Flora and Fauna Habitat Survey
Proposed Expansion of Nook Quarry
Gravel Pit Road, Nook

Figure 1. Northeast facing slope of the mining lease from the existing Quarry

Prepared for AG & BJ Riley

29/06/21

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Summary

This Flora and Fauna Habitat Survey was required to assess the status of threatened vegetation communities and habitat for threatened flora and fauna species in the mining lease (25M/2009) and proposed area for expansion of the AG & BJ Riley Quarry on Gravel Pit Rd, Nook. Project specific guidelines prepared by EPA Tasmania required particular attention to threatened fauna species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act (1999) and the Tasmanian Threatened Species Protection Act (1995) recorded nearby that may occur on site or have potential habitat on site.

Nook Quarry has been in operation for approximately 30 years. The proposed Quarry expansion will be contained within the existing mining lease.

Field surveys were carried out by Helen Morgan on Saturday 29th February 2020 and Monday 28th June 2021. The site was assessed for native vegetation communities, flora species and potential habitat for threatened fauna likely in the area.

Native vegetation communities in the mining lease included *Eucalyptus amygdalina–Eucalyptus obliqua* damp sclerophyll forest, *Eucalyptus obliqua* forest with broad-leaf shrubs and 1.6 ha of the threatened vegetation community *Eucalyptus amygdalina* forest and woodland on sandstone, as listed under Schedule 3A *Nature Conservation Act* (*2002*). A small portion of this community lies within the area originally proposed for excavation.

There were no threatened flora species recorded during the survey. No threatened fauna species or nesting or denning sites for threatened marsupial fauna were recorded on site during the survey.

Potential habitat exists on site for threatened fauna species giant freshwater crayfish (*Astacopsis gouldi*), freshwater snail (*Beddomeia sp.*), central north burrowing crayfish (*Engaeus granulatus*), Tasmanian devil (*Sarcophilus harrisii*), eastern quoll (*Dasyurus viverrinus*), spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus)*, masked owl (Tasmanian), (*Tyto novaehollandiae castanops*), Tasmanian wedge-tailed eagle (*Aquila audax* subsp. *fleayi*), grey goshawk (*Accipiter novaehollandiae*) and swift parrot (*Lathamus discolor)*.

Recommendations to reduce impacts to natural values include:

Threatened vegetation community *Eucalyptus amygdalina* forest and woodland on sandstone

1. Apply a buffer zone of 10–20 m width around the outside of the threatened vegetation community and avoid working in or impacting this area (see management map for threatened vegetation community and 20 m buffer zone and adjusted proposed quarry expansion boundary).
2. Plan and conduct Quarry operations so that the forest is not impacted by damage to substrate, surface rock fall rock fall or plant damage, as is evident in bush adjoining the current Quarry.
3. Ensure that excessive run-off with associated erosion, weed material or soil pathogens, does not enter the forest from the Quarry. However, management for some surface water availability may be necessary to protect the forest from the effects of drying.
4. Keep the forest intact by avoiding any access, particularly no machines or vehicles in the threatened vegetation community.
5. Initiate a monitoring program to record the health and condition of the forest over time so that management can adapt to changing climatic and environmental conditions as operations proceed. Baseline data (vegetation condition and species present) should be collected once the proposed expansion is confirmed, with monitoring frequency every 1-5 years, depending on the baseline data and likely timeframe before works potentially impact the community.
6. Any proposed clearing or disturbance (including rockfall) to this community, which may occur in approximately 20 years depending on progress of the mine, will require a permit for a Conservation Offset through the Conservation Assessment Section, DPIPWE.

Threatened fauna species potential habitat

Giant freshwater crayfish, freshwater snail, central north burrowing crayfish, masked owl, grey goshawk, swift parrot:

1. Protect Coal Creek habitat area through no disturbance including vegetation clearing or drainage works between the track and the creek and within the buffer zone mapped in Figure 23.
2. Sediment ponds and road run off drainage should be managed to prevent sediment entering the creek.
3. The buffer zone should include protection of the tall older forest (to maintain forest structure and masked owl habitat) and steeper slopes to the creek as mapped.
4. Restore vegetation that has been disturbed or cleared between the road and the creek and manage all drainage so that no sediment or high flows can enter the buffer zone or the creek.
5. Ensure that rockfall from quarrying activities does not impact the buffer zone.
6. Monitor and manage to control weed and disease invasion.

Tasmanian devil, spotted tailed quoll, eastern quoll:

1. Protection of the threatened vegetation community and the buffer zone to Coal Creek to protect potential habitat for Tasmanian devil, spotted tailed quoll, eastern quoll. These areas also extend existing habitat on adjacent land and corridors for movement. Retain as much connected native vegetation as possible surrounding the expansion zone.
2. Retain habitat features such as rock piles and hollow logs.
3. Develop roadkill mitigation measures such as signage, road design and speed limits.
4. Follow mitigation guidelines for road construction and increased traffic as below:
    - Avoid night time use of the road where practicable.
    - Reduce speed limit on private roads (particularly at night).
    - Reduce speed limit on roads (particularly at night) where practicable.
    - Deploy facilities such as ripple strips that alert drivers to hazards.
    - Map high risk road sections and install advisory signage.
    - Undertake education and awareness training for drivers associated with the development.
    - Increase the visibility of wildlife on roads by the use of a lightly-coloured aggregate seal.
    - Reduce the volume of traffic at night (e.g. provide buses for workers) where practicable.
    - Where practicable, and noting relevant controls and recommended vegetation buffer zones, clear vegetation on roadsides in high risk areas to enhance view field for drivers.
    - Inspect road regularly and remove dead wildlife if safe to do so.

Tasmanian wedge-tailed eagle

1. Eagle activity in proximity to the quarry should be observed and monitored especially during the eagle breeding season (which varies annually but can be most of the year e.g. February – November).
2. On ground survey of previously modelled eagle nesting habitat off site and adjoining the mining lease within 1 km to assess available eagle nesting habitat and area likely to be disturbed by the quarry expansion.
3. If eagle nest building activity occurs within 1 km of the quarry, expert advice must be sought immediately to manage and avoid disturbance during the breeding season.

If any threatened fauna are found to be on site during proposed works a permit will be required from the Policy and Conservation Advice Branch, DPIPWE.

1 Introduction

1.1 Background

Bushways Environmental Services Tasmania was engaged by AG & BJ Riley, to carry out a Flora and Fauna Habitat Survey to assess the status of threatened vegetation communities and habitat for threatened flora and fauna species in the mining lease (25M/2009) and proposed area for expansion of the Quarry at Gravel Pit Rd, Nook.

Project specific guidelines prepared by EPA Tasmania (November 2019) required particular attention to habitat for threatened fauna species listed under the Commonwealth Environment Protection and Biodiversity Conservation Act (1999) and the Tasmanian Threatened Species Protection Act (1995) recorded nearby or that may occur on site or have potential habitat on site that may occur in the area. These species included Tasmanian devil (*Sarcophilus harrisii*), spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus*), Tasmanian wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) and masked owl (Tasmanian) (*Tyto novaehollandiae* subsp. *castanops*), and threatened flora species protected under the Tasmanian Threatened Species Protection Act (1995) including snug greenhood (*Pterostylis atriola).*

The Quarry was recently assessed in December 2019 as a low risk for *Phytophthora cinnamomi* infection (Morgan 2019).

This report documents the flora and fauna habitat survey and is prepared with reference to the *Guidelines for Natural Values Surveys - Terrestrial Development Proposals* (DPIPWE, 2015) and *Survey Guidelines and Management Advice for Development Proposals that may impact on the Tasmanian Devil (Sarcophilus harrisii)* (DPIPWE 2015) and following advice from the Conservation Assessment Section DPIPWE.

1.2 Description of proposed activity

Quarry operations involve drilling, blasting, extraction and crushing, working downwards into the hilltop rather than across the hill into a Quarry face. Forest vegetation surrounding the works area was disturbed around the rim but most of the hillside forest cover was preserved for visual amenity as works proceed (pers. com. Doug Tangney 6/12/19). However, over time the entire hill and forest will be gradually removed from within the proposed expansion zone. The expanded stockpilie area is proposed to occupy an area to the southwest of the Quarry, south of the entrance road at the foot of the slope. The proposed Quarry expansion will be contained within the existing mining lease.

1.3 Description of the study area

Nook Quarry is approximately 7 km directly NNE of Sheffield, location approximately E:445176 N:5425982. The current extraction area is on a hilltop with altitude 280m-360m, which is upper catchment to the Don River (northwest) and Mersey River (northeast). The mining lease area surrounds this hill and includes slopes facing all aspects and mostly covered by forest. The Quarry has been in operation for approximately 30 years and an area previously excavated and now regenerating lies on the lower north and southeast slopes with areas of rock and gravel still exposed and some erosion. The mining lease is connected to extensive forested hill country to the northeast on Bonneys Tier and southeast on Badgers Range, managed by Sustainable Timbers Tasmania.

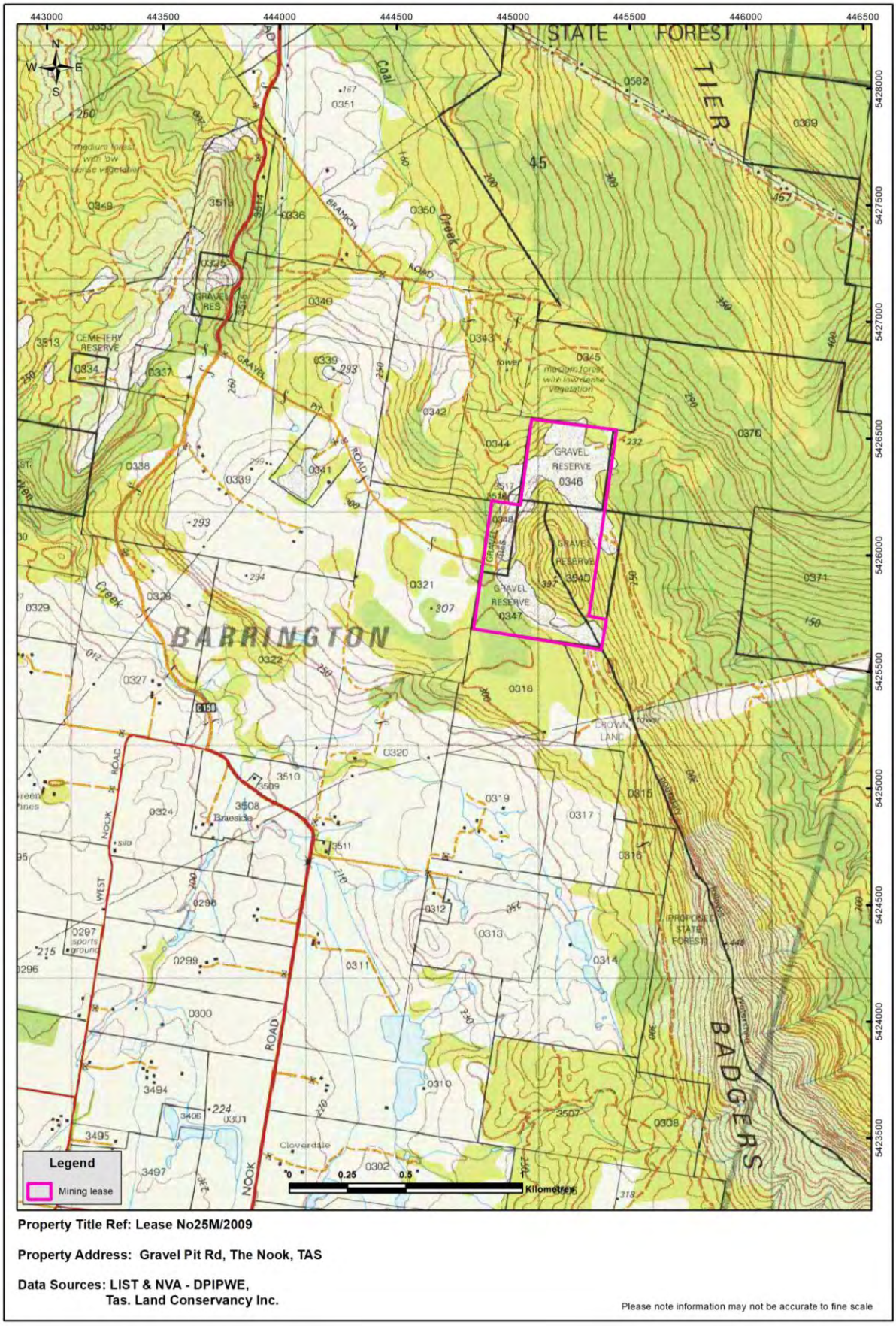

Figure 2 Location of AG & BJ Riley Mining Lease on Gravel Pit Rd, Nook

2 Survey Methodology

2.1 Background Research

A Natural Values Report was conducted through the Natural Values Atlas (28/2/20 and 27/06/21) for all threatened flora and fauna records, flora and fauna of conservation significance, TASVEG communities and biosecurity issues within 5 kilometres of the site. The desktop search included The List and NVA (28/02/20, 27/6/21) for specific records of dens of Tasmanian devil or spotted-tail quoll, masked owl (Tasmanian), raptor nests and potential Tasmanian wedge-tailed eagle nesting habitat, and giant freshwater crayfish habitat.

Details of the proposal were provided by Doug Tangney (Walters Quarry) and Richard Barnes (Van Diemen Consulting).

2.2 Flora Survey

Field surveys were carried out by Helen Morgan on Saturday 29th February 2020 (flora and fauna habitat) and Monday 28th June 2021 (fauna habitat). The Quarry was in operation at the time of the surveys.

Ecological vegetation communities were described according to TASVEG (Version 4.0 2020) classifications (Harris & Kitchener, 2013). All botanical names are in accordance with "A Census of the Vascular Plants of Tasmania and Index to the Student's Flora of Tasmania and Flora of Tasmania Online" (de Salas and Baker 2019).

Particular attention was paid to the location of threatened species or likely habitat.

Locations were recorded with a handheld GPS, using datum WGS84 (equivalent to GDA94), Map Grid of Australia MGA94 Zone 55.

2.3 Threatened Fauna Habitat Assessment

Fauna and signs of them were searched for and recorded during the course of the field survey. The site was assessed for potential habitat for threatened fauna likely in the area with special attention to potential habitat of the threatened fauna species identified by EPA Tasmania (November 2019).

Line transects were walked around the hill and across slopes with careful searches made for any potential den sites for Tasmanian devil and spotted-tail quoll. Rocky outcrops and crevices were noted and searched for signs of carnivore habitation, such as bones, hair and latrines, all marsupial scats were recorded and other animal signs such as pads, diggings and scratchings were noted.

Older trees were checked for tree hollows that could potentially provide nesting sites for masked owl. Tree hollows identified as potentially suitable in size for masked owl were inspected (where possible) for signs of use. Habitation indicators such as white splash, pellets and bones beneath likely roosting sites were searched for. Signs of tree hollow use by other animals were recorded.

Fauna Technical Note No. 16 Version 2 from the Forest Practices Authority was used to assess stream habitat in Coal Creek for juvenile giant freshwater crayfish.

The area mapped on The List as potential Tasmanian wedge-tailed eagle nesting habitat on the northeast slope of the mining lease was visually inspected and scanned with binoculars from vantage points above and below and the slope walked to identify any suitable nest trees and determine the likelihood of nest sites.

2.4 Limitations

Some plant species are not visible above ground at this time, making identification of these difficult. Some species vary in abundance from year to year. Many orchids emerge in different seasons or sporadically under conditions as yet poorly understood.

Bryophytes and lichens were not surveyed. No threatened lower plants were recorded on the Natural Values Atlas as occurring within 5 km.

A full fauna survey was not carried out. However, signs of fauna and potential habitat for threatened fauna were noted and searched more thoroughly where possible. Transects walked and surveyed aimed to cover all representative areas of bush and habitat types and visually scope all possible habitat required for assessment within the survey time and area. However, it is not possible to observe every part of the bush and available habitat.

2.5 Assessment of Conservation Significance

"Threatened" flora and fauna species are those listed at a state level on schedules 3, 4 or 5 of the Tasmanian *Threatened Species Protection Act 1995*, as well as those listed at a Commonwealth level on the *Environment Protection and Biodiversity Conservation Act 1999*. The term "threatened" or "listed" is used to cover all of the categories on these schedules, including critically endangered, endangered, vulnerable and rare (and also presumed extinct or extinct in the wild). These terms are further explained in Appendix 1.

Threatened native vegetation communities are those listed on schedule 3a of the Tasmanian *Nature Conservation Act 2002* (and clarified in the Threatened Native Vegetation Communities list, DPIWE 2014), as well as those listed at a Commonwealth level on the *Environment Protection and Biodiversity Conservation Act 1999.*

3 Results of survey

3.1 Vegetation Communities

Native vegetation communities in the mining lease included the threatened vegetation community *Eucalyptus amygdalina* forest and woodland on sandstone, as listed under Schedule 3A *Nature Conservation Act* (*2002*), and *Eucalyptus amygdalina–Eucalyptus obliqua* damp sclerophyll forest and *Eucalyptus obliqua* forest with broad-leaf shrubs. The Quarry is mapped as Extra-urban miscellaneous, which includes the area of current and historic excavation.

3.1.1 *Eucalyptus amygdalina* forest and woodland on sandstone (TASVEG Code DAS)

Threatened vegetation community – Schedule 3A *Nature Conservation Act* (*2002*)

Eucalyptus amygdalina forest and woodland on sandstone was found to occupy the area within the mining lease (1.6 ha) as mapped by TASVEG 4.0 (2020) with 0.5 ha within the originally proposed Quarry expansion zone. *Eucalyptus amygdalina* was dominant over a dense understorey that included bull oak (*Allocasuarina littoralis),* prickly box *(Bursaria spinosa)* and occasionally goldey wood (*Monotoca glauca),* prickly tea tree *(Leptosperma scoparia)* and dusty daisy bush (*Olearia lirata).* Sword sedge (*Lepidosperma* sp.) bracken fern (*Pteridium esculentum*) and leaf litter comprised the ground covers. Evidence of disturbance from past excavation included dense regrowth with abrupt changes in ground level and encroachment of excavated material on edges. Woody debris was present and the forest was in good condition with evidence of recruitment and structural diversity.

Fig. 3 *Eucalyptus amygdalina* forest and woodland on sandstone in the mining lease

3.1.2 *Eucalyptus amygdalina–Eucalyptus obliqua* damp sclerophyll forest (TASVEG Code DSC)

Eucalyptus amygdalina–Eucalyptus obliqua damp sclerophyll forest surrounds the Quarry and occurs in much of the area proposed for expansion. This community was dominated by black peppermint (*Eucalyptus amygdalina*) with stringy bark (*E. obliqua*) and occasional white gum (*E. viminalis*) on lower slopes. Understorey species included a dense sub canopy of tall prickly tea tree (*Leptospermum scoparium*), with goldey wood (*Monotoca glauca*) common. Lower shrubs were sparse with golden pea (*Aotus ericoides*), broom spurge (*Amperea xiphoclada)*, guinea flower (*Hibbertia* sp.) and woolly crossherb (*Xanthosia pilosa*). Grasses and lilies included trigger plant (*Stylidium* sp.) with cutting grass (*Gahnia grandis*) and sagg (*Lomandra longifolia*). On the lower southern slope shrubs such as dusty daisy bush (*Olearia lirata*), dolly bush (*Cassinia aculeata*) and (*Ozothamnus ferrugineus*) were more common.

Fig. 4 *Eucalyptus amygdalina–Eucalyptus obliqua* damp sclerophyll forest on the lower north facing slope

The upper edge of the forest was impacted from current quarry operations (noise, fallen rocks, damaged vegetation) while the lower edge showed the effects of past quarrying (bare ground, erosion, invasive species, sparse native regeneration), leaving a narrow band around the midslope of the hill (~280m–300m elevation) of more intact habitat. The bush on the upper and mid slopes was extremely dry (February 2020), likely due to climatic and environmental conditions combined with reduced ground water recharge from excavation of the hill.

3.1.3 *Eucalyptus obliqua* forest with broad-leaf shrubs (TASVEG Code WOB)

This community occurs in the area surrounding Coal Creek (proposed for stockpiling west of the Quarry hill) and in the south east corner. Stringy bark (*Eucalyptus obliqua*) was dominant with black peppermint (*E. amygdalina*) present and included a stand of old mature trees with tree hollows. White gum (*E. viminalis*) was also present in places, some of which appeared to be affected by ginger syndrome and were either dead or dying. Silver wattle (*Acacia dealbata*) and blackwood (*A. melanoxylon*) formed a tall sub canopy over a shrub layer dense in places with dusty daisy bush (*Olearia lirata*), stinkwood (*Zieria arborescens*), caterpillar wattle (*Acacia mucronata*), and dogwood (*Pomaderris apetala*), all commonly found in this type of community. Ferns were fairly diverse and included tree ferns (*Dicksonia antarctica*), fishbone fern (*Blechnum nudum*), mother shieldfern (*Polystichum proliferum*), ruddy ground fern (*Hypolepis rugulosa*), batswing fern (*Histiopteris incisa*), with scrambling coral fern (*Gleichenia microphylla*) and silky fan fern (*Sticherus tener*).

Fig. 5 *Eucalyptus obliqua* forest with broad-leaf shrubs, lower western slope of the mining lease

At the time of the second field survey ~1ha of this vegetation community had been mechanically cleared near the road opposite the top of Coal Creek for the proposed stockpile zone. Remaining forest contained old and mature habitat trees with understory intact in the southeast corner of the mining lease.

All vascular plant species recorded during the survey are tabled in Appendix 2.

Fig. 6 Eucalyptus obliqua forest with broad-leaf shrubs in the buffer zone of Coal Creek

3.3 Threatened flora species

There were no threatened flora species recorded during the survey. Threatened flora species slender treefern (*Cyathea cunninghamii*) was previously recorded within 500 m of the Quarry (NVA 28/02/20). The six threatened flora species recorded within 5 km (see Appendix 3) including snug greenhood *Pterostylis atriola,* were searched for during the survey but not found.

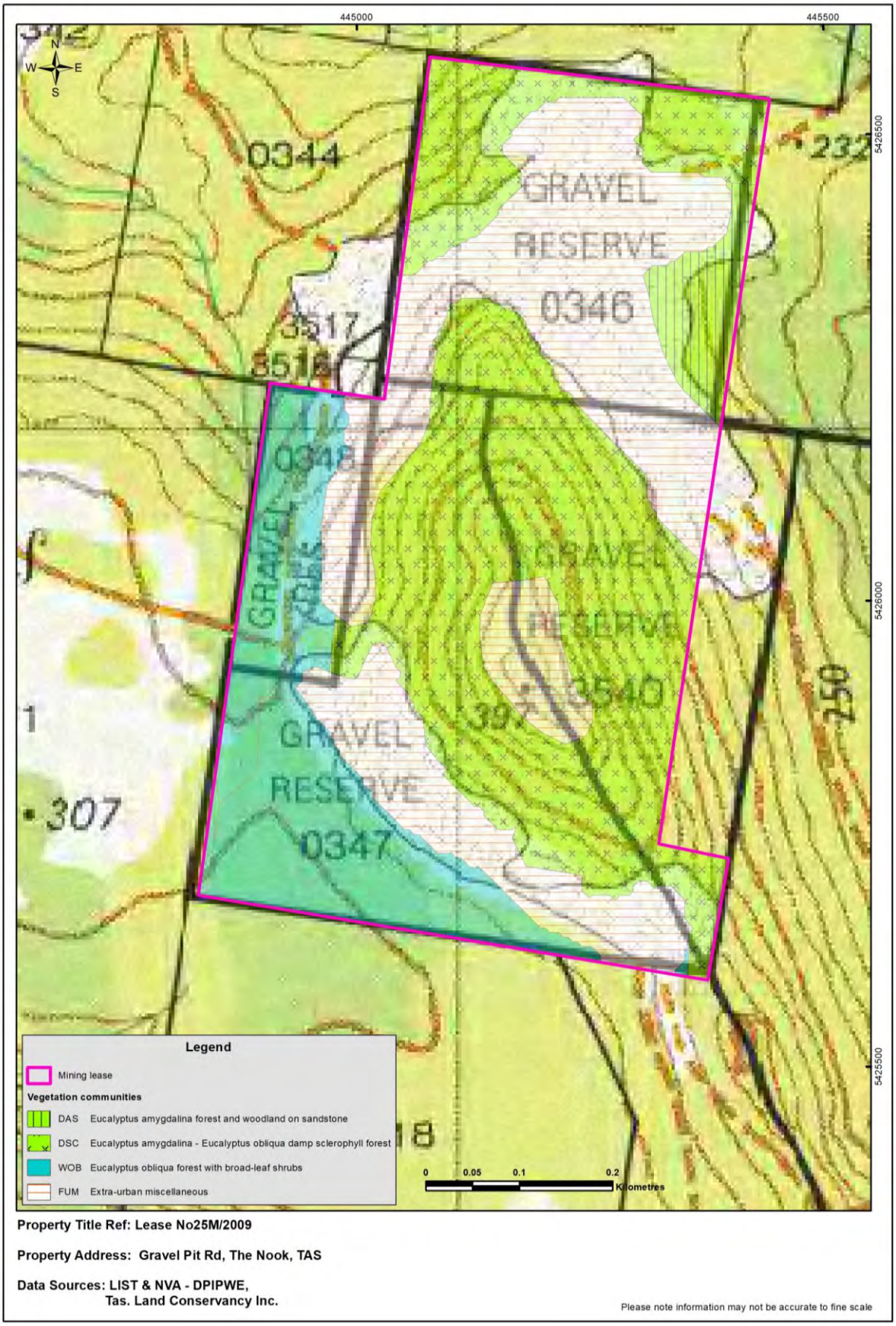

Fig. 7 Vegetation map (TASVEG 4) of AG & BJ Riley Quarry on Gravel Pit Rd, Nook

3.4 Threatened fauna habitat

A full list of threatened fauna species previously recorded within 5 km (NVA 27/06/21), their status and potential habitat on site is available in Appendix 4. Eleven threatened fauna species were previously recorded within 5 km of the site and potential habitat occurs on site for ten of these including giant freshwater crayfish (*Astacopsis gouldi*), central north burrowing crayfish (*Engaeus granulatus*), Tasmanian devil (*Sarcophilus harrisii*), eastern quoll (*Dasyurus viverrinus*), spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus)*, masked owl (Tasmanian), (*Tyto novaehollandiae castanops*), Tasmanian wedge-tailed eagle (*Aquila audax* subsp. *fleayi*), grey goshawk (*Accipiter novaehollandiae*) and swift parrot (*Lathamus discolor)*. Potential habitat for freshwater snail species (*Beddomeia* sp.) occurs on site but no *Beddomeia* species have been recorded in this catchment. No threatened fauna species were recorded on site during the survey.

Three threatened fauna species, giant freshwater crayfish, freshwater snail (Minnow River) and Tasmanian devil were previously recorded within 500 m of the site (NVA 27/6/21). Tasmanian devil has multiple recordings within 2.5 and 5 km of the mining lease, mostly on roads. Giant freshwater crayfish and freshwater snail (Minnow River) were recorded to the east in Marine Creek, part of the Mersey River catchment. Giant freshwater crayfish were also recorded 2.5 km downstream of the mining lease on Coal Creek, in a reach of the stream protected by remnant riparian vegetation. These species may occur on site.

Potential foraging or hunting habitat exists on site for other threatened fauna species recorded within 5 km of the site (NVA 27/06/21) and which may occur on site including central north burrowing crayfish, eastern quoll, spotted-tail quoll, masked owl (Tasmanian), Tasmanian wedge-tailed eagle, swift parrot and grey goshawk. Swift parrot may potentially use the site on migration for foraging in flowering eucalypts if seasonal conditions are suitable.

Marsupial prey animals for the carnivores appeared to be scarce on site as evidenced by the very few dung pellets observed during the survey. Dung pellets of red-necked wallaby (*Macropus rufogriseus*) (1) and red-bellied pademelon (*Thylogale billardierii*) (2) were found on the southeast slope and one fresh scat of common brush tailed possum (*Trichosurus vulpecular*) (1) was found on the northwest slope. Otherwise, the survey site was notably devoid of dung pellets. Animal pads were found but were not heavily used. There were signs of digging in places in the damper soil near the creek but few other signs of marsupial fauna.

Lack of animal signs suggest it is likely that long term quarrying has discouraged faunal activity in proximity to the quarry. Quarry operations cause disturbance with blasting and machinery noise, and long-term degraded areas (mapped as FUM) supported little soil with sparse vegetation cover leaving limited foraging opportunity for herbivore prey animals. Understorey on most of the hill was sparse, offering little ground cover as shelter.

The best condition fauna habitat offering diversity of structure and cover was found in the gully around Coal Creek, the areas of *Eucalyptus obliqua* forest with broad-leaf shrubs and *Eucalyptus amygdalina* forest and woodland on sandstone. These areas offer good potential threatened fauna habitat for species detailed below.

3.4.1 Potential habitat for giant freshwater crayfish, burrowing crayfish and freshwater snail

Potential habitat for giant freshwater crayfish occurs in the 100 m length upper reach of Coal Creek, a small stream and headwater of the Don River, on the western boundary of the mining lease. The stream is surrounded by wet *Eucalyptus obliqua* forest with broad-leaf shrubs and has maintained its geomorphic integrity but is vulnerable to impacts from vegetation clearing, sedimentation and drainage works upstream, presumably related to road management. In February 2020 the stream was dry in places with low flow and occasional small pools but in June 2021 signs of recent high runoff events included bare soil, collected litter, sediment movement and sedimentation in the creek, even though the creek was flowing well. Most of the stream on the mining lease was impacted by sedimentation.

The giant freshwater crayfish habitat suitability survey for Class 4 streams (Forest Practices Authority 2016) was applied and found habitat to be of low suitability due to occasional stream flow and few

boulders >40 cm diameter. However, the available habitat on site is connected to excellent condition forest and giant freshwater crayfish habitat downstream (off site) so it is important to maintain and improve giant freshwater crayfish habitat on site.

Clearing of vegetation and sedimentation from clearing, run off from roads and quarry operations are the greatest threats to giant freshwater crayfish habitat which depends on excellent water quality. Impacts to the headwater reach will flow downstream resulting in off site impacts to known giant freshwater habitat. Giant freshwater crayfish are known to move up and downstream in response to seasonal variation in streamflow (Tod Walsh pers. com. February 2021) and are negatively impacted by sedimentation and poor water quality so it is important for their survival to maintain good water quality and habitat condition throughout their potential range.

Coal Creek may provide potential habitat for burrowing crayfish and freshwater snail. The shaded forest floor of the riparian forest was well covered with leaf litter and debris with patches of tree ferns in gullies which provided potential habitat for burrowing crayfish although no sign of burrows. Freshwater snail are threatened due to their small geographic range and while *Beddomeia turnerae* have been recorded in the neighbouring catchment, no freshwater snail have been recorded in this catchment. Threats to burrowing crayfish and freshwater snail are the same as for giant freshwater crayfish.

Fig 8 Vegetation cleared and excess run off carrying sediment to the creek

Fig 9 Road drainage next to the road providing a source of sediment to Coal Creek

Fig 10 Sediment in Coal Creek

3.4.2 Potential habitat for Tasmanian devil, eastern quoll and spotted-tail quoll

Previous records were made of Tasmanian devil within 500 m (September 2009), eastern quoll and spotted-tail quoll within 5 km (September 2019) of the Quarry (NVA 27/6/21). Extensive native habitat is available for these animals in the landscape surrounding the Quarry and especially to the east on Badgers Range and Bonneys Tier.

There were few potential den sites for eastern quoll, spotted-tail quoll or Tasmanian devil in the proposed quarry expansion zone. Rocky outcrops were found on both the northwest and southeast slopes that may provide temporary (lay-up) shelter but lacked caves or crevices large enough for denning. Small rock shelters found and inspected did not contain any sign of marsupial carnivore habitat such as bones, hair, or dung pellets. Ground logs were sparse and small if present and did not provide hollows large enough for denning.

Dense understorey in the wet forest especially the area surrounding Coal Creek offered potential cover for den sites with ground logs, roots and banks present. No active dens were found and there was little evidence of marsupial traffic. There was little sign of marsupial herbivore activity and no sign of marsupial carnivore presence in the form of scats or chewed bones. A waterhole left by past excavation may be beneficial for fauna but no tracks or scats were found to suggest use.

Figs. 11 and 12 Rocky outcrop on upper northwest slope (left) and upper southeast slope (right) – no indication of marsupial carnivore activity.

While there was not much evidence of marsupial activity on site there were many records of these animals, especially Tasmanian devil, occurring locally within 5 km of the mining lease. Threats to their continued use of the landscape include increased vehicle traffic (>10%) due to quarry expansion and loss of cover due to vegetation clearing which may potentially impacts the species off site to a greater degree than on site.

3.4.3 Potential habitat for Tasmanian Wedge-tailed eagle

One wedge-tailed eagle was sighted soaring over the northwest slope during the survey. Tasmanian wedge-tailed eagle has been previously recorded in the area. Three wedge-tailed eagle nests were recorded within 3 kms northeast of the site, one of these was recorded as occupied in June 2018, (NVA 27/6/21).

Approximately 4.5 ha within the Mining Lease on the northeast slope of the hill proposed for quarry expansion was previously modelled (The List, NVA 27/6/21) as potential high quality nesting habitat for Tasmanian wedge-tailed eagle. This area was surveyed on ground and assessed as not suitable for eagle nests. No suitable nest trees were evident. The forest was of consistently small stature with the dominant eucalyptus trees mostly only slightly taller than the surrounding tea tree. No trees in this zone offered the structure and flight access suitable for an eagle nest. This slope is also extremely exposed to strong winds and unlikely to be favoured by eagles for nesting (see Fig. 1).

Figs. 13 and 14 Black peppermints, small in stature, with goldey wood and tea tree understorey on the midslope in the area mapped as potential high quality eagle nesting habitat

A more extensive area of potential wedge-tailed eagle nesting habitat was previously modelled adjoining the mining lease to the east and southeast on a large parcel (~30 km^2) of land under DPIPWE Future Potential Production Forest. This modelled area within 1 km (occupying ~140 ha) of the proposed quarry expansion was classified as ranging from low likelihood (score 0) to moderately high likelihood (score 7) potential eagle nesting habitat and approximately 20% was modelled with scores 6-7. This was not assessed on ground during this survey.

3.4.3 Potential habitat for masked owl, grey goshawk and swift parrot

Tall, mature stringy barks (*Eucalyptus obliqua*), with diameter breast height > 100cm, were noted with tree hollows of suitable size for masked owl in the *Eucalyptus obliqua* forest with broad-leaf shrubs in the Coal Creek gully to the west of the hill. Many trees were over 100 cm in diameter (large enough to form or contain large tree hollows) and on inspection from the ground two of these trees were confirmed to have tree hollows suitable in size for masked owl (>15 cm across). Tree hollows such as these take at least 200 years to form, and potentially provide masked owl habitat for many years while the trees remain standing. After tree fall they will provide habitat for other animals as ground logs and hollows. It was apparent that they were being used by arboreal mammals, likely possums, evidenced by the scrapes and runways up the trunks of the trees to the hollows. There was no sign of white splash, pellets or bones below the trees that would indicate presence of owls at this time. However, the forest was dense in places with tall trees and other suitable hollows may have been undetected.

Mature trees on the hill slope were scattered, small and contained very few tree hollows. Tree hollows found on the hill were either evidently unused or not substantial enough for a masked owl. On the southern slope smaller trees contained tree hollows that were low to the ground, not substantial and with signs of no use such as dense cobwebs.

Figs. 15 and 16 Tree hollow in black peppermint, dimension ~35 cm x 15 cm, clearly unused (left) and a mature black peppermint with hollow trunk in the forest (right), on the south facing slope

Figs.17 and 18 Large mature *Eucalyptus obliqua* trees with tree hollows large enough for masked owl, with possum scrapes evident.

The gully with wet *Eucalyptus obliqua* forest represented potential habitat for grey goshawk, broadly categorized as primarily foraging habitat but some nesting habitat (Forest Practices Authority 2011). No nests were found during this survey. This forest is also a likely area for swift parrot to find potential foraging habitat in flowering eucalypts on migration.

3.5 Weeds and Phytophthora cinnamomi

Blackberry (*Rubus fruticosus*) listed under the Tasmanian Weeds Management Act were recorded with 500 m (NVA 26/2/20). Weeds were observed on site included pine trees (*Pinus radiata*), thistles, rough catsear (*Hypochaeris radicata*) and scarlet pimpernel (*Anagallis arvensis*).

Declared weeds (*Weed Management Act 1999*) previously recorded within 5 km of the Quarry are listed in Appendix 5 including blackberry, Spanish heath, ragwort, pampas grass, gorse and English broom.

No fresh evidence of *Phytophthora cinnamomi* disease was observed in the mining lease during this survey. However, there was a previous record of *Phytophthora cinnamomi* in the closed southeast corner of the old excavation area indicating that the fungus has a presence in the area and it may potentially be introduced from off site sources. The southeast corner where the PC symptoms were recorded has been closed to all operations for many years, native regeneration is excellent and no vehicles access the area.

Fig. 19 Pines in the regenerating excavation area

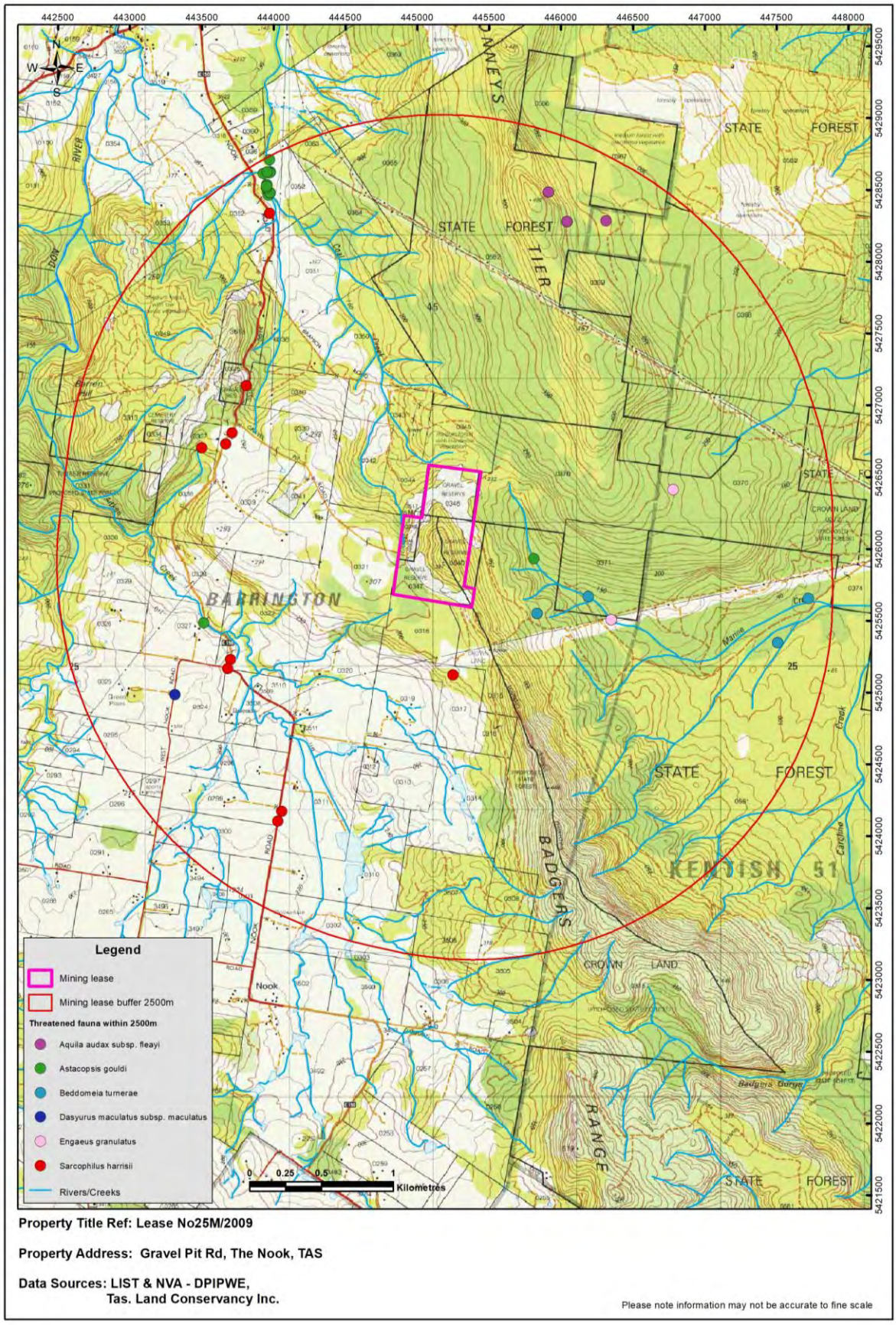

Fig. 20 Threatened fauna recorded within 2.5. km (NVA 27/06/21) of AG & BJ Riley Quarry on Gravel Pit Rd, Nook

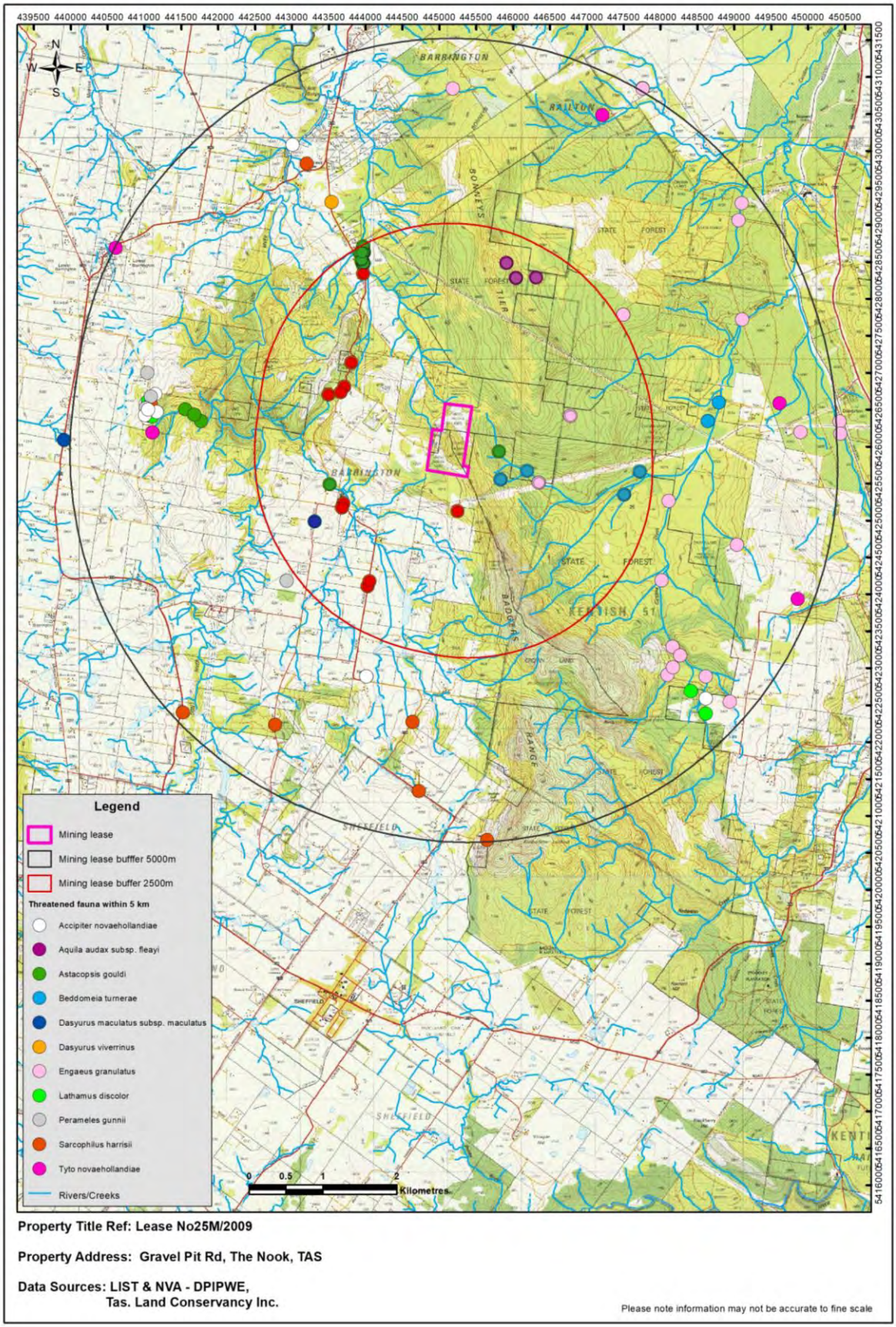

Fig. 21 Threatened fauna recorded within 5. km (NVA 27/06/21) of AG & BJ Riley Quarry on Gravel Pit Rd, Nook

4 Potential impacts and recommendations for mitigation

4.1 Threatened vegetation community

Eucalyptus amygdalina forest and woodland on sandstone, a threatened vegetation community as listed under Schedule 3A *Nature Conservation Act* (*2002*), occurs in the northeast corner of the mining lease. This forest has been encroached upon by quarrying in the past and is vulnerable to impacts from future quarrying upslope such as rock fall, erosion and vegetation damage as evidenced by current disturbance to the forest on the hill. The original proposed extent of the Quarry went to the edge of the threatened vegetation. A protective buffer zone has been recommended to reduce impacts to the forest and the proposed maximum quarry extent boundary has been adjusted to allow for the buffer (Fig. 23). Excessive dryness, likely to be influenced by deep excavation nearby and exacerbated by climate change, will likely degrade the forest.

Recommendations include:

1. Apply a buffer zone of 10–20 m width around the outside of the threatened vegetation community and avoid working in or impacting this area (see management map for threatened vegetation community and 20 m buffer zone and adjusted proposed quarry expansion boundary).
2. Plan and conduct Quarry operations so that the forest is not impacted by damage to substrate, surface rock fall rock fall or plant damage, as is evident in bush adjoining the current Quarry.
3. Ensure that excessive run-off with associated erosion, weed material or soil pathogens, does not enter the forest from the Quarry. However, management for some surface water availability may be necessary to protect the forest from the effects of drying.
4. Keep the forest intact by avoiding any access, particularly no machines or vehicles in the threatened vegetation community.
5. Initiate a monitoring program to record the health and condition of the forest over time so that management can adapt to changing climatic and environmental conditions as operations proceed. Baseline data (vegetation condition and species present) should be collected once the proposed expansion is confirmed, with monitoring frequency every 1-5 years, depending on the baseline data and likely timeframe before works potentially impact the community.
6. Any proposed future clearing or disturbance (including rockfall) to this community, will require a permit for a Conservation Offset through the Conservation Assessment Section, DPIPWE.

4.2 Threatened fauna habitat

Potential habitat exists on site for giant freshwater crayfish (*Astacopsis gouldi*), freshwater snail (e.g. *Beddomeia* sp.), central north burrowing crayfish (*Engaeus granulatus*), Tasmanian devil (*Sarcophilus harrisii*), eastern quoll (*Dasyurus viverrinus*), spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus)*, masked owl (Tasmanian), (*Tyto novaehollandiae castanops*), Tasmanian wedge-tailed eagle (*Aquila audax* subsp. *fleayi*), grey goshawk (*Accipiter novaehollandiae*) and swift parrot (*Lathamus discolor)*.

If any threatened fauna are found to be on site during proposed works a permit will be required from the Policy and Conservation Advice Branch, DPIPWE.

4.2.1 Giant freshwater crayfish, freshwater snail and burrowing crayfish

Coal Creek and the surrounding forest provided potential habitat for giant freshwater crayfish, burrowing crayfish and freshwater snail but was impacted by sedimentation. Threats to the aquatic and riparian habitat on and off site (downstream) and especially for giant freshwater crayfish include sedimentation, vegetation clearing, poor drainage management, roading and stockpiles.

Recommendations include:

1. Protect Coal Creek habitat area through no disturbance including vegetation clearing or drainage works between the active track and the creek and within the buffer zone mapped in Figure 23.
2. Sediment ponds and road run off drainage should be managed to prevent sediment entering the creek.
3. The buffer zone should include protection of the tall older forest (to maintain forest structure and masked owl habitat) and steeper slopes to the creek as mapped.
4. Restore vegetation that has been disturbed or cleared between the road and the creek and manage all drainage so that no sediment or high flows can enter the buffer zone or the creek.
5. Ensure that rockfall from quarrying activities does not impact the buffer zone.
6. Monitor and manage to control weed and disease invasion.

Fig. 22 Coal Creek in good condition for giant freshwater crayfish habitat on the title boundary. Most of the aquatic habitat upstream of this point was found to be impacted by sediment in June 2021.

4.2.2 Tasmanian devil, spotted tailed quoll, eastern quoll

Considering the level of disturbance from quarry activities (noise, vehicles, blasting), the likelihood of these animal seeking breeding habitat on this site is considered moderately low, especially while there are excellent opportunities for more suitable alternative habitat in extensive forests nearby. However, the forest surrounding Coal Creek was assessed as providing potential denning habitat and from NVA records they evidently use the surrounding landscape for movement, and likely hunting and foraging.

Threats from the quarry expansion to the continued use of the landscape by these species include:

1. loss of cover on site due to vegetation clearing, which will likely impact their off site movement;
2. increased roadkill from increased vehicle traffic by >10% due to quarry expansion, which will potentially impact the animals both on and off site.

The mitigation guidelines for avoiding impacts to Tasmanian devils (Natural and Cultural Heritage Division 2015) describes this proposal as a medium scale activity for impacts on Tasmanian devil potential denning habitat:

Scale	Activity Type	Survey Result	Potential Impacts	Possible Avoidance and Mitigation Options
Medium	Vegetation clearance, fragmentation and/or inundation (1-100 ha)	Potential den site/s present in proposed development or activity area, no evidence of current usage.	Destruction of potential den site/s. Potential disturbance to breeding individuals.	Change in proposed development or activity to avoid den site (i.e. den and surrounding 50 m buffer). Determine use status of den, undertake den closure and destruction of den subject to appropriate approvals.

Recommendations include:

1. Protection of the threatened vegetation community and the buffer zone to Coal Creek to protect potential habitat for Tasmanian devil, spotted tailed quoll, eastern quoll. These areas also extend existing habitat on adjacent land and corridors for movement.
2. Retain as much connected native vegetation as possible surrounding the expansion zone.
3. Retain habitat features such as rock piles and hollow logs.
4. Develop roadkill mitigation measures such as signage, road design and speed limits on and off site.
5. Follow mitigation guidelines for road construction and increased traffic on and off site as below:
    - Avoid night time use of the road where practicable.
    - Reduce speed limit on private roads (particularly at night).
    - Reduce speed limit on roads (particularly at night) where practicable.
    - Deploy facilities such as ripple strips that alert drivers to hazards.
    - Map high risk road sections and install advisory signage.
    - Undertake education and awareness training for drivers associated with the development.
    - Increase the visibility of wildlife on roads with use of a lightly-coloured aggregate seal.
    - Reduce the volume of traffic at night (e.g. provide buses for workers) where practicable.
    - Where practicable, and noting relevant controls and recommended vegetation buffer zones, clear vegetation on roadsides in high risk areas to enhance view field for drivers.
    - Inspect road regularly and remove dead wildlife if safe to do so.

4.2.3 Tasmanian wedge-tailed eagle

Potential impacts to Tasmanian wedge-tailed eagle from the proposal were considered low as there are no nests on site, the previously modelled high quality nesting habitat on site was found to be not suitable, and there are no existing nests within 1 km line of sight from the Quarry.

There is extensive potential nesting habitat in the adjoining forested land of Bonneys Tier and Badger Range offering substantially more choice of potentially less disturbed nesting sites. However, any disturbance from quarry expansion to this potential habitat may be a factor that deters eagles from using this site for nesting in the future or that prevents successful breeding from a nest that may be established within this area in the future.

Recommendations include:

4. Eagle activity in proximity to the quarry should be observed and monitored especially during the eagle breeding season (which varies annually but can be most of the year e.g. February – November).
5. On ground survey of previously modelled eagle nesting habitat off site and adjoining the mining lease within 1 km to assess available eagle nesting habitat and area likely to be disturbed by the quarry expansion.
6. If eagle nest building activity occurs within 1 km of the quarry, expert advice must be sought immediately to manage and avoid disturbance during the breeding season.

4.2.4 Masked owl, grey goshawk, swift parrot

Trees bearing hollows of a suitable size for masked owl exist in the *Eucalyptus obliqua* forest with broad-leaf shrubs where vegetation clearing was proposed for the stockpile area. Threats to potential habitat for masked owl, grey goshawk and swift parrot are vegetation clearing and habitat loss.

Recommendations include:

1. The buffer zone surrounding Coal Creek should include protection of the tall older forest and steeper slopes to the creek as mapped.
2. No further clearing of vegetation containing old and mature trees in the southeast corner of the mining lease.

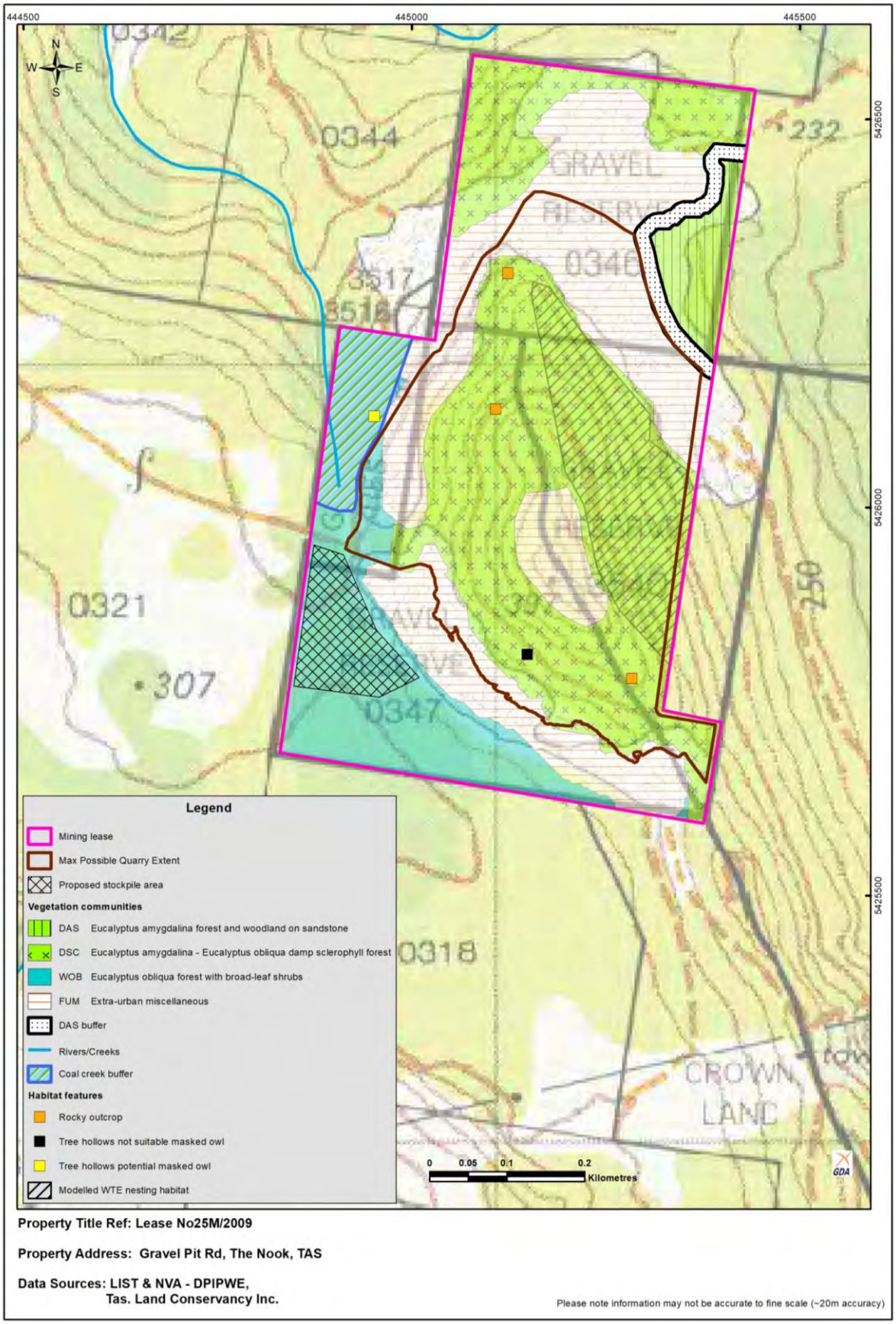

Fig.23 Natural values management map of AG & BJ Riley Quarry on Gravel Pit Rd, Nook

4.3 *Phytophthora cinnamomi* hygiene measures

No fresh evidence of *Phytophthora cinnamomi* disease was observed within the mining lease during this survey. Management recommendations for *Phytophthora cinnamomi* for current quarry operations were detailed in the recent report (Morgan 2019). The Quarry is considered to be a low risk for *Phytophthora cinnamomi* but maintenance of this status will need to be confirmed through regular monitoring and surveys for presence of *Phytophthora cinnamomi.* Risk of introduction from off site via machinery and vehicles from roads is the main management issue. The following recommendations are adapted from "Quarry and borrow pit management" in Rudman (2005 p11); Forest Practices Authority (2012) and Quarry Code of Practice (2017).

Recommendations include:

1. Strict hygiene procedures should be implemented as part of the day to day operations of the quarry to minimise transportation of *Phytophthora cinnamomi* disease and other pathogens in quarry material or attached to vehicles or machinery.
2. Quarries require annual re-assessment for *Phytophthora cinnamomi* before supplying *Phytophthora cinnamomi* sensitive areas.
3. Ensure all machinery working in the Quarry is clean and that correct washdown procedures are adhered to as per company policy and the Quarry Code of Practice (2017).
4. Do not allow machines to work from *Phytophthora*-infected areas into disease-free areas without a washdown.
5. Maintain good drainage from the Quarry to prevent water and mud accumulating in the working area.
6. Plan to conduct excavation activity during periods when soils are likely to be dry.
7. Crushed rock free of topsoil or gravel can be considered free of *Phytophthora cinnamomi.*
8. Maintain cut off drains around the Quarry to prevent *Phytophthora cinnamomi* entering the Quarry from higher ground.
9. Carefully stockpile any soil so that water from the stockpile drains away from the work area.

Washdown guidelines are available at:
https://dpipwe.tas.gov.au/Documents/15130802_52keepingitcleanspreadswe.pdf

4.4 Control of weeds

There are no serious weed issues on site but there are known declared and serious weeds in the area. Increased vehicle and transporting activity on and off site will increase the risk of weed introduction and spread both on and off site. Hygeine management recommendations for current quarry operations were detailed in a recent report (Morgan 2019) and recommendation for the expansion are below.

Recommendations include:

1. Strict hygiene procedures should be implemented as part of the day to day operations of the quarry to minimise transportation of weed propagules in quarry material or attached to vehicles or machinery.
2. Maintain regular weed management plans.
3. Monitor the site regularly for weed invasions.
4. Practice sound hygiene procedures to maintain low weed status.
5. Wash down machinery for weed control.

Washdown guidelines are available at:
https://dpipwe.tas.gov.au/Documents/15130802_52keepingitcleanspreadswe.pdf

5 Legislative Implications

5.1 Tasmanian Threatened Species Protection Act 1995

No flora or fauna species listed under this Act were found on site.

Potential habitat exists on site for fauna species protected under this Act: giant freshwater crayfish (*Astacopsis gouldi*) vulnerable; freshwater snail (*Beddomeia sp.*) rare, central north burrowing crayfish (*Engaeus granulatus*) endangered, Tasmanian devil (*Sarcophilus harrisii*) endangered, spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus)* rare, masked owl (Tasmanian), (*Tyto novaehollandiae castanops*) endangered, Tasmanian wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) endangered, grey goshawk (*Accipiter novaehollandiae*) endangered and swift parrot (*Lathamus discolor)* endangered.

A permit will be required from the Policy and Conservation Assessment Section, DPIPWE, if any of these animals are confirmed to be on site.

5.2 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

There was no habitat for flora species listed under this Act found on site.

Potential habitat was found for fauna species listed as threatened under this Act: giant freshwater crayfish (*Astacopsis gouldi*) Vulnerable; central north burrowing crayfish (*Engaeus granulatus*) Endangered; Tasmanian devil (*Sarcophilus harrisii*) Endangered; spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus)* Vulnerable; eastern quoll (*Dasyurus viverrinus*) Endangered; masked owl (Tasmanian), (*Tyto novaehollandiae castanops*) Vulnerable; Tasmanian wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) Endangered and swift parrot (*Lathamus discolor)* Endangered.

The Quarry operations are unlikely to have a significant impact (as defined under the Act) on these species.

5.3 Tasmanian Nature Conservation Act 2002 and Wildlife Regulations 1999

Eucalyptus amygdalina forest and woodland on sandstone, listed as a threatened vegetation community in Schedule 3A *Nature Conservation Act 2002,* exists on site. Clearing or disturbance to this community will require a Conservation Offset through the Conservation Assessment Section, DPIPWE.

Wildlife protected under the Wildlife Regulations is likely to occur on site. A permit may be required, from the Conservation Assessment Section, DPIPWE, if protected wildlife are killed or injured, or their products (nests etc) are damaged.

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7 Appendices

Appendix 1 Legislation relating to species of conservation significance

The Threatened Species list for Tasmania consists of plants and animals listed under the *Environmental Protection and Biodiversity Conservation Act 1999* at the Commonwealth level and/or listed under the *Tasmanian Threatened Species Protection Act 1995* at the State level.

Tasmanian Threatened Species Protection Act 1995
There are specified criteria and mechanisms for listing and de-listing of taxa under the Tasmanian *Threatened Species Protection Act 1995*. The Minister is responsible for this but is advised by a Scientific Advisory Committee (S.A.C.). Criteria are described in Guidelines for the Listing of Species under the Tasmanian *Threatened Species Protection Act 1995*[5]. It is an offence to knowingly "take" (including kill or injure) threatened flora or fauna without a permit. Permits may be applied for from the Threatened Species Unit, Department of Primary Industries, Water and Environment.

At the State level, threatened species may be placed in one of four categories that indicate their level of extinction risk. The four categories or risk codes are listed in order of decreasing seriousness:

Extinct (x): Those species presumed extinct.
Endangered (e): Those species in danger of extinction because long-term survival is unlikely while the factors causing them to be endangered continue operating.
Vulnerable (v): Those species likely to become endangered while the factors causing them to become vulnerable continue operating.
Rare (r): Those species with a small population in Tasmania that are at risk.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999
At the Commonwealth level threatened species listed in the *Environment Protection and Biodiversity Conservation Act 1999* may be placed in one of five categories that indicate their level of extinction risk. It is an offence to undertake an action that will have a significant impact on listed threatened species or communities without approval or exemption from the federal Environment Minister. A process is defined for applying for approval.

The five categories or risk codes are listed in order of decreasing seriousness:

Extinct (EX): Where a species has not definitely been located in the wild for the past 50 years.
Extinct In The Wild (EW): A species cannot be found living in the wild despite exhaustive surveys, but is still known to exist in captivity. At present we do not have any in this category in Tasmania.
Critically Endangered (CR): In this case a species is in extreme danger of becoming extinct in the immediate future.
Endangered (EN): A species at very high risk of becoming extinct in the near future.
Vulnerable (VU): A species is facing a high risk of extinction in the medium term future.

Tasmanian Regional Forest Agreement 1997
Priority Species Requiring Consideration are listed in Attachment 2 of the *Tasmanian Regional Forest Agreement 1997*. The list includes threatened species, species protected through other mechanisms (such as the Forest Practices Code) and others requiring further research to determine requirement for protection. For instance, the list includes hollow dependent species.

Tasmanian *Wildlife Regulations 1999* (*Nature Conservation Act 2002)*
Protected wildlife (currently fauna species only) is listed on Schedules 1, 2, 3 and 4. Note that these schedules also list threatened species from other states and are updated less frequently than the schedules in the *Threatened Species Protection Act 1995*. It is illegal to "take" (including kill or injure) protected wildlife or their products (nests, burrows, etc), unless authorized by a permit or licence. Permits may be applied for from the Nature Conservation Branch, Department of Primary Industries, Water and Environment.

Tasmanian *Forest Practices Act 1985* and *Regulations*
Available at www.fpa.tas.gov.au is a Forest Practices Authority 2009 information sheet that describes the legislation affecting land clearing under this Act.

Appendix 2 Vascular flora species Nook Quarry mining lease

Survey conducted 29/2/20, supplemented 28/6/21

Key:
i = introduced and naturalised in Tasmania; eT= endemic in Tasmania
Threatened species in bold-
Tasmanian status (*Threatened Species Protection Act 1995*):
en = Endangered; x = Presumed Extinct; v = Vulnerable; r = Rare
Commonwealth status (*Environment Protection and Biodiversity Conservation Act 1999*):
EX = extinct; CR = Critically Endangered; EN = Endangered; VU = Vulnerable.

Family	Full name	Common name
	EUDICOTS	
Apiaceae	*Xanthosia pilosa*	woolly crossherb
Asteraceae	*Cassinia aculeata* subsp. *aculeata*	common dollybush
	Hypochaeris radicata	rough catsear
	Olearia argophylla	musk
	Olearia lirata	forest daisybush
	Ozothamnus antennaria	sticky everlastingbush
Casuarinaceae	*Allocasuarina littoralis*	black sheoak
Dilleniaceae	*Hibbertia sp*	prickly guineaflower
Ericaceae	*Epacris impressa*	common heath
	Monotoca glauca	goldey wood
	Sprengelia incarnata	pink swampheath
Euphorbiaceae	*Amperea xiphoclada* var. *xiphoclada*	broom spurge
Fabaceae	*Acacia melanoxylon*	blackwood
	Acacia dealbata	silver wattle
	Acacia mucronata	caterpillar wattle
	Aotus ericoides	golden pea
	Dillwynia glaberrima	smooth parrotpea
	Oxylobium arborescens	tall shaggypea
	Pultenaea daphnoides	heartleaf bushpea
Haloragaceae	*Gonocarpus tetragynus*	common raspwort
Myrtaceae	*Eucalyptus obliqua*	stringybark
	Eucalyptus amygdalina	black peppermint
	Eucalyptus viminalis	white gum
	Leptospermum scoparium	common teatree
	Melaleuca ericifolia	coast paperbark
	Melaleuca pallida	yellow bottlebrush
Ranunculaceae	*Clematis aristata*	mountain clematis
Rhamnaceae	*Pomaderris apetala*	common dogwood
Rosaceae	*Acaena novae-zelandiae*	common buzzy
Rutaceae	*Zieria arborescens*	stinkwood
Stylidiaceae	*Stylidium graminifolium*	triggerplant
Thymelaeaceae	*Pimelea drupaceae*	stockmans bootlace
	Pimelea linifolia	slender rice flower
	GYMNOSPERMAE	
Pinaceae	*Pinus radiata*	radiata pine

	MONOCOTS	
Asparagaceae	*Lomandra longifolia*	sagg
Cyperaceae	*Gahnia grandis*	cutting grass
Hemerocallidaceae	*Dianella tasmanica*	forest flaxlily
	Thelionema caespitosum	tufted lily
Juncaceae	*Juncus spp.*	rush
	Juncus procerus	tall rush
Poaceae	*Poa labillardierie*	silver tussockgrass
	PTERIDOPHYTA	
Aspleniaceae	*Asplenium flabellifolium*	necklace fern
Blechnaceae	*Blechnum nudum*	fishbone waterfern
Dennstaedtiaceae	*Histiopteris incisa*	batswing fern
	Pteridium esculentum	bracken
	Hypolepis rugulosa	ruddy ground fern
Dicksoniaceae	*Dicksonia antarctica*	soft treefern
Gleicheniaceae	*Gleichenia microphylla*	scrambling coralfern
	Notogrammitis angustifolia subsp. *nothofageti*	beech finger fern
	Sticherus tener	silky fanfern
Polypodiaceae	*Microsorum pustulatum* subsp. *pustulatum*	kangaroo fern

Appendix 3 Threatened flora previously recorded within 5km of Nook Quarry site

(Natural Values Atlas, February 2020; June 2021).
found within 500 m

Key:
Tasmanian status (*Threatened Species Protection Act 1995*):
en = Endangered; x = Presumed Extinct; v = Vulnerable; r = Rare
pv/pr = protected as vulnerable/rare (This taxon is either a component of a vulnerable/rare taxon, or the name has changed from that which appears in the official legislation.)
Commonwealth status (*Environment Protection and Biodiversity Conservation Act 1999*):
EX = extinct; CR = Critically Endangered; EN = Endangered; VU = Vulnerable.

Scientific name	Common name	Conservation Status		Most recent observation date	Comments
		State	Cwth		
Caladenia caudata	Tailed spider-orchid	v	VU	Oct 1979	Not found, habitat may be too disturbed
Centipeda cunninghammii	Erect sneeze weed	v		Mar 2001	Not found on site, likely habitat moist areas near creeks,
#Cyathea cunninghammii	Slender treefern	e		Nov 2010	Not found, other ferns present, limited habitat, gully not deep as preferred habitat
Cyathea x marcescens	Skirted treefern	e		Nov 2010	Not found, other ferns present
Epilobium pallidiflorum	showy willowherb	r		Dec 2019	Not found, perhaps not moist enough.
Gynatryx pulchella	fragrant hempbush	r		Oct 2015	Not found on site, likely habitat moist areas near creeks,
Pterostylis atriola	Snug greenhood	r		Apr 2018	Not found, habitat may not be ideal with lack of burning

Appendix 4 Threatened fauna previously recorded within 5km of Nook Quarry site

(#previously recorded within 500m and *previously recorded within 2500m
Natural Values Atlas, February 2020; June 2021)

Key:
Tasmanian status (*Threatened Species Protection Act 1995*):
en = Endangered; x = Presumed Extinct; v = Vulnerable; r = Rare
pv/pr = protected as vulnerable/rare (This taxon is either a component of a vulnerable/rare taxon, or the name has changed from that which appears in the official legislation.)
Commonwealth status (*Environment Protection and Biodiversity Conservation Act 1999*):
EX = extinct; CR = Critically Endangered; EN = Endangered; VU = Vulnerable.

Scientific name	Common name	Tas. status TSPA 1995	Cwth status EPBC 1999	Most recent observation date	Comments
Accipiter novaehollandiae	Grey goshawk	e		Apr 2013	Potential foraging habitat, some nesting potential, may hunt in the area.
**Aquila audax fleayi*	Wedge-tailed eagle	e	EN	Jun 2018	No suitable nesting habitat on site, likely to hunt in the area, observed overhead during survey, nest records within 5km.
#**Astacopsis gouldi*	Giant freshwater crayfish	v	VU	#Sep 2010 /*Dec 2013	Potential habitat on site, Coal Creek.
#**Beddomeia turnerae*	Hydrobiid snail	r		Jan 1987	Potential habitat for freshwater snail species on site.
**Dasyurus maculatus* subsp. *maculatus*	Spotted-tail quoll	r	VU	Sep 2019	Potential denning and foraging habitat, likely to forage on or near site as part of wider range. No den sites or signs found.
Dasyurus viverrinus	Eastern quoll		EN	Jul 2018	Potential denning and foraging habitat. may forage on or near site as part of wider range but prefers dryer more open habitat. No den sites or signs found.
**Engaeus granulatus*	Central north burrowing crayfish	e	EN	Jul 2015	Potential habitat on site in Coal Creek riparian area.
Lathamus discolor	Swift parrot	e	EN	Dec 2013	May forage in mature eucalypt forest on site and/or nearby during migration, but no suitable nesting habitat and not preferred foraging habitat on site.
Peremeles gunnii gunnii	Eastern barred bandicoot		VU	Feb 2014	Not preferred habitat, no grassy areas.
#**Sarcophilus harrisii*	Tasmanian devil	e	EN	*Sep 2009/#Apr 2019	Potential denning and foraging habitat, likely to forage on or near site as part of wider range. No den sites or signs found.
Tyto novaehollandiae castanops	Masked owl (Tasmanian)	e	VU	Apr 1998	Potential nesting habitat in forest, tree hollows on site suitable for nesting.

Appendix 5 Declared weeds likely in area recorded within 5km of the Walters Quarry site

(Natural Values Atlas, December 2019 and June 2021).

Scientific name	Common name
Cirsium sp.	thistle species
Cortaderia sp.	pampas grass
Cytisus scoparius	english broom
Erica lusitanica	spanish heath
Hypericum perforatum subsp. *veronense*	perforated st johns wort
Ilex aquifolium	holly
Leycesteria formosa	Himalayan honeysuckle
Rubus anglocandicans	blackberry
Rubus fruticosus	blackberry
Salix x fragilis	crack willow
Senecio jacobaea	ragwort
Ulex europaeus	gorse