mitigation measures.

This section should demonstrate that all reasonable and practicable measures have been taken (having regard to best practice environmental management as defined in the EMPC Act) to avoid producing liquid waste, and to reduce the amount of liquid waste to be discharged having regard to best practice environmental management. The measures must be in accordance with the following hierarchy of waste management, arranged in decreasing order of desirability:

a) waste avoidance;

b) waste recycling/reclamation;

c) waste re-use;

d) waste treatment to reduce potentially adverse impacts; and waste disposal.

4.2.1 Legislative and policy requirements

It must be demonstrated that the proposal is consistent with the objectives and requirements of relevant water management policies and legislation, including the *Water Management Act* 1999, *State Policy on Water Quality Management 1997* (Water Policy), the *Inland Fisheries Act 1995,* the *Living Marine Resources Management Act 1995* and the *Tasmanian State Coastal Policy 1996.*

In particular, it must be demonstrated that the proposal will not prejudice the achievement of any water quality objectives set for water bodies under the *State Policy on Water Quality*

Management (see http://epa.tas.gov.au/epa/water). Where water quality objectives have not yet been set, the EPA Division should be consulted to identify the baseline water quality data required to enable the water quality objectives to be determined.

4.2.2 Discharge of wastewater to the environment

If the proposal includes any discharge of wastewater to the environment, then a detailed consideration of the nature of the discharge and of the receiving environment must be presented. Any proposed treatment processes should be described and the potential impacts upon the receiving environment must be assessed under typical and plausible worst case conditions. Note: wastewater means water used during carrying out the activity, and does not include stormwater arising from rainfall on the proposal site (see below).

- Results of any ambient surface water quality survey(s). Wherever possible mass loading of pollutants from historical sources should be quantified across a range of flow conditions. Provide a summary of all available water monitoring data (including all baseline monitoring to date).
- Monitoring results for mine water at various depths, (including pH, redox, DO, H2S, metal contents, alkalinity, acidity, Ca, Mg).
- A description, including map, and quantitative analysis of the water balance. The analysis should consider all aspects of the activity including proposed water licenses, mine dewatering and variations in precipitation and natural flow, accounting for extended dry periods and periods of excessive rainfall;
- Identify principle discharge points from the activity to the receiving environment including seepage and decant.
- Describe the sources, volume and quality of contaminated water. All potential pollutants of interest should be identified and the proposed discharge should be discussed with regard to expected annual mass loadings and discharge rate versus the flow rate and existing water quality the receiving environment.
- Best Practice Environmental Management measures to prevent or mitigate the formation of AMD, particularly from: underground acid-generating rock exposed to oxygen by dewatering; the movement of the existing tails; the exposure of tailings to the atmosphere; and the grinding of tailings to a finer size.
    - The current situation should be outlined with regard to AMD. The DPEMP should demonstrate an understanding of how and why AMD is leaving the existing TSFs.
    - Review the potential for acidic/alkaline generation; potential sources, pathways off site, and volumes.
    - Acid-base accounting for the tailings and their geochemical-kinetics properties. Testing must include a significant number of samples and as a minimum should consider the following parameters: metal contents; alkalinity; acidity; mineralogy of potential neutralising minerals; mineralogy of sulphides; and total sulphur. Static and kinetic testing will be required in order to determine appropriate handling methods.
    - Risks of AMD from mine dewatering, including sitting water and future recharge, through exposure of sulphidic geology or waste material that has

been deposited in the underground workings. Acid base accounting for the mine minerals and geochemical-kinetics properties (undertaken or proposed).

- Best Practice Environmental Management measures for ongoing collection and treatment of AMD which cannot be prevented from occurring to remove pollutants prior to discharge. This should include measures to ensure that any AMD is restricted to particular areas: management measures for spillages and contingency measures for pipe blockages should be discussed.

- Mitigation measures (for all pollutants of water) during periods when pollution control equipment may fail or be shut-down must be described and options for the storage of the treated tailings. Contingency/redundancy measures should be including for the event that water quality is poorer or volumes greater than predicted.
- The potential for the effluent to cause environmental and health effects should be evaluated through dilution modelling. This should include consideration of typical and plausible worst case situations.
- Demonstrate that the proposed discharge(s) will satisfy the requirements of the *State Policy on Water Quality Management 1997* including compliance with any relevant emission limit guidelines. Attention should be given to the Protected Environmental Values (PEV's) in the Whyte River, any threatened species and communities listed under the TSPA and/or EPBC Act, potability of downstream water that is, or is likely to be, used for human consumption, the levels of metals or other residues in fish or other downstream resident aquatic species that may affect safe human consumption and potential downstream recreational water usage;

4.2.3 Other issues

The following issues should be addressed (where relevant).

- An assessment of the potential for sediment to enter and impact on natural drainage lines and water courses through storm water run-off during both the construction and operational phases of the mine. Include details of mitigation measures and management strategies to prevent the sourcing and mobilisation of sediment (e.g. erosion control measures), and transport of sediment off-site;
- Details of stormwater management on the proposal site should be provided. The potential for pollutants to become entrained in stormwater should be assessed and measures to prevent transport of sediment off-site. An estimation of runoff volume and available detention capacity/time and of contingencies for failure of control measures, such as during heavy rainfall or flooding should be provided.
- If the proposal anticipates a discharge to a municipal sewerage system (including tankered waste), then a suitably detailed agreement with the operator of the municipal sewerage system should be negotiated.
- Details of any additional liquid wastes should be included.

4.3 Groundwater

This section should identify existing conditions, identify performance requirements to be achieved, identify any potential impacts of the proposal on groundwater quality or quantity, identify measures to avoid and mitigate any possible adverse impacts, and assess the overall impacts on groundwater following implementation of the proposed avoidance and mitigation measures.

It must be demonstrated that the proposal is consistent with the objectives and requirements of all relevant water management policies and legislation, including the *Water Management Act 1999* and the *State Policy on Water Quality Management 1997*.

- Measures to ensure protection of the quality and quantity of the region's groundwater resources including maintenance of any existing beneficial use of groundwater such as ecosystem maintenance and extraction for irrigation/consumption.
- The results of any groundwater monitoring that has been undertaken and details of a proposed groundwater monitoring and reporting program developed by a suitably qualified and experienced person must be provided (see section 6). The groundwater assessment should include major Cations and Anions results together with targeted potential pollutants such as metals, pH etc and a discussion of the potential impact of dewatering on groundwater levels/recharge.

4.4 Noise emissions

This section should identify existing conditions, identify performance requirements to be achieved, identify any potential impacts of the proposal on ambient (surrounding) noise levels (during both the construction and operational phases), identify measures to avoid and mitigate any possible adverse impacts, and assess the overall impacts on ambient noise levels following implementation of the proposed avoidance and mitigation measures.

The following issues should be addressed:

- All major sources of noise must be identified and described.
- The potential for noise emissions (during both the construction and operational phases) to cause nuisance for nearby land users should be considered and any proposed measures to mitigate noise impacts should be described.
- The potential for noise emissions to affect terrestrial, marine and freshwater wildlife and livestock.

4.5 Solid and controlled waste management

This section should demonstrate that all reasonable and practicable measures have been taken to avoid producing each type of solid waste, or controlled waste and in particular to reduce the amount of waste requiring disposal, having regard to best practice environmental management. The measures must be in accordance with the hierarchy of waste management.

Controlled waste is defined in the EMPC Act and associated regulations. A non-exhaustive listing of categories of Controlled waste can be found on the internet at: http://epa.tas.gov.au/regulation/controlled-waste-category-codes.

The following issues should be addressed:

- The source, nature and quantities of all solid (sulphidic and non-sulphidic) and/or controlled wastes likely to be generated should be identified, including general refuse, waste rock types, tailings and sulphides and their mineralogy, grain sizes and geochemical characteristics.
- Any foreseeable variations in waste generated during the start-up and operational phases should be identified and any temporary storage requirements specified.
- Facilities and methods proposed to collect, store, reuse, treat or dispose of each solid waste stream should be described in detail eg segregation, blending, capping, backfilling and reuse. Any materials with special storage or handling requirements (including hazardous or putrescible materials) should be clearly identified. The resultant concentrations and mass loads of pollutants, including estimates of performance ranges, to be emitted after treatment should be provided. Maintenance requirements should be included.
- A description of any existing or proposed dams, tailings storage/water treatment facilities including their, design, use, capacity, location and the results of any geotechnical surveys undertaken. Sufficient detail should be provided to allow a decision to be made whether referral to the Assessment Committee for Dam Construction (ACDC) is required. It is likely that a pre-construction dam report will be required, advice regarding the information requirements for such a report is available from the ACDC.
- Measures to ensure long term geotechnical stability of any dump slopes should be described.

4.6 Dangerous goods and environmentally hazardous materials

This section should identify any potential impacts from the transport, storage and usage of dangerous goods and environmentally hazardous materials associated with the proposal, identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts following implementation of the proposed avoidance and mitigation measures.

The following issues should be addressed (where relevant).

- The nature, quantity and storage location of all environmentally hazardous materials including fuels, oils, products, by-products, wastes and chemical reagents and Dangerous Goods (as defined in the *Australian Code for the Transport of Dangerous Goods by Road and Rail)* that will be used during the construction and operation of the proposal.
- The measures (such as storage of such materials within bunded areas or spill trays) to be adopted to prevent or control any accidental releases of dangerous goods and environmentally hazardous materials.
- Contingency plans for when control measures/equipment breakdowns or accidental releases to the environment occur, including proposed emergency and clean-up measures and notification procedures.

- Identify any safety management requirements for the protection of human health and safety affecting the community.
- Particular reference should be made to the management of fuels and lubricants required for equipment during construction, operational and maintenance activities.

4.7 Biodiversity and natural values

This section should identify existing conditions, identify performance requirements to be achieved, identify any potential impacts of the proposal, including the development of infrastructure directly related to the proposal, on biodiversity and nature conservation values. It should identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts on biodiversity and nature conservation values following implementation of the proposed avoidance and mitigation measures. It should address these issues in the context of the terrestrial and aquatic environment as appropriate.

4.7.1 Key legislative and policy requirements

Regard should be given to the *National Strategy for the Conservation of Australia's Biological Diversity*, the draft *Tasmania's Nature Conservation Strategy* and the *Threatened Species Strategy for Tasmania.*

4.7.2 Other biodiversity and natural values issues

The following should be addressed (where relevant).

- Information on sites or areas of landscape, aesthetic, wilderness, scientific or otherwise special conservation significance which may be affected by the proposal. Relevant information resources include the LIST (www.thelist.tas.gov.au) and the Natural Values Atlas (www.naturalvaluesatlas.dpiw.tas.gov.au).
- Impacts on terrestrial flora and fauna species, communities and habitat, with particular reference to rare and threatened species, communities and habitats, including those listed under the EPBC Act and the *Tasmanian Threatened Species Protection Act 1995* (TSP Act) including results of a survey for terrestrial threatened flora, fauna and communities. Details of proposed mitigation measures to avoid or minimise potential impacts including the minimisation of native vegetation clearance particularly of any mature and/or hollow bearing trees and management measures that will be undertaken should the dens of *Sarcophilus harrisii* or *Dasyurus maculatus maculatus* be detected.
- Identify any freshwater ecosystems of high conservation management priority using the Conservation of Freshwater Ecosystem Values (CFEV) database (accessible on the internet under water.dpiw.tas.gov.au/wist/). The scope of investigation should encompass the vicinity of the proposed development where there is likelihood of alteration to the existing environment. The specific CFEV information used for DPEMPs should be Conservation Management Priority_Potential which is appropriate for Development Proposals.
- The results of an aquatic ecological survey in any waters potentially impacted by the proposal. The NOI indicates that the study/proposal area s within a catchment supporting or likely to support the threatened *Beddomeia beli* (hydrobiid snail – Rapid River) based on predictive range mapping provided by the FPA. A targeted survey must be completed (by a suitably qualified person(s)) for this species in any potential habitat that will be

directly or indirectly impacted by the proposal. The results (and mitigation if required) should be described in the DPEMP.

- An assessment of the potential impact of the proposal on the aquatic health of the Whyte or Washington River including by water extraction and wastewater discharge. Provide details of mitigation measures to avoid or minimise any impacts.
- Impacts on identified areas or habitats of conservation significance, including designated conservation areas, areas relating to the requirements of international treaties (e.g. Japan-Australia and China-Australia Migratory Bird Agreements (JAMBA/CAMBA) and Ramsar (wetlands) Convention), or wetlands listed in *A Directory of Important Wetlands in Australia.*
- Impacts on sites of geoconservation significance or natural processes (such as fluvial or coastal features), including sites of geoconservation significance listed on the Tasmanian Geoconservation Database.
- Impacts on existing conservation reserves which may be affected by the proposal, with reference to the management objectives of the reserve(s) and the reserve management plan(s) (if any).
- Impacts on any high quality wilderness areas identified in the *Tasmanian Regional Forest Agreement* (Tasmanian RFA) which may be affected by the proposal.
- Impacts on other species, sites or areas of landscape, aesthetic, wilderness, scientific, geodiversity or otherwise special conservation significance.
- A consideration of indirect impacts in relation to matters under the EPBC Act with regard to definitions of indirect impacts provided in *Significant Impact Guidelines 1.1: Matters of National Environmental Significance (2009).* http://www.environment.gov.au/epbc/publications/pubs/nes-guidelines.pdf
- The potential for migration and/or introduction of pests, weeds and plant and animal diseases as a result of the proposal and details of a conceptual Weed and Disease Management Plan, which is in adherence to the *Tasmanian Washdown Guidelines for Weed and Disease Control: Machinery, Vehicles and Equipment Edition 1 (2004).* The plan should include actions that will be undertaken prior to, during and post construction and include a long term monitoring and control program to ensure declared and environmental weeds are not introduced, spread or taken offsite. The weed and disease management plan should be finalised prior to any works commencing on the site.

4.7.3 Requirements for surveys

Any flora and fauna surveys must, as a minimum, comply with the requirements of the document *Guidelines for Natural Values Assessment* published by the Development and Conservation Assessment Branch, Resource Management and Conservation Division of the Department of Primary Industries, Parks, Water and the Environment (DPIPWE). The methodology for surveys should be developed in consultation with DPIPWE. The DPEMP must also demonstrate how surveys are consistent with relevant DSEWPaC survey guidelines found at http://www.environment.gov.au/epbc/guidelines-policies.html.

4.8 Marine and coastal

Where relevant, this section should identify any potential impacts of the proposal on marine and coastal areas not addressed in other sections. It should identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts on marine and coastal

areas following implementation of the proposed avoidance and mitigation measures. Cross referencing should be made to other relevant sections dealing with conservation values (marine flora and fauna, geoconservation) and coastal impacts.

4.8.1 Legislative and policy requirements

It must be demonstrated that the proposal is consistent with the objectives and requirements of all relevant marine and coastal policies and legislation, including the *Living Marine Resources Management Act 1995, State Policy on Water Quality Management 1997* and the *Tasmanian State Coastal Policy 1996.*

4.9 Greenhouse gases and ozone depleting substances

This section should contain an assessment of the proposal in terms of the evolving national response to climate change and greenhouse gas emissions[3] and the Tasmanian Framework for Action on Climate Change 2008 (available at www.climatechange.tas.gov.au). The direct and indirect impacts of the proposal on greenhouse gas production and ozone depleting substances should be described.

Proponents will need to determine whether they are required to report to the Commonwealth under the *National Greenhouse and Energy Reporting Act 2007.*

4.9.1 Estimate of greenhouse gas emissions

An estimate of annual emissions of greenhouse gases generated on site should be presented in terms of carbon dioxide mass equivalents

4.9.2 Implementing greenhouse best practice

It should be demonstrated that the development will implement cost-impactive greenhouse best practice measures to achieve ongoing minimising of greenhouse gas emissions. Reference should be made to the Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2006 (refer to www.climatechange.gov.au).

Details of any feasible alternative ways of providing energy for the proposal, transporting materials to and from the proposal, design and construction of components or otherwise implementing the proposal so as to have a lesser impact on the enhanced greenhouse impact, and the justification for not adopting these alternatives should be included.

4.9.3 Ozone depleting substances

Any generation or use of ozone depleting substances in the proposal (such as in refrigeration or fire fighting) must be identified and justified.

4.10 Heritage

This section should identify potential impacts of the proposal, including the development of infrastructure directly related to the proposal, on Aboriginal and non-Aboriginal cultural heritage sites and areas. It should identify recommended measures to avoid or mitigate any potential adverse impacts on cultural heritage sites and assess the overall impacts of the proposal on cultural heritage sites following implementation of the proposed avoidance and mitigation measures.

[3] Information about the national approach to greenhouse gas emissions is available on the internet at: www.climatechange.gov.au

4.10.1 General

Potential impacts on the following should be addressed (where relevant).

- Declared World Heritage Area properties and values.
- Any places listed on the National Heritage List and values.
- Any places listed or interim listed on the Register of the National Estate and values.
- Any places listed on the Tasmanian Heritage Register (maintained by Heritage Tasmania), including consideration of cultural landscapes.
- Any places on the Tasmanian Historic Places Inventory (maintained by Heritage Tasmania).
- Any places on the Tasmanian Aboriginal Site Index (maintained by Heritage Tasmania), including consideration of cultural landscapes.
- Local government planning scheme heritage schedules.
- Any other places of heritage significance.

4.10.2 Aboriginal heritage

Aboriginal Heritage Tasmania (AHT) has advised that no Aboriginal heritage survey is required. However; the DPEMP should demonstrate awareness that any Aboriginal heritage material identified must be dealt with in accordance with the *Aboriginal Relics Act 1975.*

4.10.3 Historic heritage

The advice of Heritage Tasmania should be sought with regard to impacts on places listed on the Tasmanian Heritage Register and to establish regulatory requirements for heritage values, places and landscapes. Any approvals required under the *Historic Cultural Heritage Act 1995* should be identified.

Any Cultural Heritage survey undertaken should follow the methodology outlined in Heritage Tasmania's *Pre-development Assessment Guidelines* available at:

http://www.heritage.tas.gov.au/guidelines.html

4.10.4 Consultation

Consultation with the Tasmanian Aboriginal Lands Council, Tasmanian Office of Aboriginal Affairs, Aboriginal Heritage Tasmania, as well as with Aboriginal communities, should occur prior to any survey of potential sites to establish regulatory requirements for heritage values, places and landscapes.

4.10.5 Commonwealth Government requirements

The requirements of the Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* should also be considered where there is a threat of injury or desecration to an area which is significant as part of Aboriginal tradition, and potential impacts identified, assessed and managed in consultation with the traditional owners, Native Title claimants and any other indigenous people with rights and interests in the area.

The Australian Heritage Office can provide advice on places listed in the National Heritage List and Register of the National Estate.

4.11 Land use and development

This section should identify any potential impacts of the proposal in terms of constraints or benefits it may place on the current or future use of land within the proposal site and surrounding area. It should identify measures to avoid, mitigate and compensate for any possible adverse impacts.

The following issues should be addressed (where relevant).

- Impacts on existing or proposed tourist or recreation activities, such as camping areas, picnic areas, walking tracks, horse riding tracks, heritage trails etc.
- Impacts on residential activities.
- Impacts on industrial activities.
- Impacts on agricultural activities, including any requirement of the *State Policy for the Protection of Agricultural Land (2009)* – (see http://www.dpac.tas.gov.au/divisions/policy/state_policies)
- Impacts on local and regional tourism.
- Impacts on other commercial activities.

4.12 Visual impacts

This section should outline the existing visual setting within which the proposal infrastructure will be located and assess the capacity of the landscape to absorb any visual changes to the landscape as a result of the proposal. The assessment should also take account of the appearance of the proposal from significant vantage points. These should include points both inside and outside the site and should include viewpoints likely to be visited by tourists or recreational users. Presentation of 'artists impressions', photomontages or visual modelling is recommended. The methodology used and assumptions made in the assessment should be clearly identified.

Measures to avoid and mitigate potential adverse visual impacts should be identified, such as minimising vegetation clearance, facility height, size, design, colour, separation and post-construction revegetation.

4.13 Socio-economic issues

This section should contain information on the existing social and economic environment that may be affected by the proposal and the social and economic impacts of the proposal during the construction, operation and decommissioning phases.

The following issues should be addressed (where relevant):

- A summary of the social/demographic characteristics of the population living in the vicinity of the proposal site, identifying any special characteristics which may make people more sensitive to impacts from the proposal than might otherwise be expected.
- A summary of the characteristics of the local and regional economy (e.g. existing employment trends, land values).
- An estimate of total capital investment for the proposal.
- The impacts on local and State labour markets for both the construction and operational phases of the proposal. Skills and training opportunities should also be discussed.

- The impacts on upstream/downstream industries, both locally and for the State.
- The extent to which raw materials and services will be sourced locally.
- A qualitative assessment of community infrastructure impacts, including recreational, cultural, health and sporting facilities and services. Any proposals to enhance or provide additional community services or facilities should be described.
- Community demographic impacts (changes to cultural background, occupation, incomes).
- Impacts on land values, and demand for land and housing.
- Impacts on the local, regional, state and national economies.

4.14 Health and safety issues

This section should review any health and safety issues relating to employees, site visitors and the public which have not been addressed in other sections.

It must be demonstrated that occupational health and safety issues have been taken into account during the planning of the proposal, including an analysis of alternatives. It should be demonstrated that compliance with the *Workplace Health and Safety Act 1995* and the *Workplace Health and Safety Regulations 1998* will be achieved. Safety management systems to be used during construction and operational phases should be described.

The following issues should be addressed.

- Construction phase safety issues.
- Security arrangements to prevent unauthorised access to the proposal site during construction.
- Operations, maintenance and inspection safety issues.

4.15 Hazard analysis and risk assessment

This section should contain a preliminary analysis (appropriate to the scale of the project) of the potential for a major hazard event (such as an explosion) to occur and proposed safeguards to prevent such an occurrence. The preliminary analysis should systematically identify all potential major hazards (internal and external) to people and the environment associated with the construction, operation, maintenance and decommissioning of the proposal.

- A risk assessment incorporating the requirements of Australian/New Zealand Standard AS/NZS 4360:1995 *Risk Management*, or equivalent, should be conducted, to identify all credible risks associated with specific major hazard events identified through hazard analysis. The risk assessment should identify measures to avoid and mitigate potential adverse effects.

The following issues should be addressed by the risk assessment (where relevant):

- Identify hazard events with the potential to cause a major accident or significant impact on people or the environment. This should include consideration of the risks associated with malfunctions, accidents or fires, in addition to those posed by natural disasters such as such as storms, bushfires, seismic events and floods, including the impact of extreme

rainfall events or flooding on the AMD management system. For each hazard event, estimate the frequency and consequence of such an event occurring;

- Identify high risk locations and facilities;
- Describe technical and management safeguards to be employed to assess and minimise the likelihood of occurrence and the consequences of identified hazard events; and
- Define the objectives and management principles to be adopted for the preparation of a detailed emergency plan (including emergency response, recovery/cleanup procedures and consultation with relevant emergency services).

4.16 Fire risk

This section should identify the potential fire risk associated with the proposal. This should include consideration of fire within the site, fire escaping from the site and the impact of wildfire originating outside the development. Measures to avoid and mitigate potential adverse impacts should be outlined, including the objectives and management principles to be adopted for the preparation of a fire response plan. The proponent should demonstrate compliance with the relevant requirements of the *Fire Services Act 1979* and the *Workplace Health and Safety Act 1995.*

4.17 Infrastructure and off-site ancillary facilities

This section should identify potential impacts on any significant off-site or infrastructure facilities (including increased use of existing infrastructure, such as roads, ports and quarries), identify measures to avoid and mitigate any possible adverse impacts and assess the overall impacts following implementation of the proposed avoidance and mitigation measures. For example, upgrading or re-routing of roads, rail or other services required as a result of the proposal, should be detailed.

This Section should identify roads and other infrastructure to be used by vehicles for the proposal (during both construction and operation). Potential environmental impacts associated with construction and use of such infrastructure should be assessed.

4.18 Environmental management systems

This section should provide information on strategic matters relating to environmental management of the proposal, including a description of the following.

- Any environmental management systems or environmental policies implemented or proposed by the proponent, which are relevant to the environmental management of the proposal.
- Organisational structure and environmental responsibility within that structure for the proposal.
- Procedures and instructions to employees (including contractors) on minimising adverse environmental impacts of activities, as well as employee induction and education programs to ensure an appropriate response to operational environmental concerns should be included in relevant sections.

4.19 Cumulative and interactive impacts

Where relevant, this section should contain an assessment of the potential cumulative impacts of the proposal, based on existing and other formally proposed developments in the region, which have not been addressed in previous sections. Interactions between biophysical, socio-economic and cultural impacts of the proposal should be discussed.

4.20 Traffic impacts

This Section should identify roads to be used by vehicles associated with the proposal (both during construction and operation) and the likely volume and nature of traffic and timing of traffic flows, including details of the current usage of these roads. Impacts associated with altered traffic flows should be discussed (such as impacts on other roads users and residences adjacent to roads).

5. EPBC ACT REQUIREMENTS

This chapter is required for the final approval of the proposal under the EPBC Act and must address matters described in Schedule 4 of the Commonwealth *Environment Protection and Biodiversity Conservation Regulations 2000* (see Appendix 1).

To the extent that elements of parts 2, 5, 6 and 7 repeat information that will be covered elsewhere in the DPEMP, a cross reference will be sufficient. Parts 3 and 4, however, require particular attention with explicit reference to listed threatened species in this chapter.

As a minimum the following matters under the EPBC Act must be addressed:

Listed communities:

- Alpine Sphagnum Bogs and Fens (Endangered).

Listed threatened species:

- Wedge-tailed Eagles (*Aquila audax fleayi*) (Engangered).
- Spotted-tailed Quoll (*Dasyrus maculatus maculatus)* (Vulnerable).
- Tasmanian Devil (Sarcophilus harrisii) (Endangered).
- Australian Grayling (Prototroctes maraena) (Vulnerable).
- Tasmanian Azure Kingfisher (Ceyx azureus diemensis) (Endangered).
- Tasmanian Masked Owl (*Tyto novaehollandiae castnops*) (Vulnerable).

The information provided on these matters should be consistent with any relevant publicly available policy guidance or listing advice provided by DSEWPaC.

This section of the DPEMP must provide enough information about the project and its relevant impacts (including quantification of impacts and consideration of direct and indirect impacts) to allow the Commonwealth Minister to make an informed decision whether to approve the project under the EPBC Act.

In addition to consideration of matters of national environmental significance the following information must be provided:

- Details of any proceedings under a Commonwealth, State or Territory Law for the protection of the environment or the conservation and sustainable use of natural resources against:

  - The person proposing to take the action; and/or
  - For an action for which a person has applied for a permit, the person making the application.
- Details of the corporation's environmental policy and planning framework which must be provided if the person proposing to take the action is a corporation.

6. MONITORING AND REVIEW

This section should provide an outline of a monitoring, review and reporting programme for each sector of the proposal which should include the sites to be sampled, sampling procedures, parameters to be analysed, the frequency of sampling and format and frequency of reporting. The rationale and frequency of sampling for sampling specific points should be clearly detailed

The programme should be designed to meet the following objectives:

- Monitoring of compliance with emission standards and other performance requirements identified in the DPEMP.
- Assessing the effectiveness of the performance requirements and environmental safeguards in achieving environmental quality objectives.
- Assessing the extent to which the predictions of environmental impacts in the DPEMP have eventuated.
- Assessing compliance with commitments made in the DPEMP.

7. DECOMMISSIONING AND REHABILITATION

Due to the finite nature of mining operations and their susceptibility to external economic influences, mine closure planning should commence before the operation commences. The DPEMP should describe an on-going, staged approach to site decommissioning and rehabilitation throughout the proposal life and should contain sufficient detail to enable a bond to be established to protect the Crown from future liabilities in the event of unforeseen mine closure or company failure.

The DPEMP should include a conceptual mine closure plan for end-of-mine life and/or premature mine closure with a framework for regular review/development of these concepts as development of the mine occurs. This should consider, as a minimum, the following:

- Consideration of long term stability (ie post-mine closure) of all areas of the site including tailings dams and mine pit closure plans partly or fully dewatered mine. Including the potential for AMD, including sources, long term volumes and pathways to the environment.
- Any ongoing maintenance requirements for collection and treatment facilities.
- The conceptual proposed method of rehabilitation of disturbed areas, including the replacement of stockpiled topsoil and revegetation techniques (using local provenance species) to be applied and contingencies to achieve satisfactory rehabilitation, should the operation cease during the life of the DPEMP.
- Description of the concepts for any necessary decontamination of the site.
- Post closure monitoring programs.

Determination of the cost estimate should be based on the closure (decommissioning and rehabilitation) concepts correlated to the proposed level of development/disturbance associated with the project. It is envisaged that with future revisions of the closure plan, revision of the closure cost estimate will also be undertaken to more accurately reflect the true cost of decommissioning and rehabilitation of the site.

8. COMMITMENTS

This section should contain a consolidated commitments table listing all of the commitments made throughout the DPEMP. Commitments must be sequentially numbered, unambiguous statements of intent. For each commitment, the table must specify when the commitment is to be implemented, specify who is responsible for the undertaking of the commitment, and refer to the section of the DPEMP where the commitment is detailed.

The commitments will provide a basis for the preparation of conditions of approval, should approval be granted.

9. CONCLUSION

This section should briefly describe the proposal and draw together the critical environmental impacts of the proposal, both positive and negative, including impacts on listed threatened species and communities under the EPBC Act. It should present a balanced overview of the net environmental impacts of the proposal, and the extent to which any adverse impacts on the environment can be satisfactorily avoided, mitigated, remediated or compensated. The conclusion should also describe how the proposal meets the objectives of relevant Commonwealth and State assessment and planning policies and legislation.

10. REFERENCES

This section should provide details of authorities consulted, reference documents etc.

11. APPENDICES

As a means of improving readability of the DPEMP document, detailed technical information which supports the DPEMP should be included in appendices. The salient features of the appendices should be included in the main body of the DPEMP. Care should be taken to avoid inconsistencies between technical content of Appendices and the DPEMP itself, unless carefully explained.

GLOSSARY

AMD – Acid and metalliferous drainage

DPEMP – Development Proposal and Environmental Management Plan

DPIPWE - Department of Primary Industries, Parks, Water and the Environment

DSEWPAC - Department of Sustainability, Environment, Water, Population and Communities (Cth).

EMPC Act – Environmental Management and Pollution Control Act 1994

EPBC Act - Environment Protection and Biodiversity Conservation Act 1999 (Cth)

JAMBA/CAMBA - Japan-Australia and China-Australia Migratory Bird Agreements

Tasmanian RFA - Tasmanian Regional Forest Agreement

TSP Act - *Threatened Species Protection Act 1995*

ROM - Run of Mill

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MEMORANDUM

To:	**Chris Dunks**	**Phone:**	**0439 998 808**
Company:	**Bright Phase Resources Limited**	**Fax No:**	
Cc:			
From:	**Mick McKeown**	**Email:**	**mmckeown@miningone.com**
Date	**2 June 2012**		
Project:	**Cleveland Tin**		
Subject:	**ASX Waiver – Draft ~~v1~~**		

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This memorandum is not a report of Mineral Resources or Ore Reserves in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, 2004 edition ("JORC Code").

This memorandum has been prepared for Bright Phase Resources Limited in accordance with ASX Companies Update~~s~~ 05/04 and 11/07, in particular, this memorandum applies to previously prepared reports which include statements of historical estimates not reported in accordance with the JORC Code. ~~.~~ This memorandum has been prepared to accompany an application by Bright Phase Resources Limited for a waiver to enable non-JORC Compliant reporting of historical resource estimates and this memorandum must not be used for any other purpose.

Introduction

The Cleveland Mine ("Cleveland") at Luina on the West Coast of Tasmania operated from 1968 to 1986. Cleveland produced about 36,000 tonnes of tin in concentrate and about 15,000 tonnes of copper in concentrate~~s~~ and ranks as the third largest tin producer in Tasmania behind Renison Bell which has produced over 200,000 tonnes of tin in concentrate and Mt Bischoff which has produced about 60,000 tonnes of tin in concentrate.

Cleveland was operated by Cleveland Tin N.L., Aberfoyle Limited and other Aberfoyle group companies (collectively referred to here as "Aberfoyle"). Cleveland closed in 1986. The tin price fell significantly in 1985 following the collapse of price support from the

International Tin Council. In addition, Aberfoyle had turned its attention to lead, zinc and copper following the discovery of the Que River deposit in 1974 and the Hellyer deposit in 1983. It is, perhaps, no coincidence that Cleveland was closed in June 1986, the same month that the Hellyer orebody was exposed in the Hellyer Decline.

The historic data remaining from Aberfoyle's Cleveland operation is comprehensive and was developed during~~in~~ operation of a successful underground mine and mill.

When Cleveland closed, three known resources remained:

- a tin and copper resource in the Cleveland mine.
- a tungsten resource in the Cleveland mine, and
- a tin resource in Cleveland Tailings Dams No 1 and No 2.

Each of these resources is dealt with separately in this memorandum. The numbering of the sections in each description follows the numbering of the Requirements for non-JORC Code Compliant Historical and Foreign Reporting in ASX Companies Update No 11/07.

The Cleveland tin and copper mineralisation is of the sulphide-cassiterite style which also occurs at Renison Bell, Mt Bischoff and Queen Hill, all of which also occur on Tasmania's West Coast. Tin occurs as cassiterite and lesser stannite and copper occurs as chalcopyrite and lesser stannite in semi-massive to massive iron sulphides.

The Cleveland tungsten mineralisation occurs in quartz vein stockwork associated with a quartz porphyry intrusive. Tungsten occurs principally as wolframite with trace amounts of scheelite.

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Tin and Copper Resource in the Cleveland Mine

Tin at Cleveland occurs principally as cassiterite, a tin oxide with the formula SnO_2 and less commonly as stannite, a tin-copper-iron sulphide with the formula (Sn,Cu,Fe)S. For deposits where both tin minerals are present, Sn assays are usually reported as total Sn, representing all the Sn in a sample, and~~or~~ as soluble Sn, representing the Sn which occurs as stannite. Copper at Cleveland occurs principally as chalcopyrite, a copper sulphide with the formula $CuFeS_2$.

The ~~The~~ paragraph numbers in this section coincide with the paragraph numbers under Requirements for non-JORC Compliant Historical and Foreign Reporting in the ASX Companies Update 11/07.

1. The historical resource referred to here is not reported in compliance with the JORC Code and it is uncertain that following evaluation and/or further exploration that the resource will ever be able to be reported in accordance with the JORC Code.

All reports available on the hard rock resource were reported pre-JORC and not completed within JORC specifications. All efforts will be made by Bright Phase Resources to upgrade the historic estimates to comply with the JORC code; however, evaluation has not yet been completed and the results of this evaluation remain uncertain.

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Table 1 Cleveland Mine – Tin and Copper Mineral Resources

Cleveland Mine – Tin and Copper – Mineral Resources			
Indicated Mineral Resources			
0.35% Sn (total) Cut-off Grade			
Lens	**tonnes**	**% Sn (total)**	**% Cu**
Hall's	3,400,000	0.71	0.33
Henry's	450,000	0.81	0.47
Khaki and Lucks	680,000	0.70	0.22
B South and Battery	620,000	0.57	0.22
Total	**5,200,000**	**0.70**	**0.31**
Inferred Mineral Resources			

0.35% Sn (total) Cut-off Grade			
Lens	**tonnes**	**% Sn (total)**	**% Cu**
Hall's	1,100,000	0.69	0.2
Khaki and Lucks	40,000	0.73	0.15
B South and Battery	190,000	0.86	0.35
Total	**1,330,000**	**0.72**	**0.22**

2. The source of the historical resource estimate is:

- **Dronseika, E.V., 1986.** Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Unpublished report for Aberfoyle Resources Limited, Cleveland Division by E.V. Dronseika, Senior Mine Geologist.

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In addition, there are several other documents which support or explain aspects of the historical resource estimate and these are listed at the bottom of Table 3.

3. Dronseika's 1986 resource estimate of the tin-bearing sulphide cassiterite lodes is relevant. It was prepared when the mine closed and there has been no work in the mine since then. McArthur's 1983 report is also relevant. It clearly sets out the procedure for estimating resources at Cleveland.

At the time of closure, in 1986, the mine was allowed to flood and has remained flooded through the subsequent period with no ~~for~~ mining. All historic resource estimates can therefore be considered to be unchanged since the mine closure. There have been no applications for mining rights submitted to Mineral Resources Tasmania in the time since closure and all records of exploration have focused on the tailings ~~material~~ stored in dams on the site.

4. The historical resource estimate is reliable. The data used for the Aberfoyle resource estimate was compiled during Aberfoyle's ownership of Cleveland from 1961 to 1986. During that time, Aberfoyle drilled over 2000 diamond drill holes into the Cleveland deposit and mined about 7 million tonnes of ore over a period of 18 years, from 1968 to 1986. In the 1970s, Aberfoyle was one of the leading tin producers in Australia with four operating tin mines: Cleveland, the Storeys Creek and Aberfoyle mines in North-East Tasmania, and the Ardlethan mine in southern New South Wales. The author worked for Aberfoyle from 1970 to 1973 and was acquainted with many of the Aberfoyle staff who worked at Cleveland. He knows of no reason to doubt the competence of the geologists who worked

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at Cleveland, in fact, Aberfoyle personnel were recognised as efficient operators with good record keeping and reporting practices.

When the mine closed, the mine plans showing the locations of the workings, geological plans, sections and longitudinal projections, and the drill logs for the diamond drill holes were placed in storage in Burnie and are available for use. In addition, the drill core from 87 diamond drill holes is stored in the Core Store of Mineral Resources Tasmania at Mornington in Tasmania.

Some of the existing data ~~could be~~has been verified by Bright Phase Resources ~~duplicate testing or by other means, for example, sampling and assay could be verified~~ by re-splitting and assaying the existing drill core (McKeown, 2011). S~~, or s~~urveying could be verified by re-surveying, however, this has not yet been done.

The nature of defects in the assessment and reporting criteria noted for the historical resource estimate and their likely impacts on the quality of the resource report are listed in Table 2. The Assessment and Resource Reporting Criteria listed in Table 3 have been categorised using the terms listed under Nature of Defects.

Table 2 Nature of Defects - Likely Impact on Resource Report Quality and Likely Impact on Subsequent Use of the Resource Report

Nature of Defects	Likely Impact on Resource Report Quality	Likely Impact on Subsequent Use of Resource Report
Acceptable: no defects	None	None
Defects tolerable	Low	No material impact
Defects not acceptable	Quality severely compromised	Severely compromised

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Table 3 Cleveland Sn and Cu Resource Estimate – Assessment and Reporting Criteria

Cleveland Sn and Cu Resource Estimate	
Sampling Techniques and Data	
Sample recovery.	Acceptable. A sampling of drill logs by the author did not reveal that core loss was a problem during diamond drilling. The reliability of core recovery was confirmed in discussions with a contemporary Aberfoyle geologist. Aberfoyle reported that core recovery at Cleveland was consistently good (Cox, 1967). This is in accordance with the reported ground conditions in the Cleveland mine which have been reported as competent to highly competent (Everett, 1977) and Buckland, 1980).
Logging.	Acceptable to tolerable. A sampling of drill logs by the author indicated that the logs contained adequate locational, sampling and assay data. Lithological logging was not always carried out but, given the nature of the mineralisation, even though not ideal, this lack is tolerable.
Sub-sampling techniques and sample preparation.	Acceptable. Drill core was split longitudinally and crushing and pulverising were subject to specific and definite protocols. Aberfoyle paid particular attention to sampling technique and sample preparation (Cox, 1967). The reliability of sub-sampling techniques and sample preparation has been confirmed by re-sampling and re-assaying

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	of existing drill core by Bright Phase Resources (McKeown, 2011).
Quality of assay data and laboratory tests.	Acceptable. Assays were conducted at the Tasmanian Mines Department Laboratory at Launceston and at Cleveland and check samples, although not recorded in the drill logs, were in use (Cox, 1967). The reliability of the assays is also partly confirmed by reconciliations of resources to production (Dronseika, 1986). The reliability of Sn assays has been confirmed by re-sampling and re-assaying of existing drill core by Bright Phase Resources (McKeown, 2011).
Verification of sampling and assaying.	Tolerable. Some verification of assay data was carried out routinely. Check samples, although not recorded in the drill logs, were in use (Cox, 1967). The reliability of the assays is also partly confirmed by reconciliations of resources to production (Dronseika, 1986).
Location of data points.	Acceptable. Locations of drill hole collars, channel samples and mine workings were established by Surveyors.
Data spacing and Distribution.	Acceptable. Data spacing was sufficient for creation of useable Sn and Cu variograms (Dronseika, 1986). Generally, geological interpretation did not extend more than 10m beyond diamond drill hole intercepts or mine development (Dronseika, 1986).
Orientation of data in relation to geological structure	Acceptable. The strike and dip of the host geological formation and of the sulphide cassiterite mineralisation was well known from the beginning of systematic evaluation by Aberfoyle in 1961 and the drill holes and channel samples were oriented

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	accordingly.
Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle. However, there was a culture of internal reviewing of the methods used for resource estimates including reconciliation of resources to production (Dronseika, 1986, and McArthur, 1983) and a review of sampling methods (Cox, 1967).
Estimation and Reporting of Mineral Resources	
Database integrity.	Tolerable. The specific measures to ensure database integrity are not known. However, every sample in the data used for the resource estimate is listed in the Appendix to the resource report, including the three dimensional coordinates of the sample, the total Sn assay, the soluble Sn assay and the Cu assay.
Geological interpretation.	Tolerable. The geological interpretation was devised by the Cleveland Senior Mine Geologist on 1:200 and 1:500 cross-sections and longitudinal projections (Dronseika, 1986). The mineralisation was interpreted as at least 10 lenses within a specific geological formation and lens terminations were interpreted by a geologist (Dronseika, 1986 and McArthur, 1983). Halls Formation, the geological formation which contains the lenses of mineralisation, dips nearly vertically and is known over a strike length of 700m, an across strike width of about 200m, and a down-dip extent of over 800m (Ransom and Hunt, 1975 and Dronseika, 1986). Halls Formation and the lenses of mineralisation are interpreted as being offset by flat lying faults (Ransom and Hunt, 1975 and Everett, 1977).
Dimensions.	Acceptable.

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	Halls Formation, the geological formation which contains the lenses of mineralisation, dips nearly vertically and is known over a strike length of 700m, an across strike width of about 200m, and a down-dip extent of over 800m (Ransom and Hunt, 1975 and Dronseika, 1986). The spatial dimensions for each lens were quoted in the resource report (Dronseika, 1986).
Estimation and modelling techniques.	Tolerable. Mineralisation was modelled as two dimensional 10m X 10m blocks, grade estimates of total Sn, acid soluble Sn and Cu were made by ordinary kriging and depletion was made for mineralisation which had been mined (Dronseika, 1986). These were appropriate techniques. No check estimates were reported but resource reporting included annual reconciliation of resources to production (Dronseika, 1986) No assumptions were made about the recovery of by-products. No estimates of S grade were made.
Moisture.	Acceptable. All assays were reported on a dry basis.
Cut-off parameters.	Tolerable. The resources were reported using a cut-off grade of 0.35% total Sn which was estimated as "the absolute minimum value whereby in situ materials of that grade, once diluted by mining process, could never be mined and treated at a profit" (Dronseika, 1986). It is not clear what costs were taken into account for this definition but, given cut-off grades at similar mines, this is not an unreasonable estimate.
Mining factors or assumptions.	Acceptable. Resources were estimated, not reserves, and no

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	mining factors were used.
Metallurgical factors or assumptions.	Acceptable. Varying metallurgical recoveries were applied to each lens or part of a lens and the effects of the varying recoveries were taken into account in the calculations. This approach wais reasonable and important. Not all the Sn at Cleveland occurs as cassiterite, for example, the soluble Sn occurs as stannite, and only the Sn which occurs as cassiterite is potentially recoverable by gravity or tin flotation.
Bulk density.	Tolerable. Bulk densities of 3.05 and 3.08 tonnes per cubic metre were used (Dronseika, 1986). These were the same as had been used in earlier estimates. The sources of the bulk densities are not known but given the style of the mineralisation the bulk densities are reasonable.
Classification.	Tolerable. The resources were classified as Measured, Indicated and Inferred using these definitions: Measured: “Materials for which estimates of the quality and quantity have been computed from sample analyses and measurements from closely spaced and geologically well known sample sites such that: (a) the pattern of ore continuity is well understood; (b) the actual metal content will have a high probability of being in the range 90% to 110% of the prediction.” (Dronseika, 1986) Indicated: “Materials for which estimates of the quality and quantity have been computed partly from sample analyses and measurements, and partly from reasonable geologic projections such that: (a) the pattern of ore continuity is understood though surprises are still possible; (b) the actual metal content will have a high probability of being in the range 70% to 130% of

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	the prediction." (Dronseika, 1986) Inferred: "Quantitative estimates are based largely on broad knowledge of the geological character of the deposit and for which there are few sample measurements. The estimates are based on an assumed continuity or repetition of which there is geologic evidence." (Dronseika, 1986). These categories were reasonable and were reasonably defined.
Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle. However, there was a culture of internal reviewing of the methods used for resource estimates including reconciliation of resources to production (Dronseika, 1986, and McArthur, 1983) and a review of sampling methods (Cox, 1967).
Discussion of relative accuracy/confidence	Tolerable. See Classification above. Reconciliation of mill feed and resources removed were made 18 times between 1970 and 1986. The reconciliation from May 1985 to June 1986 indicated a tonnage increase of 37% and a grade decrease of 10%.

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References quoted in the table above:

Buckland, K.R., 1980. Tin-copper ore mining at Cleveland Tin Limited, Luina, Tas. *in* Woodcock, J.T., 1980, Mining and Metallurgical Practices in Australasia, Monograph Series No. 10, The Australasian Institute of Mining and Metallurgy.

Cox, R., 1967. The use of comparative sampling methods at Cleveland mine, Tasmania, March 1967. Unpublished report, Aberfoyle Tin Development Partnership, Cleveland Development Project.

Dronseika, E.V., 1986. Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Unpublished report for Aberfoyle Resources Limited, Cleveland Division by E.V. Dronseika, Senior Mine Geologist.

Everett, H.R., 1977. Current mining practice at Cleveland mine of Abminco N.L.. in Underground Operators' Conference, October 1977, The AusIMM Broken Hill Branch.

McArthur, G.A., 1983. Schematic 1983 Ore Reserve Procedure, 31 May 1983. Unpublished report for Cleveland Tin Ltd.

McKeown, M.V., 2011. Re-sampling and re-assaying of Cleveland drill core. Memorandum from Mick McKeown to Mike Adams, 12 December, 2011. Mining One Pty Ltd.

Ransom, D.M. and Hunt, F.L., 1975. Cleveland tin mine *in* Knight, C.L. (editor), 1975, Economic Geology of Australia and Papua New Guinea, Monograph Series No. 5, The Australasian Institute of Mining and Metallurgy.

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5 a. The historical resource estimate is material because it deals explicitly and directly with the tin and copper resources remaining at Cleveland. The estimate was reported to have been made using the relevant geological and mining data available at the operating mine at the time. (Refer to section 4 above).

5 b. Bright Phase Resources intends to de-water the flooded Cleveland mine and, if required, conduct diamond drilling of the mineralisation to acquire new data and to confirm historical data. Bright Phase Resources primarily intends to confirm the reliability of historical drill hole data by re-splitting and re-assaying existing drill core held at the Mineral Resources Tasmania Core Store at Mornington, Tasmania.

The creation of a~~A~~ digital drill hole database ~~will be made~~ using the existing hard copy drill logs held in Burnie, Tasmania has commenced.~~.~~

The existing mine workings will be digitised using the existing hard copy plans held at Burnie, Tasmania and Mineral Resources Tasmania, Rosny Park, Tasmania.~~.~~

The Aberfoyle geological interpretation will be digitised using the existing hard copy plans, cross-sections and longitudinal projections held at Burnie, Tasmania.

5 c. The work proposed by Bright Phase Resources will be funded by a public float of the Company.

5 d. The Cleveland leases are the only targets for Bright Phase Resources.

6. The historical estimates are listed above and the resource categories compare reasonably with current JORC Code definitions.

7. No additional work on hard rock resource definition has been completed since mine closure. The mine was allowed to flood after closure and no access has been possible

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since that time. No records of surface drilling activity on EL7/2005 since mine closure have been lodged with Mineral Resources Tasmania (MRT).

8. . Bright Phase Resources plans to undertake a program to validate the historic resource estimates detailed by Aberfoyle and upgrade these estimates to current JORC code requirements. The program will be developed under the guidance of a competent geologist and is anticipated to include the following aspects:

- A thorough search of available Aberfoyle mine exploration and production data for the Cleveland operation. This will target the determination of what records of sampling, auditing and general data validation practices are available for JORC compliant reporting of the estimates.
- Where inadequate records are available, or indications that the methodologies used were not in compliance with JORC reporting standards, work will be implemented to drill the ore body using appropriate methods. The extent of this drilling program will be determined by a competent geologist to provide sufficient information to support historical estimates.
- Existing data will be digitised and used to develop a 3D model of the mineralisation and the mine.

9. This report is consistent with the guidance contained in the ASX Companies Updates No 11/07 and 05/04.

10. The information in this report that relates to Mineral Resources is based on information compiled by Michael McKeown who is a Fellow of the Australasian Institute of Mining and Metallurgy. Michael McKeown is employed by Mining One Pty Ltd and he has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Michael McKeown consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.

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Tungsten Resource in the Cleveland Mine

Tungsten at Cleveland occurs as wolframite, an iron and manganese tungsten oxide with the formula $(Fe,Mn)WO_4$. In the mining industry, tungsten assays are usually expressed as $\%WO_3$ and this was the practice at Cleveland.

The paragraph numbers in this section coincide with the paragraph numbers under Requirements for non-JORC Compliant Historical and Foreign Reporting in the ASX Companies Update 11/07.

1. The historical resource referred to here is not reported in compliance with the JORC Code and it is uncertain that following evaluation and/or further exploration that the resource will ever be able to be reported in accordance with the JORC Code.

Table 4 Cleveland Mine – Tungsten Mineral Resources

Cleveland Mine – Tungsten - Mineral Resources		
Inferred Mineral Resources		
Cut-off Grade % WO_3	**tonnes**	**% WO_3**
0.20	3,800,000	0.28
0.30	1,230,000	0.35
0.40	140,000	0.43

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2. The source of the historical resource estimate is:

- **Dronseika, E.V., 1983**. Geological assessment of the Foley zone mineralisation at Cleveland mine Tasmania, May 1983. Unpublished report for Cleveland Tin Ltd.

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In addition, there are several other documents which support or explain aspects of the historical resource estimate and these are listed at the bottom of Table 6.

3. The wolframite bearing quartz vein stockwork is known as Foleys Lode. Dronseika's 1983 resource estimate for Foleys Lode is relevant. It was prepared by the geologist who was most familiar with the geology of Foleys lode and clearly describes how the resource estimate was made.

At the time of closure, in 1986, the mine was allowed to flood and has remained flooded through the subsequent period with no ~~for~~ mining. All historic resource estimates can therefore be considered to be unchanged since the mine closure. There have been no applications for mining rights submitted to Mineral Resources Tasmania in the time since closure and all records of exploration have focused on the tailings ~~material~~ stored in dams on the site.

4. The historical resource estimate is reliable. The data used for the resource estimate was compiled during Aberfoyle's ownership of Cleveland from 1961 to 1986. During that time, Aberfoyle drilled over 2000 diamond drill holes into the Cleveland deposit, including 24 which tested the Foley Zone, and mined about 7 million tonnes of ore over a period of 18 years, from 1968 to 1986. In the 1970s, Aberfoyle was one of the leading tungsten~~in~~ producers in Australia with ~~four~~ two operating ttungsten~~in~~ mines: ~~: Cleveland,~~ the Storeys Creek and Aberfoyle mines in North-East Tasmania~~, and the Ardlethan mine in southern New South Wales~~. The author worked for Aberfoyle from 1970 to 1973 and was acquainted with many of the Aberfoyle staff who worked at Cleveland. He knows of no reason to doubt the competence of the geologists who worked at Cleveland, in fact, Aberfoyle personnel were recognised as efficient operators with good record keeping and reporting practices.

When the mine closed, the mine plans showing the locations of the workings, geological plans, sections and longitudinal projections, and the drill logs for the diamond drill holes were placed in storage in Burnie and are available for use. In addition, the drill core from 87 diamond drill holes, including at least seven drilled into Foleys Lode, is stored in the Core Store of Mineral Resources Tasmania at Mornington in Tasmania.

Some of the existing data could be verified by duplicate testing or by other means, for example, sampling and assay could be verified by re-splitting and assaying the existing drill core, or surveying could be verified by re-surveying, however, this has not yet been done.

The nature of defects in the assessment and reporting criteria noted for the historical resource estimate and their likely impacts on the quality of the resource report are listed in Table 5. The Assessment and Resource Reporting Criteria listed in Table 6 have been categorised using the terms listed under Nature of Defects.

Table 5 Nature of Defects - Likely Impact on Resource Report Quality and Likely Impact on Subsequent Use of the Resource Report

Nature of Defects	Likely Impact on Resource Report Quality	Likely Impact on Subsequent Use of Resource Report

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Acceptable: no defects	None	None
Defects tolerable	Low	No material impact
Defects not acceptable	Quality severely compromised	Severely compromised

Table 6 Cleveland WO_3 Resource Estimate – Assessment and Reporting Criteria

Cleveland WO_3 Resource Estimate	
Sampling Techniques and Data	
Sample recovery.	Acceptable. A sampling of drill logs by the author did not reveal that core loss was a problem during diamond drilling. The reliability of core recovery was confirmed in discussions with a contemporary Aberfoyle geologist. Aberfoyle reported that core recovery at Cleveland was consistently good (Cox, 1967). This is in accordance with the reported ground conditions in the Cleveland mine which have been reported as competent to highly competent (Everett, 1977) and Buckland, 1980) and, in the quartz porphyry host rock, as excellent (Dronseika, 1983). Core recovery in the WO_3 mineralisation was in excess of 95% (Dronseika, 1983).
Logging.	Acceptable. 5500m of core was logged in detail noting country rock, wall-rock alteration, structures, mineralogy, vein thickness and vein to core angle (Dronseika, 1983). A sampling of drill logs by the author indicated that the logs contained adequate locational, geological, sampling and assay data. In addition, there are 64 petrological and mineralogical descriptions made under the microscope by AMDEL and Latrobe University

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	(included in Dronseika, 1983).
Sub-sampling techniques and sample preparation.	Acceptable. Drill core was split longitudinally and crushing and pulverising were subject to specific and definite protocols. Aberfoyle paid particular attention to sampling technique and sample preparation (Cox, 1967).
Quality of assay data and laboratory tests.	Tolerable. Samples were routinely assayed in the laboratory at Cleveland. Thirty samples were re-split and re-assayed by AMDEL Laboratories. Some samples were re-assayed by AMDEL Laboratories. The correlation of assay results for WO_3 was acceptable (Hample and Waters, 1983).
Verification of sampling and assaying.	Tolerable. Samples were routinely assayed in the laboratory at Cleveland. Thirty samples were re-split and re-assayed by AMDEL Laboratories. Some samples were re-assayed by AMDEL Laboratories. The correlation of assay results for WO_3 was acceptable (Hample and Waters, 1983).
Location of data points.	Acceptable. Locations of drill hole collars, channel samples and mine workings were established by Surveyors.
Data spacing and Distribution.	Acceptable. Data spacing was sufficient for creation of useable WO_3 variograms with relatively low nugget effect and ranges for spherical models of up to 150m (McArthur, 1983 in Dronseika, 1983).
Orientation of data in relation to geological structure	Acceptable. The strike and dip of the quartz porphyry intrusion and the quartz vein stockwork mineralisation was well known from the beginning of systematic evaluation by Aberfoyle in 1970 and the drill holes were oriented accordingly.

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Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle. However, there was cooperation during the resource estimate between the Project Geologist (E. V. Dronseika) and the Senior Mine Geologist (G.A. McArthur)
Estimation and Reporting of Mineral Resources	
Database integrity.	Tolerable. The specific measures to ensure database integrity are not known but the descriptions of the work carried out by Dronseika (Dronseika, 1983) and McArthur (McArthur, 1983) imply a systematic and thorough approach.
Geological interpretation.	Tolerable. The geological interpretation was devised by the Cleveland Project Geologist using 1:500 mine plans, cross-sections and longitudinal projections. The interpretation was based on detailed logging of 5500m of drill core and underground mapping. (Dronseika, 1983) The mineralisation was interpreted as a stockwork of quartz veins surrounding an intrusion of quartz porphyry in the form of a steeply dipping stock. The quartz porphyry stock is known from near sea level to 600m below sea level. The wolframite bearing quartz vein stockwork is known from 300m above sea level to 600m below sea level. The maximum extents of the quartz vein stockwork extends are 900m vertically, 300m along strike and 300m across strike. (Dronseika, 1983)
Dimensions.	Acceptable. The wolframite bearing quartz vein stockwork is known from 300m above sea level to 600m below sea level. The maximum extents of the quartz vein stockwork extends are 900m vertically, 300m along strike and 300m across strike.

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	(Dronseika, 1983)
Estimation and modelling techniques.	Tolerable. Mineralisation was modelled as three dimensional blocks, grade estimates of WO_3 were made by ordinary kriging (Dronseika, 1983). These were appropriate techniques. No check estimates were reported. No assumptions were made about the recovery of by-products. No estimates of S grade were made.
Moisture.	Acceptable. All assays were reported on a dry basis.
Cut-off parameters.	Tolerable. The resources were reported using cut-off grades of 0.2%, 0.3% and 0.4% WO3. Given the existence of underground access to Foleys Lode, current tungsten prices and the author's understanding of likely mining and processing costs, a marginal cut-off grade of 0.2% WO_3 waswould be reasonable.
Mining factors or assumptions.	Acceptable. Resources were estimated, not reserves, and no mining factors were used.
Metallurgical factors or assumptions.	Tolerable for Inferred Category Not acceptable for Indicated Category Metallurgical test work to estimate the flotation response for wolframite was undertaken by Aberfoyle Central Metallurgical Services; the note which refers to the test work reports concentrate grades which were achieved but not mill recoveries (Thomas, 1983). However, in the author's experience, given the size of the wolframite grains reported in drill logs and in thin and polished sections and the

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	generally magnetic nature of wolframite, mill recoveries of the order of 60% to 80% could be expected. Metallurgical test work was carried out to determine whether photometric ore sorting would be practically useful to beneficiate the wolframite bearing quartz stockwork mineralisation. Results were not encouraging (Hamill, 1981).
Bulk density.	Tolerable. Bulk density of 2.87 tonnes per cubic metre was used (Dronseika, 1983). The source of the bulk density is not known but given the style of the mineralisation the bulk density is reasonable.
Classification.	Tolerable for Inferred Category. Unacceptable for Indicated Category. The resources were classified as Indicated but no definition of the category was given (Dronseika, 1983). However, in another almost contemporaneous Aberfoyle Report written by the same author, categories were defined as: Measured: "Materials for which estimates of the quality and quantity have been computed from sample analyses and measurements from closely spaced and geologically well known sample sites such that: (a) the pattern of ore continuity is well understood; (b) the actual metal content will have a high probability of being in the range 90% to 110% of the prediction." (Dronseika, 1986) Indicated: "Materials for which estimates of the quality and quantity have been computed partly from sample analyses and measurements, and partly from reasonable geologic projections such that: (a) the pattern of ore continuity is understood though surprises are still possible; (b) the actual metal content will have a high probability of being in the range 70% to 130% of the prediction." (Dronseika, 1986)

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	Inferred: "Quantitative estimates are based largely on broad knowledge of the geological character of the deposit and for which there are few sample measurements. The estimates are based on an assumed continuity or repetition of which there is geologic evidence." (Dronseika, 1986). These categories were reasonable and were reasonably defined. Given the lack of metallurgical test work to estimate mill recoveries, the resources should be classified as Inferred rather than Indicated.
Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle. However, there was a culture of internal reviewing of the methods used for resource estimates including reconciliation of resources to production (Dronseika, 1986, and McArthur, 1983) and a review of sampling methods (Cox, 1967).
Discussion of relative accuracy/confidence	Tolerable. See Classification above.

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References quoted in the table above:

Buckland, K.R., 1980. Tin-copper ore mining at Cleveland Tin Limited, Luina, Tas. *in* Woodcock, J.T., 1980, Mining and Metallurgical Practices in Australasia, Monograph Series No. 10, The Australasian Institute of Mining and Metallurgy.

Cox, R., 1967. The use of comparative sampling methods at Cleveland mine, Tasmania, March 1967. Unpublished report, Aberfoyle Tin Development Partnership, Cleveland Development Project.

Dronseika, E.V., 1983. Geological assessment of the Foley zone mineralisation at Cleveland mine Tasmania, May 1983. Unpublished report for Cleveland Tin Ltd.

Dronseika, E.V., 1986. Geological Resource Assessment, Cleveland Tin Mine, as at End of Milling-Mining Operations, 12th June 1986. Unpublished report for Aberfoyle Resources Limited, Cleveland Division.

Everett, H.R., 1977. Current mining practice at Cleveland mine of Abminco N.L.. *in* Underground Operators' Conference, October 1977, The AusIMM Broken Hill Branch.

Hamill, J.P., 1981. Ore sorting of Foley's zone. Internal Memorandum to G.A. McArthur, 27th October 1981, Cleveland Tin Limited.

Hample, B.W. and Waters, M.T., 1981. Accuracy of Foley's mine assays in comparison to outside assay services. Internal Memorandum to G.A. McArthur, 16th July 1981, Cleveland Tin Limited.

Thomas, I., 1983. Analysis of metallurgical products from Foley Zone Upper Stockwork. Internal Memorandum to G.J. McArthur, 22nd March 1983, Aberfoyle Central metallurgical Services.

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5 a. The historical resource estimate is material because it deals explicitly and directly with the tungsten Resources at Cleveland. The estimate was reported to have been made using the relevant geological and mining data available at the time. (Refer to section 4 above).

5 b. Bright Phase Resources intends to de-water the flooded Cleveland mine and, if required, conduct diamond drilling of the mineralisation to acquire knew data and to confirm historical data. Bright Phase also intends to confirm the reliability of historical drill hole data by re-splitting and re-assaying existing drill core held at the Mineral Resources Tasmania Core Store at Mornington, Tasmania.

Creation of a~~A~~ digital drill hole database ~~will be made~~ using the existing hard copy drill logs held in Burnie, Tasmania has commenced.~~.~~

The existing mine workings will be digitised using the existing hard copy plans held at Burnie, Tasmania and at Mineral Resources Tasmania, Rosny Park, Tasmania.~~.~~

The Aberfoyle geological interpretation will be digitised using the existing hard copy plans, cross-sections and longitudinal projections held at Burnie, Tasmania.

5 c. The work proposed by Bright Phase Resources will be funded by a public float of the Company.

5 d. The Cleveland leases are the only targets for Bright Phase Resources.

6. The historical estimates are listed above and the resource category compares well with current JORC Code definitions.

7. No additional work on hard rock resource definition has been completed since mine closure. The mine was allowed to flood after closure and no access has been possible

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since that time. No records of surface drilling activity on EL7/2005 since mine closure have been lodged with Mineral Resources Tasmania (MRT).

8. Bright Phase Resources plans to undertake a program to validate the historic resource estimates detailed by Aberfoyle and upgrade these estimates to current JORC code requirements. The program will be developed under the guidance of a competent geologist and is anticipated to include the following aspects:

- A thorough search of available Aberfoyle mine exploration and production data for the Cleveland operation. This will target the determination of what records of sampling, auditing and general data validation practices are available for JORC compliant reporting of the estimates.
- Where inadequate records are available, or indications that the methodologies used were not in compliance with JORC reporting standards, work will be implemented to drill the ore body using appropriate methods. The extent of this drilling program will be determined by a competent geologist to provide sufficient information to support historical estimates.
- Existing data will be digitised and used to develop a 3D model of the mineralisation and the mine.

9. This report is consistent with the guidance contained in the ASX Companies Updates No 11/07 and 05/04.

10. The information in this report that relates to Mineral Resources is based on information compiled by Michael McKeown who is a Fellow of the Australasian Institute of Mining and Metallurgy. Michael McKeown is employed by Mining One Pty Ltd and he has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Michael McKeown consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.

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Tin Resource in the Cleveland Tailings Dams

Tin at Cleveland occurs principally as cassiterite, a tin oxide with the formula SnO_2 and less commonly as stannite, a tin-copper-iron sulphide with the formula (Sn,Cu,Fe)S. For deposits where both tin minerals are present, Sn assays are usually reported as total Sn, representing all the Sn in a sample, or as soluble Sn, representing the Sn which occurs as stannite.

The paragraph numbers in this section coincide with the paragraph numbers under Requirements for non-JORC Compliant Historical and Foreign Reporting in the ASX Companies Update 11/07.

~~1.~~1. The historical resource referred to here (see Table 7) is not reported in compliance with the JORC Code and it is uncertain that following evaluation and/or further exploration that the resource will ever be able to be reported in accordance with the JORC Code.

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Table 7 Cleveland Tailings Dams – Mineral Resources

Cleveland Tailings Dams – Tin - Mineral Resources		
Inferred Mineral Resources		
0.0% Sn Cut-off Grade		
	tonnes	**% Sn**
Tailings Dam 1	910,000	0.4
Tailings Dam 2	2,700,000	0.3
Total	3,600,000	0.3

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2. The source of the historical resource estimate is the milling records for the Cleveland mill as reported in:

- **Foo, K.A., 1981.** Performance of concentrators within Aberfoyle, past present and future, March 1981. Unpublished report, Aberfoyle Limited.

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This resource estimate was made in 1981, five years before Cleveland closed in 1986. The estimates have been updated by reference to:

- **Moony, N., 2008.** Review of Cleveland tin tailings deposits in Tasmania. Unpublished report by Esker Milling and Processing Pty Ltd for The Lynch Group.

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In addition, there are several other documents which support or explain aspects of the historical resource estimate and these are listed at the bottom of Table 9.

3. All the tailings from the treatment of ore from the Cleveland Mine are stored in two tailings dams at Cleveland: Tailings Dam 1 (TD1) and Tailings Dam 2 (TD2). The tailings dams contain tin in the form of cassiterite. The tin recovery in the Cleveland Mill was such that the dams now contain significant tonnages of tin, some of which should be recoverable with modern metallurgical methods. Aberfoyle metallurgists investigated the re-treatment of the stored tailings from 1979 to 1984.

4. The historical resource estimate is reliable. The data used for the resource estimate was compiled during Aberfoyle's ownership of Cleveland from 1961 to 1986. During that time, about 7 million tonnes of ore were treated over a period of 18 years, from 1968 to 1986. In the 1970s, Aberfoyle was one of the leading tin producers in Australia with four operating tin mines: Cleveland, the Storeys Creek and Aberfoyle mines in North-East Tasmania, and the Ardlethan mine in southern New South Wales. The author worked for Aberfoyle from 1970 to 1973 and was acquainted with many of the Aberfoyle staff who worked at Cleveland. He knows of no reason to doubt the competence of the geologists who worked at Cleveland.

The resource estimate is based on the metallurgical records of the Cleveland Mill from 1969 to 1986 (Foo, 1981 and ~~Enraght-~~Moony, 2008).

The existing data has been partly verified by test drilling of the tailings dams in 2008 (Brewer, 2008).

The nature of defects in the assessment and reporting criteria noted for the historical resource estimate and their likely impacts on the quality of the resource report are listed in Table 8. The Assessment and Resource Reporting Criteria listed in Table 9 have been categorised using the terms listed under Nature of Defects.

Table 8 Nature of Defects - Likely Impact on Resource Report Quality and Likely Impact on Subsequent Use of the Resource Report

Nature of Defects	Likely Impact on Resource Report Quality	Likely Impact on Subsequent Use of Resource Report
Acceptable: no defects	None	None
Defects tolerable	Low	No material impact
Defects not acceptable	Quality severely compromised	Severely compromised

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Table 9 Cleveland Tailings Resource Estimate – Assessment and Reporting Criteria

Cleveland Tailings Resource Estimate	
Sampling Techniques and Data	
Sample recovery.	Acceptable. The tailings grade is based on sampling in the Cleveland Mill and subsequent metallurgical mass balances from 1968 to 1986.
Logging.	Not applicable.
Sub-sampling techniques and sample preparation.	Acceptable. Sampling in the Cleveland Mill was subject to metallurgical mass balances from 1968 to 1986.
Quality of assay data and laboratory tests.	Acceptable. Samples were taken routinely in the Cleveland Mill and routinely assayed in the laboratory at Cleveland. Assaying in the Cleveland Mill was subject to metallurgical mass balances from 1968 to 1986.
Verification of sampling and assaying.	Acceptable. Samples were taken routinely in the Cleveland Mill and routinely assayed in the laboratory at Cleveland. Assaying in the Cleveland Mill was subject to metallurgical mass balances from 1968 to 1986. Drilling of the tailings dams in 2008 confirmed the grade of the tailings (Brewer, 2008).
Location of data points.	Not applicable.
Data spacing and Distribution.	Acceptable. Sampling in the Cleveland Mill was routine and subject to metallurgical mass balances from 1968 to 1986. A very large number of tailings samples were taken during that time, probably at least one

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	per day from 1968 to 1986.
Orientation of data in relation to geological structure	Not applicable. However, the drilling in 2008 suggested that there is layering in the dams.
Audits or reviews.	Acceptable. The Aberfoyle estimates of tonnage and grade of tailings made in 1981 (Foo, 1981) were confirmed in 2008 (Moony, 2008) and by Goodall, 2011.~~,~~
Estimation and Reporting of Mineral Resources	
Database integrity.	Tolerable. The specific measures to ensure the integrity of the Aberfoyle metallurgical data are not known but, given that the data was collected at a large operating mill, it is reasonable to assume that the data is sound.
Geological interpretation.	Not applicable.
Dimensions.	Acceptable. TD1 is 300m long, 100m wide and a maximum depth of about 20m. TD2 is 400m long, 0m to 200m wide and has a maximum depth of about 35m.
Estimation and modelling techniques.	Tolerable. There is no model of the tailings deposits. The tonnages and grades were estimated directly from records of tailings discharge from the Cleveland Mill.
Moisture.	Acceptable. All assays were reported on a dry basis.
Cut-off parameters.	Acceptable. The resource is quoted at 0.0% Sn (total) cut-off grade. Given that all the tailings will probably need re-treatment without selectivity, this is

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	reasonable.
Mining factors or assumptions.	Not applicable. All the tailings will probably need re-treatment without selectivity, this is reasonable.
Metallurgical factors or assumptions.	Tolerable for Inferred Category. Foo (1981) considered that mill recoveries from treatment of run of mine ore of 65% for Sn could be maintained under best operating conditions at the time. This is considerably better than the mill recoveries during the routine operation of the mill up until that time. This implies that some, at least, of the tin in the tailings dams should be recoverable. Stribley et al. (1984) reported that mill recoveries from treatment of tailings of between 33% and 45% for Sn were attainable using conventional gravity and flotation processing.
Bulk density.	Not applicable. Tailings discharge from the Cleveland Mill was measured in tonnes.
Classification.	Acceptable for Inferred Category. The resources were not classified in the historical estimates. However, given they would be classified as Inferred Mineral Resources today.
Audits or reviews.	Tolerable. There are no known audits or reviews by personnel outside Aberfoyle.
Discussion of relative accuracy/confidence	Acceptable. A Mineral Resource is a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such from, quality and quantity that there are reasonable prospects for eventual economic extraction (JORC, 1984). By this measure, the tailings are a Mineral Resource. An Inferred Mineral Resource is that part of a Mineral Resource for which tonnage, grade and

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	mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability (JORC, 1984). By this measure, the tailings for which the tonnage and grade have been determined from the sampling and assaying techniques used in the Cleveland Mill and confirmed in part by drilling of the dams, may be classified as Inferred.

References quoted in the table above:

Brewer, A., 2008. Cleveland tailings drilling, 17/3/2008. Memorandum from Adrian Brewer, Brewer Geological Services to John Lynch.

Foo, K.A., 1981. Performance of concentrators within Aberfoyle, past present and future, March 1981. Unpublished report, Aberfoyle Limited.

Goodall, W., 2011. 110711 Cleveland tailings reserve calc – annual report basis.xlsx. Spreadsheet prepared from Aberfoyle Public Annual Reports. Bright Phase Resources Ltd, 11 July 2011; McKeown, M., 2011. Cleveland Historical Production 3 Aug MM.xls. Validation and extension of this spreadsheet, 3 August 2011.

~~**Goodall, W., 2011**. 110711 Cleveland tailings reserve calc – annual report basis.xlsx. Spreadsheet prepared from Aberfoyle Public Annual Reports. Bright Phase Resources Ltd, 11 July 2011.~~

Moony, N., 2008. Report on the Cleveland tailings deposit, 2008. Unpublished report by Esker Milling and Processing Pty Ltd for The Lynch Group.

Stribley, D.J., Tapp, G.C. and Meik, S.S, 1984. Cleveland tailings re-treatment, pilot plant and laboratory flotation results, February 1984. Unpublished report by Aberfoyle Central Metallurgical Services

5 a. The historical resource estimate is material because it deals explicitly and directly with the tin resources in the Cleveland tailings dams.

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5 b. Bright Phase Resources intends to perform a grid-based drilling and sampling programme across tailings dams No 1 and No 2. The drill spacing will be selecte-d in consultation with a competent geologist or mining engineer.

5 c. The work proposed by Bright Phase Resources will be funded by a public float of the Company.

5 d. The Cleveland leases are the only targets for Bright Phase Resources.

6. The historical estimate made in 1981 was not classified into any category.

7. As noted in Section 2 above, the historical estimate included in Foo (1981) has been updated by the 2008 estimate included in Moony (2008).

8. Bright Phase Resources intends to undertake a comprehensive programme of drilling of tailings dams No 1 and No 2 and representative metallurgical composites will be collected during this programme. The drill spacing will be selecte-d in consultation with a competent geologist or mining engineer. In conjunction with the drilling programme, a detailed survey of the tailings dams will be undertaken as warranted by a review of existing data to confirm the volume and tonnage of tailings in the dams.

A metallurgical evaluation programme will be performed including:

- Bench-scale evaluation of optimum metallurgical parameters for each stage of- the proposed flowsheet.
- Mineralogical evaluation of key products from bench scale testwork using QEMSCAN (Quantitative Evaluation of Minerals by Scanning Electron Microscope) to define the fine scale mode of occurrence of valuable minerals and key gangue minerals.
- Laboratory pilot-scale or locked-cycle evaluation of process ~~flow~~.
- Vendor evaluation where required for optimum unit operations in fine-particle gravity and flotation.

9. This report is consistent with the guidance contained in the ASX Companies Updates No 11/07 and 05/04.

10. The information in this report that relates to Mineral Resources is based on information compiled by Michael McKeown who is a Fellow of the Australasian Institute of Mining and

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Metallurgy. Michael McKeown is employed by Mining One Pty Ltd and he has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity he is undertaking to qualify as a Competent Person as defined in the 2004 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Michael McKeown consents to the inclusion in this report of the matters based on his information in the form and context in which it appears.

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