# Survey of the Giant Freshwater Lobster (*Astacopsis gouldi*) at Nelson Bay River.

Prepared by Kanunnah Pty Ltd

for

Pitt and Sherry Pty Ltd

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**AUTHORSHIP**

Field assessment: Todd Walsh

Report production: Bronwyn Walsh, Todd Walsh

Base data for mapping: TasMap

***Disclaimer***

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# 1 Executive Summary

A number of locations near Nelson Bay River were assessed to determine the likelihood of the Giant Freshwater Lobster (*Astacopsis gouldi*) being present. Habitat assessments, some trapping and visual searches were undertaken at various locations. No specimens were observed or trapped in any of the surveyed areas. The habitat in Nelson Bay River near the proposed mining area appears highly suitable for *A. Gouldi*. However, the river can be considered to be at the margins of the range of the species. The habitat in the two major tributaries in the proposed mining area varied in habitat suitability. One was considered very poor habitat, while the other was considered marginal habitat. Nelson Bay River is a highly unusual case, as the river was not considered to be within the known range of *A. gouldi* until a specimen was discovered during an AusRivAS assessment in May 2005. This is the only specimen known to have been found in the river.

The mine is considered unlikely to significantly impact on the species given that the creeks within the mine area are poor potential habitat and there will be no disturbance to Nelson Bay River itself. Mine management will need to ensure that there are no sedimentation or acid drainage impacts on Nelson Bay River.

# 2 Introduction

## 2.1 Background

The Giant Freshwater Lobster (*Astacopsis gouldi*) is a designated Threatened Species endemic to parts of Northern Tasmania. As such, any planned developments that may impact upon it must include a study estimating the likely impact on any population in the area. The proposed Shree Minerals mining project is to be located near Nelson Bay River, thus requiring an investigation relating to *A. gouldi* and potential impacts. Kanunnah Pty Ltd has been contracted to provide a report detailing the habitat suitability for *A. gouldi* in this area.

This report covers the survey and evaluations for the proposed Shree Minerals mining project to be located near Nelson Bay River.

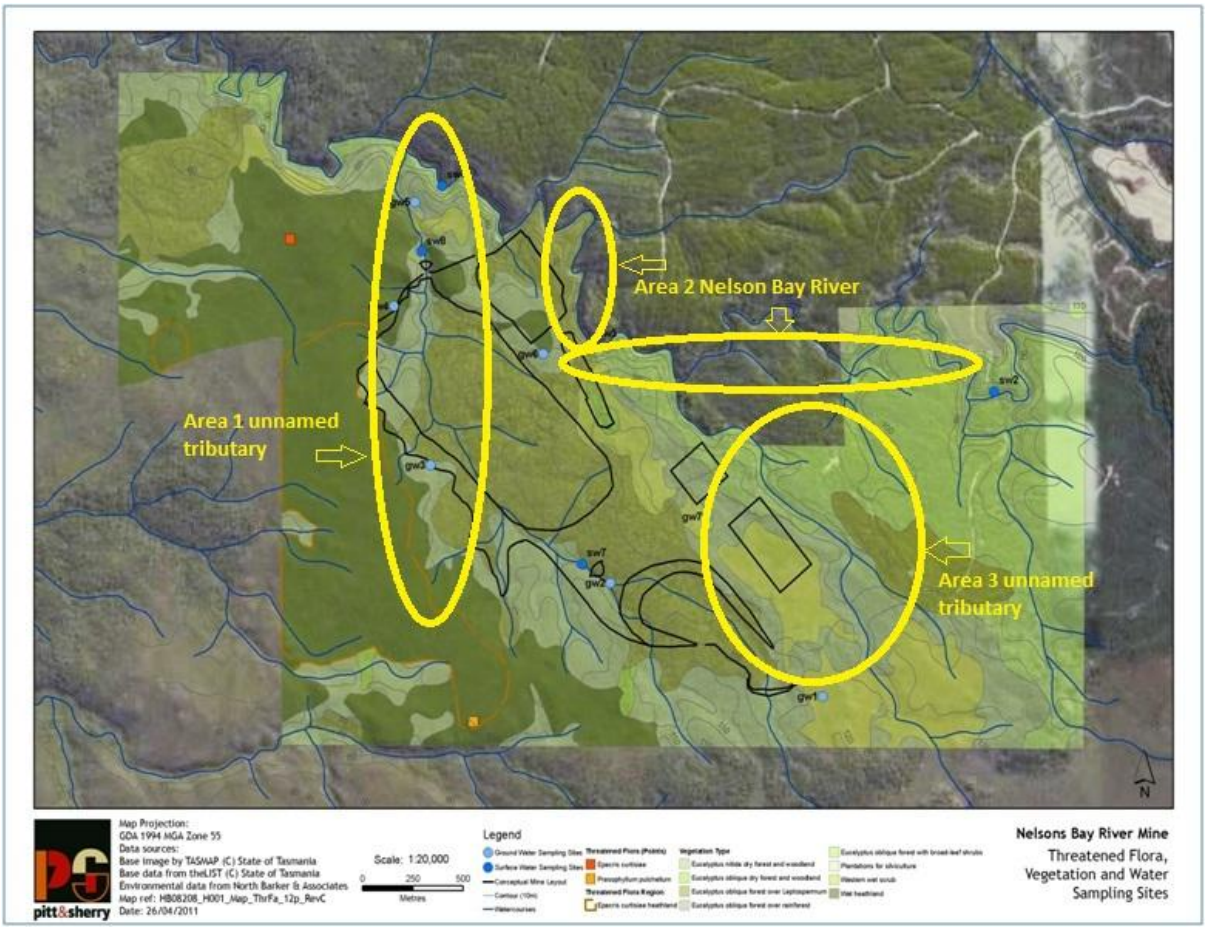
## 2.2 Site Description

Nelson Bay River is situated in the North-West of Tasmania, as shown in Figure 1.

Figure 1: General location of the proposed mining project near Nelson Bay River.

Figure 2 shows the location of the proposed mining project.

Figure 2: Projected area of the proposed mining project and location of three of the five survey sites (original image courtesy of Pitt and Sherry).




## 2.3 Survey Aims

- To evaluate the habitat potential for *Astacopsis gouldi* and suitability of any potential habitat for maintaining *A. gouldi* populations.

## 2.4 Surveyor

The surveys were conducted by Todd Walsh of Kanunnah Pty Ltd, on the 24th, 25th and 31st of May, 2011. The report was compiled by Todd Walsh and Bronwyn Walsh of Kanunnah Pty Ltd

Todd Walsh holds an Associate Diploma of Applied Science (Aquaculture)

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## 2.5 Permits

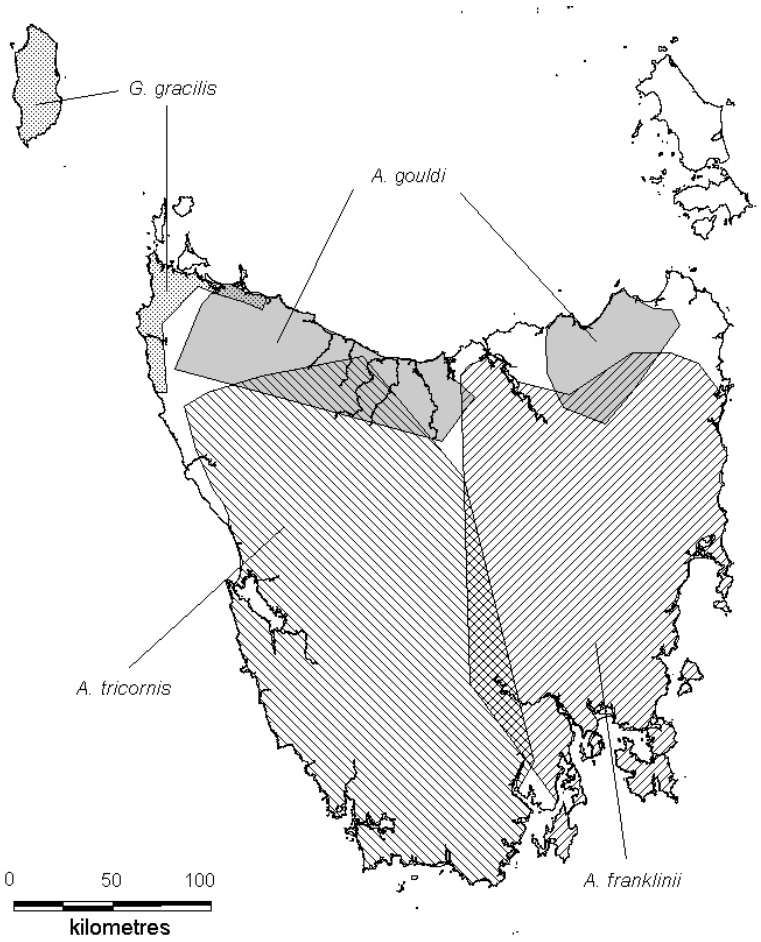
Survey, collection and specimen handling/management is permitted under DPIW permits TFA10138, in the name of Todd Walsh, and Inland Fisheries Service Permit IFS 2010-18, in the name of Todd Walsh and Bronwyn Walsh. As required by permit conditions, relevant data and reports will be forwarded to the relevant authorities.

# 3 Methods

## 3.1 Background information on *Astacopsis gouldi*

*Astacopsis gouldi*, commonly known as the Giant Freshwater Lobster, is the largest freshwater crustacean in the world, with a recorded length of 76cm and weights exceeding 4.5 kg (Hamr, 1990; Horwitz, 1991; Walsh, 2006a). Its recorded distribution ranges from the Arthur-Pieman catchment in North-West Tasmania, across the northern part of the state in most river systems discharging into Bass Strait (see Figure 3). Two other species of *Astacopsis* are recognised: *A. franklinii* and *A. tricornis*. These are smaller *Astacopsis* species, and have different distributions to *A. gouldi*, although there is some overlap for all three species' distributions.

Figure 3: distribution map for *Astacopsis* species (image courtesy of Richardson, Doran and Hansen, 2006)



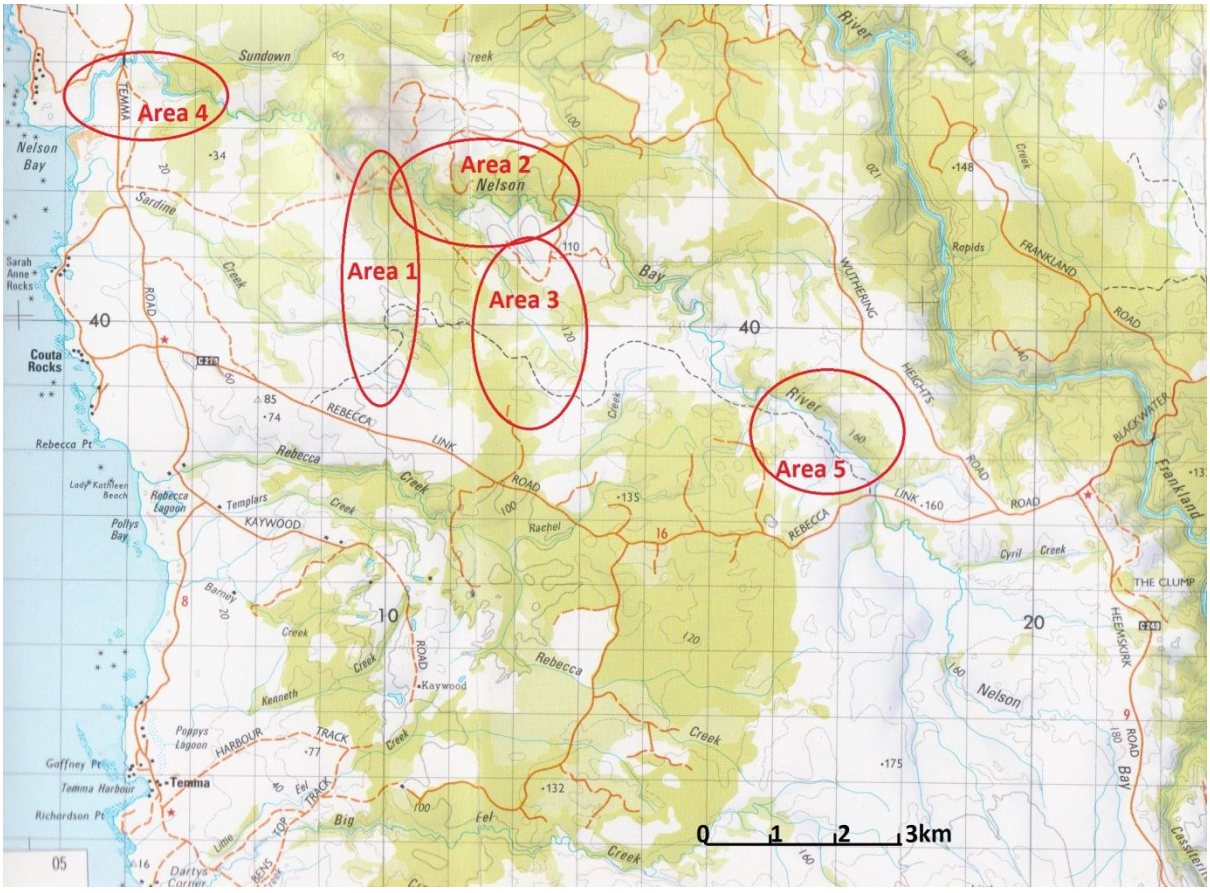

Habitat requirements for *Astacopsis gouldi* may vary, depending on the age-class in question. Juveniles (approx. 10mm – 75 mm Carapace Length (CPL ) (T. Walsh, pers. comm.)) require shallow, fast-flowing streams with substrates containing primarily cobbles and boulders, that are used for shelter; adults often move to slower-flowing reaches where they dig burrows in stream banks and underneath logs and boulders in the stream bed (Lynch and Bluhdorn, 1997; Walsh, pers. comm.). As a general rule, *A. gouldi* requires well-vegetated forest streams with low turbidity and even temperatures (*ibid*). Abundant in-stream and riparian vegetation provides both food and habitat for *A. gouldi*; it also protects the water from temperature extremes and often acts as a filtration system, reducing the turbidity level of the water (Lynch and Bluhdorn, 1997). In-stream woody debris is of particular importance to *A. gouldi* (Hamr, 1990), and is usually considered a critical habitat requirement; *A. gouldi* subsists primarily on woody debris and leaf litter (Hamr, 1990) and large logs provide the bulk of in-stream structures that *A. gouldi* uses for shelter (Hamr, 1990; Lynch and Bluhdorn, 1997). Davies (2004) states that *A. gouldi* prefers water temperatures of less than 18˚C and oxygen levels greater than 7mg/L, and notes that they are sensitive to sedimentation. Davies and Cook (2004) give an approximate threshold value of 5% silt substrate and salinity threshold of 160 microsiemens/cm (no *A. gouldi* were captured in these conditions during their surveys). These are important factors to consider when evaluating both the likelihood of *A. gouldi* being present at any given site within its distribution, and also when considering the potential impacts that any development may have on these values.

## 3.2 Field survey

Five nominated locations were surveyed for habitat suitability of *Astacopsis gouldi*. The sites were extremely inaccessible in places, so assessment was undertaken at any access points that could be reached. The sites were as follows:

- Area 1 – Unnamed tributary of Nelson Bay River. From 250m upstream of junction with Nelson Bay River to 2000m upstream (approx. 309750mE/5442660mN to 310500mE/5441050mN).
- Area 2 – Nelson Bay River. From 100m upstream of junction with unnamed tributary of Area1 to 3000m upstream, Wuthering Heights 10 spur road crossing (approx. 309800mE/5442880mN to 312870mE/544790mN).
- Area 3 – Unnamed tributary of Nelson Bay River. From 500m upstream of junction with Nelson Bay River to 1000m upstream (approx. 311500mE/5441535mN to 312000mE/5441020mN).
- Area 4 – Nelson Bay River from Southern Ocean estuary to 1500m upstream from Temma Road (approx. 305200mE/5443156mN to 307330mE/5443800mN).
- Area 5 – Nelson Bay River from Rebecca Road crossing to 1500m downstream (approx. 317630mE/5437595mN to 316780mE/5438670mN).

Figure 4: Map of surveyed areas.




Geographic datum used: – Map Grid of Australia MGA94 Zone 55.

Site surveys covered various stream lengths and riparian surveys included 30m either side of the stream. Habitat assessment of each site was based on a combination of AusRivas, Tasmanian River Condition Index (TRCI) and criteria set out by Walsh and Nash (2002) and Davies and Cook (2004) (see Appendix). Visual searching[1] for *Astacopsis* was also undertaken at all five sites. The exact amount of time spent at each site depended on the amount of available habitat: sites with no shelter (e.g., cobble, boulder or woody debris) were not surveyed as intensively as sites assessed with suitable habitat; the amount of man-hours spent at each site was based on the habitat suitability and ease of access through the site. Trapping was carried out at Areas 4 and 5 due to their accessibility (other sites had visual searching for juveniles carried out); no other sites were trapped due to the difficulties experienced accessing them (detailed further below).

Surveys are conducted during daylight hours. The prevailing weather conditions during the survey period were overcast. Mr Walsh has been trapping *Astacopsis* professionally for over ten years, and recreationally for over thirty years. He uses his years of experience to find the most likely sites for *Astacopsis* habitation and he has a high success rate for catching *Astacopsis* species where they are present.

The Nelson Bay River site has presented many challenges, the most obvious one being the extreme difficulty of movement across the terrain. There is scrub and bush in this area that is basically only penetrable with the assistance of a chainsaw. The scrub can be over 2m in height and the density is extremely thick. There were some sites that traps were not considered suitable due to the impenetrability of the vegetation, backpacks and machetes were the only equipment carried in these regions.

[1] Visual searching: This involves the lifting of larger rocks where juveniles may be present. A hand net is placed immediately downstream of the rock/woody debris in order to capture any animals flushed out by the water current in the process of lifting the rock/woody debris. Larger specimens may also be observed using this method.

# 4 Results

- **Area1** – Unnamed tributary of Nelson Bay River. From 250m upstream of junction with Nelson Bay River to 2000m downstream (approx. 309750mE/5442660mN to 310500mE/5441050mN).

Figure 5: Unnamed tributary of Nelson Bay River showing high levels of sediment (Area 1).

This tributary of Nelson Bay is a middle catchment waterway that flows through the proposed mining project and enters the Nelson Bay River. The tributary was surveyed from various access points, as the vegetation made traversing the entire tributary near impossible. Visual searching was carried out for *A. gouldi*, but no *A. gouldi* were sighted. There appeared to be little to no habitat capable of supporting a significant population.

The area surveyed was a mixture of wet and dry scrub with sparse dry *Eucalyptus* forest on both sides. The river substrate was predominantly silt and pebble. There is little habitat for juvenile *A. gouldi* and it is anticipated that this whole tributary would ether dry up or become too hot in summer. There were no significant undercut banks located, which would provide some habitat and shelter in drought conditions. There was some in-stream woody debris , but the stream is very shallow, heavily silted and has little to no larger rocky substrate which would help support a juvenile or adult population of *A. gouldi*. This stream would not be considered *A. gouldi* habitat regardless of whether it was in the known range of the species or not.

Figure 6: Unnamed tributary of Nelson Bay River showing the average depth of the stream (Area 1, autumn flow).

- Area 2 – Nelson Bay River. From 100m upstream of junction with unnamed tributary of Area1 to 3000m downstream, Wuthering Heights 10 spur road crossing (approx. 309800mE/5442880mN to 312870mE/544790mN).

The Nelson Bay River site is a middle catchment waterway that flows near the proposed mining project and enters the Southern Ocean. The river was surveyed from various access points, as the vegetation and steep banks made traversing the entire river near impossible. A habitat assessment was undertaken near the mine site. Visual searching was carried out for *A. gouldi* in riffle areas, but no *A. gouldi* were sighted.

There is plentiful habitat available to support a population of *A. gouldi*. There is a moderate level of in-stream woody debris, and high levels of cobble and boulder. The water depth is sufficient to assist survival during drought periods, and there are also numerous areas of undercut banks, to further assist survival in very low flow periods. The overstorey is predominantly trees and much denser than the riparian zones of the adjacent tributaries. There is sufficient riparian zone to support recruitment of in-stream woody debris.

The area was not trapped as the terrain is very difficult to penetrate with backpacks and safety equipment, let alone bulky trapping equipment. Trapping will be a much more onerous exercise; it

is estimated that up to 2 weeks would be required just to survey the Nelson River in the proposed mine area if trapping surveys are necessary.

The riffle areas contain plentiful moss covered boulder and cobble, which are habitat requirements of juvenile *A. gouldi* (Davies and Cook 2004). The rock sizes and water flow would establish the Nelson River as a prime habitat location, if it was located inside the known range of *A. gouldi.* The middle section of the Nelson bay River appears to have the most suitable habitat for A. gouldi, the downstream point of Area 2 (Figure 3. 100m upstream of junction with unnamed tributary of Area1) shows the river changing into the bedrock bed and sides that characterise the lower section of the river (and many of the west coast streams in general). The upper Nelson Bay River (Rebecca Road crossing) and the lower Nelson Bay River (Temma Road crossing) do not have the same habitat characteristics of the middle section, and would be considered marginal habitat at best. The Nelson Bay River near the proposed mining area would be considered excellent habitat if it were within the previously known range of *A. gouldi*. Anecdotal evidence does not point to the Nelson Bay River as having been a recreational fishing site for *A. gouldi*.

Figure 7: Nelson Bay River at Wuthering 10 Spur road crossing (Area 2).

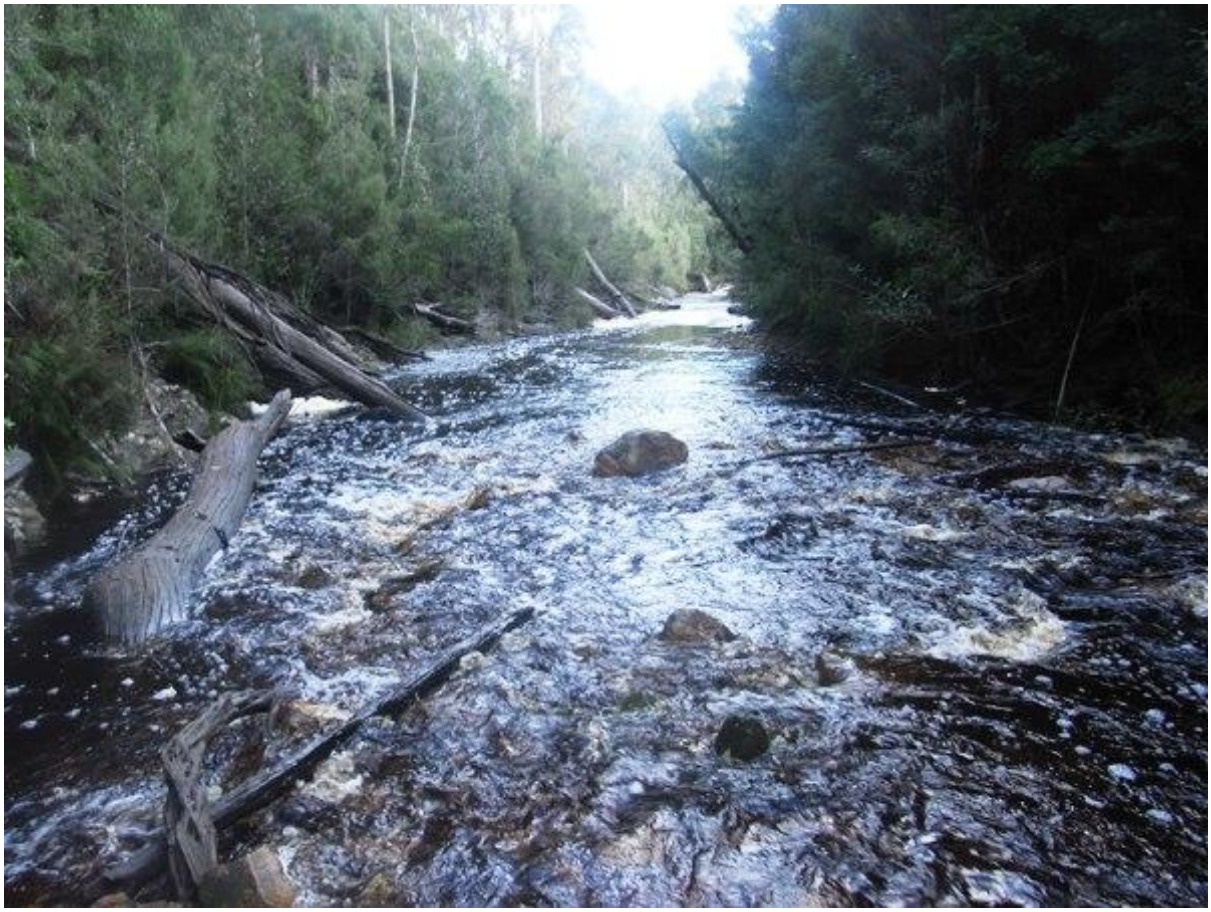


Figure 8: Nelson Bay River 100m upstream of junction with unnamed tributary of Area1 (Area 2).

- Area 3 – Unnamed tributary of Nelson Bay River. From 500m upstream of junction with Nelson Bay River to 1000m upstream (approx. 311500mE/5441535mN to 312000mE/5441020mN).

This tributary of Nelson Bay is a middle catchment waterway that flows through the proposed mining project and enters the Nelson Bay River. The tributary was surveyed from various access points, as the vegetation made traversing the entire tributary near impossible. Visual searching was carried out for *A. gouldi*, but no *A. gouldi* were sighted. There appeared to be some habitat capable of supporting a population.

The area surveyed was a mixture of wet and dry scrub with sparse dry *Eucalyptus* forest on both sides. The river substrate was predominantly silt, gravel and pebble. There is some available habitat for juvenile *A. gouldi* and high levels of in-stream woody debris. It is anticipated that this whole tributary would dry up in summer. There may be billabongs along this tributary that may support juveniles in the dry periods, especially with the amount of woody debris to slow evaporation rates. It is considered that this tributary could support a small population of *A. gouldi*, but would have limited available habitat in the summer months.

Figure 9: Unnamed tributary of Nelson Bay River (Area 3).

- Area 4 – Nelson Bay River from Southern Ocean estuary to 1500m upstream from Temma Road (approx. 305200mE/5443156mN to 307330mE/5443800mN).

This Nelson Bay River site is a lower catchment waterway that flows downstream from the proposed mining project and enters the Southern Ocean. The river was surveyed from the mouth upstream to 1.5km upstream of Temma Road Bridge. The river was surveyed at regular intervals as the vegetation and steep banks made traversing the entire river near impossible. Traps were set in this section, but no *A. gouldi* were captured.

There is little cobble or boulder apparent in the lower reaches of the river. The substrate appears to be predominantly bedrock, with little in-stream woody debris. The water depth is sufficient to assist survival during drought periods, but there appears to be little areas of undercut banks, to further assist survival in very low flow periods. There does not appear to be habitat capable of supporting a long term population of *A. gouldi.* The overstorey is predominantly scrub, with some eucalypt, with little chance of recruitment of woody debris for the river. There is insufficient riparian zone to support recruitment of in-stream woody debris. This section of river would be marginal habitat at best and appears highly unlikely to support an *A. gouldi* population. Anecdotal evidence points to this lower section of river being stocked with *A. gouldi*, with no captures reported.

Figure 10: Lower Nelson Bay River (Area 4).

- Area 5 – Nelson Bay River from Rebecca Road crossing to 1500m downstream (approx. 317630mE/5437595mN to 316780mE/5438670mN).

This Nelson Bay River site is an upper catchment waterway that flows downstream from the bridge at Rebecca Road toward the proposed mining project. The river was surveyed at regular intervals from the bridge to 1.5km downstream. Traps were set in this section, but no *A. gouldi* were captured. The riffle zone at the bridge was actively searched for juvenile *A. gouldi*, as this was the site of a juvenile capture during an AusRivAS survey in 2005 (Walsh 2005); none were located on this occasion.

The area surveyed was a mixture of wet and dry scrub with sparse dry *Eucalyptus* forest on both sides. The river substrate was cobble, gravel and pebble in the few riffle zones in this area. There is some available habitat for juvenile *A. gouldi* and some in-stream woody debris. It is known that this upper catchment dries up or become a series of billabongs in summer. There may be billabongs along this tributary that may support juveniles in the dry periods, and some undercuts to provide shelter when the river dries up even more.

Figure 11: Upper Nelson Bay River (Area 5).

Table 1: Approximate substrate composition of survey sites

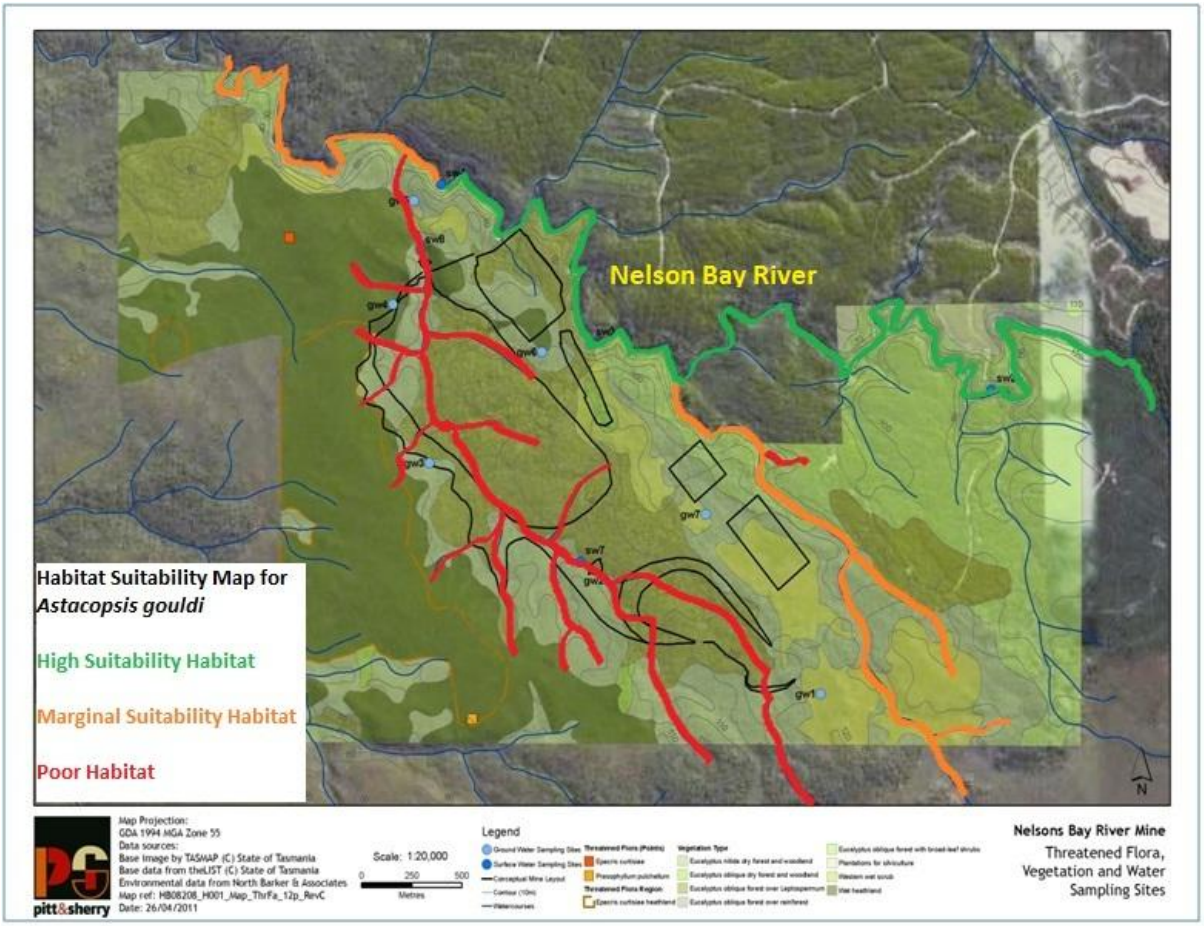
| Site Code | In-Stream Woody Debris | Bedrock | Boulder | Cobble | Pebble | Gravel | Sand | Silt | Moss |
|---|---|---|---|---|---|---|---|---|---|
| Area 1 | Low | 1% | 0% | 2% | 12% | 20% | 5% | 60% | 15% |
| Area 2 (deep water in most areas) | Moderate | Est >10% | Est >20% | Est >20% | Est >10% | Est >10% | Est 5% | Low | 25% |
| Area 3 | High | 1% | 2% | 15% | 27% | 30% | 5% | 20% | 25% |
| Area 4 (deep water in most areas) | Very Low | Est >50% | Est >20% | Est >20% | Est >10% | Est >10% | N/A | N/A | 5% |
| Area 5 (deep water in many areas) | Low | Est >20% | Est >20% | Est >20% | Est >10% | Est >10% | 5% | <5% | 5% |

# 5 Discussion and Recommendations

Davies and Cook, in their 2004 report to the Forest Practices Board, cite the habitat preferences of juvenile *Astacopsis gouldi* as being for wide streams at intermediate catchment sizes with low levels of silt/sediment, low salinity and high levels of moss cover and boulder substrate. A number of sources also state that in-stream woody debris is an important habitat feature (Hamr, 1990; Lynch and Bluhdorn, 1997); this has been borne out by experience, with the incidence of location of *A. gouldi* in streams with little to no available larger substrate cover and low in-stream woody debris being negligible (Walsh, pers. comm.).

Given these habitat requirements, it is the consultant's opinion that the habitat in the proposed mine area is diverse, with some excellent habitat to be found in the Nelson Bay River main. The availability of suitable rocky substrate in parts of the waterway is favourable to *A. gouldi*. The high availability of in-stream woody debris also provides excellent habitat. The tributaries are marginal to poor habitat, and it is the consultant's opinion that if the area were inside the known range of *A. gouldi*, then the likelihood of a population would still be very low. The areas of high- marginal- and poor- suitability habitat for *A. gouldi* are shown in Figure 11. It can be seen that the most suitable habitat falls on the boundary of the proposed site, while the main tributary within the site rates poorly for *A. gouldi* potential.

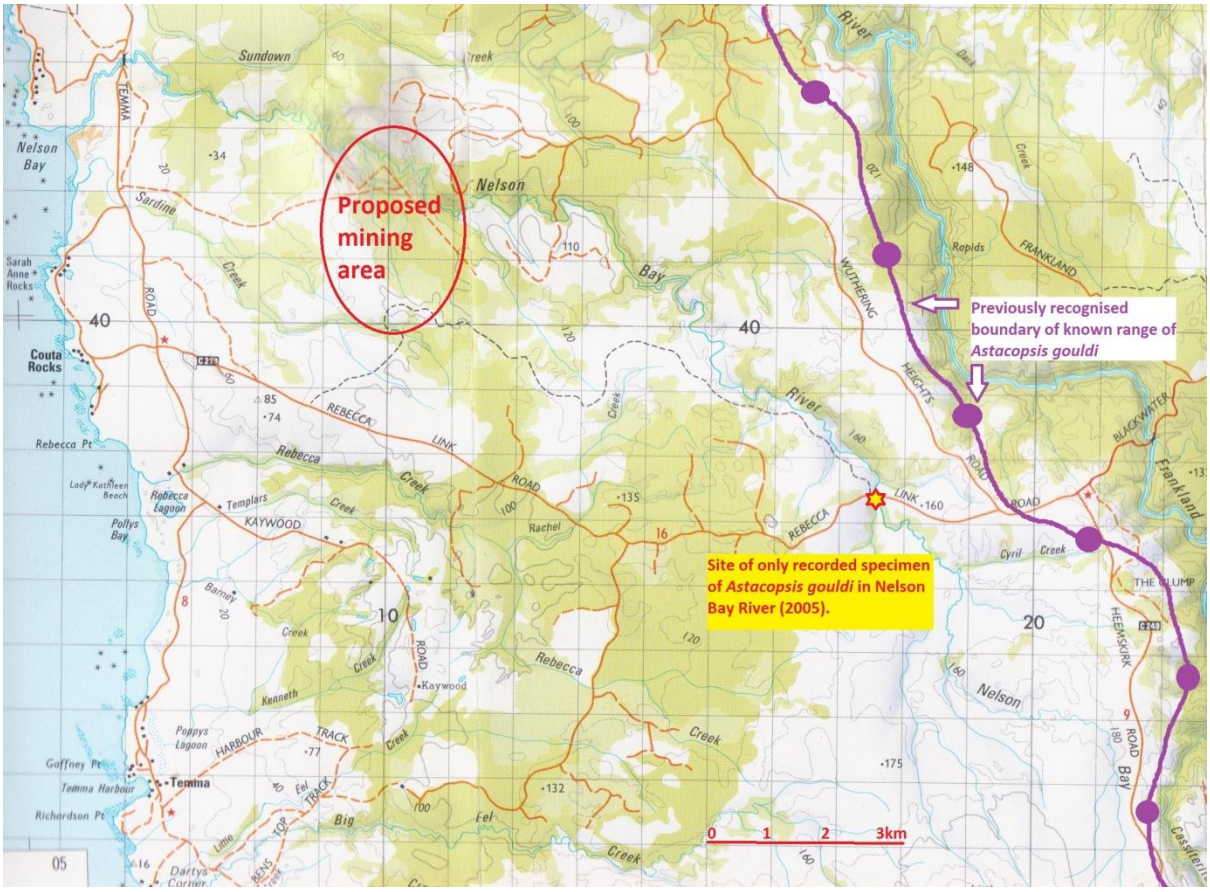
Figure 12: Habitat suitability map of *A. gouldi* at proposed mining area.



The major issue with this site is that previous to 2005 it was not recognised as being within the range of *A. gouldi*. There was an individual captured in 2005, and this has since raised the question of whether there is a permanent population in the River, and how it came to be present. There are a few theories as to how a juvenile *A. gouldi* came to be found in this waterway:

- The tributaries of Nelson Bay River and the Frankland River (known *A. gouldi* river) are within 200m of each other close to the capture site. It is more than feasible that an individual could cross between the 2 tributaries (such as near the intersection of Rebecca and Wuthering Heights Roads, which can be seen in the map below).
- There is anectodal evidence that many of the creeks and rivers that flow into the Southern Ocean were stocked by amateur fishermen. These stockings have been confirmed as commonplace, especially in the 1970's (I. Walsh pers comm.).
- The Nelson Bay catchment has possibly always contained a small population of *A. gouldi*.

Figure 13: Map of known *A. gouldi* distribution, and capture site of juvenile in 2005.




The location of the captured individual is more than 6 km from the proposed mining area. No other *A. gouldi* have been captured near this site, despite intensive trapping. The Nelson Bay River is more indicative of the *A. gouldi* free west coast streams than the waterways inside its previously recognised range. The determination of whether the Nelson Bay River has always been in the geographical range of *A. gouldi* is an extremely difficult question, and one that has arguments from both sides.

The question of impacts upon the population of *A. gouldi* should they be considered present is entirely dependent upon the actions that could potentially directly affect the waterways. The reduction of riparian coverage issues are minimal due to the location of the operation and the vegetation that predominantly exists within the works areas.

The major threats that the proposed action could create would be the impact on the waterways, in particular the substrate and the water quality. Sedimentation is a major issue for many waterways in the range of *A. gouldi*. Higher sediment levels are believed to have had a major impact upon lower catchment areas. Sedimentation particularly affects juveniles (Davies and Cook 2004) by removing available food and shelter. Land clearing and the deposition of tailings etc could contribute to raised sediment levels and therefore may need to be addressed.

Acid mine drainage has been a huge issue for *A.gouldi* populations in other catchments. The Arthur River catchment has many km of affected waterway, due to tin mining at Mt Bischoff (near Waratah), it is estimated that >20km of the Arthur River main is devoid of *A. gouldi* due to the acidity of the water (T. Walsh pers comm.). The water that comes from the old mining operation at Mount Bischoff is essentially acid, and the volume is extremely difficult and expensive to mitigate, and to this stage only limited success has been achieved. Higher salinity levels can also be an issue. Many of these issues can be associated with poor historical mining practices; however these are the issues that will need to be addressed when considering *A. gouldi.*

The Nelson Bay River site near the proposed mining area will be difficult and expensive to properly survey for *A. gouldi*. The surveys would required 2 people due to OH&S requirements and general safety issues, and would be expensive due to the terrain and vegetation. Experience of trapping in similar locations suggests that a 500m stretch of river could take a full day to actively trap. Experience has also shown that 2 trapping surveys are the minimum required to determine some form of population structure and density (T. Walsh Pers Comm.).

The proponents may wish to have AusRivAS assessments (http://ausrivas.canberra.edu.au/) carried out in the three waterways located near the proposed mine area prior to the area being developed for mining and then during operations. An upstream site and a downstream site in each tributary/river would provide baseline data and ongoing impact data. These assessments provide a before and after picture of the aquatic fauna health, and is a nationally recognised rapid fauna assessment. AusRivAS assessments can only be carried out in autumn and spring.

# 6 References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# 7 Appendix

**Summary of Essential Habitat Assessment Criteria**

In stream habitat:

- Shelter must be available; adults require woody debris, undercut banks or boulders for habitat. One of these must be present.
- Sediment which fills in all available pools and undercut banks severely restricts habitat availability for adults and juveniles.

Substrate:

- Predominantly cobble substrate or larger.
- Riffle areas must be relatively sediment free (<5% silt for juveniles).
- Other fine sediments such as sand, gravel and pebble appear to be unsuitable for juvenile *A. gouldi* and cannot be the largest available substrate.

Water Quality:

- High in oxygen content, temperature range 4-21˚C,
- Electrical conductivity <500 microsiemens
- Low turbidity after rainfall events to prevent sedimentation.

Riparian zone and canopy:

- Riparian zone predominantly trees with closed canopy (especially smaller tributaries), shading important for temperature regime.
- Riparian zone must have ability to supply waterway with in-stream woody debris and plant material for food. Trees provide a good food source and habitat.
- Grassland, tea tree and scrub do not appear to provide suitable habitat for *A. gouldi*.

*Complete assessment criteria may be accessed at:*

- *AusRivas criteria http://ausrivas.canberra.edu.au/*
- *TRCI criteria contact DPIW Tasmania*
- *Walsh, T. and Nash, W. (2002). Factors influencing the health of the Giant Freshwater Lobster in Tasmanian Rivers. Unpub. Report, Inland Fisheries Service, Hobart.*
- *Davies P and Cook L. (2004). Juvenile Astacopsis gouldi in headwater streams-relative abundance and habitat. Report to the Forest Practices Board.*