Hellyer Tailings Storage Facility (TSF2)

Assessment of likely downstream Impacts to MNES
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Summary Review of TSF 2 operation

Under the EPBCA, a significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.

The operation of TSF 2 will be to store sulfidic tailings under water in perpetuity.

As a consequence, the environmental risks to MNES associated with the operation of TSF 2 relate to downstream MNES Species, potential water quality impacts and risks of dam failure. An EPBC Protected Matters Report dated 17 July 2017, suggests that the following species may be present downstream and hence liable to be adversely impacted by emissions from TSF2:

- Azure kingfisher
- Australian Grayling
- Galaxiella pusilla

Downstream water quality

Disposal of acid generating materials below a water cover is one of the most effective methods for limiting AMD generation. In water, the maximum concentration of dissolved oxygen is approximately 30 times less than in the atmosphere. More importantly, the transport of oxygen through water by advection and diffusion is severely limited relative to transport in air. For example, the diffusive transfer of oxygen in water is on the order of 10,000 times slower than diffusive transfer in air. Results of field and laboratory testing have confirmed that submergence of AMD generating materials is one of the best available methods for limiting AMD generation over the long term (MEND, 2001).

The TSF 2 in the Hellyer Mine lies in the headwaters of the Que river system. The Que River flows from the mining lease in a south-westerly direction, where it joins the Huskisson River before flowing into the Pieman River approximately 30km south west of the TSF 2.

The tributaries of the Que River dissect the Que River plateau, and flow in a generally south-westerly direction. Some areas of the Que River catchment have been substantially disturbed. In the west and north of the catchment are the Murchison Highway and the Cradle Mountain Link Road. To the north of the Cradle Mountain Link Road are eucalypt plantations on freehold land. Major TasNetworks high voltage transmission line corridors trisect the area. In the east, the native forests have been logged. The southern portion contains the Que River Mine.

All discharge from the TSF 2 will report to the Que River, which then reports to the Huskisson River and in turn to the Pieman River. The discharge will be limited to supernatant overflow during winter rains. During the 10 years in which the TSF 2 is being actively managed, supernatant water will be returned to the main TSF for use in the mineral processing mills. On closure excess clean water will be diverted away from the TSF 2 and supernatant will overflow to the Que River. There may be some seepage from the base of the dam wall.

Que River

The Que River is a moderately to severely disturbed system, which has received water discharge from both the Hellyer and Que River mines into its headwaters for decades. Discharges from the Que River Mine emanate from its settling dam, which overflows regularly during winter and intermittently during summer. The Hellyer TSF with its larger catchment overflows most days of the year. Comparing the calculated fluxes of metals and sulfates discharged from the Hellyer TSF and the Que River settlement dam shows that the mean fluxes from Que River generally exceed the fluxes from Hellyer by a factor of between 22.2:1 for Total Zn to 4.1:1 for Total Al, for the decade from 2006 to 2016.

Table 1 shows selected water quality parameters in the Que River at the Murchison Highway gauging station, which is 2.8 km below the Hellyer TSF outflow and 3.6 km below the Que River settlement dam outflow.

Table 1 Que River at Murchison Highway Sep 06 – May 17

	Acidity to pH 8.3 mg/L	**Ph**	**Al (Total) mg/L**	**Cd (Total) mg/L**	**Cu (Total) mg/L**	**Pb (Total) mg/L**	**Ni (Total) mg/L**	**Zn (Total) mg/L**
Mean	10.06	6.12	0.59	0.004	0.02	0.07	0.02	0.87
Median	8	6.21	0.47	0.002	0.01	0.05	0.019	0.68
Maximum	37	8.1	3.16	0.098	0.12	0.56	0.06	6.48
Std. deviation	7.29	0.88	0.44	0.01	0.01	0.08	0.01	0.71
90th percentile	22	7.2	1.04	0.006	0.03	0.14	0.04	1.69
75th percentile	12	6.77	0.72	0.004	0.02	0.08	0.03	1.02
20th percentile	5	5.37	0.28	0.0013	0.008	0.01	0.01	0.40
10th percentile	4	4.9	0.21	0.001	0.006	0.007	0.01	0.287
ANZECC*			0.15#	0.0008	0.0025	0.0094	0.017	0.031

* Australian and New Zealand Environment Conservation Council (ANZECC) guidelines for surface waters for the protection of 80% of species (disturbed ecosystem)

Total Al guideline value for pH>6.5, which is above both the median and mean values at the site.

No specific water quality objectives currently exist for the Que River. Site-specific water quality objectives can be established where sufficient scientific data is available. Where data is not available, the water quality objectives default to the trigger values in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000* (ANZECC, 2000) and in a moderately to severely disturbed ecosystem such as the Que River, the default ANZECC guidelines of 80% species protection for aquatic ecosystems apply.

All of the total metal concentrations in Table 1 are above the ANZECC trigger level values for the protection of 80% of species, except for the 10th percentile for total Pb.

The current water quality in the Que River indicates that aquatic MNES species would not thrive and that food for the Azure Kingfisher would be sparse.

The operation of TSF 2 provides an opportunity to:

- Remove approximately 50% of the existing pyrite from the existing tailings. The pyrite will be processed and sold as concentrate by HGM. This will significantly reduce the long term AMD risk from the site.

- Remediate current AMD sources on site such as exposed tailings, a temporarily capped ROM and tailings in the eastern and western arms which have intermittent shallow water covers.

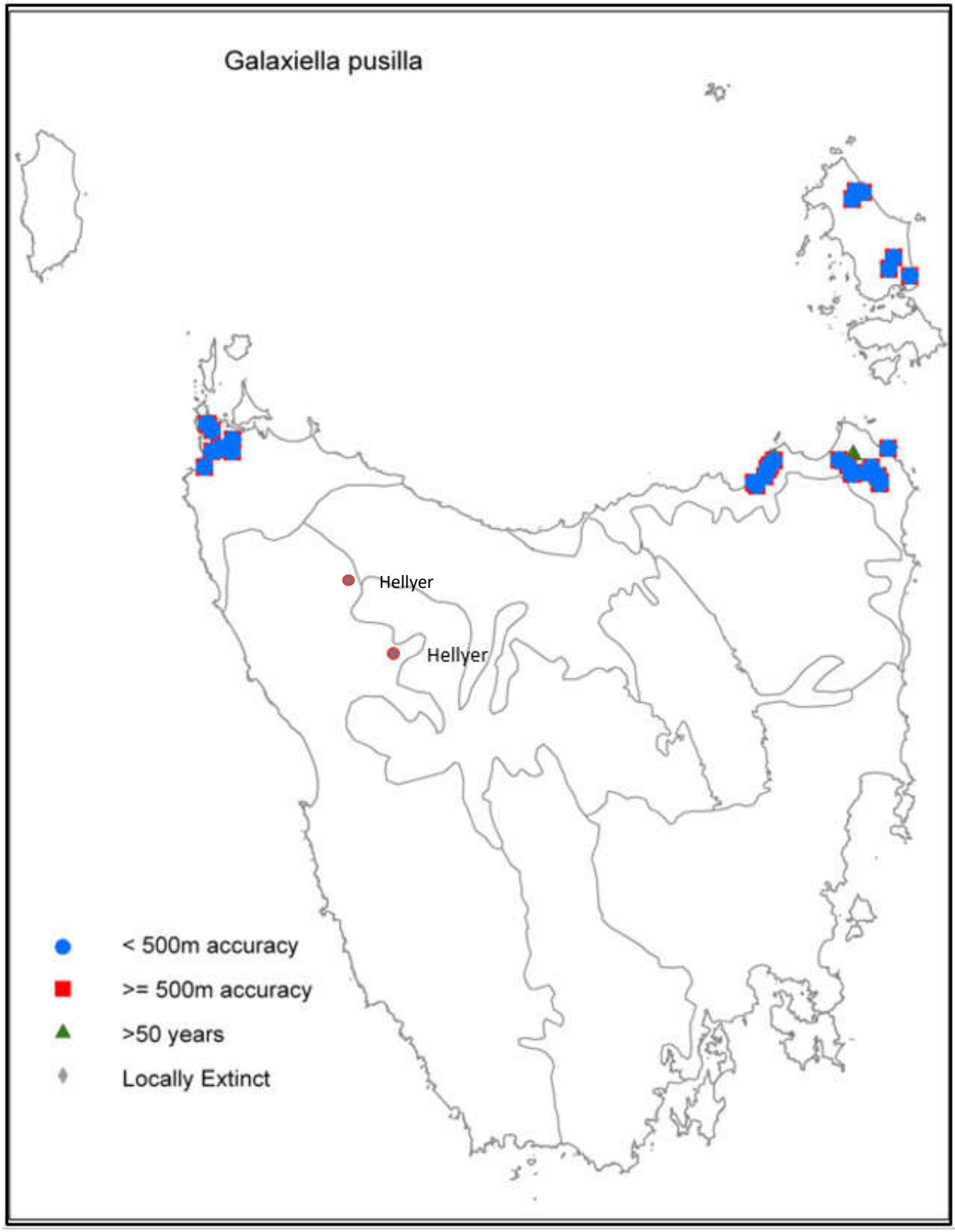
This should improve downstream water quality in the long term and benefit aquatic MNES species.

Matters of National Environmental Significance Potentially Affected.

Galaxiella pusilla

There is no listing advice for *Galaxiella pusilla*. Recorded observations on the Tasmanian threatened species link website shows that the species has only been observed in the far north west (~110 km away) and far north east (~120 km away) of the State.

Figure 1 Distribution of Galaxiella pusilla



Source: http://www.threatenedspecieslink.tas.gov.au/Pages/Dwarf-Galaxias.aspx

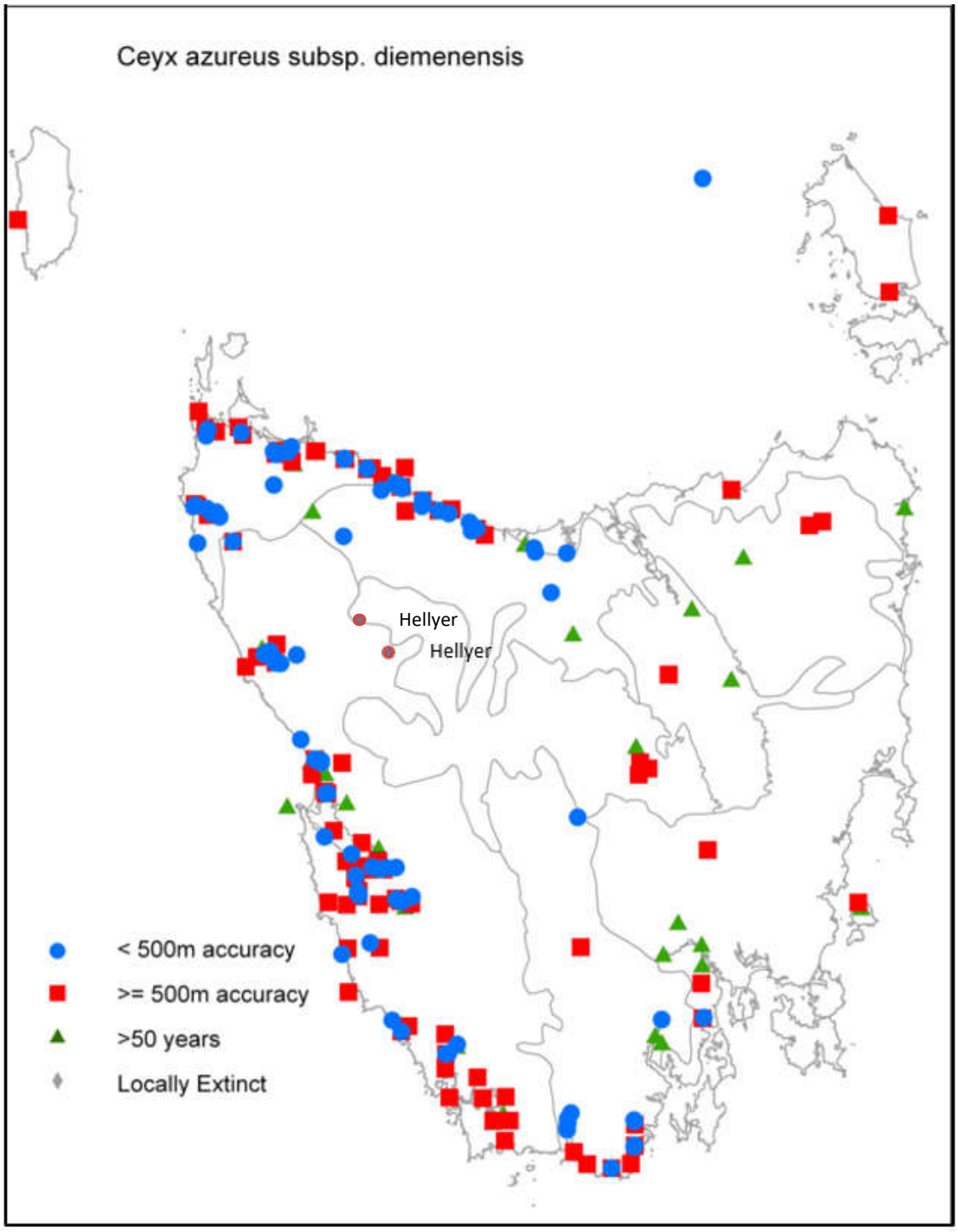
Given the distance to known habitat, there should be no direct or indirect impact on the species from the operation of TSF 2.

Tasmanian azure kingfisher (*Ceyx azureus diemenensis*)

The Tasmanian Azure Kingfisher (*Ceyx azureus* subsp. *diemenensis*) is a small brightly coloured bird which occurs only in Tasmania. The subspecies is found in shady and overhanging forest vegetation along the forested margins of major rivers on the south, west, north and northwest coasts, with other occurrences in the northeast, east, centre and Bass Strait islands. The Tasmanian Azure Kingfisher catches prey by plunging from perches overhanging the water. It feeds on small fish, freshwater crayfish, aquatic insects, and occasionally frogs. The number of birds is thought to be fewer than 250 mature individuals. The main threat to the Tasmanian Azure Kingfisher is clearing and modification of river-side vegetation.

The Tasmanian subspecies of the azure kingfisher is distinctly larger than the mainland counterpart, with subtle variation in colour intensity (Wapstra et al. 2010). It inhabits tree-lined waterways, lakes, ponds and other wetlands with dense streamside vegetation, in particular in western and north-western Tasmania (Wapstra et al. 2010) with only isolated occurrences elsewhere. It is historically also known from eastern Tasmania. Resident birds are typically associated with heavily vegetated riparian areas along major rivers, favouring sites with overhanging trees touching or close to the water level. Nesting occurs in hollows in riverbanks.
The Pieman River is well documented as supporting this species (covered by regular sightseeing river boats). The Que River is within the upper catchment of the Pieman River, but separated from the section inhabited by azure kingfisher by a large impoundments – the Pieman Dam.

Figure 2 Distribution of Tasmanian Azure Kingfisher



Source: http://www.threatenedspecieslink.tas.gov.au/Pages/Tasmanian-Azure-Kingfisher.aspx

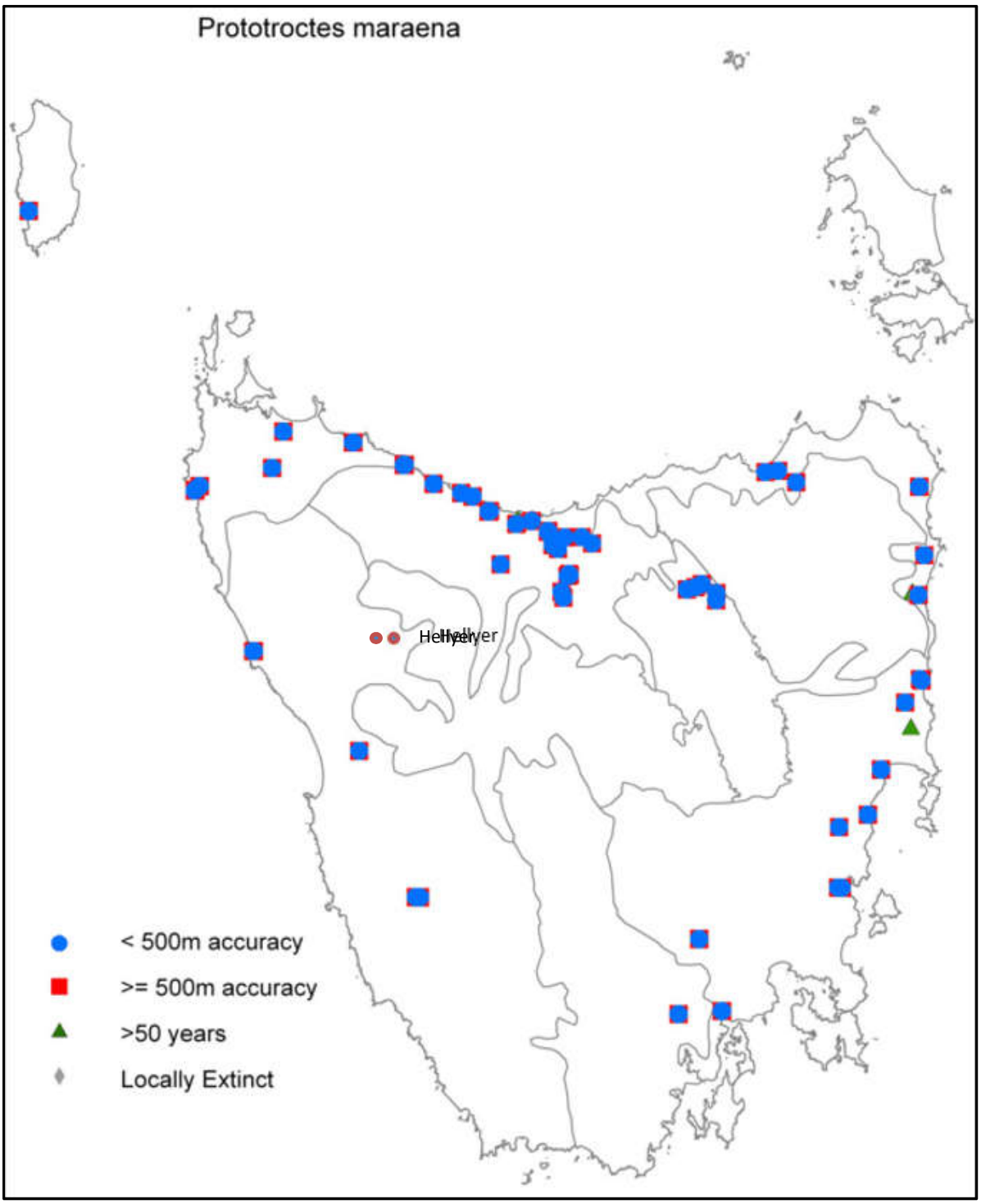
Given the distance to known habitat, there should be no direct or indirect impact on the species from the operation of TSF 2.

This project provides an opportunity for long term mitigation of this threat by improved tailings dam design and management of legacy AMD pollution.

Australian grayling (*Prototroctes maraena*)

This native fish migrates between fresh and marine waters. Adults live and breed in fresh waters, and the larvae are swept downstream into coastal waters. The Australian grayling has been recorded near the mouth of the Pieman River. It is also likely to utilise lower and middle reaches of other rivers and creeks which are not obstructed by barriers affecting fish passage.
There is a lack of information on the Tasmanian population of this species, but it is believed the range has contracted due to barriers to upstream and downstream movement.

Figure 3 Distribution of Australian grayling



http://www.threatenedspecieslink.tas.gov.au/Pages/Australian-Grayling.aspx

The known habitat and observations of the Grayling in the Pieman River are approximately 50 km to the southwest of TSF 2. Given the distance to known habitat, and the barrier presented by the Pieman River dam there should be no direct or indirect impact on the species from the operation of TSF 2.

This project provides an opportunity for long term mitigation of this threat by improved tailings dam design and management of legacy AMD pollution.

Dam Failure Risks

Given that TSF 2 will be located downstream of the main embankment of the current Hellyer Dam, it is likely that it will adopt a similar consequence category of 'High C'. The consequence from a dam failure can vary and ANCOLD's *Guidelines on the Consequence Categories for Dams* (ANCOLD, 2012) defines a range of consequence categories according to the severity of the impacts.

TSF 2 will be designed, constructed and maintained to meet Australian National Committee on Large Dams (ANCOLD) 2012 *Guidelines on tailings dams* standards and obtain approval for the dam under the Tasmanian *Water Management (Safety of Dams) Regulations 2015.* The risk of failure, and the distance downstream to any MNES species habitat means that the risk of an adverse significant impact in a MNES species is low.

Direct Impact Summary

*Australian grayling (*Prototroctes maraena*)*

Based on mitigation measure that will be implemented, the action will not impact on the Australian grayling according to the MNES guidelines (Table 2).

Table 2 Significant Impact Criteria – Australian grayling (Vulnerable)

Criteria for significant impact for vulnerable species.	Outcome	Justification
1. lead to a long-term decrease in the size of an important population of a species;	No	Mitigation will involve water quality monitoring and management planning to protect water downstream and this project aims to improve tailings dam design.
2. reduce the area of occupancy of an important population;	No	No population is known close by and there are a number of barriers to movement. Closest record is at the mouth of the Pieman River.
3. fragment an existing important population into two or more populations;	No	No population is known close by and there are a number of barriers to movement. Closest record is at the mouth of the Pieman River.
4. adversely affect habitat critical to the survival of a species;	No	As per 1, mitigation will prevent impacts to freshwater in known habitat at the mouth of Pieman River and improve tailings management. 'Critical habitat' under the EPBCA is not included for this species on the EPBC Register of Critical Habitat.
5. disrupt the breeding cycle of an important population;	No	As above
6. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	No	No habitat will be modified if mitigation measures are adopted.

Criteria for significant impact for vulnerable species.	Outcome	Justification
7. result in invasive species that are harmful to the vulnerable species becoming established in the vulnerable species' habitat*,	No	No new invasive species pressures will be introduced from the TSF 2
8. interferes substantially with the recovery of the species.	No	The construction phase for TSF 2 will have negligible impact to the recovery of this species.

*Tasmanian Azure Kingfisher (*Ceyx azureus diemenensis*)*

Based on mitigation measure that will be implemented, the action will not impact on the Tasmanian azure kingfisher according to the MNES guidelines (Table 3).

Table 3 Significant Impact Criteria – Tasmanian azure kingfisher (Endangered)

Criteria for significant impact for endangered and critically endangered species.	Outcome	Justification
1. lead to a long-term decrease in the size of a population;	No	No population is known close by. AMD pollution from long term mining is likely to have affected habitat suitability within the Que River. Consequently there will be no direct impact to habitat that may affect population size. Potential impact to water quality will be mitigated.
2. reduce the area of occupancy of the species;	No	As above
3. fragment an existing population into two or more populations;	No	As above
4. adversely affect habitat critical to the survival of a species;	No	As above
5. disrupt the breeding cycle of a population;	No	As above.
6. modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;	No	As above
7 .result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat;	No	This TSF 2 will not increase the current threats from invasive species that will affect the bird or their food source.
8. introduce disease that may cause the species to decline;	No	No new invasive species pressures will be introduced from the TSF 2.

9. interfere with the recovery of the species.	No	The TSF 2 will not interfere with the recovery actions listed in the Conservation Advice with appropriate controls to manage the risk of pollution to water quality downstream.