

# Native Vegetation Clearance

## Data Report

### GORGES WALKING TRAIL

### WAPMA THURA - SOUTHERN FLINDERS RANGES

### NATIONAL PARK

Clearance under the *Native Vegetation Regulations 2017*

April 2022



# Glossary and abbreviations

<b>ALA</b>	Atlas of Living Australia
<b>BAM</b>	Bushland Assessment Method
<b>BDBSA</b>	Biological Database of South Australia (maintained by DEW)
<b>CP</b>	Conservation Park
<b>DAWE</b>	Department of Agriculture, Water and the Environment
<b>DEW</b>	Department for Environment and Water (South Australia)
<b>EPBC Act</b>	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
<b>GIS</b>	Geographic Information System (ESRI mapping software)
<b>ha</b>	Hectare(s)
<b>IBRA</b>	Interim Biogeographical Regionalisation of Australia
<b>km</b>	kilometre(s)
<b>m</b>	metres
<b>The National Park</b>	Wapma Thura – Southern Flinders Ranges National Park
<b>NP</b>	National Park
<b>NPW Act</b>	<i>National Parks and Wildlife Act 1972</i>
<b>NVB</b>	Native Vegetation Branch, Department for Environment and Water
<b>NVF</b>	Native Vegetation Fund
<b>N&amp;Y</b>	Northern and Yorke Landscape Management Region
<b>PMST</b>	Protected Matters Search Tool (EPBC Act; maintained by DAWE)
<b>SA</b>	South Australia(n).
<b>SASCC</b>	South Australian Seed Conservation Centre
<b>SEB</b>	Significant Environmental Benefit
<b>TBC</b>	Total Biodiversity Score (BAM methodology)
<b>TEC</b>	Threatened Ecological Community
<b>UBS</b>	Unit Biodiversity Score (BAM methodology)

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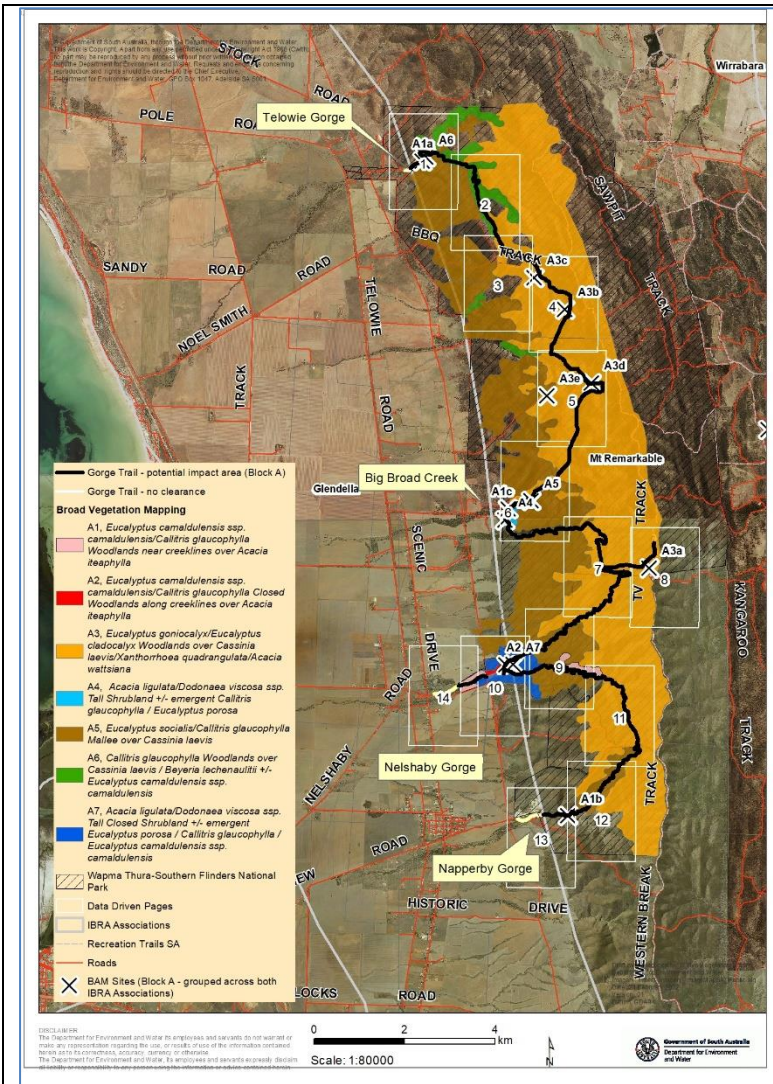
# 1. Application information

**Table 1. Application details.**

<b>Applicant:</b>	Department for Environment and Water (DEW) – National Parks and Wildlife		
<b>Key contact:</b>	Matthew Ackland Project Manager Department for Environment and Water		
<b>Landowner:</b>	Minister for Climate, Environment and Water		
<b>Site Address:</b>	Wapma Thura - Southern Flinders Ranges National Park (Napperby to Telowie Gorge)		
<b>Local Government Area:</b>	District Council of Mount Remarkable Port Pirie Regional Council	<b>Hundred:</b>	Telowie Napperby Darling (?)
<b>Crown Land – Minister for Environment and Water (Mount Remarkable National Park)</b>			
<b>Title ID:</b>	CR6267/56 CR6267/56 CR6267/53 CR6267/51 CR6267/51 CR6267/51 CR6267/51 CR6267/51 CR6267/51 CR6267/51 CR6267/51 CR6267/52	<b>Parcel ID</b>	H330900 S439 H330900 S491 H330900 S515 H240800 S347 H240800 S237 D35859 A21 H240800 S239 H240800 S236 H240800 S322 H240800 S323 H330500 S4
<b>Crown Land – Minister for Climate, Environment and Water (Wapma Thura-Southern Flinders Ranges NP)</b> <b>No clearance required – Telowie Gorge</b>			
<b>Title ID:</b>	CR6267/58	<b>Parcel ID</b>	D27599 A15
<b>Private Landholder 1 – No clearance required (Napperby)</b>			
<b>Title ID:</b>	CR5758/747	<b>Parcel ID</b>	H240800 S352
<b>Private landholder 2 – no clearance required (Nelshaby)</b>			
<b>Title ID:</b>	CR5752/852	<b>Parcel ID</b>	D35859 A20

## Summary of proposed clearance

<b>Purpose of clearance</b>	Clearance required for the construction of a recreational hiking trail
<b>Native Vegetation Regulation</b>	Regulation 12, Schedule 1; clause 36, Recreation track
<b>Description of the vegetation under application</b>	<p>Clearance of 5.067 hectares (ha) of native vegetation for the construction of an approximately 40 kilometre (km) hiking trail (Figure 1) within the Wapma Thura - Southern Flinders National Park (the National Park). The clearance impact is based on a distance of 33.8 km once excluding existing trails and applying a 1.5 metre footprint. The final track is expected to vary between 0.5 m to 1.2 m but with some degradation on the edges expected. Vegetation under application is classified broadly under the following Bushland Assessment Method (BAM) sites:</p> <ul style="list-style-type: none"> <li><i>BAM A1 – 1.669 ha of Eucalyptus camaldulensis ssp. camaldulensis/Callitris glaucophylla Woodlands near creeklines over Acacia iteaphylla</i></li> <li>• <i>BAM A2 – 0.200 ha Eucalyptus camaldulensis ssp. camaldulensis/Callitris glaucophylla Closed Woodlands along creeklines over Acacia iteaphylla</i></li> <li>• <i>BAM A3 – 2.379 ha Eucalyptus goniocalyx/Eucalyptus cladocalyx Woodlands over Cassinia laevis/Xanthorrhoea quadrangulata/Acacia wattiana</i></li> <li>• <i>BAM A4 – 0.099 ha Acacia ligulata/Dodonaea viscosa ssp. Tall Shrubland +/- emergent Callitris glaucophylla / Eucalyptus porosa</i></li> <li>• <i>BAM A5 – 0.357 ha Eucalyptus socialis/Callitris glaucophylla Mallee over Cassinia laevis</i></li> <li>• <i>BAM A6 – 0.353 ha Callitris glaucophylla Woodlands over Cassinia laevis / Beyeria lechenaultii +/- Eucalyptus camaldulensis ssp. camaldulensis</i></li> <li>• <i>BAM A7 – 0.010 ha Acacia ligulata/Dodonaea viscosa ssp. Tall Closed Shrubland +/- emergent Eucalyptus porosa / Callitris glaucophylla / Eucalyptus camaldulensis ssp. camaldulensis</i></li> </ul>
<b>Total proposed clearance area (ha)</b>	Clearance comprises 5.067 ha of remnant native vegetation along approximately 33.8 km of walking trail.
<b>Level of clearance</b>	Level 4
<b>Overlay (Planning and Design Code)</b>	Not applicable



**Figure 1. Map of proposed clearance area in Black with broad vegetation mapping in background and BAM Sample Point Locations indicated with a cross.**

**Mitigation hierarchy**

Below is a summary of mitigation approaches. Detailed mitigation strategies are provided in the mitigation hierarchy section (Section 4.4).

**AVOID**

Except where clearing is required for permanent trail works or excavation operations, all trees, native shrubs and understorey grasses shall be preserved and protected from construction equipment and operations. Clearance of large trees, trees with hollows and trees of threatened species will be avoided. Clearance of threatened flora will be avoided and minimised as feasible based on the desktop assessment, field results and trail micro-sighting. The trail will be subject to final assessment by a qualified ecologist to avoid threatened flora including threatened orchids as feasible. Clearance of high value vegetation in the Nelshaby Gorge area will be avoided, utilising existing trails in the area and avoiding an unusual occurrence of *Codonocarpus cotonifolius* which was previously considered Regionally Extinct in the Norther and Yorke (N&Y) Region.

Through micro-sighting existing trails and open areas will be utilised where possible, including some use-age of the existing walking and vehicle trail network near Nelshaby Gorge, Telowie Gorge and Napperby Gorge.

	<p><b>MINIMISE</b></p> <p>Current industry best practice will be used in the design and construction of the trail. The construction of the trails is anticipated to be designed to minimal width but may depend on the Class. For example if areas of the trail are Class 1, they would be a minimum of 1200mm, whilst the majority of the trail is proposed as Class 4 therefore is expected to be less than a metre in width. Clearance will be undertaken using non-mechanical approaches where feasible with hand cutting and removal of vegetation, in addition to use of natural in-situ objects being used as trail features and points of interest. Where required, features or structures such as stair treads, staircases or viewing nodes may be constructed from in-situ material native to the site where this is possible and where this is not possible, other introduced materials will require approval by DEW.</p> <p>Clearance of vegetation, specifically trees and threatened flora, will be minimised where feasible and the contractor will keep the amount of site clearance to a minimum. In addition, unless agreed by DEW, all trees with a trunk diameter of 300mm or greater will be retained (DEW 2021). Secondary impacts are recognised as weed invasion, introduction of pathogens, the creation of feral animal corridors, increased erosion risk and altered hydrology. A range of mitigation strategies have been considered and/or recommended as outlined in Section 4.4.</p> <p><b>REHABILITATE</b></p> <p>At the completion of works, all disturbed construction areas that do not require landscaping or planting, will be scarified and left in a condition which facilitates natural regeneration. This includes allowing regeneration of the area adjacent to the trail between the potential 1.5m construction footprint and the final impact corridor of 0.5 to 1.2m.</p> <p><b>OFFSET</b></p> <p>Payment into the Native Vegetation Fund, unless a suitable on-ground offset can be identified.</p>
<p><b>SEB Offset proposal</b></p>	<p>Payment of \$259,826.91 into the Native Vegetation Fund (NVF) including a \$12,372.71 administration fee.</p> <p>On ground SEB options are being investigated, but otherwise the offset requirements will be met via payment into the NVF.</p>



# 2. Purpose of clearance

## 2.1 Description

The proposed clearance is associated with the construction of a 40-50 km hiking trail named the “Gorges Walk” (the Project Area) in South Australia (SA) through Wapma Thura - Southern Flinders Ranges National Park (the National Park), recently proclaimed on 21 November 2021 after the amalgamation of Telowie Gorge Conservation Park (CP), Wirrabera Forest CP and a discrete portion of Mount Remarkable National Park (NP) known as the Napperby Block. The trail will also traverse small areas of private land near Napperby Gorge, but no clearance is expected in this area (Figure 2, Figure 3). The Gorges Walk forms part of the Department for Environment and Water’s (DEW) ‘Parks 2025’ project which aims to build the capacity of parks across the state to conserve South Australia’s natural landscapes and wildlife, activate nature-based tourism, boost the local economy and strengthen local communities. The Gorges Walking Trail is a major component of the \$10m Remarkable Southern Flinders Building Better Regions Fund agreement which is a partnership between Commonwealth and State Governments and facilitated by the Foundation for National Parks and Wildlife. Other project partners include Regional Development Australia Yorke and Mid North, the Nukunu Wapma Thura Corporation, the District Council of Mount Remarkable, the District Council of Port Pirie and Northern Areas Council along with private landowners (DEW 2021).

The Gorges Walk Concept Plan has been developed for DEW by Tredwell Management based on market research, a gap analysis, consultation with key stakeholders, site visits and spatial analysis. The concept presents the opportunity to develop an immersive and iconic walking trail network across the gorges of the Southern Flinders Ranges Park Precinct, offering the opportunity for walkers to confidently explore the region’s rugged landscapes with appreciation of the region’s biodiversity and cultural heritage (Tredwell 2021).

## 2.2 Background

The proposed Gorges Trail occurs predominantly in the National Park, winding through Gorges and rocky ridges extending from Telowie Gorge then south to Napperby Gorge, with an extension to the Bluff tower. The Gorges Walk is intended as a multiday hike but the current layout includes several lower access points that will allow for shorter hikes including Telowie Gorge (Holman Rd), Big Broad Creek (Jenkins Rd), Nelshaby Gorge (Flinders View Drive) and Napperby Gorge (Gulfview Rd) (Figure 2). Other exit points are proposed at the Bluff and potentially along the Go-Kart Track which forms part of the Heysen Trail.

The Gorges Walk alignment is proposed as occurring entirely within the Telowie Gorge Land System; and mainly occurs within the Mt Remarkable IBRA Association, but with some far lower reaches in the Glendella IBRA Association. The trail is proposed to traverse the western slopes of the Telowie Gorge Land System which comprises a steep to very steep range of hills rising abruptly from the coastal plains between Port Germein and Warnertown (DEW 2022b). The Eastern extent of the proposed trail will terminate along a well-defined north-south oriented ridge forming a watershed between east and west flowing streams which runs almost the full length of the Land System (DEW 2022b). Slopes are steeper and much more strongly dissected on the western side where deep gullies such as Telowie Gorge have been incised to depths of up to 300 m and cliffs are common in the steeper gorges and as a discontinuous rampart below the main ridge on the western side (DEW 2022b). These spectacular Gorges define the focus of the walk, but the Gorges Walk is proposed to also

ascend out of deeply cut gorges to Woodlands and higher slopes rising to 740m at the Bluff tower with spectacular views across the Spencer Gulf to Eyre Peninsula and east across the more subdued Wirrabera Formation.

Few existing walking trails exist through the Project Area with short somewhat unformed trails extending up Telowie Gorge (Nukunu Trail) and Napperby Gorge (Napperby Gorge Hike) with somewhat limited signage or information. The Heysen Trail also extends along the central ridge named "Go Kart Track" which represents a vehicle track of rocky steep terrain. Other vehicle tracks and fire breaks have been established along the western slopes for parks access and fire prevention. The current application is restricted to the main "hero experience" Gorges Walk, but there is an intention to develop at least some overnight campgrounds throughout the walk, possibly at Napperby, Nelshaby, Broad Creek, Wallaby Ridge and Telowie Gorge. The Gorges concept Plan (Tredwell. 2021) describes the Gorges Walk offering hikers overnight accommodation options at exclusive hiker camp sites, serviced on-trail wilderness accommodation, or off-trail in surrounding towns and villages. However, any serviced accommodation would be subject to private investment and is outside the scope of this proposal. An overview of potential (conceptual) development is provided on Figure 4 (extracted from Tredwell 2021). In addition to the main Gorges Walk "hero experience" a range of supplementary experiences have been identified, with prioritised and staged delivery, including a range of unconfirmed short walks, day walks and overnight walks accessible from trailheads at Telowie Gorge, Nelshaby Reservoir and Napperby Gorge (Tredwell 2021). The current assessment did not involve assessment of potential sites for campgrounds, accommodation or additional trails and these would need to be assessed and approved under the current Native Vegetation and Planning Legislation once formally proposed.

### **2.3 Details of the proposal**

The proposed trail is approximately 40-50km, but the impact area has been calculated along 33.8 km once excluding existing tracks and trails; and based on the spatial data provided and queried (in Lamberts) with the DEW GIS team. An impact area of 1.5m has been applied for this distance, but it is expected the final walking trail will be narrower post construction, particularly in areas that are cleared using non mechanical methods. The trail is primarily intended to be constructed at a specification which meets the Australian Standard for Walking Trail Classification (AS2156.1) Class 4, but there may be a desire to construct lower classification trails around key nodes to enhance the user experience (Tredwell 2021), noting this has not been factored into the impact footprint.

Tredwell Management's conceptual trail alignment was produced based on a combination of desktop assessment and on-site ground truthing and DEW understands these trail alignments are likely to change when the contractor undertakes further ground truthing as part of their design work and any preliminary alignments created as part of the tender process. The ground truthing will be comprehensive and aim to thoroughly survey the entire land parcels, identify key features to include, areas to avoid and conduct the works in consultation with the Native Vegetation Branch (NVB) (DEW), First Nations groups and Land Managers (DEW 2021).

No flagging has occurred and it is expected that minor changes in the trail alignment are likely and considered feasible under the current assessment with mapping applied across the broader landscape which can be applied for minor re-alignments. However, more intensive development in any one area (such as campgrounds) would require more detailed survey and mapping to accurately determine vegetation types, significant areas and species; and options for mitigation. This is of particular importance around the Nelshaby Gorge area which was not adequately assessed for broader development with mapping based largely on DEW mapping and brief inspections of nearby vegetation. This area is highlighted as sensitive given its general floristic composition of 'arid zone meets wetland' and given that the area

supported an unusual occurrence of a *Codonocarpus cotonifolius* (Desert Poplar), a species previously considered previously regionally extinct in the N&Y Landscape Management Region.

### General location map

The Project Area has been divided into 14 “map pages” to assist in navigation during the field survey and reference to threatened flora or areas of significance (Figure 3.). Map pages are a Geographic Information System (GIS) tool and are indicated on Figure 3. Figure 2 provides an overview of the Project Area in the landscape.

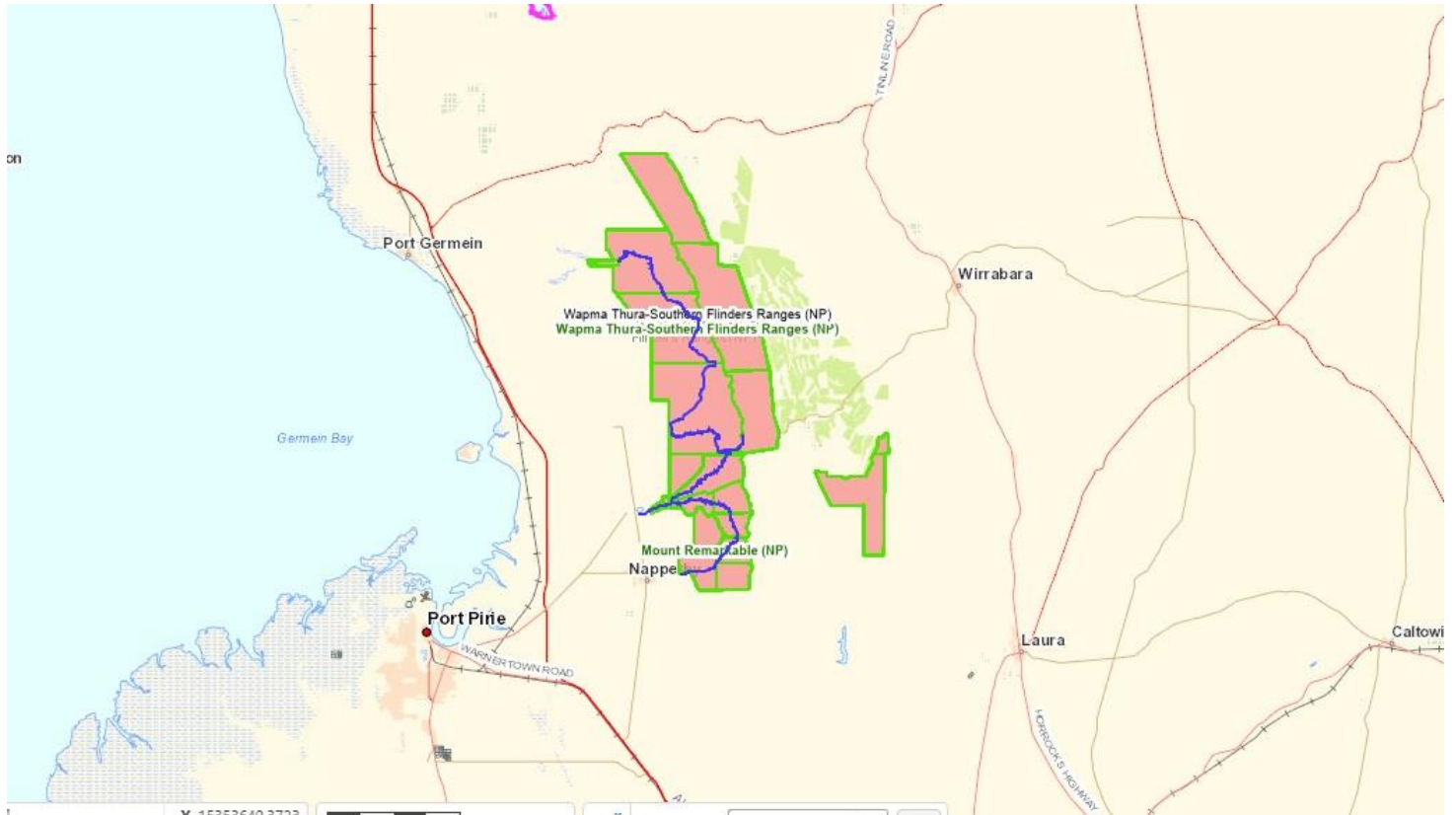


Figure 2. Proposed Epic Trail in Blue (base map extracted from EnvMaps (2022a)).



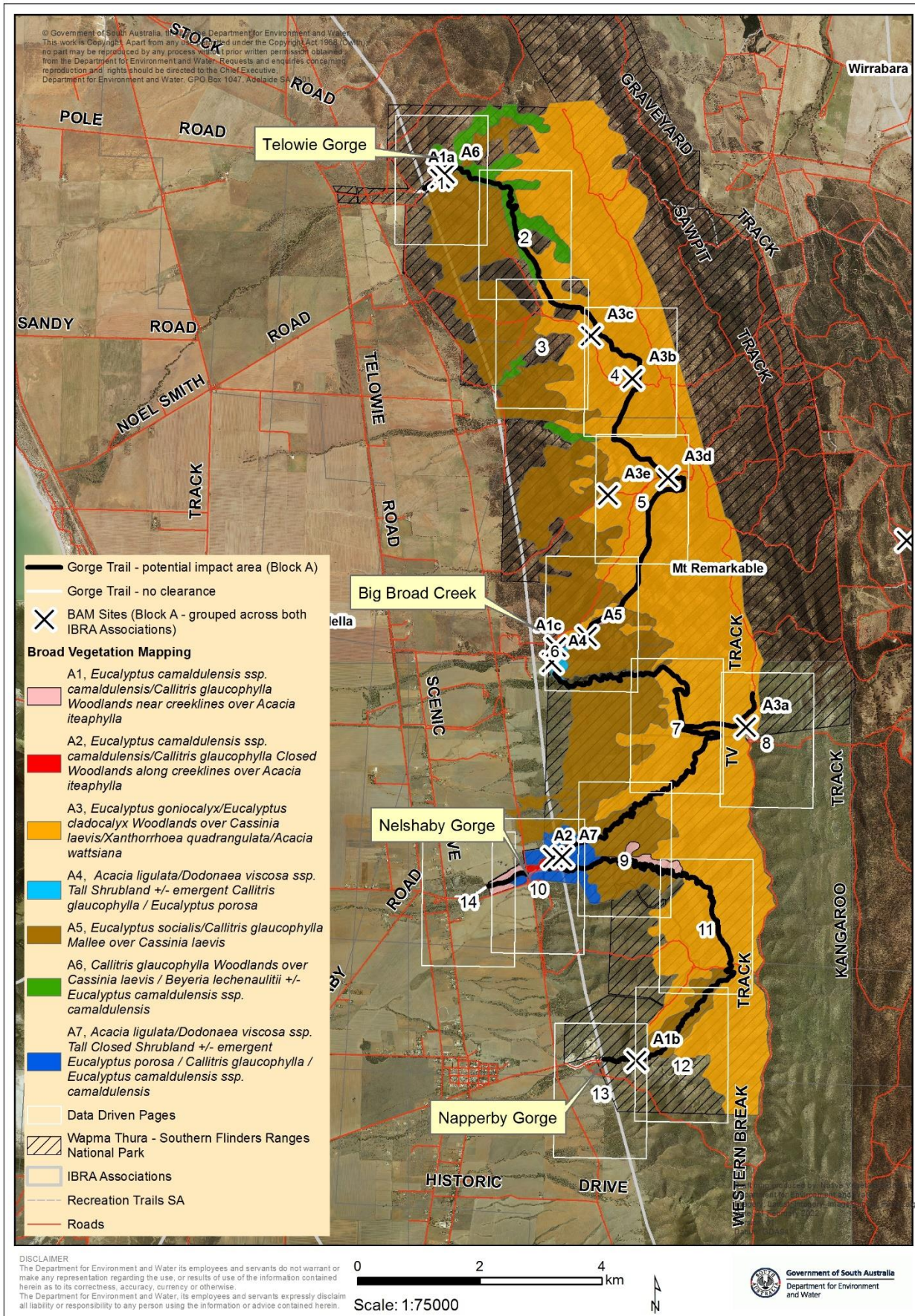


Figure 3. Overview map indicating broad vegetation mapping, trail alignment and data driven map pages (mapping tool).



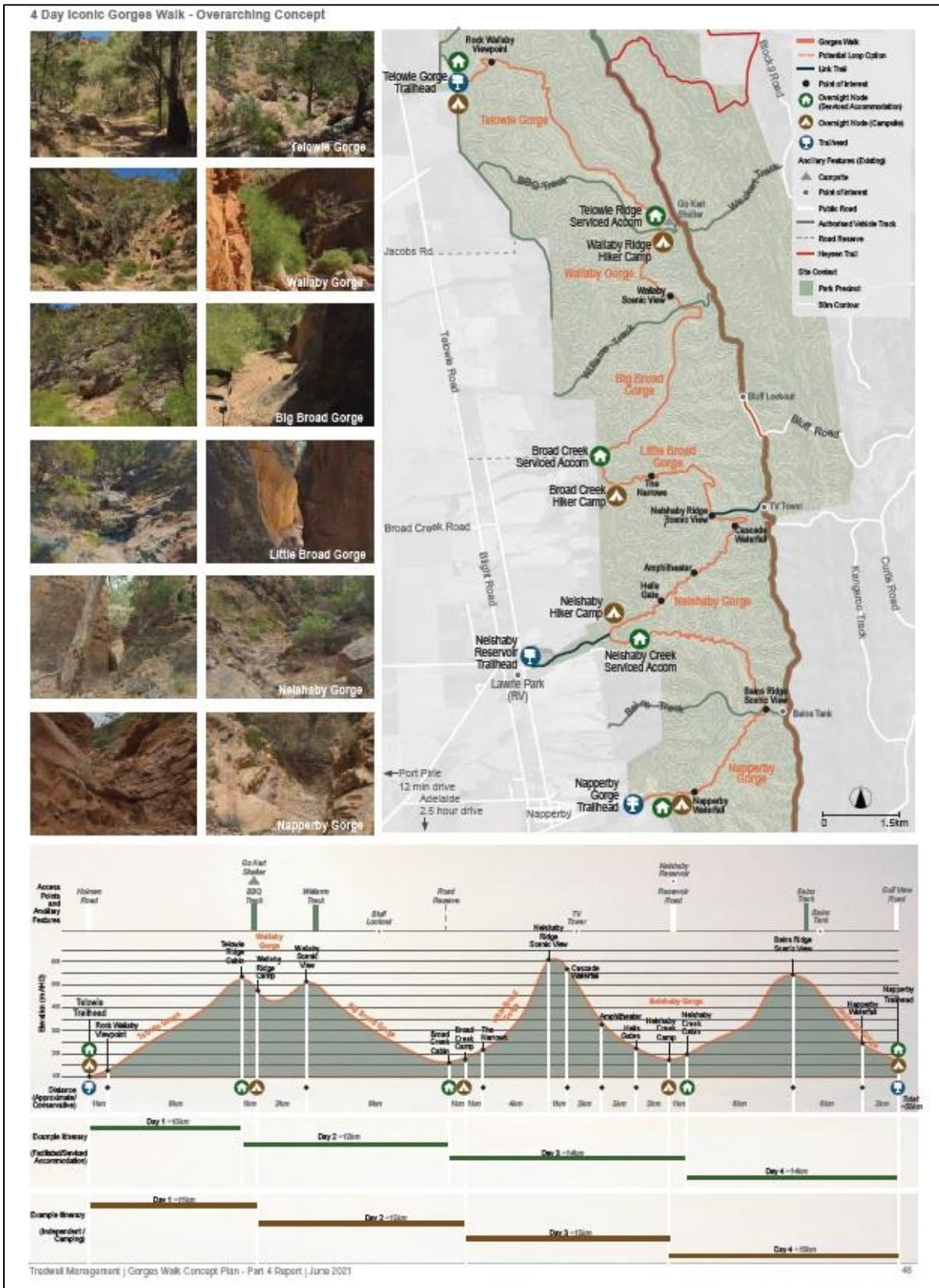


Figure 4. Concept plan extracted from the Gorges Concept Plan (Tredwell 2021). Campground locations are not confirmed and would form part of future native vegetation assessment and clearance approval under legislation current at the time. Serviced accommodation would be only via private investment and is outside the scope of the DEW proposal.

## **2.4 Approvals required or obtained**

Approvals are required under the:

- *Native Vegetation Act 1991*
- *Aboriginal Heritage Act 1988*

In addition, "Matters of National Significance" were identified as possibly occurring within the trail alignment. A self-assessment against Matters of National Significance, which possibly occur on site, would assist in ruling out the need for an approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Nationally threatened orchids have been identified as likely to occur or possibly occurring in the Project Area based on nearby records and habitat suitability. However, it is unknown if they occur in the actual trail alignment as the survey coverage was limited based on survey timing in addition to difficult terrain and time constraints. Presence can only be determined with targeted survey of the alignment during the orchid's visible life phase (generally September to October). The area of highest risk are considered Sugar Gum/Long-leaf Box Woodlands and *Callitris* Woodlands (particularly south facing); in addition to creeks and creek flanks. Targeted survey and more intensive pre-clearance survey prior to trail construction would assist in mitigating risk and avoiding existing populations. Overall, the risk to Nationally threatened orchids is considered relatively low given the long linear nature of the trail. The highest threat is considered to be weed invasion; therefore an appropriate weed management approach would assist in mitigating off target impacts.

Nationally threatened *Yellow-footed Rock Wallaby* are known to utilise habitat in the National Park, particularly in the deep gorges, but the species is not expected to be impacted by the walking trail alone, provided adequate pest management is established. However, impact to this species should be given additional consideration with regard to other potential development that may occur in the park.

## **2.5 Native Vegetation Regulation**

The application to clear native vegetation is made under Regulation 12, Schedule 1, Clause 36 of the *Native Vegetation Regulations 2017*.

## **2.6 Development Application information (if applicable)**

The walking trail development is exempt from requiring development approval under the *Planning Development and Infrastructure Regulations 2017* in accordance with Schedule 4, Clause 20. Further development may be subject to additional approvals and should be assessed at that time under the current legislation.



# 3. Method

## 3.1. Desktop Assessment

The Bushland Assessment Methodology (BAM) was applied to the assessment of vegetation for the Gorges Trail. The BAM was developed by the NVB (NVC 2020) and derived from the Nature Conservation Society of South Australia's Bushland Condition Monitoring methodology (Croft *et al.* 2007, 2008a, 2008b, 2009; Milne and Croft 2012; Milne and McCallum 2012).

A desktop flora assessment was undertaken prior to the field survey with a goal of identifying important species, habitat and sensitive areas. It was intended that sensitive areas would be visited during the survey but this was somewhat limited given the difficult terrain and time constraints. As required by the BAM, 5km searches of the Biological Databases of South Australia (BDBSA), Naturemaps/EnvMaps (DEW 2022a) and using the Protected Matters Search Tool (PMST) (DAWE 2022a) were undertaken to identify threatened species and communities that may occur in the project area. Searches were supplemented with information from NVB fauna experts and other resources including the South Australian Seed Conservation Centre (SASCC 2022), the SA Flora census (SA Herbarium 2022) and the Atlas of Living Australia (ALA 2022).

Nationally threatened ecological communities (TEC) and threatened species considered likely or known to occur within 5km based database searches were assessed for their likelihood of occurrence within the Project Area based on the criteria in Table 2. All species were assessed for their likelihood of occurrence, but only fauna and flora species observed since 1995 with a spatial reliability of less than 1km; and/or for which suitable habitat occurred in the Project Area were included in the BAM scoresheets. Note that the BAM does not generally require threatened flora not observed during the survey to be included in the BAM scoresheets, but as the on-ground survey coverage was so limited for Gorges Walk, flora species were included in the scoresheets when observed since 1995 in a similar vegetation type and where the habitat was deemed suitable. This includes several threatened orchids that are known to occur and could not be accessed and/or were outside of their visible life phase during the survey.

**Table 2. Criteria for the likelihood of occurrence of species within the Study area**

Likelihood	Criteria
HIGHLY LIKELY/ KNOWN	Recorded in the last 10 years, the species does not have highly specific niche requirements, the habitat is present and falls within the known range of the species distribution; or the species was recorded as part of field surveys.
LIKELY	Recorded within the previous 20 years, the area falls within the known distribution of the species and the area provides habitat or feeding resources for the species.
POSSIBLE	Recorded within the previous 20 years, the area falls inside the known distribution of the species, but the area provides limited habitat or feeding resources for the species.  Recorded within 20-40 years, survey effort is considered adequate, habitat and feeding resources present, and species of similar habitat needs have been recorded in the area.
UNLIKELY	Recorded within the previous 20 years, but the area provides no habitat or feeding resources for the species, including perching, roosting or nesting opportunities, corridor for movement or shelter.  Recorded within 20 -40 years; however, suitable habitat does not occur, and species of similar habitat requirements have not been recorded in the area.  No records despite adequate survey effort.

## 3.2. Field Survey and BAM Assessment

A broad native vegetation assessment of the proposed Gorges Trail was undertaken by an Officer of the NVB between 1 and 5 November 2021; accompanied for some sample points by local DEW parks staff. For each sample point a BAM assessment was undertaken in line with the methodology, focusing on flora and habitat on site, but with limited opportunities to collect fauna observation data due to time constraints and other limitations.

The Project Area was highly inaccessible therefore a sample point approach was taken, guided by the desktop assessment, including targeting a range of mapped vegetation types. There was an intention to visit sensitive areas or areas with previous records, but this was not possible in the majority of cases. Furthermore, much of the Project Area has very few threatened species records given the inaccessibility. The BAM sample points represent areas that could be accessed during the survey timeframe with the intention of sampling characteristic vegetation types within the trail alignment (at the time of the survey) and applying these values across the broader landscape based on DEW mapping, aerial photography and knowledge of the site. However, it should be noted that survey coverage outside of the BAM sample points was limited and much of the Project Area was inaccessible or could not be reached within the survey timeframe. However, it is expected the BAM scores provide a reasonable reflection of the value of vegetation overall, with the exception of *Eucalyptus porosa* Woodlands and Shrublands around Nelshaby Gorge which were not considered to be adequately surveyed (but in which impact is expected to be minimal or negligible based on the current proposal). Follow up surveys may be required in some areas to confirm the vegetation type (particularly where it could be threatened) and to determine the presence of significant vegetation.

The BAM scoresheets were completed in line with the BAM methodology. However, given the complexity and limited access, some amendments were made to scoresheets based on the desktop assessment, aerial photography and expected site features including location of the site and the predicted condition of vegetation. This includes manual amendments made to some attributes such as tree canopy cover, regeneration, floristic composition and the presence of threatened flora; and the likelihood of use by threatened fauna. This approach is deemed appropriate for a trail of this scale, located in inaccessible terrain and that may be subject to realignment following micro-sighting and ground truthing.

The rainfall factor was calculated using rainfall figures *approximately* every 2km along the proposed trail vicinity, then averaged to determine a rainfall figure of 529mm.

The impact footprint was calculated by applying broad mapping across the site then clipping it in the ESRI ArcMap Geographic Information System (GIS) using a 0.75m impact footprint from either side of the trail alignment provided in February 2022. Should the alignment be altered, the broad vegetation groupings can be re-clipped in GIS to determine the impact of the alignment.

### 3.2.1. Limitations

The Project Area was topographically very difficult to access and survey coverage was further limited within the available timeframe. Some areas of the trail alignment are currently not possible to access without potentially hiking for many hours or several days and will only become more readily accessible once the trail is partially constructed. A limited series of vehicle tracks extend up the lower ridges of the range and across the Summit (the Bluff), but outside of these tracks the ranges are not easily accessible by vehicle therefore most sample points on the higher slopes are directly adjacent these tracks as there was limited time to walk in and severe weather further limited access. The gorges were not accessible by vehicle but could be accessed via foot as time and safety considerations permitted.

The survey did not cover the majority of the trail alignment, but vegetation was found to be of similar value, particularly on the upper slopes and with five sample points in upper slope woodlands, it is expected a reasonable representation was made with regard to the value of vegetation in this area. However, the area of *Callitris* Woodland near the northern side of BBQ Track could not be assessed in the timeframe and it is considered this area may contain threatened species based on DEW records and vegetation type (Figure 36). Vegetation on the mid slopes had very limited survey coverage due to very steep terrain and time constraints. Sample points were assessed where possible but transitions between Sugar Gum/Long Leaf Box, Red Mallee and *Callitris* Woodland were based only on remnant vegetation mapping with sample points used from other locations. *Eucalyptus porosa* Woodland in Nelshaby Gorge was not assessed at all, whilst Shrubland in this area (BAM A7) was based on assessment in other locations, brief anecdotal information and photographs. This area will require more intensive assessment should it be further developed (e.g. with more extensive trail network).

The survey was conducted in November and outside the visible life phase of many native orchids, including Nationally threatened orchids (particularly *Caladenia* spp. (spider Orchids)). *Prasophyllum* spp. (Leek Orchids) may be visible in November but none were observed and given the survey coverage was limited their presence within the trail alignment cannot be determined. However, overall the impact to orchid populations is expected to be minimal, provided mitigation strategies and some follow up on ground surveys are conducted during the orchid's visible life phase, particularly in sensitive areas (Long-leaf Box/Sugar Gum, *Callitris* Woodlands and creek flanks).

The fauna assessment was largely based on the desktop assessment given the access and coverage limitations, in addition to time constraints. However, fauna was recorded opportunistically where observed. Consideration has been given to project impacts on threatened fauna and efforts will be made to reducing any potential impacts.

# 4. Assessment Outcomes

## 4.1. Vegetation assessment – Field Survey

### 4.1.1. General description of the vegetation, the site and matters of significance

The Telowie Gorge Land System is characterised by very rough, rocky ground, with abundant surface sandstone, quartzite and rocky outcrops (DEW 2022b); and it was noted during the survey that rocks tended to large Boulders (>1m) near the Bluff. Generally speaking, the terrain is steep and rocky, with shallow alluvium and large rocky slabs and outcrops, scree slopes and small boulder clusters, and it is indicated in the tender documentation (DEW 2021) that some of these areas may not be suitable for machinery. The higher slopes supports intact vegetation communities integrating between *Eucalyptus goniocalyx* and *Eucalyptus cladocalyx* Woodlands and varying in their understorey from dense and shrubby to more open and diverse floristic structure. The highest rocky ridges fall sharply west to lower ridges of similar vegetation on more subdued but steep ridges and integrating to *Eucalyptus socialis* Mallee on the lower western slopes where rainfall is lower. Patches of *Allocasuarina verticillata* Woodland and *Callitris glaucophylla* Woodland are recorded as occurring in isolated areas throughout these Woodlands, but these were not assessed during the survey.

High slopes drain into spectacular rocky gorges which dissect the range to the west and support Woodlands of *Eucalyptus camaldulensis* ssp. *camaldulensis* and *Callitris glaucophylla* over SA rare species *Acacia iteaphylla* which is locally common in the park. The gorges varied from supporting dense vegetation to open rocky areas with most creeks found to contain at least some water and these areas known to provide important habitat for Nationally Threatened Yellow-footed Rock Wallaby. The lower western slopes (outside of the gorges) exhibit low hills supporting vegetation representative of a more arid climate including *Acacia ligulata* Tall Shrublands over chenopods with emergent *Callitris glaucophylla* and *Eucalyptus* spp. (*camaldulensis* ssp. *camaldulensis*, *porosa*, *socialis*, *goniocalyx*).

The vast majority of the trail occurs in the Mt Remarkable IBRA Association, but does extend to the Glendella IBRA Association near Telowie Gorge, Napperby Gorge and Nelshaby Gorge. There is no impact expected in the Glendella IBRA Association at Telowie or Napperby, but there may be a small impact at Nelshaby. However, given the minimal or negligible impact expected in these areas (and for simplicity), vegetation was grouped into one Block "Block A".

Overall, Block A was stratified into seven vegetation types (Figure 19, Table 3). Vegetation community stratification is very broad being largely based on remnant vegetation mapping, aerial photography and a limited number of BAM sample points generally located outside of vegetation near the trail alignment. Woodlands of *E. goniocalyx* and *E. cladocalyx* (BAM A3) were grouped as it was not feasible to differentiate between them across the entire site and the species often co-occurred. However five sample points were averaged therefore the result is considered to provide a reasonable indication of the value. BAM A3 vegetation was found to be intact and considered in good to excellent condition with some areas appearing more affected by the 2014 Bangal Fire with dense *Acacia wattiana* dominating understorey whilst in other locations the vegetation was more open and diverse. *Eucalyptus socialis* was only sampled once on the steep flank of Big Broad Creek (BAM A5) but was found to be in good to excellent condition and is expected to be intact and of high value across the park. The gorges and creeks (BAM A1 and A6 - including Telowie Gorge, Big Broad Creek, Napperby Gorge and parts of Nelshaby Gorge) were variable with more weed invasion near areas commonly traversed areas, but large *E. camaldulensis* ssp. *camaldulensis* providing valuable habitat for local fauna. Parts of Nelshaby Gorge (BAM A2) were considered to be of very high value as they supported a unique floristic composition of arid species adjacent a wide

densely vegetated creekline. This area was also found to contain specimens of *Codonocarpus cotonifolius* (Desert Poplar) which was previously considered regionally extinct in the N&Y region. Impact in this area should be minimised and this population MUST be avoided (Figure 23). The gorges generally contained open rocky areas that could be utilised for the trail but SA Rare *Acacia iteaphylla* was thick and abundant in patches throughout, therefore some clearance and/or pruning of this species is expected. Shrublands near Big Broad Creek (BAM A4) were in good condition and considered of moderate value but scored a high UBS as they reflected a 'treeless community' which can result in a higher score. Similarly, Tall Shrublands near Nelshaby Gorge scored highly as they were highly diverse and tree attributes were not scored (noting this community was based only on photos and desktop assessment). Due to time and access limitations *Allocasuarina verticillata* Woodland on the higher slopes (e.g. near BBQ Track) was not surveyed and along with *Callitris* Woodlands in this area may be of very high value supporting increased threatened flora (Figure 36). This area should be checked thoroughly for threatened species and the trail offset to avoid significant areas.

There were no threatened communities found to occur in the trail alignment and it is considered unlikely that they would occur based on the current (or similar) alignment.

Table 3 provides a breakdown of the Blocks, BAM Sites, broad vegetation descriptions, the area proposed for clearance and the scores for each BAM site. Figure 19 to Figure 24 provide overview maps of the vegetation and Block impact area.

**Table 3. Broad vegetation communities described within the Project Area (based on sample points, remnant vegetation mapping and aerial photography).**

BAM Block	BAM Site	Vegetation Description	Area (ha)	*UBS	**TBS	SEB Points required
A	A1	<i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i> / <i>Callitris glaucophylla</i> Woodlands near creeklines over <i>Acacia iteaphylla</i>	1.669	59.49	99.29	104.25
	A2	<i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i> / <i>Callitris glaucophylla</i> Closed Woodlands along creeklines over <i>Acacia iteaphylla</i>	0.200	78.23	15.65	16.43
	A3	<i>Eucalyptus gonicalyx</i> / <i>Eucalyptus cladocalyx</i> Woodlands over <i>Cassinia laevis</i> / <i>Xanthorrhoea quadrangulata</i> / <i>Acacia wattiana</i>	2.379	66.528	158.27	166.18
	A4	<i>Acacia ligulata</i> / <i>Dodonaea viscosa</i> ssp. Tall Shrubland +/- emergent <i>Callitris glaucophylla</i> / <i>Eucalyptus porosa</i>	0.099	85.91	8.51	8.93
	A5	<i>Eucalyptus socialis</i> / <i>Callitris glaucophylla</i> Mallee over <i>Cassinia laevis</i>	0.357	71.05	25.36	26.63
	A6	<i>Callitris glaucophylla</i> Woodlands over <i>Cassinia laevis</i> / <i>Beyeria lechenaultii</i> +/- <i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i>	0.353	70.89	25.02	26.28
	A7	<i>Acacia ligulata</i> / <i>Dodonaea viscosa</i> ssp. Tall Closed Shrubland +/- emergent <i>Eucalyptus porosa</i> / <i>Callitris glaucophylla</i> / <i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i>	0.010	100.23	1.00	1.05
	<b>Total</b>			<b>5.067</b>		<b>333.150</b>

\*UBS: Unit Biodiversity Score; \*\*TBS: Total Biodiversity Score (BAM Methodology).



#### 4.1.2. Details of the vegetation associations / scattered trees proposed to be impacted

Table 4. Block A, BAM Site A1 – The gorges (excluding parts of Nelshaby Gorge)

<p><b>*Vegetation Association A1 (A1a, A1b, A1c)</b></p>	<p><i>Eucalyptus camaldulensis ssp. camaldulensis/Callitris glaucophylla Woodlands along creeklines over Acacia iteaphylla</i></p>
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Figure 5. BAM A1a Telowie Gorge. Left: Partly existing trail near BAM Site A1. Right: overview photo indicating *Callitris glaucophylla* on cliff edges.



Figure 6. BAM A1b Napperby Gorge. Left: *Acacia iteaphylla* fringing flowing creekline (may require some clearance). Right: More open area of Napperby Gorge. Clearance should be negligible through this section.



<b>*Vegetation Association A1 (A1a, A1b, A1c)</b>	<i>Eucalyptus camaldulensis ssp. camaldulensis/Callitris glaucophylla Woodlands along creeklines over Acacia iteaphylla</i>
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**Figure 7. BAM A1c Big Broad Creek. Left/right: Overview photos of Big Broad Creek. This area is more reflective of a creek than a gorge but does contain open areas where clearance can be minimised. Creek flanks rise sharply from the main channel.**

<b>General description</b>	<p>Gorges and creeks vary from moderate to good condition but are expected to improve to excellent condition further upstream in areas less readily accessible. Mix of large trees with hollows and abundant regrowth of juvenile trees. Most areas had reasonable diversity but weed annual Veldt Grass was abundant at ground level in the lower reaches. The mid-storey was often dominated by SA Rare <i>Acacia iteaphylla</i> which is locally abundant but classified as threatened with limited distribution and clearance of this species should be minimised. The existing Nukuna and Napperby Trails commence at the lower reaches of Telowie and Napperby Gorge, but become less formed and narrower further into the gorge where upgrades are expected. Areas of the existing trails may also require upgrade in the National Park, but it is expected that open rocky areas will be utilised as feasible.</p>							
<b>Threatened species or community</b>	<p><u>Threatened flora observed:</u> <i>Acacia iteaphylla</i>, <i>Acacia gracilifolia</i>.  <u>Other threatened flora included in scoresheets:</u> <i>Rytidosperma tenuis</i>.</p> <p><u>Threatened fauna observed:</u> Elegant Parrot, Peregrine Falcon, Yellow-footed Rock Wallaby (scats)  <u>Other threatened fauna included in scoresheet:</u> Chestnut-rumped Heathwren, Eastern Shrike-tit, Diamond Firetail, Gilberts Whistler, Hooded Robin, Jacky Winter, Painted Buttonquail, Scarlet Robin, White-wing Chough, Black Falcon, Common Brush-tail Possum, Carpet Python, Flinders Worm-Lizard.</p>							
<b>Landscape context score</b>	1.09		<b>*Vegetation Condition Score</b>	A1a	51.59	<b>*Conservation significance score</b>	A1a	1.18
				A1b	54.44		A1b	1.18
				A1c	48.44		A1c	1.18
<b>*Unit biodiversity Score</b>	A1a	66.36	<b>Area (ha)</b>	1.669	<b>Total biodiversity Score</b>	99.29		
	A1b	49.80						
	A1c	62.30						

\*A1a Telowie Gorge, A1b Napperby Gorge, A1c Big Broad Creek



**Table 5. Block A – Nelshaby Gorge**

<b>Vegetation Association A2</b>	<i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i> / <i>Callitris glaucophylla</i> Closed Woodlands along creeklines over <i>Acacia iteaphylla</i>
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**Figure 8. Nelshaby Gorge Area. Top left: Dense River Red Gum regeneration in the creek at survey site (Nelshaby Gorge north arm). Top right: unusual occurrence of *Codonocarpus cotonifolius* (Desert Poplar) previously thought to be regionally extinct in N&Y Region. Bottom left: Quarry area with Rare *Acacia iteaphylla* in the foreground. Bottom right: Nelshaby Gorge south arm.**

<b>Vegetation Association A2</b>	<i>Eucalyptus camaldulensis ssp. camaldulensis/Callitris glaucophylla Closed Woodlands along creeklines over Acacia iteaphylla</i>				
<b>General description</b>	Excellent condition with dense regrowth and unusual floristic composition of arid and wetland species. It is expected that diversity is significantly higher than indicated and likely that additional threatened species occur, but the survey was limited by time constraints. Some areas retained water, whilst on the creek flanks vegetation transitioned to <i>Callitris</i> and <i>Acacia</i> Shrubland with a small population of <i>Codonocarpus cotonifolius</i> observed in one area, which although not rated for SA was thought to be regionally extinct in the N&Y region. Clearance of this species must be avoided. There appears to be a mosaic of vegetation types in this area and there was insufficient time to survey intensively, therefore mapping and scores are based on remnant vegetation mapping, photos and general observations. There is an existing track that could be utilised to access the lower reaches of the gorge avoiding clearance through the creekline until further upstream. It is strongly recommended that this track is utilised. Further development in this area would require further survey to avoid significant vegetation.				
<b>Threatened species or community</b>	<p><u>Threatened flora observed:</u> <i>Acacia iteaphylla</i>, <i>Codonocarpus cotonifolius</i> (regionally significant)</p> <p><u>Other threatened flora included in scoresheets:</u> <i>Rytidosperma tenuis</i>, <i>Olearia pannosa ssp. cardiophylla</i>, <i>Olearia pannosa ssp. pannosa</i>, <i>Elatine gratioloides</i>, <i>Acacia gracilifolia</i>, <i>Austrostipa densiflora</i>.</p> <p><u>Threatened fauna observed:</u> none.</p> <p><u>Threatened fauna included in scoresheet:</u> Chestnut-rumped Heathwren, Eastern Shrike-tit, Diamond Firetail, Gilberts Whistler, Hooded Robin, Jacky Winter, Painted Buttonquail, Scarlet Robin, White-wing Chough, Common Brush-tail Possum, Carpet Python, Black Falcon, Flinders Worm-Lizard, Flinders Ranges Short-tailed Grasswren, Yellow-footed Rock Wallaby.</p>				
<b>Landscape context score</b>	1.09	<b>Vegetation Condition Score</b>	59.96	<b>Conservation significance score</b>	1.26
<b>Unit biodiversity Score</b>	59.96	<b>Area (ha)</b>	0.200	<b>Total biodiversity Score</b>	15.65



Table 6. BAM A3 – Sugar Gum and Long-leaf Box Woodlands, upper slopes across the park.

<p><b>*Vegetation Association A3a, A3b, A3c, A3d, A3e</b></p>	<p><i>Eucalyptus goniocalyx/Eucalyptus cladocalyx</i> Woodlands over <i>Cassinia laevis/Xanthorrhoea quadrangulata/Acacia wattsiiana/Calytrix tetragona</i></p>
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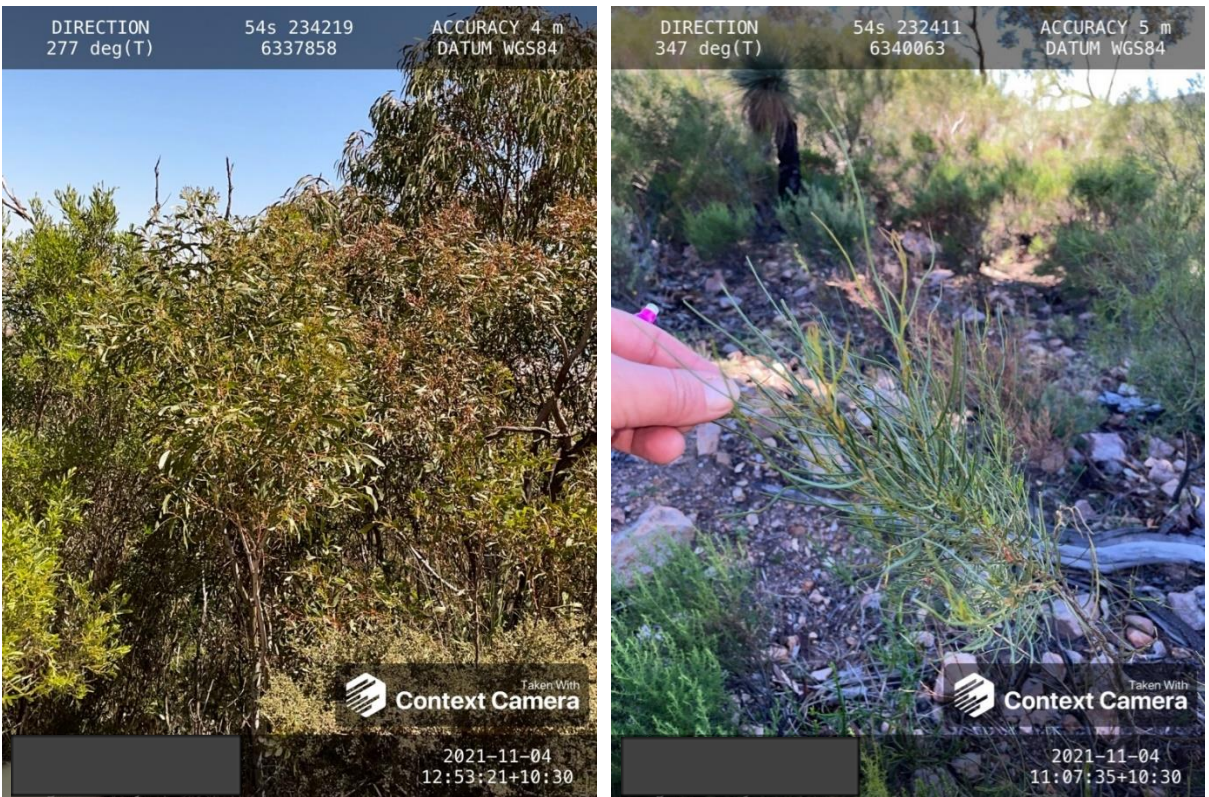
Figure 9. Left/right: BAM Sample A3a – *Eucalyptus goniocalyx* Woodland on steep slopes at the Bluff. Right: *Asplenium flabellifolium* (Necklace Fern) under large boulders at the Bluff Tower.



Figure 10. BAM Sample Point A3b – *Eucalyptus goniocalyx* Woodland regrowth in fire break area on the BBQ track.



<p><b>*Vegetation Association A3a, A3b, A3c, A3d, A3e</b></p>	<p><i>Eucalyptus goniocalyx/Eucalyptus cladocalyx Woodlands over Cassinia laevis/Xanthorrhoea quadrangulata/Acacia wattsiiana/Calytrix tetragona</i></p>
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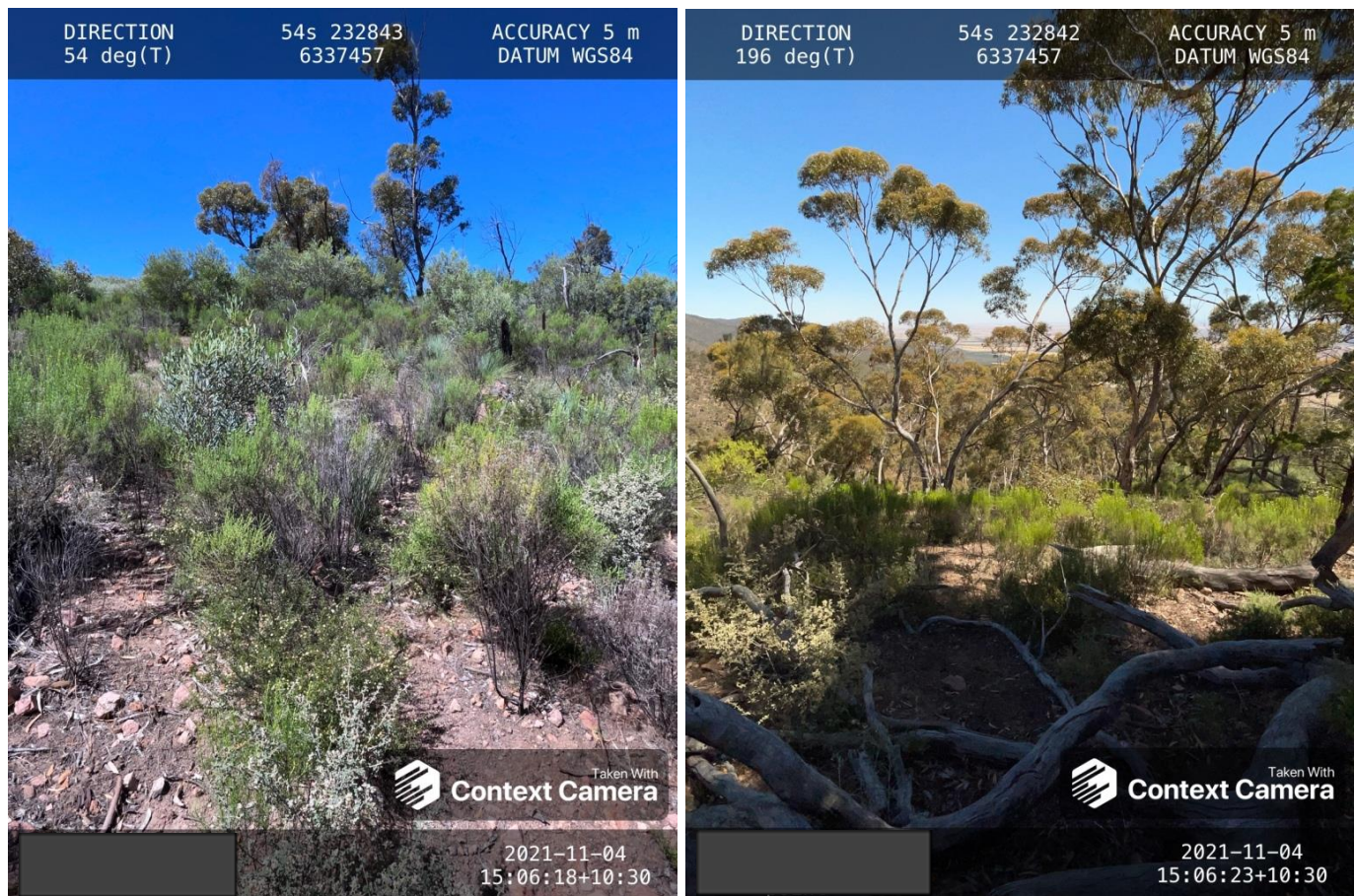
**Figure 11. Left/right: BAM Sample Point A3c – *Eucalyptus cladocalyx* +/- *E. goniocalyx* on BBQ track. Right: SA rare *Acacia gracilifolia* abundant at site.**



**Figure 12. Left/right: BAM Sample Point A3d – *Eucalyptus cladocalyx* Low Open Woodland over *Acacia wattsiiana*.**



<b>*Vegetation Association A3a, A3b, A3c, A3d, A3e</b>	<i>Eucalyptus goniocalyx/Eucalyptus cladocalyx</i> Woodlands over <i>Cassinia laevis/Xanthorrhoea quadrangulata/Acacia wattsiiana/Calytrix tetragona</i>
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**Figure 13. Left/right: BAM Sample Point A3e - *Eucalyptus goniocalyx* Low Open Woodland +/- *Eucalyptus cladocalyx* Low Open Woodland over *Calytrix tetragona*, Williams Track (old growth woodland here is not impacted).**

<b>General description</b>	<p>Good to excellent condition of intact mixed <i>E. goniocalyx</i> and <i>E. cladocalyx</i> Woodlands. Understorey varied and appeared somewhat dependent on the frequency and intensity of fire history with recently burnt areas (BAM A3a) supporting high diversity but dominated by <i>Xanthorrhoea quadrangulata</i>, whilst understorey in some areas burnt in the Bangal fire in 2014 were dominated by <i>Acacia wattsiiana</i>. Fire has also affected the condition and health of trees in some areas therefore the scores may be lower than if assessed in the absence of recent fire history. Weeds were generally limited to areas adjacent tracks and included common weeds such as Wild Oats and Cats-ear. Cape Weed was also abundant along tracks edges and care should be taken to avoid the spread of this more noxious weed into the National Park away from tracks where it is expected weeds are few or absent.</p>
<b>Threatened species or community</b>	<p><u>Threatened flora observed:</u> <i>Acacia iteaphylla</i>, <i>Acacia gracilifolia</i>, <i>Olearia pannosa ssp. cardiophylla</i>, <i>Ozothamnus scaber</i>.  <u>Other threatened flora included in scoresheets:</u> <i>Caladenia coactilis</i>, <i>Caladenia xantholeuca</i>, <i>Logania saxatilis</i>, <i>Eucalyptus cajuputea</i>, <i>Eucalyptus percostata</i>, <i>Philotheca angustifolia ssp. angustifolia</i>, <i>Cryptandra campanulata</i>, <i>Acacia montana</i>, <i>Austrostipa breviglumis</i>, <i>Austrostipa gibbosa</i>, <i>Olearia pannosa ssp. pannosa</i>, <i>Austrostipa densiflora</i>, <i>Veronica decorosa</i>, <i>Caladenia flaccida</i>, <i>Caladenia saxatilis</i>, <i>Prasophyllum pallidum</i>.</p>

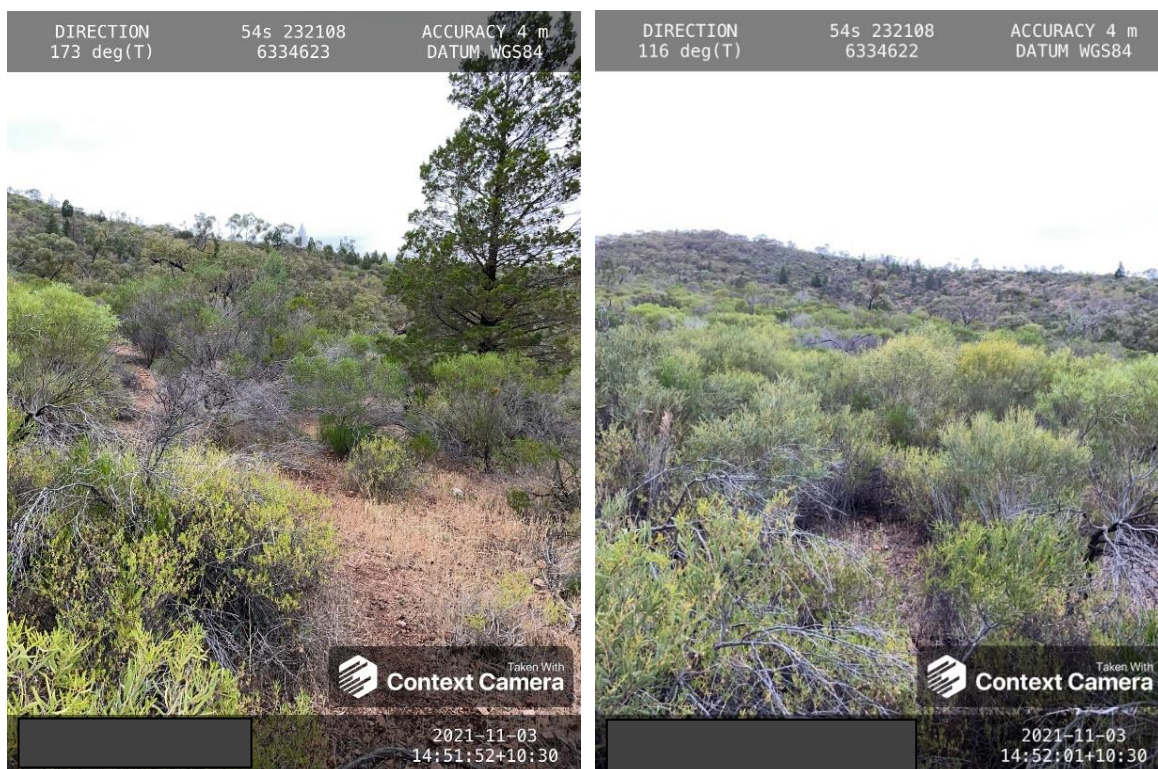


<b>*Vegetation Association A3a, A3b, A3c, A3d, A3e</b>	<i>Eucalyptus goniocalyx/Eucalyptus cladocalyx Woodlands over Cassinia laevis/Xanthorrhoea quadrangulata/Acacia wattiana/Calytrix tetragona</i>							
	<p><u>Threatened fauna observed:</u> none.</p> <p><u>Threatened fauna included in scoresheet:</u> Chestnut-rumped Heathwren, Eastern Shrike-tit, Diamond Firetail, Gilberts Whistler, Hooded Robin, Jacky Winter, Painted Buttonquail, Scarlet Robin, White-wing Chough, Brush Bronzewing, Elegant parrot, Carpet Python, Yellow-footed Rock Wallaby, Common Brush-tail Possum, Flinders Worm-Lizard.</p>							
<b>Landscape context score</b>	1.09		<b>Vegetation Condition Score</b>	<b>A3a</b>	54.11	<b>Conservation significance score</b>	A3a	1.3
			<b>A3b</b>	44.70	A3b		1.3	
			<b>A3c</b>	50.75	A3c		1.3	
			<b>A3d</b>	35.83	A3d		1.3	
			<b>A3e</b>	49.36	A3e		1.3	
			<b>Average</b>	<b>46.95</b>	<b>Average</b>		<b>1.3</b>	
<b>Unit biodiversity Score</b>	A3a	76.68	<b>Area</b>	2.379		<b>Total Biodiversity Score</b>	158.27	
	A3b	63.34						
	A3c	71.91						
	A3d	50.77						
	A3e	69.94						
	<b>Average</b>	<b>66.53</b>						

\*A3a Bluff Tower, A3b BBQ Track, A3c BBQ Track, A3d Williams Track, A3e Williams Track.

**Table 7. Block A - BAM Site A4 *Acacia* Shrubland with emergent *Callitris* on lower more arid western slopes.**

<b>Vegetation Association A4</b>	<i>Acacia ligulata</i> / <i>Dodonaea viscosa</i> ssp. <i>Tall Shrubland</i> +/- emergent <i>Callitris glaucophylla</i> / <i>Eucalyptus porosa</i>
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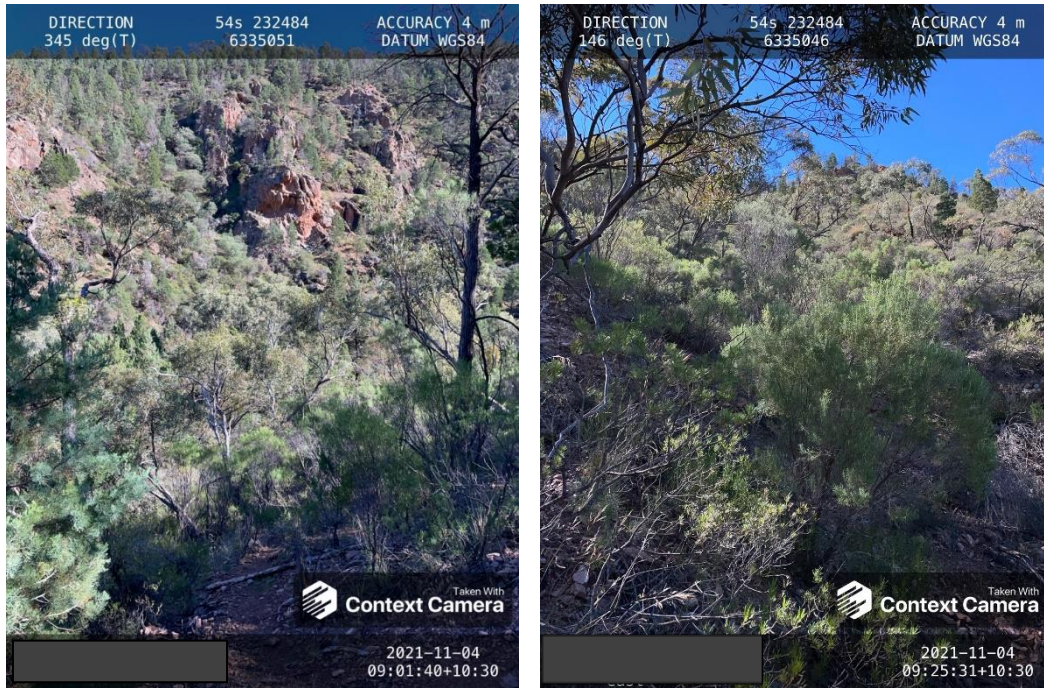


**Figure 14. *Acacia* shrubland on low rise between Big Broad and Little Broad Creek.**

<b>General description</b>	Fair condition with somewhat increased weed cover than some sites partly due to its close proximity to the edge of the park and cleared farming properties. However, the site retained high diversity for its vegetation type and scored a high UBS, partly as it was assessed as a treeless community which excludes weightings related to tree attributes. Weeds include abundant Fescue (* <i>Vulpia</i> sp.), Wild Oats and Brome. An existing track occurs along the fenceline through this area which should be considered for the Gorges Walk, rather than clearing additional vegetation.				
<b>Threatened species or community</b>	<p><u>Threatened flora observed in or near site:</u> none.</p> <p><u>Other threatened flora included in scoresheets:</u> none.</p> <p><u>Threatened fauna observed:</u> none.</p> <p><u>Threatened fauna included in scoresheet:</u> Eastern Shrike-tit, Diamond Firetail, Gilberts Whistler, Hooded Robin, Jacky Winter, Scarlet Robin, White-wing Chough, Elegant parrot, Flinders Ranges Short-tailed Grasswren.</p>				
<b>Landscape context score</b>	1.09	<b>Vegetation Condition Score</b>	72.98	<b>Conservation significance score</b>	1.08
<b>Unit biodiversity Score</b>	85.91	<b>Area (ha)</b>	0.099	<b>Total biodiversity Score</b>	8.51

**Table 8. Block A - BAM Site A5 *Eucalyptus socialis* (Red Mallee) Woodlands on western mid slopes.**

<b>Vegetation Association A5</b>	<i>Eucalyptus socialis/Callitris glaucophylla</i> Mallee over <i>Cassinia laevis</i>
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**Figure 15. *Eucalyptus socialis* Woodland surveyed on the flanks of Big Broad Creek.**

<b>General description</b>	Good to excellent condition with reasonable diversity and little weed cover. The survey extent was limited to the flanks of Big Broad Creek which quickly became very steep, therefore the survey somewhat represents a transition area between <i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis/Callitris</i> Creeklines and Mallee on the higher slopes. Based on DEW mapping this vegetation type extends throughout the western mid slopes of the park therefore it is expected a range of threatened flora species may occur. Few weeds were present, but Annual Veldt Grass ( <i>*Ehrharta</i> sp.) was noted as spreading from the creek.				
<b>Threatened species or community</b>	<p><u>Threatened flora observed:</u> none.</p> <p><u>Other threatened flora included in scoresheets:</u> <i>Caladenia coactilis</i>, <i>Caladenia xantholeuca</i>, <i>Logania saxatilis</i>, <i>Eucalyptus cajuputea</i>, <i>Eucalyptus percostata</i>, <i>Philotheca angustifolia</i> ssp. <i>angustifolia</i>, <i>Cryptandra campanulata</i>, <i>Acacia montana</i>, <i>Austrostipa breviglumis</i>, <i>Austrostipa gibbosa</i>, <i>Olearia pannosa</i> ssp. <i>cardiophylla</i>, <i>Olearia pannosa</i> ssp. <i>pannosa</i>, <i>Austrostipa densiflora</i>, <i>Caladenia flaccida</i>, <i>Caladenia saxatilis</i>, <i>Prasophyllum pallidum</i>, <i>Acacia gracilifolia</i>, <i>Acacia iteaphylla</i>, <i>Anthocercis angustifolia</i>, <i>Veronica parkalliana</i>, <i>Thelymitra parkalliana</i>.</p> <p><u>Threatened fauna observed:</u> none.</p> <p><u>Threatened fauna included in scoresheet:</u> Eastern Shrike-tit, Diamond Firetail, Gilberts Whistler, Hooded Robin, Jacky Winter, Painted Buttonquail, Scarlet Robin, Peregrine Falcon, White-wing Chough, Brush Bronzewing, Chestnut-rumped Heathwren (Southern Flinders Ranges), Elegant parrot, Carpet Python, Yellow-footed Rock Wallaby, Common Brush-tail Possum, Flinders Worm-Lizard.</p>				
<b>Landscape context score</b>	1.09	<b>Vegetation Condition Score</b>	72.98	<b>Conservation significance score</b>	1.3
<b>Unit biodiversity Score</b>	71.05	<b>Area (ha)</b>	0.357	<b>Total biodiversity Score</b>	25.36



**Table 9. Block A, BAM Site A6 – *Callitris glaucophylla* Woodlands near creeklines and in gullies.**

<b>Vegetation Association A6</b>	<i>Callitris glaucophylla</i> Woodlands over <i>Cassinia laevis</i> / <i>Beyeria lechenaultii</i> +/- <i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i>
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**Figure 16. Looking east at *Callitris* Woodlands on the flanks of Telowie Gorge.**



**Figure 17. Looking downslope at *Callitris* Woodlands on the flanks of Telowie Gorge.**



<b>Vegetation Association A6</b>	<i>Callitris glaucophylla</i> Woodlands over <i>Cassinia laevis</i> / <i>Beyeria lechenaultii</i> +/- <i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i>				
<b>General description</b>	Good to excellent condition improving away from the more degraded creeklines. <i>Callitris</i> Woodland surveyed was generally rocky and on steeper slopes but was noted to occur in most drainage lines and extending to upstream creeks which were not surveyed and is likely to be on hills of lower aspect. May provide habitat for Nationally threatened <i>Caladenia xantholeuca</i> , particularly on south-facing slopes.				
<b>Threatened species or community</b>	<p><u>Threatened flora observed in or near site:</u> <i>Acacia iteaphylla</i>.</p> <p><u>Other threatened flora included in scoresheets:</u> <i>Acacia gracilifolia</i>, <i>Anthocercis angustifolia</i>, <i>Asperula syrticola</i>, <i>Prasophyllum pallidum</i>, <i>Thelymitra grandiflora</i>, <i>Acacia montana</i>, <i>Caladenia xantholeuca</i>, <i>Logania saxatilis</i>, <i>Eucalyptus cajuputea</i>, <i>Eucalyptus percostata</i>, <i>Cryptandra campanulata</i>, <i>Acacia montana</i>, <i>Austrostipa breviglumis</i>, <i>Austrostipa gibbosa</i>, <i>Austrostipa densiflora</i>, <i>Veronica decorosa</i>, <i>Caladenia flaccida</i>, <i>Prasophyllum pallidum</i>.</p> <p><u>Threatened fauna observed:</u> Peregrine Falcon.</p> <p><u>Threatened fauna included in scoresheet:</u> Eastern Shrike-tit, Diamond Firetail, Gilberts Whistler, Hooded Robin, Jacky Winter, Painted Buttonquail, Scarlet Robin, White-wing Chough, Brush Bronzewing, Chestnut-rumped Heathwren (Southern Flinders Ranges), Elegant parrot, Carpet Python, Yellow-footed Rock Wallaby, Common Brush-tail Possum, Flinders Worm-Lizard.</p>				
<b>Landscape context score</b>	1.09	<b>Vegetation Condition Score</b>	50.03	<b>Conservation significance score</b>	1.30
<b>Unit biodiversity Score</b>	70.89	<b>Area (ha)</b>	0.353	<b>Total biodiversity Score</b>	25.02

**Table 10. Block A, BAM Site A7 – diverse Acacia Shrubland near Nelshaby Gorge**

<b>Vegetation Association A7</b>	<i>Acacia ligulata/Dodonaea viscosa ssp. Tall Closed Shrubland +/- emergent Eucalyptus porosa / Callitris glaucophylla / Eucalyptus camaldulensis ssp. camaldulensis</i>
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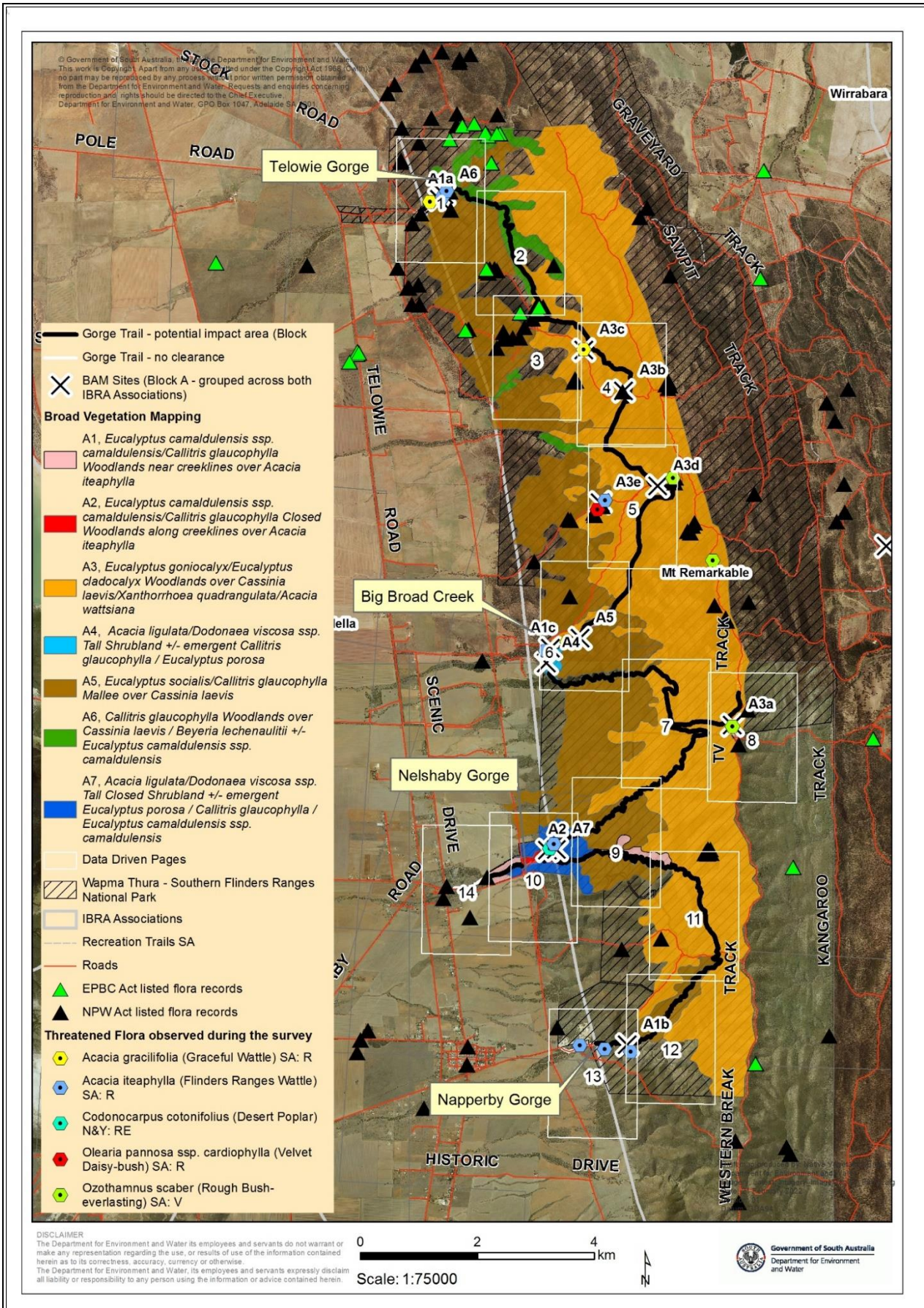


**Figure 18. Dense diverse *Acacia* Shrubland near Nelshaby Gorge with SA rare *Acacia iteaphylla* and ‘Regionally Extinct’ *Codonocarpus cotonifolius* in the foreground. Right: Existing track near the old quarry and potential walking area which should be used rather than clearing additional vegetation in this high value area.**

<b>General description</b>	<p>BAM A7 was not specifically surveyed given time restraints but was separated post field given its high value compared with the BAM A4 Shrubland and that DEW mapping indicated the shrubland might extend further.</p> <p>It is expected the shrubland is in good to excellent condition with high diversity and a unique mix of species given the unusual location on a wide creek but with arid climatic conditions. A small population of <i>Codonocarpus cotonifolius</i> (Desert Poplar) was observed on the creek flanks which was considered Regionally Extinct in the N&amp;Y Region. It is also expected this community will provide important habitat for Nationally listed Flinders Ranges Short-tailed Grass Wren.</p>
<b>Threatened species or community</b>	<p><u>Threatened flora observed:</u> <i>Acacia iteaphylla</i>, Regionally extinct <i>Codonocarpus cotonifolius</i> (N&amp;Y);  <u>Other threatened flora included in scoresheets:</u> <i>Olearia pannosa ssp. pannosa</i>, <i>Rytidosperma tenuis</i>, <i>Olearia pannosa ssp. cardiophylla</i>.</p> <p><u>Threatened fauna observed:</u> none.  <u>Threatened fauna included in scoresheet:</u> Eastern Shrike-tit, Diamond Firetail, Gilberts Whistler, Hooded Robin, Jacky Winter, Painted Buttonquail, Scarlet Robin, White-wing Chough, Brush Bronzewing, Elegant Parrot, Carpet Python, Yellow-footed Rock Wallaby, Flinders Ranges Short-tailed Grass Wren, Flinders Worm-Lizard, Black Falcon, Peregrine Falcon.</p>

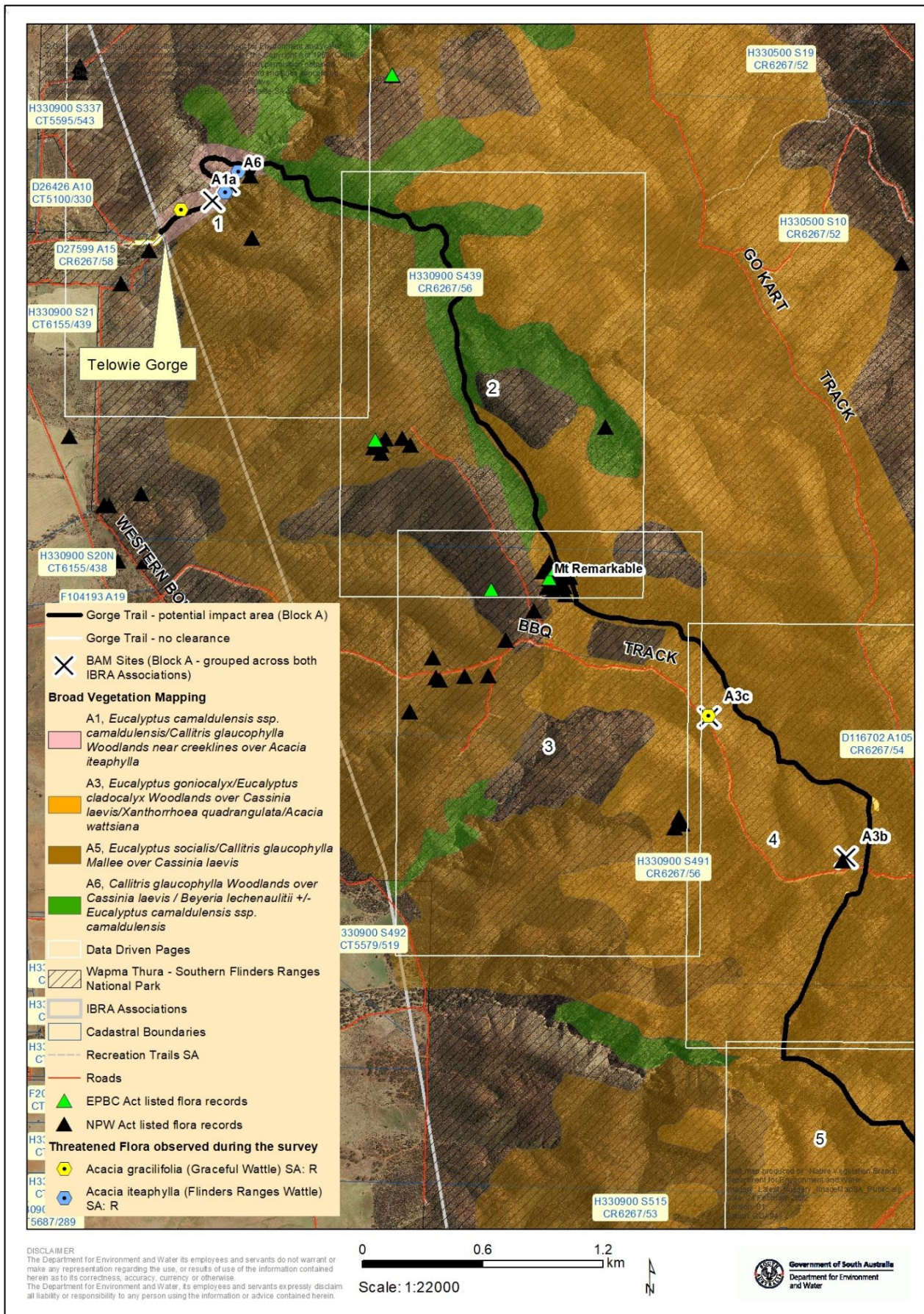
<b>Vegetation Association A7</b>	<i>Acacia ligulata/Dodonaea viscosa ssp. Tall Closed Shrubland +/- emergent Eucalyptus porosa / Callitris glaucophylla / Eucalyptus camaldulensis ssp. camaldulensis</i>				
<b>Landscape context score</b>	1.09	<b>Vegetation Condition Score</b>	72.98	<b>Conservation significance score</b>	1.26
<b>Unit biodiversity Score</b>	100.23	<b>Area (ha)</b>	0.01	<b>Total biodiversity Score</b>	1





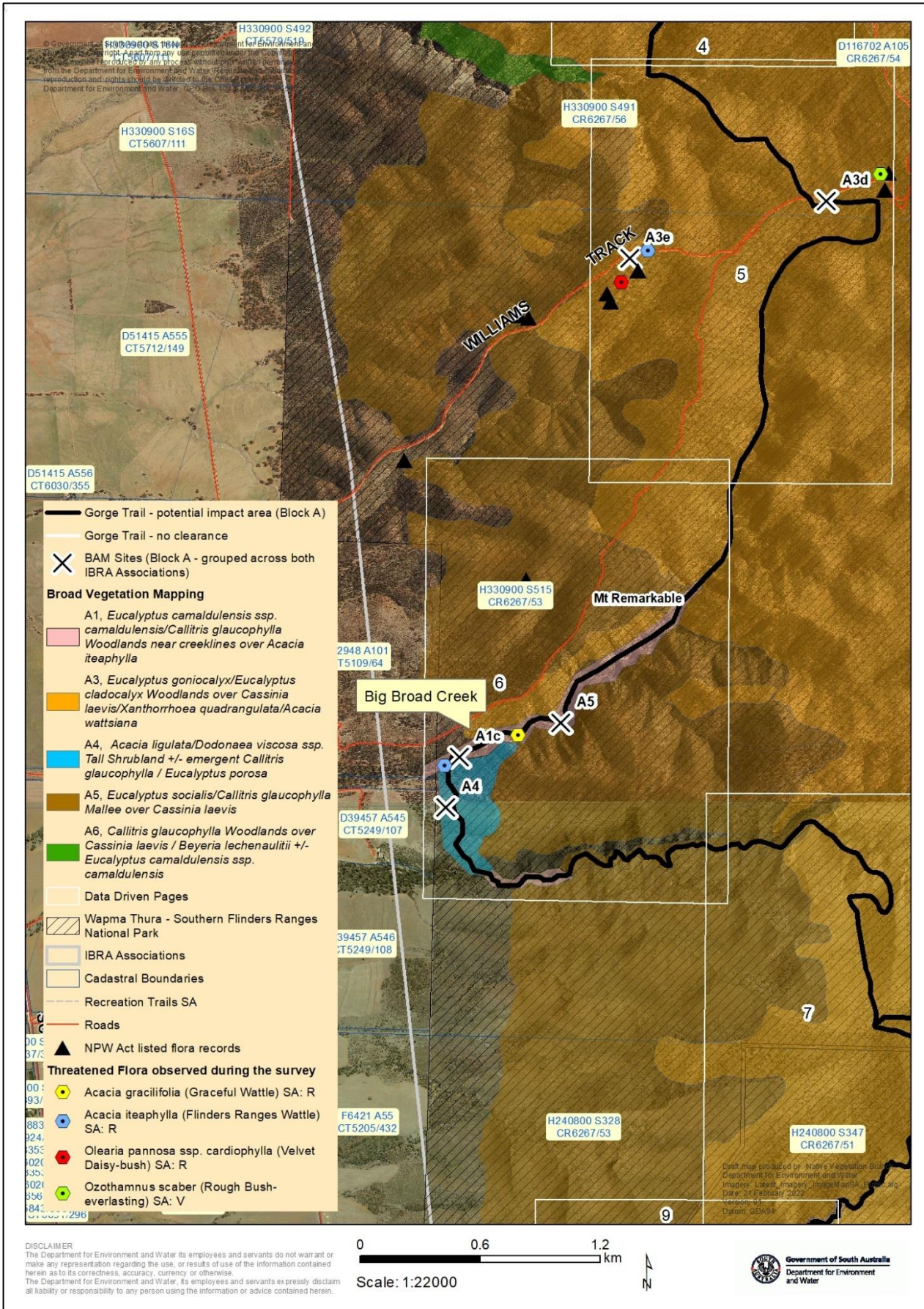
**Figure 19. Overview of proposed Epic Trail showing broad vegetation communities and correlating BAM sample points. Threatened flora observed during the survey are depicted by species, whilst threatened flora records based on BDBSA records data are shown as generic symbols (individual species cannot be displayed at this scale).**





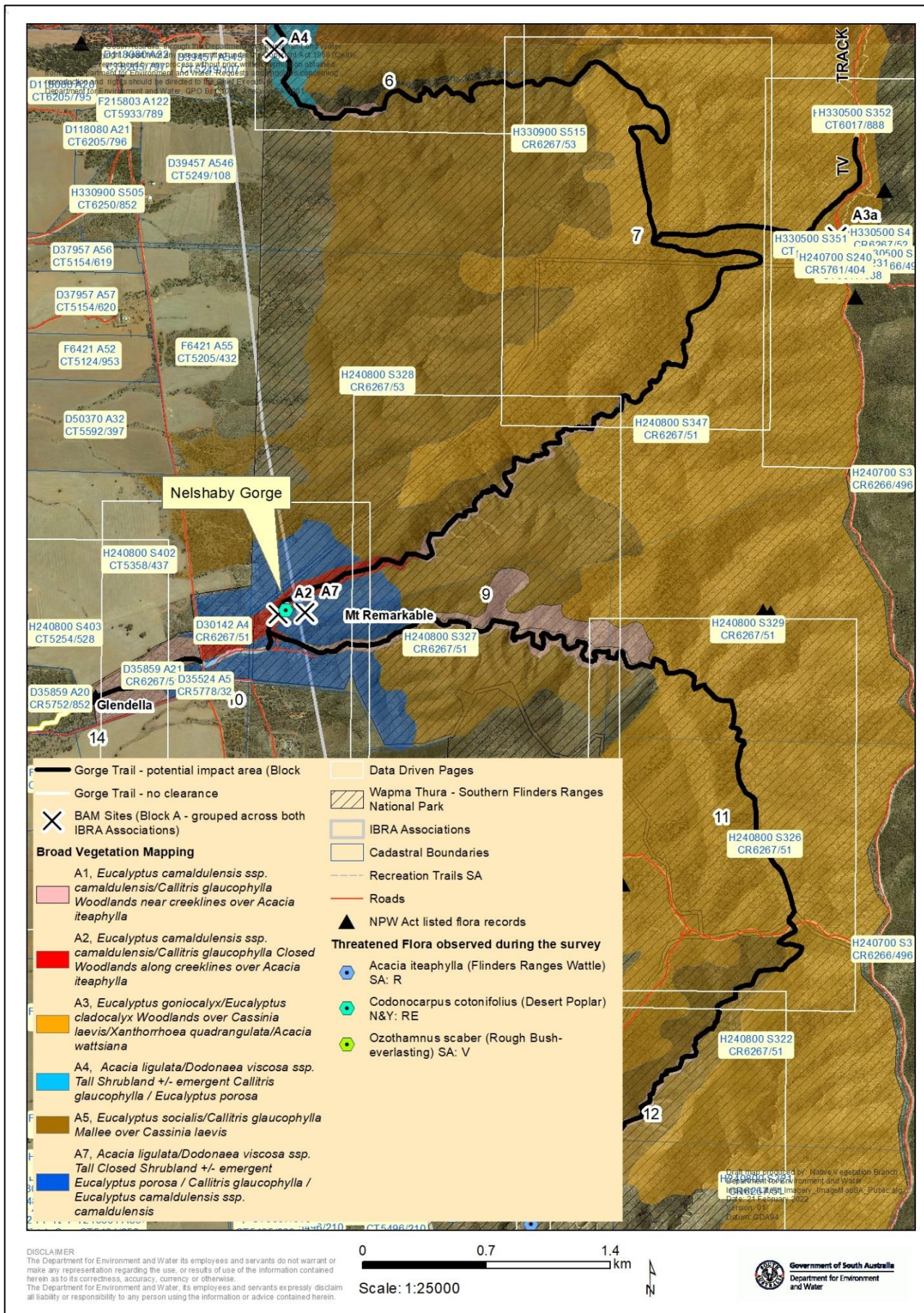
**Figure 20. Vegetation Block A – map pages 1 to 4 showing broad vegetation types and correlating BAM sample points. Threatened flora observed during the survey are depicted by species, whilst threatened flora records based on BDBSA records data are shown as generic symbols (individual species cannot be displayed at this scale).**





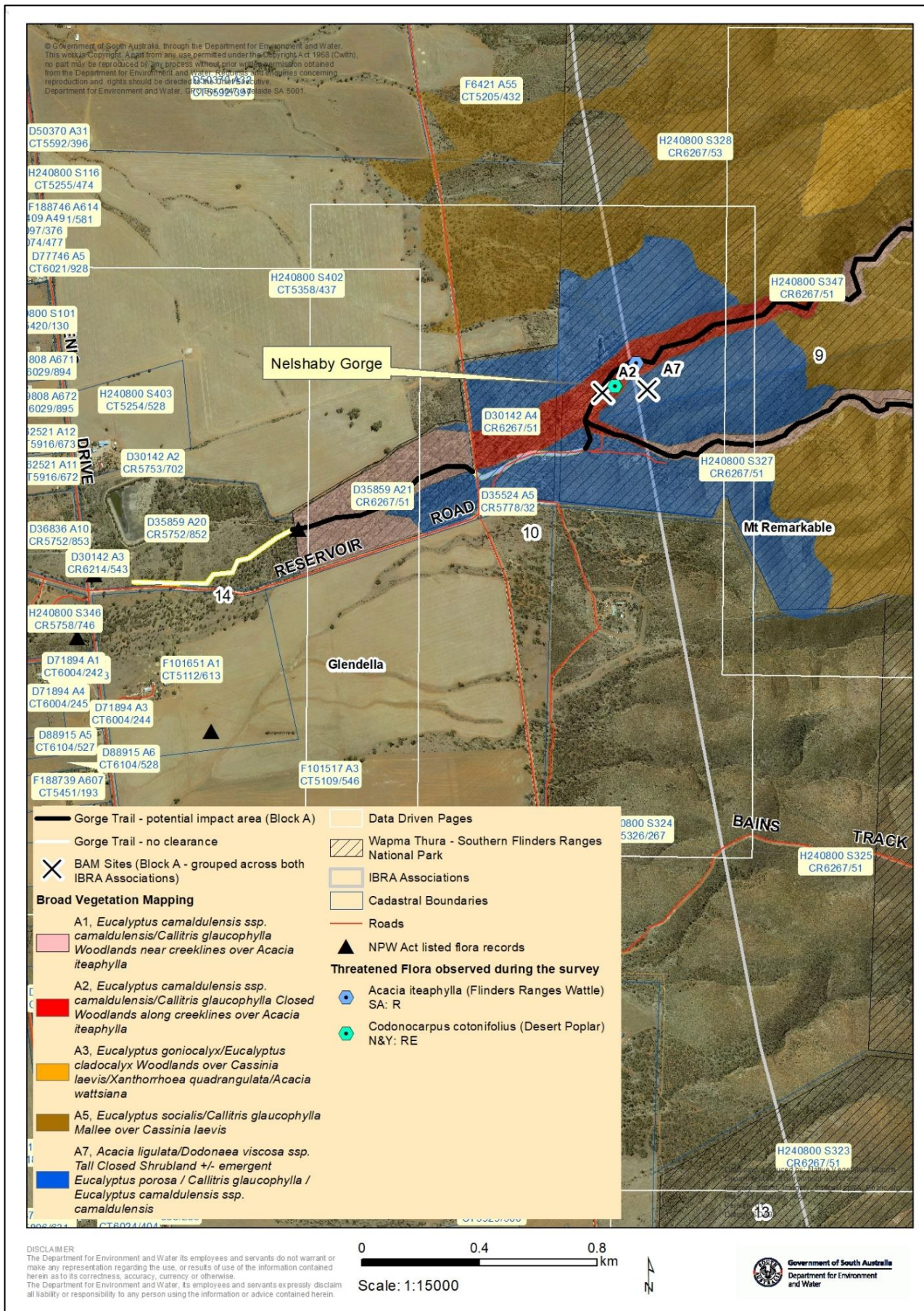
**Figure 21. Vegetation Block A – map pages 5 to 7 showing broad vegetation types and correlating BAM sample points. Threatened flora observed during the survey are depicted by species, whilst threatened flora records based on BDBSA records data are shown as generic symbols (individual species cannot be displayed at this scale).**





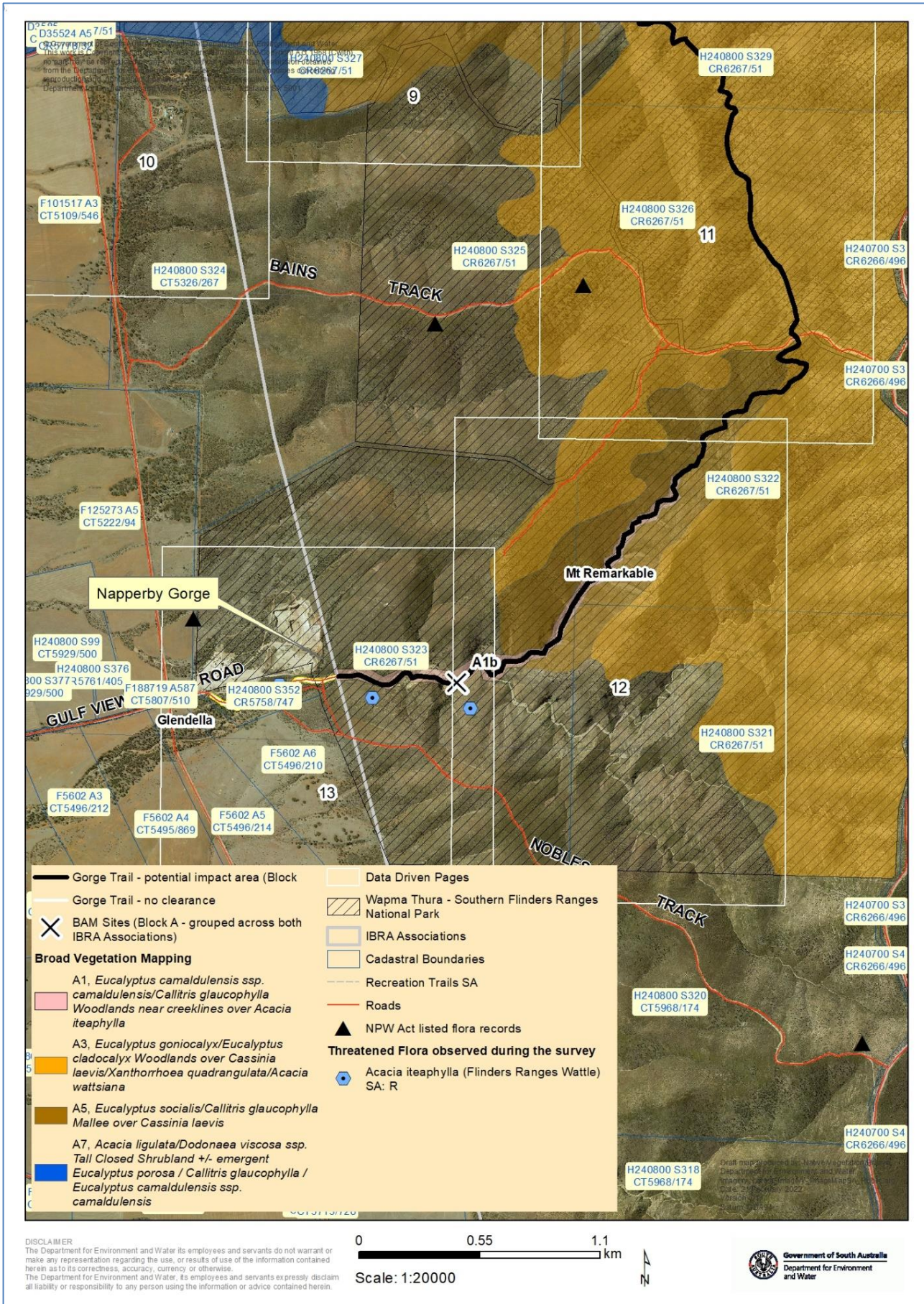
**Figure 22. Vegetation Block A – map pages 7 to 11 (1:25,000) showing broad vegetation types and correlating BAM sample points. Threatened flora observed during the survey are depicted by species, whilst threatened flora records based on BDBSA records data are shown as generic symbols (individual species cannot be displayed at this scale).**





**Figure 23. Vegetation Block A – Nelshaby Gorge Area (1:15,000).** Threatened flora observed during the survey are depicted by species, whilst threatened flora records based on BDBSA records data are shown as generic symbols (individual species cannot be displayed at this scale).





**Figure 24. Vegetation Block A – map pages 11 to 13 showing broad vegetation types and correlating BAM sample points. Threatened flora observed during the survey are depicted by species, whilst threatened flora records based on BDBSA records data are shown as generic symbols (individual species cannot be displayed at this scale).**



## 4.2. Threatened Ecological Communities and Threatened Species Assessment

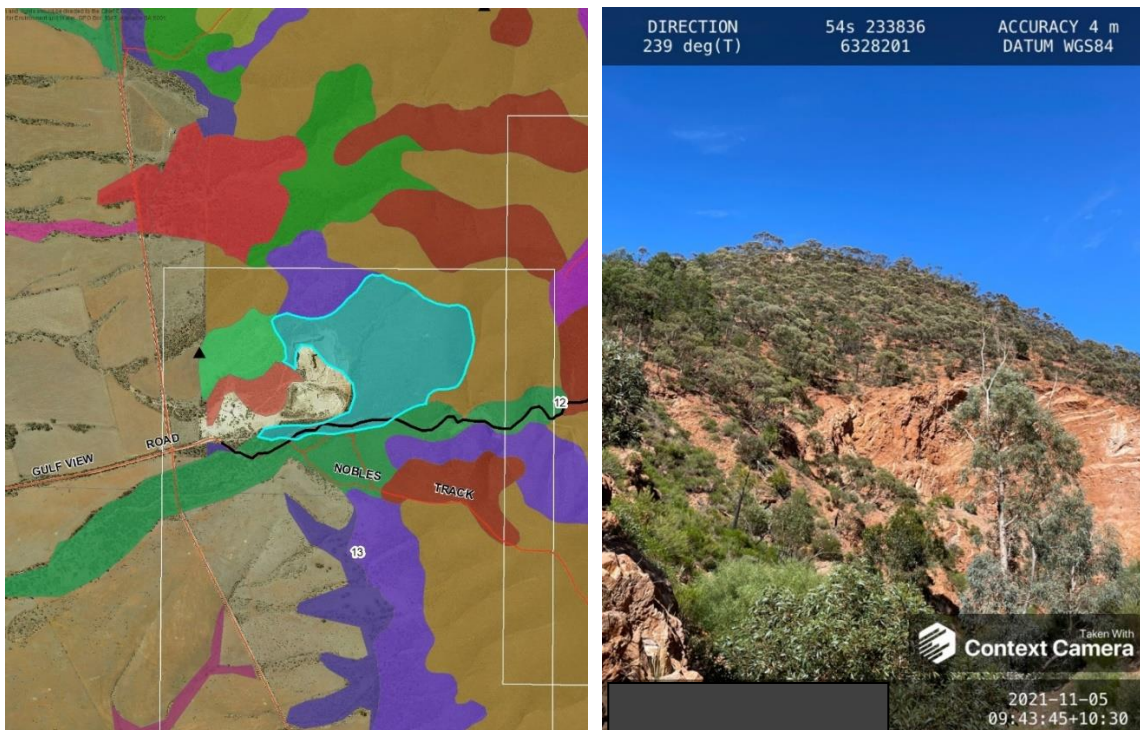
### 4.2.1. Threatened Vegetation Communities

Based on the EPBC PMST search it was found that one threatened community is likely to occur within the Project Area as follows:

- *E. odorata* +/- *E. leucoxydon* Grassy Low Woodland on loamy soils of low hills which is EPBC ACT Critically Endangered when meeting minimum condition criteria; and is also classified as SA Endangered based on the provisional list of threatened communities for SA, (DEH in progress).

This community is described as highly modified by clearance and grazing and the few examples in reserves are very small. *E. odorata* is largely confined to SA (DEH, in progress).

Remnant vegetation mapping (DEW) indicates the community extends over a small area at the southern extent of the proposed trail near Gulfview Road and Napperby Gorge (Figure 25). The Gorges Walk is proposed to wind through Woodlands in the Gorge and creek (BAM A1) where the community would be unlikely to occur. However, Peppermint Box Woodland possibly occurs on hills adjacent Napperby Gorge based on the appearance of vegetation (from a distance) (Figure 25); and based on DEW mapping (Figure 25). Should any Peppermint Box Woodland be found during micro-sighting, it should be avoided and where it cannot be avoided, an assessment against EPBC Act listing criteria and a self-assessment under the EPBC Act would be recommended. However, it seems unlikely that a small area of proposed trail would have a significant impact on the community provided appropriate mitigation strategies, including intensive weed and pathogen management, are implemented.



**Figure 25. Left: Peppermint Box Woodland mapped near the trail alignment based on DEW remnant vegetation mapping (aqua highlight). Right: Potential Peppermint Box Woodland at the top of Napperby Gorge based on appearance and DEW mapping (could not be accessed). This area will not be affected as the trail will be contained to Napperby Gorge.**

#### 4.2.2. Threatened Flora

The Gorges Walk 5km BDBSA search indicated that 57 threatened flora species have been observed within 5km of the proposed trail, including 250 individual specimen records. Of these, approximately 111 records are within the project area (e.g. within the map pages), with some records near the proposed trail, particularly on the lower slopes, likely due to high accessibility in these areas.

##### Nationally threatened flora

Of the species recorded within 5km, 11 are Nationally threatened, including six orchids. A further three species were identified in the PMST search. Seven species are considered to possibly occur (*Caladenia gladiolata*, *Caladenia xantholeuca*, *Olearia pannosa* ssp. *pannosa*, *Prasophyllum pallidum*, *Prasophyllum validum*, *Senecio megaglossus* and *Veronica parnkalliana* (Table 3)). The other species are considered unlikely to occur as there are few old records and/or the habitat may be deemed unsuitable. Based on discussion with the SA Herbarium the Nationally threatened species that are most likely to be in the trail alignment are *P. pallidum* and *O. pannosa* ssp. *pannosa*, both more likely on lower slopes. Both species have multiple populations in SA and it appears unlikely the trail would have any impact on overall populations. Regardless, the trail should be aligned to avoid any specimens observed.

Table 2 provides a summary of the Nationally threatened flora that have been recorded within 5km or were identified in the PMST search, their habitat preference, the map page number they have been recorded within and the likelihood of their occurrence. Based on discussion with the SA Herbarium, it was indicated that the anticipated risk to Nationally threatened species populations is low, based on the current trail alignment. However, the occurrence of Nationally threatened species cannot be ruled out and overall impact is currently unknown, therefore all orchid populations should be avoided during trail alignment selection and construction (noting orchids have limited visible life phase).

##### State and regionally threatened flora (Northern and Yorke).

Of the State threatened flora (not including those with a National listing), ten were classified as likely or known to occur whilst 21 were classified as possibly occurring. Species classified as unlikely to occur generally had very old or limited records; or habitat was considered unsuitable.

Threatened species found on site include State threatened *Acacia gracilifolia*, *Acacia iteaphylla*, *Olearia pannosa* ssp. *cardiophylla* and *Ozothamnus scaber*; and Regionally Extinct *Codonocarpus cotonifolius*. Other species considered most likely to occur include *Acacia montana*, *Anthocercis angustifolia*, *Cryptandra campanulata*, *Eucalyptus percostata*, *Logania saxatilis* and *Philothea angustifolia* ssp. *angustifolia*, acknowledging that many other species may occur (Table 13). These species have all been observed within the Project Area, had multiple records and it is expected there is suitable habitat on site. The SA Herbarium advised that SA threatened species *Caladenia coactilis* and *Caladenia flaccida* may also occur and it is expected a number of State rated species could occur in the trail alignment, particularly on rocky ridges and in *Callitris* Woodlands and damp areas. The proposed trail would not be expected to have long term impacts on overall populations of these widespread species, provided mitigation strategies are implemented, but any specimens or populations should be avoided if observed.

Four State listed species were observed as mentioned above (Table 11, Figure 19), noting that some grasses have not been identified to species level. Threatened flora species were observed at ten of the BAM sites and it is highly likely that threatened flora is very widespread, particularly on the rocky ridges, in the Sugar Gum and Long-leaf Box



Woodlands, in *Callitris* Woodlands and in the gorges and creeks. Orchids particularly are likely to occur but were outside their visible life phase at the time of the survey. Rare flora specimens observed were dominated by locally common species *Acacia iteaphylla* (Figure 27, Figure 28), with occasional *Acacia gracifolia* (Figure 29, Figure 30). *Ozothamnus scaber* (Figure 32) was observed on the ridgetop near the Bluff and scattered along tracks and in Woodlands on the higher slopes. One grazed specimen of *Olearia pannosa* ssp. *cardiophylla* was observed away from the proposed trail on Williams Track (Figure 31).

In addition to the NPW threatened flora species listed, a disjunct population of *Codonocarpus cotonifolius* (Desert Poplar) was found in Nelshaby Gorge (Figure 20). This species is classified as Regionally Extinct in the N&Y Region with the most recent records near Crystal Brook in the late 1880's and most recently from Clements Gap in 1912 (Figure 26). Therefore, these specimens represent an unusual occurrence outside its currently known range and an important remnant to be avoided. The species does not currently have a State or National rating like the only other SA species in its genera *Codonocarpus pyramidatus* (Slender Bell-fruit) which is rated Vulnerable under the EPBC Act and Endangered under the NPW Act.



**Figure 26. Distribution of *Codonocarpus cotonifolius* in SA (map derived from Flora Census SA). Records in the N&Y region are from 1883 (Crystal Brooke) and 1912 (Clements Gap).**

Table 11 provides a list of the threatened flora species observed during the survey, whilst Figure 27 to Figure 33 provides photos of some of the threatened plants specimens observed in the field. Figure 19 to Figure 24 provides maps of threatened species observed during the survey and the distribution of threatened species records under the NPW Act and the EPBC Act (represented as generic point data).

**Table 11. Threatened flora species observed during November 2021 survey.**

Scientific Name	Common name	NPW Act rating	Regional rating N&Y	Observation comment
<i>Acacia gracilifolia</i>	Graceful wattle	Rare	Rare	Occasionally in creeklines and patches on hills.
<i>Acacia iteaphylla</i>	Flinders Ranges Wattle	Rare	Rare	Common and abundant in creeklines and occasional patches on hills.
<i>Codonocarpus cotonifolius</i>	Desert Poplar	-	Regionally extinct	A small population scattered at Nelshaby Gorge.
<i>Olearia pannosa</i> ssp. <i>cardiophylla</i>	Velvet Daisy-bush	Rare	Endangered	One specimen at BAM A3e (Williams Track).
<i>Ozothamnus scaber</i>	Rough Bush-everlasting	Vulnerable	Endangered	Occasionally on ridge tops and tracks. Likely widespread on rocky ridges.



**Table 12. Nationally threatened flora species recorded in the Biological Databases of South Australia within 5km or identified in the 5km Protected Matters Search.**

Species (common name)		NP&W Act	EPBC Act	Date of last record	Data source	Record notes	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Acacia spilleriana</i>	Spiller's Wattle	EN	E	2016	1	One recent record 3km from the proposed trail near map page 8.	Endemic to South Australia and is restricted to northern Mount Lofty Ranges between Tarlee and Burra, growing in open mallee communities on low hills on calcareous soils.	UNLIKELY - very rare and only one record. Distinct plant.
<i>Acanthocladium dockeri</i>	Spiny Everlasting	CR	E	2008	1, 2	Six records near Telowie Rd west of the Park (Page 3).	Found mainly along road reserves in the mid-north region of South Australia, growing in grassland or low grassy shrubland. Originally collected from the Riverland but 'presumed extinct' there.	UNLIKELY - very rare and occurs on roadsides in grassland.
<i>Caladenia gladiolata</i>	Bayonet Spider-orchid	EN	E	2002	1, 2	Two records 1km north of proposed trail in <i>E. socialis</i> on map page 1.	"Two of the 4 known populations occur near Mount Remarkable. Known to grow in <i>E. leucoxyton</i> (SA Blue Gum)/ <i>E. cladocalyx</i> (SugarGum) Woodland in the NP (Willowi). It is likely that this species was widespread in fertile grasslands before settlement, but it is now rare and known from only 3 or 4 localities (Flora census). <i>Caladenia gladiolata</i> grows in <i>Eucalyptus leucoxyton</i> , <i>E. cladocalyx</i> Woodlands.	POSSIBLE– Recent records, possible suitable habitat.
<i>Caladenia macroclavia</i> (Non-current)	Large-club Spider-orchid	EN	E	2002	1, 2	Two records west of map page 3 on BBQ track roadside in Tussock Grassland.	Non-current but historically found in the South-east in South Australia, growing in heathlands and coastal scrublands, often in areas of high rainfall or in dry exposed environments in a variety of soil types.	UNLIKELY (non-current)
<i>Caladenia tensa</i>	Inland Green-comb Spider-orchid	EN	-	1986	1, 2	Two records outside of the park in farmland (?) - may be inaccurate.	Found in the upper South-east in South Australia, growing in dry woodland and mallee on sandy loams. Flowering from September to November.	UNLIKELY – old/unreliable records.

Species (common name)		NP&W Act	EPBC Act	Date of last record	Data source	Record notes	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Caladenia xantholeuca</i>	Flinders Ranges White Caladenia	EN	E	2002	1, 2	Four records north of map page 1.	Endemic to SA, known to have occurred in three sub-populations in the Southern Flinders Ranges. Two in Mt Remarkable NP and another in Telowie Gorge CP (now Wapma Thura - Southern Flinders Ranges NP). Thought to be extinct since 1982 the species was re-discovered and any sub-populations are considered to be critical for conservation. Occurs in <i>Callitris glaucophylla</i> woodland, often on south-facing slopes in heavily shaded areas, where it grows on mossy rock ledges and red-brown loam soils. The distribution overlaps with the “Peppermint Box (Eucalyptus odorata) Grassy Woodland of South Australia” EPBC Act-listed threatened ecological community.	POSSIBLE– suitable habitat, recent nearby records.
<i>Glycine latrobeana</i>	Clover Glycine	VU	V	1987	1	Two records several km east of trail outside of park.	Found in the southern Flinders Ranges, southern Mount Lofty Ranges and the South-east in South Australia, growing in grasslands and grassy woodlands on heavy soils.	UNLIKELY - few old records, habitat perhaps not suitable.
<i>Olearia pannosa</i> ssp. <i>pannosa</i>	Silver Daisy-bush	VU	V	2016	1, 2	Four records east of trail at southern end in <i>E. goniocalyx</i> or <i>E. cladocalyx</i> near map page 11.	Endemic to South Australia and found scattered in the southern part usually on roadsides and with few individuals.	POSSIBLE- on roadsides in woodland/ Mallee
<i>Prasophyllum pallidum</i>	Pale Leek-orchid	VU	R	1985	1, 2	Four records on map pages 2 and 3.	Endemic to South Australia and found in southern Flinders Ranges and the Mount Lofty Ranges, growing on the more fertile soils of woodland and well-grassed open forests.	UNLIKELY – no records in project area
<i>Prasophyllum validum</i>	Mount Remarkable Leek-orchid	VU	V	1985	1, 2	One record on map page 2, 3.	Little is known of the ecology or biology of the species, although it seems to prefer relatively dry woodland habitats. Currently 18 populations containing about 3,200 plants are known. In South Australia, <i>P. validum</i> occurs in <i>E. cladocalyx</i> woodland.	POSSIBLE – one old record but inaccessible area and suitable habitat on site.
<i>Senecio macrocarpus</i>	Large-fruit Fireweed	VU	-	-	2	None	Occurring in a variety of habitats including grasslands, sedgeland, shrublands and woodlands. Often in depressions that are waterlogged in winter, on sandy loam to heavy clay soils.	UNLIKELY– no records very rare and in water-logged depressions.



Species (common name)		NP&W Act	EPBC Act	Date of last record	Data source	Record notes	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Senecio megaglossus</i>	Superb Groundsel	VU	-	-	2	None	Endemic to South Australia and found in the Flinders Ranges, Mid-North and the Marne River, growing on rocky gorges and valley slopes in tall open shrubland, woodland, and open-woodland on variable soils of loam and clay loams.	POSSIBLE– suitable habitat but no records.
<i>Swainsona pyrophila</i>	Yellow Swainson-pea	VU	-	-	2	None	A fire responsive species. Short-lived, fire-adapted species that occurs in mallee vegetation communities in inland south-eastern Australia,	UNLIKELY – no records. However, may occur in woodland after fire
<i>Veronica parnkalliana</i>	Port Lincoln Speedwell	EN	E	1986	1, 2	Two records several km east of trail outside of park	Endemic to South Australia. It was first recorded from Eyre Peninsula but now only known from the southern Flinders Ranges. Germinates after fire.	UNLIKELY - few very old records.

Source; 1- BDBSA, 2 - Protected matters search tool, 3 – SA Herbarium.

NP&W Act; E= Endangered, V = Vulnerable, R= Rare.

EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable.

**Table 13. Summary of State threatened flora species recorded within 5km of the Project Area or observed during the survey.**

Species (common name)		NP&W Act	Date of last record	Record notes	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Acacia gracilifolia</i>	Graceful Wattle	R	2017	25 records, the vast majority in the northern area of the track (Page 1-4). Records adjacent Whytes Track, Holman Rd. Map pages 1, 2, 3, 4, 11.	Endemic to South Australia and restricted to the southern Flinders Ranges and northern Mount Lofty Ranges, growing on rocky hillsides and in gorges in open woodland scrub on shallow compact loam soil. Flowering between August and November.	KNOWN - multiple records, suitable habitat  <b>Sighted during survey</b>
<i>Acacia iteaphylla</i>	Flinders Ranges Wattle	R	2017	34 records scattered throughout the project area, including close to the track. Map pages 1, 2, 3, 5, 14, 11.	Endemic to South Australia and found on northern Eyre Peninsula eastward to the Flinders Ranges and northern Mount Lofty Ranges growing on hillsides amongst rocky outcrops or in valleys along rocky creek banks.	KNOWN - multiple records, suitable habitat  <b>Sighted during survey</b>
<i>Acacia montana</i>	Mallee Wattle	R	2009	Nine records all in the far north of the site generally growing in Sugar Gum Woodland or <i>E. socialis/E. gracilis</i> woodland. Record directly adjacent proposed trail on Page 2 and near BBQ track. Map pages 1, 2, 3.	Found on eastern Eyre Peninsula, southern Flinders Ranges, northern Mount Lofty Ranges and the lower Murray region in South Australia, growing in open scrub on hard alkaline red duplex and grey-brown calcareous loamy soils	LIKELY - multiple records, suitable habitat
<i>Anogramma leptophylla</i>	Annual Fern	R	1989	Two records east of Page 4.	Common on damp banks amongst grasses or in rocky crevices. In Tasmania <i>Anogramma leptophylla</i> grows in shallow soil layers over rock, on exposed or semi-exposed outcrops in dry or damp sclerophyll forest. Plants are mostly found on rock ledges, often on, or just inside, the drip line of the overhead rock-face. The substrate is variable, including dolerite, basalt and sandstone.	UNLIKELY - may occur in gullies and moist areas. If present but unlikely to be affected.
<i>Anthocercis angustifolia</i>	Narrow-leaf Ray-flower	R	1996	Seven records in the northern section of the trail growing in <i>Callitris</i> Woodland, <i>Acacia ligulata</i> shrubland and Mallee. Record directly adjacent track on Page 2/3. Records on map pages 1, 2 and 3.	Endemic to South Australia and found in the Flinders Ranges and the southern Mount Lofty Ranges growing on steep rocky slopes on clay-loam; prolific particularly after fires.	LIKELY – particularly in northern section.



Species (common name)		NP&W Act	Date of last record	Record notes	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Asperula syrticola</i>	Southern Flinders Woodruff	R	1991	Two old records in <i>E. socialis</i> Mallee on Page 1 and 6	Grassy habitat.	POSSIBLE – grassland, lower slopes.
<i>Austrostipa breviglumis</i>	Cane Spear-grass	R	2019	Eight records east of the trail on map pages 4-8 near TV Track.	Found in the Flinders Ranges and the Mount Lofty Ranges in South Australia growing in hills and ridges on sandy loam soils.	POSSIBLE – recent records, more likely on ridges.
<i>Austrostipa densiflora</i>	Fox-tail Spear-grass	R	1992	One record on Bains Track in Sugar Gum Woodland. Map page 11.	Found in the Flinders Ranges, southern Mount Lofty Ranges and Kangaroo Island, growing in rocky sites on sandy, shallow rock or low-fertility soils.	POSSIBLE – rocky habitat.
<i>Austrostipa gibbosa</i>	Swollen Spear-grass	R	2020	Five records scattered through site.	Found in the southern Flinders Ranges, Mount Lofty Ranges and the South-east in South Australia growing on rich loamy soil along creeks and seasonally wet areas in woodland and grassland.	POSSIBLE – low lying areas.
<i>Bothriochloa macra</i>	Red-leg Grass	R	1997	One record 4.9km north of the site.	Found mainly in the southern part of South Australia south of Port Augusta but with a few scattered records further north in grasslands and grassy woodland communities but often in degraded sites. Flowering between December and April.	POSSIBLE – few records but suitable habitat on lower slopes.
<i>Brachyscome ciliaris</i> var. <i>subintegrifolia</i>		R	1978	One historical record (1978) at southern extent of site near proposed trail. Map page 13.	Limited information - favouring red earths and grey sands over limestone or clay, in disturbed areas and on the margins of salt pans.	UNLIKELY - one very old record and potentially unsuitable habitat.
<i>Brachyscome parvula</i>	Coast Daisy	R	2011	Two records at the southern extent near page 12 in <i>E. gonicalyx</i> Woodland.	Scattered eastward from the Mount Lofty Ranges to the lower South-east in South Australia, growing on coastal cliffs and saline, marshy ground near the sea, to inland grassland, woodland and forest.	UNLIKELY – marshy areas.
<i>Caladenia coactilis</i>	Flinders Ranges Caladenia	R	2007	Four records spread throughout the site. Map pages 2, 3.	This <i>Caladenia</i> usually grows in open forest and is found in the southern Flinders Ranges and northern Mount Lofty Ranges.	POSSIBLE - woodlands/forests.
<i>Caladenia flaccida</i>	Drooping Spider-orchid	V	2007	Three records in the north of the site (page 2/3). One record right on proposed trail on Page 2/3.	Limited information. Grows on ridges and slopes in sclerophyll forest with <i>Callitris</i> , in sandy soils or clay loams. Flowering from August to October.	POSSIBLE - woodlands/forests.

Species (common name)		NP&W Act	Date of last record	Record notes	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Caladenia saxatilis</i>	Star Spider-orchid	R	2007	Three records, 3km north of trail.	Limited info - This spider orchid occurs in the Flinders Ranges, Northern Lofty, Murray and Yorke Peninsula botanical regions of South Australia where it grows among rocks in tall forest.	POSSIBLE - rocky areas/woodlands.
<i>Caladenia stellata (NC)</i>	Star Spider-orchid	R	1988	Two records directly adjacent trail on Page 2, 3.	<i>Callitris</i> woodland.	POSSIBLE - nearby records, suitable habitat.
<i>Callitriche umbonata</i>	Water Starwort	V	1989	One old record 4.5km east of proposed trail	Found along the Murray River and the South-east in South Australia, growing in damp and swampy places.	UNLIKELY - few records, marshy habitat. May occur in damp areas in creeks but unlikely to be affected if present.
<i>Crassula peduncularis</i>	Purple Crassula	R	1988	One old record 4.5km east of trail	Grows in marshy areas which are rarely flooded; occurring mainly in south-eastern Australia.	UNLIKELY - few records, marshy habitat. May occur in damp areas in creeks but unlikely to be affected if present.
<i>Cryptandra campanulata</i>	Long-flower Cryptandra	R	2008	Two records on page 2, 3 and BBQ track.	<i>Cryptandra campanulata</i> Schltld. grows in rocky habitats of the northern Mount Lofty Ranges and southern Flinders Ranges.	LIKELY – recent records, may occur in rocky habitat.
<i>Dianella longifolia var. grandis</i>	Pale Flax-lily	R	2016	One record several km southeast of map page 12	The taxonomy of the <i>Dianella longifolia</i> group is under revision and the distribution is likely to change. This species was previously recorded from the southern Flinders Ranges, Mount Lofty Ranges and the South-east in South Australia, growing in grassy woodland.	POSSIBLE – recent record, grassy areas e.g. Peppermint Box Woodland. Unlikely to be affected.
<i>Diuris behrii</i>	Behr's Cowslip Orchid	V	1988	One old record nearly 5km east of site.	Found in the southern Flinders Ranges and the Mount Lofty Ranges with a few records from Eyre Peninsula growing in native grassland, open woodland and grassy forest; grows on more fertile soils, especially amongst Kangaroo Grass and <i>Triodia</i> on gentle slopes and flats.	UNLIKELY - one old record.
<i>Elatine gratioloides</i>	Waterwort	R	1997	Two records, at northern and southern ends of site. Map pages 1 and 14.	Found scattered across South Australia except for Kangaroo Island, growing in or on the margins of stationary or slow-flowing water to 40 cm deep.	POSSIBLE - in wet areas. Could be avoided and unlikely to be affected if present.
<i>Eremophila subfloccosa ssp. glandulosa</i>	Green-flower Emubush	R	1990	Four old records, some near proposed trail near map pages 2 and 3.	Limited information. <i>Eremophila subfloccosa</i> can be grown in a range of soil types but thrives in alkaline soils.	POSSIBLE – somewhat recent records, suitable habitat. Distinctive species, can be avoided.



Species (common name)		NP&W Act	Date of last record	Record notes	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Eucalyptus albens</i>	White Box	R	1970	Five records scattered widely, some near track (map page 2).	Confined in SA as scattered trees amongst more numerous intermediates between this species and <i>E. microcarpa</i> to an area south of Melrose. Although it is rare throughout SA it occurs commonly around Melrose. Found in the southern Flinders R, growing in undulating to hilly terrain on loam to clay soils.	POSSIBLE – nearby (but old) records and suitable habitat on lower slopes. Tree removal will be avoided so unlikely to be affected if it is found to occur.
<i>Eucalyptus cajuputea</i>	Green Mallee	R*	2019	Eight records some in the vicinity of the trail on map page 2, 3 and near 5.	Growing on rocky hillslopes and ridges and deeper soils on footslopes and undulating plains.	POSSIBLE - but can be avoided if observed.
<i>Eucalyptus percostata</i>	Ribbed White Mallee	R	2009	13 records in or near park including close to the proposed trail on pages 1, 2 and 3.	Endemic to South Australia and found in the southern Flinders Ranges between Quorn and Napperby, growing on well-drained clay-loams in woodland and mallee on slopes and foot of rocky hills.	LIKELY - but can be avoided if observed.
<i>Eucalyptus viridis ssp. viridis (NC)</i>	Green Mallee	R	1986	One old record several km north of trail	? Non-current	UNLIKELY – if observed can be avoided.
<i>Glycine tabacina</i>	Variable Glycine	V	2011	Five records several km east of proposed trail	Found in the southern Flinders Ranges, southern Mount Lofty Ranges and the lower South-east in South Australia, growing in <i>Eucalyptus camaldulensis</i> woodland, more often in shady or moist gullies on sandy loam soils.	POSSIBLE - in gullies (e.g. Redgum Woodland).
<i>Juncus radula</i>	Hoary Rush	V	2020	One recent record 3.3 km from southern end of trail	Found in the southern Flinders Ranges, Mount Lofty Ranges and the upper South-east, growing on seasonally damp areas in depressions and along drainage lines in woodland and open grassland.	UNLIKELY - no records within trail alignment. May occur in damp areas but could be avoided.
<i>Logania saxatilis</i>	Rock Logania	R	2011	15 records near map page 2, 3 and 4 and one record on map page 11.	Endemic to South Australia and found in the Flinders Ranges and the Mount Lofty Ranges, growing on steep-sided sandstone gorges in open woodland community and in crevices of rocky outcrops in shallow sandy or clay-rich soils.	LIKELY - multiple records, suitable habitat. Avoid if observed.
<i>Maireana rohrlachii</i>	Rohrlach's Bluebush	R	1981	One old record 600m north of trail, map page 1.	Heavy soil, clay, dams etc.	UNLIKELY - prefers heavy soil near dams etc. One old record.
<i>Mentha saturoioides</i>	Native Pennyroyal	R	2008	Three records several km east of trail.	Found scattered from the Gammon, Flinders and Mount Lofty Ranges, southern Eyre Peninsula and the upper South-east in South Australia, growing on heavy, seasonally wet soils.	UNLIKELY – no records near trail. May occur in damp areas but could be avoided. Distinctive species.

Species (common name)		NP&W Act	Date of last record	Record notes	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Olearia pannosa</i> ssp. <i>cardiophylla</i>	Velvet Daisy-bush	R	2005	seven records close to tracks near the trail mainly in <i>E. goniocalyx</i> and <i>E. socialis</i> woodland. Map pages 2, 5, 8 and 11.	Velvet Daisy-bush occurs mainly in dry open forest, on shallow rocky soils where the mean annual rainfall ranges from 450 to 650 millimetres.	KNOWN – recent records, shallow rocky areas and hills. <b>Sighted during survey</b>
<i>Olearia picridifolia</i>	Rasp Daisy-bush	R	1988	One old record map 2/3.	Found mainly in mallee and heath on alkaline soils derived from limestone or dunes.	POSSIBLE - in mallee and heath.
<i>Ozothamnus scaber</i>	Rough Bush-everlasting	V	2011	Six records on lower eastern slopes of <i>E. goniocalyx</i> and <i>E. cladocalyx</i> on map pages 4 and 5.	Known to occur in peppermint box woodland. Endemic to South Australia and found in the Flinders Ranges.	LIKELY – on higher slopes and in Woodlands <b>Sighted during survey</b>
<i>Philothea angustifolia</i> ssp. <i>angustifolia</i>	Narrow-leaf Wax-flower	R	2007	Three records on map pages 2, 3 and near 4. In <i>Callitris</i> and Sugar Gum Woodlands.	Unknown – records in <i>Callitris</i> and Sugar Gum.	LIKELY – several recent records, suitable habitat.
<i>Phyllangium sulcatum</i>		V	1992	Two records 2.5 km north of trail.	Found on northern Eyre peninsula and the Flinders Ranges in South Australia, growing in sheltered, rocky areas on shallow soils overlaying rock.	UNLIKELY – can be avoided if present in rock crevices.
<i>Rytidosperma tenuis</i>	Short-awn Wallaby-grass	R	1999	One record right adjacent proposed trail on map 1.	Growing conditions - cool moist to well-drained soil in grassy forests.	POSSIBLE - local record, suitable habitat on lower slopes.
<i>Santalum spicatum</i>	Sandalwood	V	2011	Eight records at northern and southern extent.	Found scattered across the central region of South Australia. Drier areas and Mallee.	POSSIBLE - in drier areas.
<i>Senecio laceratus</i>	Cut-leaf Groundsel	R	1900	One old record at northern extent of trail in <i>E. socialis</i> Mallee on map page 1.	Near water holes throughout the arid ranges of central Australia, nowhere abundant.	UNLIKELY – very old record.
<i>Solanum eremophilum</i>	Rare Nightshade	R	1997	Four records in <i>E. porosa</i> woodland in drainage lines near track extent on map page 14.	An inadequately known species, recorded from scattered localities in S.A., N.S.W. and VIC (Flora SA 2022).	UNLIKELY - very old records



Species (common name)		NP&W Act	Date of last record	Record notes	Species known habitat preferences	Likelihood of use for habitat – Comments
<i>Spyridium bifidum</i> ssp. <i>bifidum</i>	Marble Range Spyridium	V	2011	Three records near map page 11 and 12 in Sugar Gum Woodland.	Limited information - likely woodland/mallee.	POSSIBLE – recent records, suitable habitat.
<i>Thelymitra aristata</i>	Great Sun-orchid	E*	2011	One old record in sensitive area map 2/3.	? Out of known range. Found in the south-east in South Australia, north of Mt Gambier, growing in clay or gravel soils in forest or scrubland around swamp margins in damp sands.	UNLIKELY - very old records, out of species range.
<i>Thelymitra grandiflora</i>	Great Sun-orchid	R	2007	Two records near map 12 in <i>E. goniocalyx</i> / <i>E. cladocalyx</i> Woodland.	The giant sun orchid grows in forest and scrubland, often in rocky places. It is widespread and locally common in the Mount Lofty Ranges and Southern Flinders Ranges.	POSSIBLE - local but old record, suitable habitat.
<i>Thysanotus tenellus</i>	Grassy Fringe-lily	V	1992	Two records 2km east of track	Peppermint Box grassy woodlands.	UNLIKELY – unlikely to occur in trail alignment but may occur on lower slopes in Peppermint Box Woodland.
<i>Veronica decorosa</i>	Showy Speedwell	R	2006	Two records at northern end and map 11 in <i>E. goniocalyx</i> Woodland.	In rocky gorges and gullies and on ridge-tops mainly in the Flinders Ranges.	POSSIBLE – suitable habitat, recent record.
NP&W Act; E= Endangered, V = Vulnerable, R= Rare						

Photo log – threatened flora species



Figure 27. *Acacia iteaphylla* (Flinders Ranges wattle) (SA Rare) - Telowie Gorge.



Figure 28. *Acacia iteaphylla* (SA Rare). Left: widespread in Napperby Gorge. Right: Widespread in Big Broad Creek.





Figure 29. *Acacia gracilifolia* (Graceful Wattle) (SA Rare) in Telowie Gorge.



Figure 30. *Acacia gracilifolia* (Graceful Wattle) (SA Rare) at BAM Site A3c.





Figure 31. *Olearia pannosa ssp. cardiophylla* (Velvet Daisy-bush) (SA Rare) at BAM Site A3e.



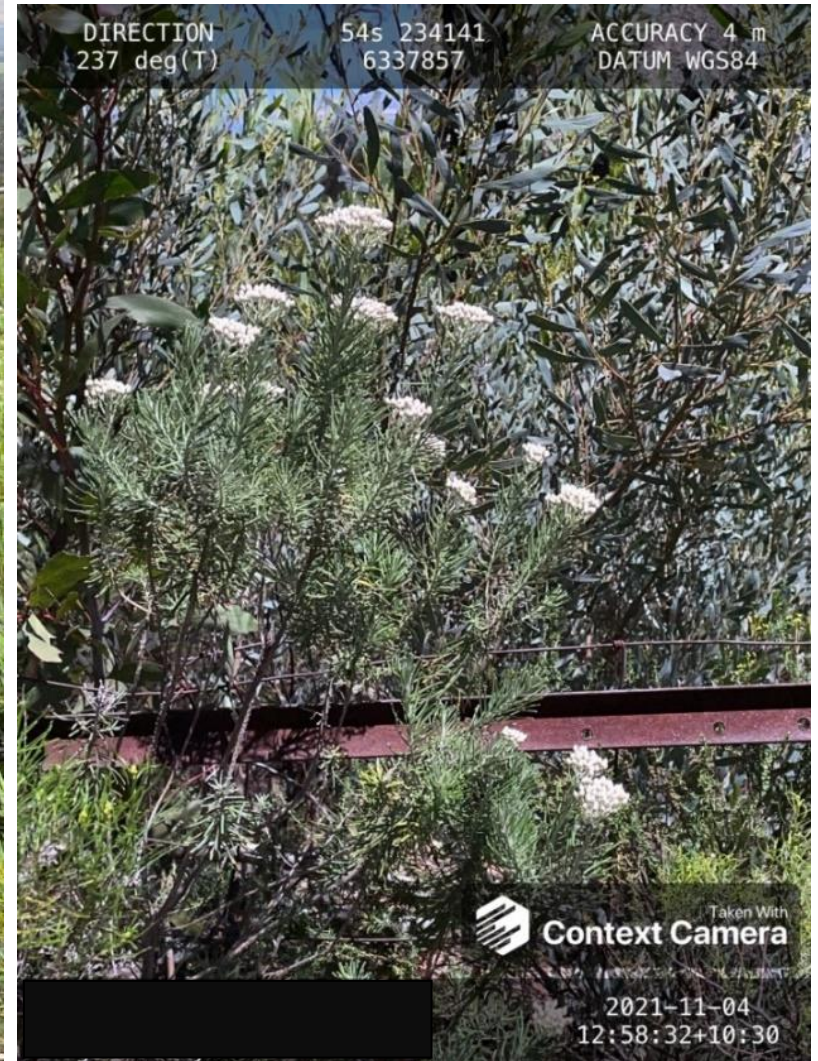


Figure 32. *Ozothamnus scaber* (Rough Bush Everlasting) (SA Vulnerable) at the Bluff and along the Williams Track.





Figure 33. *Codonocarpus cotonifolius* (Desert Poplar) - described as regionally extinct in N&Y Region (unusual occurrence) and must be avoided.



### 4.2.3. Desktop Assessment Fauna

The National Park is considered an important refuge as it comprises somewhat un-fragmented blocks of native vegetation which are largely weed and feral predator free in some areas. Linear clearance through more intact areas may impact on threatened fauna species by providing a corridor for weeds and feral predators.

Threatened fauna species considered known or likely to utilise habitat within the site include Nationally threatened species Short-tailed Grasswren (Flinders Ranges subspecies) which is expected to occur in the Sheoak Woodlands over *Triodia* in the Nelshaby Gorge area. The park is also known habitat for Nationally threatened Yellow-footed Rock-wallaby which utilise habitat in the Gorges and surrounding landscapes. The site may also provide habitat for the Flinders-ranges Worm lizard which has a National listing but is not listed under the NPW Act.

State listed species known or likely to utilise habitat on site include threatened birds Chestnut-rumped Heathwren, Crested Shrike-tit, Diamond Firetail, Gilberts Whistler, Hooded Robin, Jacky Winter, Painted Buttonquail, Scarlet Robin, White-winged Chough, Elegant Parrot and Peregrine Falcon. Carpet Python may occur near creeklines lines with large Gums, whilst Brush-tailed Possum may utilise areas in the vicinity of trees with hollows.

A disjunct population of native mouse known as Desert Mouse (*Pseudomys desertor*) is also known from the Telowie Gorge area (pers. Comm. G. Carpenter (NVB Branch, DEW)). The species is not rated for SA but may represent an unusual occurrence requiring further investigation into its taxonomy and distribution.

Table 14 provides a summary of species identified as occurring within 5km based on the BDBSA assessment, the Protected Matters Search Tool, onsite observations and fauna experts within the NVB. Figure 34 indicates the general distribution of records of fauna species threatened under the EPBC Act and NPW Act.

**Table 14. Species observed on site, or recorded within 5km of the application area since 1995, or the vegetation is considered to provide suitable habitat**

Species (common name)		EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
<b>Aves</b>							
<i>Biziura lobata menziesi</i>	Musk Duck	-	R	1	2002	The nest is a large cup of trampled vegetation, loosely lined with fine grasses and feathers, and is hidden in dense reeds. One clutch of eggs is laid each year. They mainly feed on animals, including aquatic insects, crustaceans, snails, shellfish, fish, frogs and ducklings, but some seeds of aquatic plants are also eaten on occasion.	UNLIKELY – habitat not suitable.
<i>Corcorax melanorhamphos</i>	White-winged Chough	-	R	1	2003	Found in open forests and woodlands. The species tends to prefer the wetter areas, with lots of leaf-litter, for feeding, and available mud for nest building.	LIKELY - suitable habitat exists onsite, species recently recorded. Given the linear nature of the development, this species and its habitat is highly unlikely to be impacted by the works.
<i>Falco hypoleucos</i>	Grey Falcon	VU	R	2	No records within 5km	Restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. It favours lightly timbered and untimbered lowland plains that are crossed by tree-lined watercourses (Schoenjah in litt. 2016 in Birdlife 2022) but frequents other habitats including grassland and sand dune habitats (J. Schoenjahn in litt. 2016 in Birdlife 2022).	UNLIKELY – no previous records of it occurring. Nearest records >13km away. If present would not be affected by the proposal.
<i>Falco peregrinus macropus</i>	Peregrine Falcon	-	R	1	2000 (Also observed)	Small numbers breed on cliff faces and in large hollows in red gums and sugar gums (pers. Comm. Graham Carpenter)	KNOWN – Species known from project area. Expected to utilise habitat for flying over, perching, roosting in cliffs and large hollows in Creeklines. Given there it is intended that large trees will be retained, the trail would not have impact on the



Species (common name)		EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
					during survey)		species. Specific focus should be given to avoiding clearance of trees with hollows.
<i>Falco subniger</i>	Black Falcon	-	R	1	2001	The Black Falcon is found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas. It roosts in trees at night and often on power poles by day (Birdlife Australia).	POSSIBLE – Recent nearby records. May occur along Gorges.  The proposed linear clearance with limited (or no) clearance of trees is expected to have no impact on the species.
<i>Falcunculus frontatus</i>	Eastern Shriketit	-	R	G. Carpenter	2001 (Env Maps)	Red gum and blue gum woodlands (pers. comm. G. Carpenter)	POSSIBLE– suitable habitat on lower slopes. Given the linear nature of the proposed clearance and the intention to remove little or no trees, the proposal is expected to have no impact on the species.
<i>Hieraetus morphnoides</i>	Little Eagle	-	V	1	2004	The Little Eagle is seen over woodland and forested lands and open country, extending into the arid zone. It tends to avoid rainforest and heavy forest (Birds in Backyards 2022).	POSSIBLE – recent record, possible suitable habitat but unlikely to be affected.
<i>Hylacola pyrrhopygius pedleri</i>	Chestnut-rumped Heathwren (southern Flinders Ranges)	-	V	G. Carpenter	2010	Record within 5km. An isolated population occurs in the southern Flinders Ranges with records at Mt Remarkable and above Wirrabara in Long-leaf Box and Sugar Gum woodlands along highest parts (G. Carpenter pers. Comm.). The species forage mainly on the ground beneath dense, low vegetation, especially in areas with abundant fallen branches or rocks, and they sometimes also forage in low shrubs or low branches of small trees (Birdlife Australia).	KNOWN: multiple records, suitable habitat on slopes and ridges.  Given the linear nature of the proposed clearance, the proposal is expected to have no impact on the species. However, weed invasion and movement of feral predators along the trail poses an increased risk to species preferring habitat of lower vegetation stratum.
<i>Grantiella picta</i>	Painted Honeyeater	VU	R	2	-	The species inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, callitris, and trees on farmland or gardens. The species prefers	UNLIKELY – no records anywhere near the site Some mistletoe habitat occurs, but project is highly LIKELY to impact this species given removal of trees will be limited and there are no records of the species utilising habitat on the project area.

Species (common name)		EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						woodlands which contain a higher number of mature trees, as these host more mistletoes	
<i>Melanodryas cucullata</i>	Hooded Robin	-	R	1 G. Carpenter	2010	River Red Gum and Blue Gum woodlands plus Box woodlands (pers. Comm. G. Carpenter). Hooded Robins are found in lightly timbered woodland, mainly dominated by acacia and/or eucalypts. The Hooded Robin sits on exposed perches, such as dead branches and stumps and pounces on arthropods (mainly insects). It forages on or near the ground and constructs a cup-shaped nest of leaves and bark, bound with spiders' web, placed in a crevice, hollow or hole in a tree or stump.	LIKELY – Suitable habitat, multiple records. Proposal UNLIKELY to affect this species, particularly given there is low likelihood of many trees being removed.  However, weed invasion and movement of feral predators along the trail poses an increased risk to species utilising habitat of lower vegetation stratum.
<i>Microeca fascinans</i>	Jacky Winter	-	R	1	2000	Prefer open woodland with an open shrub layer and a lot of bare ground. Often seen in farmland and parks.	LIKELY - suitable habitat exists onsite on lower slopes. Given the linear nature of the clearance, this species and its habitat is highly UNLIKELY to be impacted by the works.
<i>Neophema elegans</i>	Elegant Parrot	-	R		2010	Inhabiting open habitats, the Elegant Parrot can be found in a wide variety of habitats, including grasslands, shrublands, mallee, woodlands and thickets, bluebush plains, heathlands, saltmarsh and farmland. Nesting in hollow branches of trees. Usually feed on the ground, where they take the seeds of grasses or low-growing shrubs.	LIKELY – Multiple records, suitable habitat exists onsite on lower slopes and along creeklines. Given the linear nature of the clearance and the low likelihood of tree removal, this species and its habitat is highly unlikely to be impacted by the works. The species is fairly mobile and adjacent habitat is widely available. However, removal of trees with hollows should be avoided.
<i>Pachycephala inornate</i>	Gilberts Whistler	-	R	1	2001	Box woodlands over <i>Acacia wattasiana</i> (pers. Comm. G. Carpenter). usually preferring to remain concealed among the foliage of the shrubs in mallee or acacia shrublands. dense, continuous or patchy understorey of shrubs such as acacias, <i>Eremophila</i> , <i>Dodonaea</i> or <i>Cassia</i> ; they inhabit these shrubs in the understorey (Birdlife 2022).	LIKELY – multiple records, widespread suitable habitat across site with areas of dense <i>Acacia</i> throughout ( <i>wattasiana</i> , <i>ligulata</i> , <i>iteaphylla</i> ).  Removal of midstorey shrubs is expected to have some limited impact on habitat for this species, but given the trail is long and linear overall impact to



Species (common name)		EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
							the species would be negligible with abundant shrubby vegetation.
<i>Pedionomus torquatus</i>	Plains Wanderer	CE	E	2	No records	Species inhabit sparse grasslands with c.50% bare ground, with most vegetation less than 5 cm in height and some widely spaced plants up to 30 cm high (Garrett et al., 2011).	UNLIKELY – Very rare. Habitat not suitable – prefers low open habitat). There are no records and no suitable habitat on site.
<i>Petroica boodang</i>	Scarlet Robin	-	R	1	2010	E. goniocalyx and Sugar Gum woodlands, plus Blue Gum woodlands.  The Scarlet Robin lives in open forests and woodlands. During winter, it will visit more open habitats such as grasslands and will be seen in farmland and urban parks and gardens at this time. Species forages on or near the ground and uses tree forks with dense cover to build nests.	LIKELY - suitable habitat exists onsite.  Given the linear nature of the clearance, this species and its habitat is highly unlikely to be impacted by the works. The species is fairly mobile and adjacent habitat is widely available. However, weed invasion and movement of feral predators along the trail poses an increased risk to species utilising habitat of lower vegetation stratum.
<i>Rostratula benghalensis (sensu lato)</i>	Painted Snipe	EN	E	2	No records	Generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains.	UNLIKELY – no suitable habitat or nearby records.
<i>Stagonopleura guttata</i>	Diamond Firetail	-	V	1 G. Carpenter	2010	Red Gum and Blue Gum woodlands plus Box woodlands (G. Carpenter pers. Comm.). Diamond Firetails are found in open grassy woodland, heath and farmland or grassland with scattered trees (Birdlife 2022). Diamond Firetails feed on the ground and generally eat ripe or partially ripe seeds and can be seen hopping around on the ground. The Diamond Firetail builds a nest with green grass blades and stems and lines it with fine	LIKELY – multiple records. Woodland s across site, particularly lower slopes.  The trail could potentially impact on some habitat of this species through shrub and tree removal, but given the linear clearance is UNLIKELY to impact on the species overall population.

Species (common name)		EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						grasses and feathers. The nest can be found in trees and shrubs with dense foliage	
<i>Turnix varius</i>	Painted Buttonquail		R	1 G. Carpenter	2004	E. goniocalyx and Sugar Gum woodlands, plus Blue Gum woodlands (G. Carpenter pers. Comm.). The species tends to prefer closed canopies with some understory and deep leaf litter on the ground. Painted Button Quail are active during the evening, night and early morning, feeding on the ground (Birdlife 2022)	LIKELY – multiple records, suitable habitat in some more wooded vegetation with litter on the ground.  The trail could potentially impact on habitat of this species through shrub and tree removal, and the mobilization of weeds and feral predators as the species utilises ground level litter and may be vulnerable to predators. However, given the narrow linear nature of the trail impact to the species is unlikely.
<i>Zoothera lunulata halmaturina</i>	Bassian Thrush	VU	-	1	1999	Mostly inhabits damp eucalypt forest or woodland. Densely forested areas and gullies are favored, usually with a thick canopy overhead, a thick understory of small trees and tall shrubs, and leaf-litter below. In much of its range, suitable habitat is confined to creek lines or dune swales where the birds forage for worms among damp leaf litter. Damp habitats seem particularly important in summer. In this region the species is known to occur in the southern Flinders Ranges from Wirrabara Forest Reserve and Telowie Gorge Conservation Park to Mt Remarkable National Park (DEH, 2008; Garnett et al., 2011, Schodde & Mason, 1999).	POSSIBLE - habitat exists onsite and the location is within the known distribution of this species although last record is more than 20 years ago.  This is a mobile species which may relocate during the construction period. Operation of the trail net work is unlikely to impact this species.
<b>Mammals</b>							
<i>Petrogale xanthopus</i>	Yellow-footed Rock-wallaby	VU	-	2	2015	The Yellow-footed Rock Wallaby inhabits rocky outcrops, cliffs and ridges in semi-arid country, ranging from sandstones, limestones and	KNOWN – Telowie Gorge is known habitat for this species. Vegetation removal along the trail is expected to have no impact on the species.



Species (common name)		EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						conglomerates in the Flinders Ranges, to granites in the Gawler Ranges and Olary Hills (Copley & Alexander, 1997 in DAWE 2022)). These rocky outcrops provide shelter sites that enable the wallabies to escape predators. Furthermore, these areas often contain permanent fresh water, although the supply may be restricted to mere soaks at the edges of rock faces (Lim et al., 1992 in DAWE 2022).	However, providing a corridor for feral predators through the gorges (Wallaby habitat) and into the high country of a currently un-developed wilderness may pose increased risk of predation. The trail should be monitored for signs of predators such as cats and foxes and an appropriate control program established should evidence of increased activity be observed.
<i>Trichosurus vulpecula</i>	Common Brushtail Possum	-	R	1	2011	Found in Eucalyptus and Sheoak woodlands. As arboreal animals, they make their nests (also known as dens) in tree hollows or other dark confined spaces such as hollow logs, dense vegetation or cork crevices.	POSSIBLE – No records but some suitable habitat may exist. suitable habitat exists onsite and recently recorded. Nature and extent of the clearance is not likely to have a significant impact on the species there is limited clearance of trees expected. Trees with hollows should not be removed.
<b>Reptilia</b>							
<i>Aprasia pseudopulchella</i>	Flinders Ranges Worm-lizard	VU	-	2	none	The species occurs in open woodland, native tussock grassland, riparian habitats and rocky isolates. It prefers stony soils, or clay soils with a stony surface, and has been found sheltering beneath stones and rotting stumps. The species is sometimes found underground debris and logs, or in ant and termite nests (Cogger 2000, Cogger et al. 1993; Wilson & Knowles 1988). Distribution overlaps with the EPBC Act-listed TEC Peppermint Box ( <i>Eucalyptus odorata</i> ) Grassy Woodland of SA	POSSIBLE – suitable habitat exists and the location is within the known distribution of this species. A few scattered near Mambray Creek. The species is also thought to be more widespread in SA and hence does not have a state listing. Nature and extent of the clearance is not likely to have a significant impact on this species (if present).
<i>Notechis scutatus ater</i>	Krefftt's Tiger Snake	VU	-	2	none	Restricted to wetter parts of the Flinders Ranges and Broughton River, within the 500 mm annual rainfall isohyet, along permanent and semi-permanent watercourses and forages in water for frogs, tadpoles and possibly fish. It occurs in rocky, often steep margins of watercourses that may dry to become isolated pools during the summer,	UNLIKELY – limited or no suitable habitat exists onsite. Previously, recorded within 5km of the site 15 years ago. However the record notes an observation of a "brown snake", which could on balance be another common species within the Park. The trail alignment is expected to cross water courses only in a few locations and they are

Species (common name)		EPBC Act	NPW Act	Data source	Date of last record	Species known habitat preferences	Likelihood of use for habitat – Comments
						beginning in September. Riparian vegetation (southern Flinders Ranges) consists of woodland dominated by river red gum ( <i>Eucalyptus camaldulensis</i> ) and sugar gum ( <i>Eucalyptus cladocalyx</i> ). (Wilson & Knowles 1988; Mirtschin & Bailey 1990; Cogger et al. 1993 in DAWE 2022b).	<p>expected to be degraded and not sitting water with the exception of the large watercourse near Melrose where clearance is limited or absent and a number of trails already exist.</p> <p>The nature and extent of the clearance is unlikely to have a significant impact on populations of this species.</p>
<i>Morelia spilota</i>	Carpet Python	-	R	1	2011	Occurs in mesic (areas with moderate amounts of moisture) to semiarid habitats. It is arboreal, terrestrial, and rock-dwelling. In some areas it shelters in burrows made by other animals, hollow tree limbs, or rock crevices. Favoured logs are often 150 mm in diameter, with a hollow section that usually extends for at least one metres.	<p>LIKELY – multiple records in north or project area, suitable habitat, mainly in gorges and creeklines.</p> <p>Impact can be minimised by avoiding removal of trees.</p> <p>There is not expected to be any impacts on population of this species.</p>
<i>Varanus varius</i>	Lace Monitor	-	R	1	1974	Woodland habitats where it can forage in the leaf litter and termite mounds, known to climb trees and utilise hollows. Occurs in isolated populations in the Southern Flinders Ranges.	<p>POSSIBLE– Old record but suitable habitat.</p> <p>Individual observed driving from Mambray Creek to the Link Lands west of Mount Remarkable. The long linear trail is not expected to have any impact on the species. Impact can be minimised by avoiding removal of trees.</p> <p>There is not expected to be any impacts on population of this species.</p>
<p>Source; 1- BDBSA, 2 - Protected matters search tool, 3 – other (including personal comments by fauna expert graham Carpenter).  NP&amp;W Act; E= Endangered, V = Vulnerable, R= Rare.  EPBC Act; Ex = Extinct, CR = Critically endangered, EN = Endangered; VU = Vulnerable.</p>							



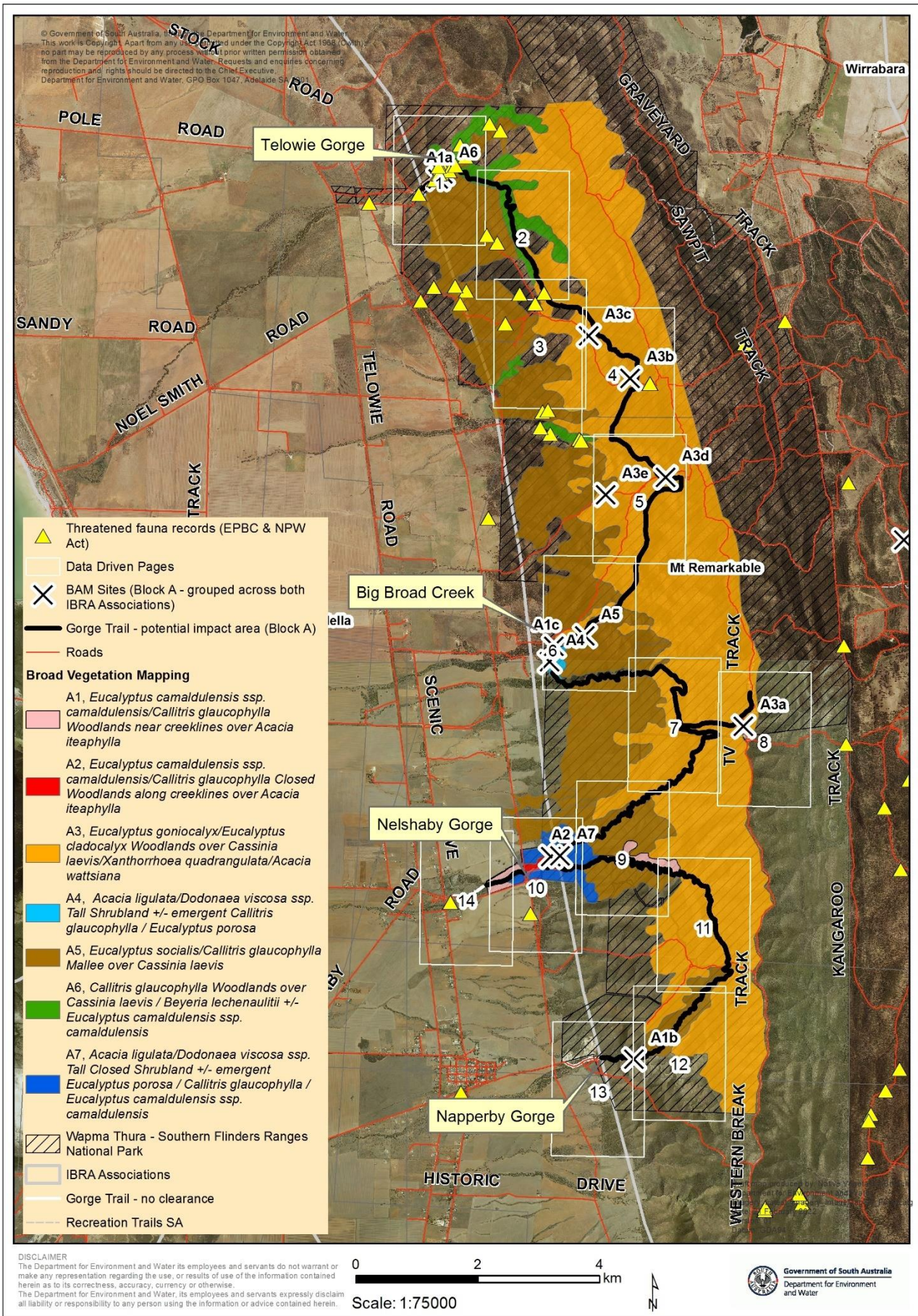


Figure 34. Distribution of threatened fauna records within the Project Area (EPBC Act and NPW Act).



## 4.3. Cumulative impacts

*When exercising a power or making a decision under Division 5 of the Native Vegetation Regulations 2017, the NVC must consider the potential cumulative impact, both direct and indirect, that is reasonably likely to result from a proposed clearance activity*

### General impact

The direct impact includes clearance of approximately 5.067 ha of native vegetation all of which is intended to occur within the National Park. Whilst the proposed alignment extends on to private land near Napperby Gorge and Nelshaby Gorge, existing tracks are present in these areas and there is expected to be no clearance required. Should clearance be required on private land, the impact area should be adjusted and written permission provided from each private landholder.

The total proposed trail may be up to 40-50 km in length but the clearance impact area has been calculated as extending along 33.8 km once excluding existing trails and projecting in Arcmap using Lamberts. It should be noted that the GIS coordinate system applied had a high impact on the figures, therefore the data was queried by NVB with DEW GIS specialists and found to be accurate at 33.8km of impact area (excluding existing trails). This appears to vary from the distances specified in the Gorges Concept Plan (Tredwell 2021) and spatial data provided which specifies a distance of closer to 40-50km (including all existing trails). Regardless, the overall impact area of 5.067 ha is possibly an overestimate as some areas within the deeper Gorges are expected to comprise minimal or no clearance as they have rocky open areas. However, without accurate micro-siting that is difficult to determine and whilst it is expected the overall direct impact area may be an overestimate, it is expected that degradation will occur directly adjacent the main trail through weed invasion and 'edge effect', particularly in low lying areas and creeks which are more susceptible to weed invasion.

The construction works and trail usage are expected to introduce and spread weeds, commonly observed near other trails which has the potential to impact threatened species in a wilderness which is largely weed free away from existing trails. Proposed and recommended mitigation strategies are described under 'Minimisation' in Section 4.4. in relation to minimisation of weed invasion through construction and operations; in addition to an adequate weed monitoring and control program once the trail is established.

### Threatened species

The clearance is expected to involve the clearance of some threatened flora, particularly of *Acacia iteaphylla* which is abundant and sometimes dense in the Gorges, but clearance will be minimised as feasible. Avoidance and minimisation recommendations are provided under 'Avoidance' in Section 4.4 aimed at reducing total direct impact, particularly for species of concern. The full extent of threatened flora extent is largely unknown due to limited survey coverage and some annual species (including orchids) being outside of their visible life phase.

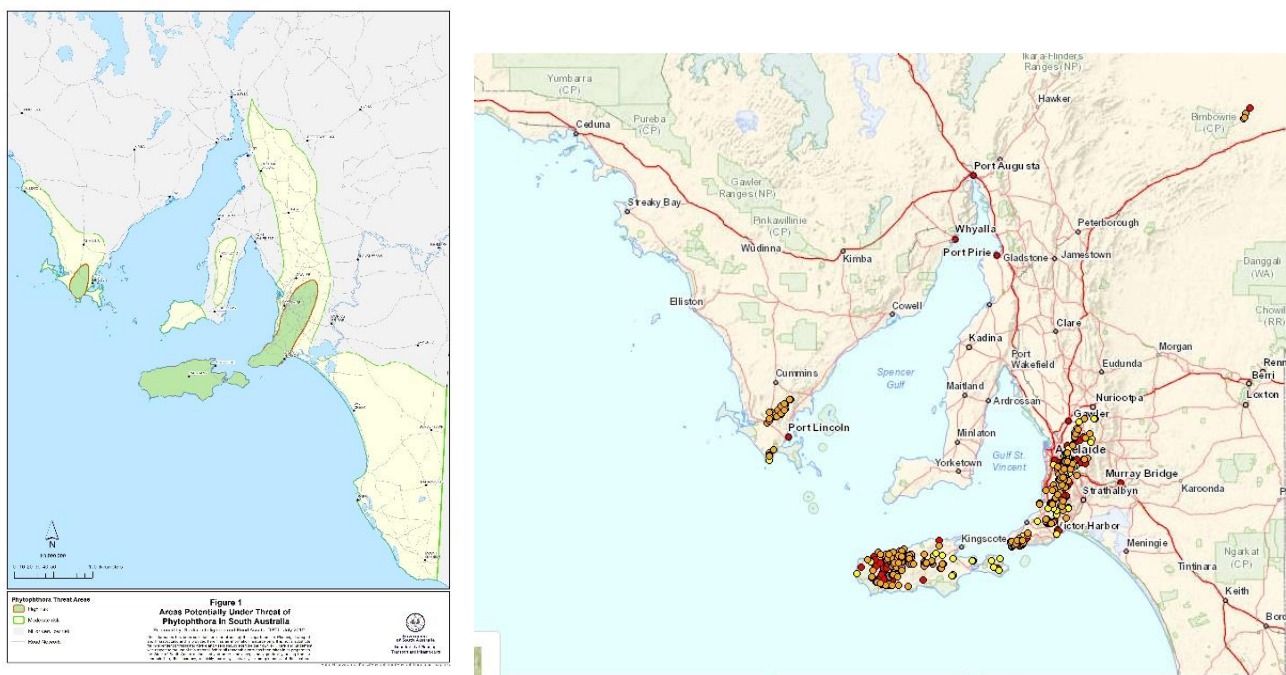
### Feral animals

The trail has the potential to provide a corridor for feral animals such as foxes, cats and goats to move along. Feral animal monitoring and control is recommended (as required) to reduce the risk of the trail becoming a corridor for feral animals, posing a risk of predation on native fauna species and increased grazing pressure.



## Phytophthora

There is some risk of introduction of Phytophthora (*Phytophthora cinnamoni*), but provided it is considered, the risk is expected to be very low. Phytophthora is a parasitic pathogen that lives in soil and water and attacks the roots and basal stems of plants. This pathogen has been introduced to SA and can cause extensive damage to native vegetation by killing or injuring native plants (DIT 2000). Phytophthora has not been identified within or near the National Park, but there is some potential for its establishment given the environmental conditions, including climate, slightly acid and infertile soils; and the presence of susceptible host species (DEH 2006a). This statement is from the Mount Remarkable National Park Management Plan (DEH 2006a) and is probably more related to the wetter Mount Remarkable area (rather than the previous Napperby Block of the Mount Remarkable NP). Although drier overall, the peaks of Wapma Thura - Southern Flinders Ranges NP near the Bluff have an average of 652mm which is higher than the annual rainfall at the Summit of Mt Remarkable and *Xanthorrhoea quadrangulata* is abundant throughout woodlands. This species is particularly susceptible to Phytophthora which can spread quickly downhill with the movement of water through the soil and slowly in any direction through 'root to root' contact (DEH 2006a). Other susceptible species onsite include *Allocasuarina verticillata* and *Hibbertia* spp. There are no known infestations in the vicinity, the nearest being on the lower Eyre Peninsula; in addition to at Nuriootpa and at Bimbowrie Conservation Park. The Southern Flinders Ranges has been classified as 'Moderate Risk' to infestation of the soil fungus (Figure 35). However, given the very high value of the vegetation and the abundance of *Xanthorrhoea* in the main park, specific attention should be given to potential impact, particularly where machinery, vehicles and equipment have moved through or been used in risk areas (Figure 35); and in relation to contaminated soil being introduced by walkers. Guidance for Phytophthora management is available in Phytophthora (Dieback) Control Environmental Instruction 21.3 (DIT 2000) and the Phytophthora Guidelines (DEH 2006b).



**Figure 35. Left: Map indicating Phytophthora risk levels in SA (DIT 2000). Right: Map indicating known Phytophthora records in South Australia (Source EnvMaps/NatureMaps, DEW 2022a).**

Indirect impacts occurring during operation of the trail will also be managed as part of the standard operations of the National Park and issues will be addressed through these operations. It should also be recognised that National

Parks and Wildlife, as part of their stewardship role, will continue to monitor for disturbance impacts as part of the trail operations and National Parks and Wildlife can close and rehabilitate trails at their discretion.

## 4.4. Mitigation Hierarchy

When exercising a power or making a decision under Division 5 of the Native Vegetation Regulations 2017, the NVC must have regard to the mitigation hierarchy. The NVC will also consider, with the aim to minimise, impacts on biological diversity, soil, water and other natural resources, threatened species or ecological communities under the EPBC Act or listed species under the NPW Act.

### **a) Avoidance – outline measures taken to avoid clearance of native vegetation**

#### Clearance of trees and general clearance

Critical to the success of delivering a high-amenity trail is the preservation of the natural landscape, including trees and shrubs. Except where clearing is required for permanent works or excavation operations, all trees, native shrubs and understorey grasses shall be preserved and protected from construction operations and equipment.

Whilst the clearance of some smaller *Eucalyptus camaldulensis* ssp. *camaldulensis* and *Callitris glaucophylla* specimens within the Gorges and creeks may be required, it is intended that clearance of trees in the trail alignment is avoided. There were no threatened tree species observed during the survey but there are records of SA threatened species *Eucalyptus percostata*, *Eucalyptus cajuputea* and *Eucalyptus albens* in the Project Area.

The trail will be designed around trees to retain vegetation and valuable habitat on site, which has added benefits for the walking experience through enhancement of the natural surroundings (DEW 2021). Retaining the existing canopy structure in Woodlands across the site is expected to lower the overall impact on habitat impact, whilst also reducing visual impact such that the trail will be less visible from the surrounding landscape, an important cultural consideration. Avoidance will be particularly focussed on medium to large trees, trees of threatened species and trees containing hollows. Clearance of trees with a trunk diameter of three hundred (300) millimetres or greater will be avoided unless approved by DEW (DEW 2021).

#### Threatened ecological communities

There is no anticipated clearance of TEC based on the current alignment. However, the alignment will be retained within the Napperby Gorge to avoid potential clearance in Peppermint Box Woodland expected to occur on the slopes above this Gorge. Should the trail be positioned such that it affects Peppermint Box Woodland, an assessment against EPBC listing criteria will be undertaken and consideration of whether the trail constitutes a significant impact under the EPBC Act is recommended, noting this is considered unlikely provided appropriate mitigation strategies are implemented.

#### Threatened flora

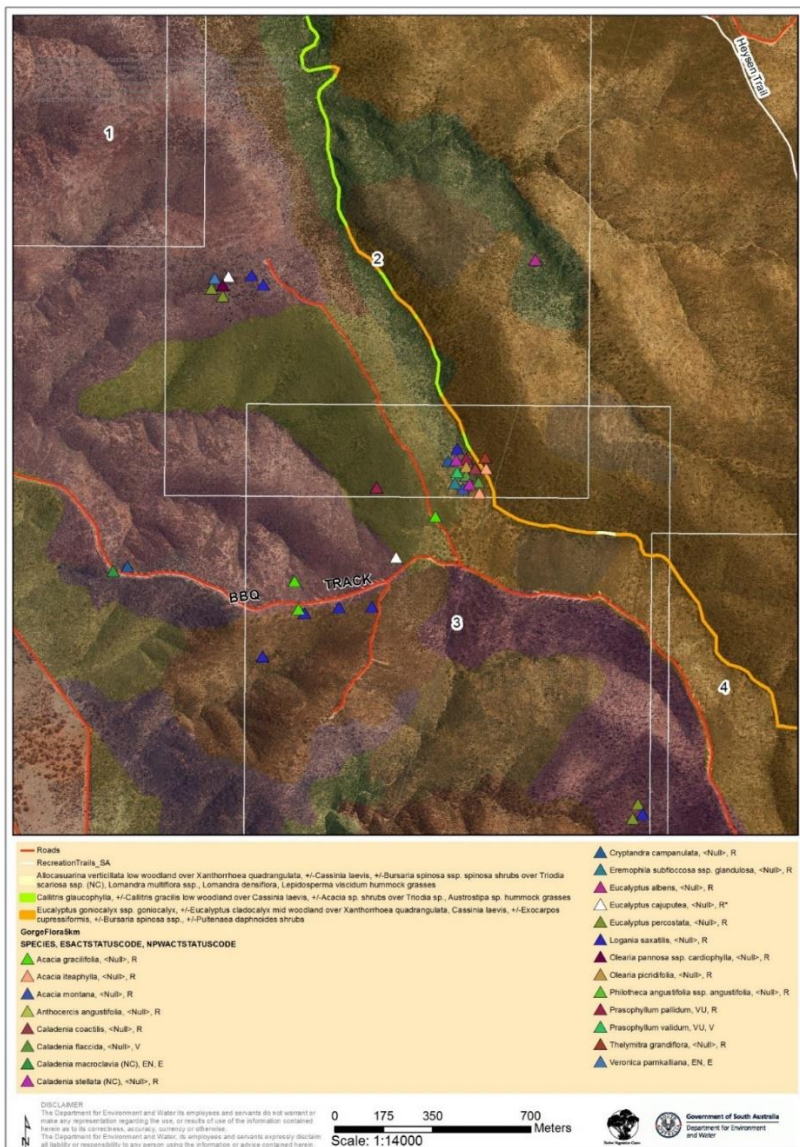
It is expected that some clearance of threatened *Acacia iteaphylla* may be required in the gorges, particularly in Nelshaby Gorge which comprises thick vegetation with understorey dominated by *A. iteaphylla*. However it is expected that clearance of all other threatened flora found to occur or that may occur can be avoided. It is somewhat difficult to indicate the high-risk areas for threatened flora as the Project Area is largely unsurveyed and records relate to accessibility more than other factors. However, it is expected the areas of highest risk are Sugar Gum/Long leaf Box Woodlands, (particularly rocky areas - which is most of the park), *Callitris* Woodlands (particularly south facing slopes), wet areas in the Gorges and sheltered rock crevices. More open or grassy woodlands that may occur



on lower slopes may support threatened flora, but the trail will be largely retained to Gorges in these areas therefore impact is expected to be negligible.

It is expected that more cryptic herbaceous species and ferns that may occur in wet areas and under rocks can be avoided. The distribution of orchids is largely unknown and species in the Orchidaceae family can be difficult to identify, therefore an approach that avoids clearance of any species of orchid observed will be adopted by the proponent, with the exception of *Pterostylis* spp. (Greenhood) species which are unlikely to be threatened in the park. Orchids have a limited visible life phase, therefore this approach will require balancing with trail construction feasibility. Areas of focus should include *Callitris* Woodlands, sheltered Sugar Gum Woodlands and open grassy Woodlands with fertile soils. An area of particular concern is near *Callitris* Woodland near BBQ track which could not be accessed during the survey but contains a number of threatened flora records in *Callitris* Woodland and Long-leaf Box/Sugar Gum Woodland (Figure 36).

It is recommended an ecologist or suitably qualified flora expert review the final trail alignment prior to construction to ensure clearance of threatened flora and trees have been avoided.



**Figure 36. Sensitive area near trail alignment with several threatened species records including Nationally threatened orchids. This area will be thoroughly checked before any clearance occurs.**

**b) *Minimisation – if clearance cannot be avoided, outline measures taken to minimise the extent, duration and intensity of impacts of the clearance on biodiversity to the fullest possible extent (whether the impact is direct, indirect or cumulative).***

Impact footprint and alignment

The alignment has been selected based on initial ground truthing with a goal of traversing the spectacular Gorges then rising out on to the ridge tops and back into the Gorges. There is limited option for major realignment as the terrain is significantly steep and the Gorges are the main focus area. Regardless, micro-sighting will occur to maximise the use of open and rocky areas, minimise the clearance of native vegetation and avoid significant areas as described or as discovered during more intensive ground truthing. Furthermore, existing vehicle or walking tracks will be used where they occur (e.g. Nelshaby Gorge, Napperby Gorge, Telowie Gorge, Big Broad Creek (upper Shrubland), Go-Kart Track (the Bluff) (noting some may require upgrade).

A conservative approach was taken when calculating the potential clearance impact, assuming a 1.5m wide footprint. However, the construction of trails are anticipated to be designed to be of minimal width, closer to 0.5m or 1m. It is expected that some degradation will occur on trail edges, mainly through weed spread.

General Construction approach and clearance mitigation

Current industry best practice will be used in the design and construction of the trail and special consideration will be given to mitigating challenges imposed by soil type and geology by:

- adhering to sustainable trail building principles outlined in the trail design guidelines of the tender documentation (DEW, 2021);
- designing / constructing the right trail for the soil, geology and terrain; and
- using the most appropriate construction method for the soil, geology and terrain (mechanised or hand-built; natural or imported surface).

The trail will maximise the use of natural features and in-situ objects such as rocks and logs as trail features, and points of interest (DEW 2021). It is anticipated that rocks embedded in the trail surface will be stable and retained. Smaller rocks requiring removal will be utilised for bench stabilisation and the sifted soil used to form the trail surface. Where large rocks cannot be avoided and micro-siting is unviable, rock relocation will take place into cleared areas (DEW 2021).

The contractor will keep the amount of site vegetation clearance to a minimum and there will ensure that no clearing is done outside of the allocated corridor without written approval from DEW. In addition to this requirement, unless agreed to by DEW, trees with a trunk diameter of three hundred (300) millimetres or greater will be maintained (DEW 2021). The Contractor shall exercise care to preserve the natural landscape, including trees and shrubs, and shall conduct construction operations to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works or excavation operations, all trees, native shrubbery, and vegetation, shall be preserved and protected from damage by the Contractor's construction operations and equipment (DEW 2021). All unnecessary destruction, scarring, damage or defacing of the landscape resulting from the Contractor's operations, shall be repaired, replanted, reseeded or otherwise corrected as directed by DEW and at the Contractor's expense (DEW 2021). After completion of the work, all areas disturbed by construction that do not require landscaping or planting, shall be scarified and left in a condition which will facilitate natural vegetation, provide for proper drainage and prevent erosion.



Machine traffic outside the trail tread or approved access roads will be limited and may occur only when required for safe operation, emergency, repair or as part of any other pre-approved plan (DEW 2021). These specifics may change depending on DEW requirements and any additional clearance will require notification to NVB (and the offset adjusted).

All excavated material not used in the trail tread or other trail structures will be stabilised and spoils will be distributed in a thin layer adjacent to the trail tread and not placed in drainages or swales (DEW 2021). When possible, spoils will be mulched with native materials to discourage erosion while native seed stocks re-establish.

It is proposed that hand finishing and grading of the trail tread, back-slope, down-slope spoils, and drainage features shall result in a surface that matches the texture of the surrounding forest floor while enabling water to drain off the trail, whilst exceptions to this may occur on flatter areas without natural side slope (DEW 2021).

### Water Courses and hydrology

The Contractor will ensure that works are conducted in a manner that reduces risks of geotechnical failure such as landslide or alluvial gully erosion (DEW, 2021). The Contractor, in the design and construction of the trail needs to ensure that no erosion is likely to occur or any potential erosion to be minimised (DEW 2021).

The Contractor will to the best of their ability comply with the following drainage requirements unless otherwise agreed (DEW 2021):

- the trail grade should not exceed half of the grade of the hillside or side-slope the trail is traversing;
- knicks, rolling grade dips and grade reversals should be incorporated where required to shed water from the trail, and should be placed no further apart than twenty (20) metres;
- rolling crown switchbacks should be used when a hillside turn requires specific engineering for drainage; and
- the application of the most appropriate out-slope or in-slope trail building technique.

Where the trail crosses a watercourse (including seasonal), the Contractor will carefully consider the most appropriate design and construction method (armouring, culvert, bridge) to ensure the crossing is sustainable with minimal disturbance to the natural flow of water (DEW 2021). Alterations to localised hydrology will also be mitigated through the installation of filter strips, being vegetated areas down-slope of the trail corridor intended to treat sheet flows coming off the trail. Filter strips function by slowing down flow velocities, filtering out sediments and providing an opportunity for infiltration into the underlying soils (DEW 2021).

### Erosion

To mitigate the risk of erosion occurring, and subsequently impacting vegetation, control measures will include staging of operations, progressive restoration of disturbed areas and spreader banks, or other such measure to disperse concentrated run-off (DEW 2021). In addition the trail will be finished as the project advances.

### Weed and pathogen management

The Southern Flinders is classified as a moderate risk of *Phytophthora cinnamoni* infestation, but the wetter areas of the National Park and those supporting abundant *Xanthorrhoea* could be considered of higher risk, particularly given the high value of the vegetation. Mitigation measures will be implemented regarding avoidance of bringing foreign soil and plant material into the site with particular focus made in the instance where machines, vehicles and equipment have been used in areas of known *Phytophthora* infestation (Figure 35). Further mitigation is provided in the dot points below, including adequate signage.

Weed invasion is considered a high threat to intact native vegetation communities in Wapma Thura NP which are largely free of noxious weeds away from farmland areas, Gorges and existing vehicle tracks which contained a higher abundance of weeds. An adequate weed mitigation approach will be implemented during construction. To reduce the spread of invasive plant species the tender document (DEW 2021) specifies that (1) all hand tools and mechanised equipment will be free of invasive seeds and clean of any dirt and mud when entering the project site; and (2) consideration will be made while trail clearing and construction through areas occupied by invasive species (such areas to be identified by DEW) as to not propagate as construction progresses; and (3) the use of imported surface and organic material will require the further approval of DEW. The following mitigation approaches are further recommended to minimise the risk of the introduction and spread of pathogens and weeds including:

- earth-moving machinery, vehicles and equipment will be clean of soil and vegetation prior to entering and leaving the area to be cleared;
- no known weed or pathogen affected soil, mulch, fill or other material will be brought into the area to be cleared;
- the movement of machines and other vehicles will be restricted to the limits of the areas to be cleared;
- personnel entering the work site will ensure their clothing and shoes are clean and free of weed seeds;
- any soil introduced to the site will be free of weed seeds and pathogens; and
- the site will be monitored for new outbreaks during construction and weeds should be removed using low impact methods (e.g. hand pulling juvenile specimens).

An ongoing weed monitoring and control program should be considered to minimise the risk of new and noxious weeds during trail operation. Some weed invasion is expected, but more noxious and invasive weeds introduced may threaten intact vegetation and local threatened species (including orchid) populations. Mitigation for weeds and pathogens may include adequate signage and cleaning stations at appropriate risk points (e.g. at the commencement of the trail, where the trail rises out of the more weed infested gorges, in all the lower exit points near private land and near the Bluff tower carpark (e.g. where the proposal trail traverses weed infested areas and extends into weed free wilderness). These areas should also become focus areas for weed control to mitigate further spread. Signage may be combined with 'STOP' signal and include interesting features of the National Park and Epic Trail.

The trail poses some difficulty for weed monitoring and maintenance given the difficult terrain and length. However, an appropriate weed management control program should be considered to minimise the risk of new and noxious outbreaks. The trail is expected to require ongoing monitoring and maintenance to address erosion, fallen timber and vegetation regrowth, therefore this may provide an opportunity to monitor and control weeds concurrently.

### Threatened Flora

Clearance of all threatened flora will be avoided which the exception of some limited pruning or clearance of *Acacia iteaphylla* where absolutely necessary. Further detail on threatened flora mitigation is provided under 'Avoidance'.

- c) *Rehabilitation or restoration – outline measures taken to rehabilitate ecosystems that have been degraded, and to restore ecosystems that have been degraded, or destroyed by the impact of clearance that cannot be avoided or further minimized, such as allowing for the re-establishment of the vegetation.***

After completion of the work, all areas disturbed by construction that do not require landscaping or planting, shall be scarified and left in a condition which will facilitate natural vegetation, provide for proper drainage and prevent erosion (DEW 2021).



**d) Offset – any adverse impact on native vegetation that cannot be avoided or further minimized should be offset by the achievement of a significant environmental benefit that outweighs that impact.**

*The NVC will only consider an offset once avoidance, minimization and restoration have been documented and fulfilled. The SEB Policy explains the biodiversity offsetting principles that must be met.*

Potential on ground offsets are being considered. However, SEB requirements will be achieved through payment into the Native Vegetation Fund, unless a suitable on-ground offset can be identified.

## 4.5. Principles of Clearance

The Native Vegetation Council will consider Principles 1(b), 1(c) and 1(d) when assigning a level of Risk under Regulation 16 of the Native Vegetation Regulations. The Native Vegetation Council will consider all the Principles of clearance of the Act as relevant, when considering an application referred under the Planning, Development and Infrastructure Act 2016, but this is not required for the current application.

POF

**Table 15. Assessment against the Principles of Clearance.**

Principle of clearance	Relevant information	Assessment against the principles	Moderating factors that may be considered by the NVC														
<p><b>Principle 1(b) – significance as a habitat for wildlife</b></p>	<p>Much of the vegetation in the Project Area forms part of a National Park with vast areas of intact native vegetation providing habitat for threatened fauna species.</p> <p>Species that may (or are known to) utilise habitat on site include Chestnut-rumped Heathwren, Eastern Shrike-tit, Diamond Firetail, Gilberts Whistler, Hooded Robin, Jacky Winter, Painted Buttonquail, Scarlet Robin, White-wing Chough, Black Falcon, Peregrine Falcon, Flinders Ranges Short-tailed Grasswren, Flinders Worm-Lizard, Carpet Python, Common Brush-tail Possum, Yellow-footed Rock Wallaby.</p> <p><b>BAM vegetation community threatened fauna scores:</b></p> <table border="1" data-bbox="268 1261 715 1507"> <tbody> <tr><td>A1</td><td>0.1</td></tr> <tr><td>A2</td><td>0.1</td></tr> <tr><td>A3</td><td>0.1</td></tr> <tr><td>A4</td><td>0.08</td></tr> <tr><td>A5</td><td>0.1</td></tr> <tr><td>A6</td><td>0.1</td></tr> <tr><td>A7</td><td>0.1</td></tr> </tbody> </table>	A1	0.1	A2	0.1	A3	0.1	A4	0.08	A5	0.1	A6	0.1	A7	0.1	<p><u>Seriously at Variance</u> All associations</p>	<p>Although vegetation within the trail alignment provides important habitat for threatened fauna species, including Nationally threatened species, clearance in any one area is expected to be minor given the long linear nature of the trail.</p> <p>Clearance of trees in general and particularly large trees and/or trees with hollows will be avoided further reducing impact on fauna. However, removal of trees is considered a potential threat to fauna.</p> <p>The highest threat to fauna (apart from tree removal) is expected to be (1) the introduction of weeds that may invade and affect understorey and species that rely on native shrub layers/leaf litter etc; and (2) opening a corridor for feral animals that may predate on threatened fauna.</p> <p>The NVC may consider moderating the clearance to At Variance provided they are satisfied (1) there is an adequate weed and feral animal monitoring and control program established; (2) that large trees, trees with hollows and trees of threatened species will not be removed.</p>
A1	0.1																
A2	0.1																
A3	0.1																
A4	0.08																
A5	0.1																
A6	0.1																
A7	0.1																



Principle of clearance	Relevant information	Assessment against the principles	Moderating factors that may be considered by the NVC																
<p><b>Principle 1(c) – plants of a rare, vulnerable or endangered species</b></p>	<p>The site is known habitat for many threatened flora species. Five species threatened under the NPW Act were observed during the survey including <i>Acacia iteaphylla</i>, <i>Acacia gracilifolia</i>, <i>Olearia pannosa ssp. cardiophylla</i> and <i>Ozothamnus scaber</i>. An unusual occurrence of <i>Codonocarpus cotonifolius</i> (Desert Poplar) was also observed in Nelshaby Gorge. Although this species does not have a State rating, it was previously thought to be regionally extinct in the N&amp;Y region and its clearance MUST be avoided. It is expected a number of other threatened flora species occur, including Nationally threatened Orchids with limited visible life phase.</p> <p><b>BAM vegetation community threatened flora scores:</b></p> <table border="1" data-bbox="268 853 715 1099"> <tr><td>A1</td><td>0.08</td></tr> <tr><td>A2</td><td>0.16</td></tr> <tr><td>A3</td><td>0.2</td></tr> <tr><td>A4</td><td>0.0</td></tr> <tr><td>A5</td><td>0.2</td></tr> <tr><td>A6</td><td>0.2</td></tr> <tr><td>A7</td><td>0.16</td></tr> </table>	A1	0.08	A2	0.16	A3	0.2	A4	0.0	A5	0.2	A6	0.2	A7	0.16	<p><u>Seriously at Variance</u> A2, A3, A5, A6, A7</p> <p><u>At Variance</u> A1, A4</p>	<p>The proposal is considered to pose a moderate to high threat to threatened species within the park based on the high quality of vegetation and the number of threatened flora species observed given the limited survey extent. Threats include removal of threatened specimens and introduction of weeds.</p> <p>Given the lack of survey coverage the impact to threatened species is somewhat unknown, particularly for orchids. Micro-siting and follow up surveys prior trail construction are required to mitigate risk to threatened flora species. It is expected that only then could the NVC consider moderating factors.</p>		
A1	0.08																		
A2	0.16																		
A3	0.2																		
A4	0.0																		
A5	0.2																		
A6	0.2																		
A7	0.16																		
<p><b>Principle 1(d) – the vegetation comprises the whole or part of a plant community that is Rare, Vulnerable or endangered</b></p>	<p>There were no threatened communities found to occur within the current trail alignment therefore clearance is considered Not at Variance.</p> <p>Should the trail alignment move into any areas of Peppermint Box Woodland, this would require reassessment.</p> <p>Threatened community scores</p> <table border="1" data-bbox="268 1503 715 1794"> <thead> <tr> <th>BAM</th> <th>TCS</th> </tr> </thead> <tbody> <tr><td>A1</td><td>1</td></tr> <tr><td>A2</td><td>1</td></tr> <tr><td>A3</td><td>1</td></tr> <tr><td>A4</td><td>1</td></tr> <tr><td>A5</td><td>1</td></tr> <tr><td>A6</td><td>1</td></tr> <tr><td>A7</td><td>1</td></tr> </tbody> </table>	BAM	TCS	A1	1	A2	1	A3	1	A4	1	A5	1	A6	1	A7	1	<p><u>Not At Variance</u> All sites</p>	<p>Not applicable.</p>
BAM	TCS																		
A1	1																		
A2	1																		
A3	1																		
A4	1																		
A5	1																		
A6	1																		
A7	1																		

## 4.6. Risk Assessment

The proposed clearance is classified as risk level 4 with a Total Biodiversity Score of 333.1 (Table 16).

**Table 16. Summary of the level of risk associated with the application.**

<b>Total clearance</b>	No. of trees	0
	Area (ha)	5.067 ha
	Total Biodiversity Score	333.10
<b>Seriously at variance with principle 1(b), 1(c) or 1 (d)</b>	1(b) and 1(c)	
<b>Risk assessment outcome</b>	Level 4	

# 5. Clearance Summary

## Clearance Area(s) Summary table

Table 17 provides a summary of the Blocks, BAM sites and their corresponding SEB values whilst Table 18 provides a summary of the total SEB requirement and Table 19 provides a summary of the rainfall factor calculated and the applicable economies of scale figure for the SEB calculation.

**Table 17. Impact Summary with UBS and SEB Requirements**

Block	Site	Species diversity score	TEC Score	Threatened plant score	Threatened fauna score	UBS	Area (ha)	Total Biodiversity score	Loss factor	Loadings	Reductions	SEB Points required	SEB payment	* Admin Fee
A	A1	25.33	1	0.08	0.1	59.49	1.669	99.29	1			\$3,687.98	\$73,759.64	\$4,056.78
A	A2	26	1	0.16	0.1	78.23	0.200	15.650	1			\$581.15	\$11,623.10	\$639.27
A	A3	19.6	1	0.2	0.1	66.528	2.379	158.27	1			\$5,878.78	\$117,575.65	\$6,466.66
A	A4	30	1	0	0.08	85.91	0.099	8.510	1			\$315.91	\$6,318.26	\$347.50
A	A5	24	1	0.2	0.1	71.05	0.357	25.36	1			\$942.15	\$18,843.03	\$1,036.37
A	A6	24	1	0.2	0.1	70.89	0.353	25.02	1			\$929.50	\$18,589.95	\$1,022.45
A	A7	30	1	0.16	0.1	100.23	0.010	1.00	1			\$37.23	\$744.59	\$40.95
							<b>Total</b>	<b>5.067</b>	<b>333.101</b>			<b>349.76</b>	<b>\$247,454.20</b>	<b>\$12,372.71</b>

\* DEW Projects do not attract GST for the administration fee, therefore GST has been subtracted from the administration figures.

**Table 18. SEB Totals summary table**

	Total Biodiversity score	Total SEB points required	SEB Payment	* Admin Fee	Total Payment
<b>Application</b>	333.10	349.76	\$247,454.20	\$12,372.71	\$259,826.91

\* DEW Projects do not attract GST for the administration fee, therefore GST has been subtracted from this figure.

**Table 19. Economies of scale and rainfall factors applied to calculate the SEB.**

<b>Economies of Scale Factor</b>	0.5
<b>Rainfall (mm)</b>	529



# 6. Significant Environmental Benefit

A Significant Environmental Benefit (SEB) is required for approval to clear under Division 5 of the *Native Vegetation Regulations 2017*. The NVC must be satisfied that as a result of the loss of vegetation from the clearance that an SEB will result in a positive impact on the environment that is over and above the negative impact of the clearance.

The SEB requirement has been provided as a dollar value for payment into the Native Vegetation Fund. However, investigations into on ground SEB options are being explored.

## ACHIEVING AN SEB

Indicate how the SEB will be achieved by ticking the appropriate box and providing the associated information:

- Establish a new SEB Area on land owned by the proponent.
- Use SEB Credit that the proponent has established. Provide the SEB Credit Ref. No. \_\_\_\_\_
- Apply to have SEB Credit assigned from another person or body. The [application form](#) needs to be submitted with this Data Report.
- Apply to have an SEB to be delivered by a Third Party. The [application form](#) needs to be submitted with this Data Report.
- Pay into the Native Vegetation Fund.

## PAYMENT SEB

The proponent is exploring on ground SEB but without a confirmed SEB area and management plan, an approval for the clearance of native vegetation cannot be provided. Therefore, the proponent proposes to initially pay into the fund but with a delayed start to payment as agreed with the Native Vegetation Assessment Panel.

**Table 20. SEB Totals summary table**

	Total Biodiversity score	Total SEB points required	SEB Payment	*Admin Fee	Total Payment
<b>Application</b>	333.10	349.76	\$247,454.20	\$12,372.71	\$259,826.91

\* DEW Projects do not attract GST for the administration fee, therefore GST has been subtracted from this figure.

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