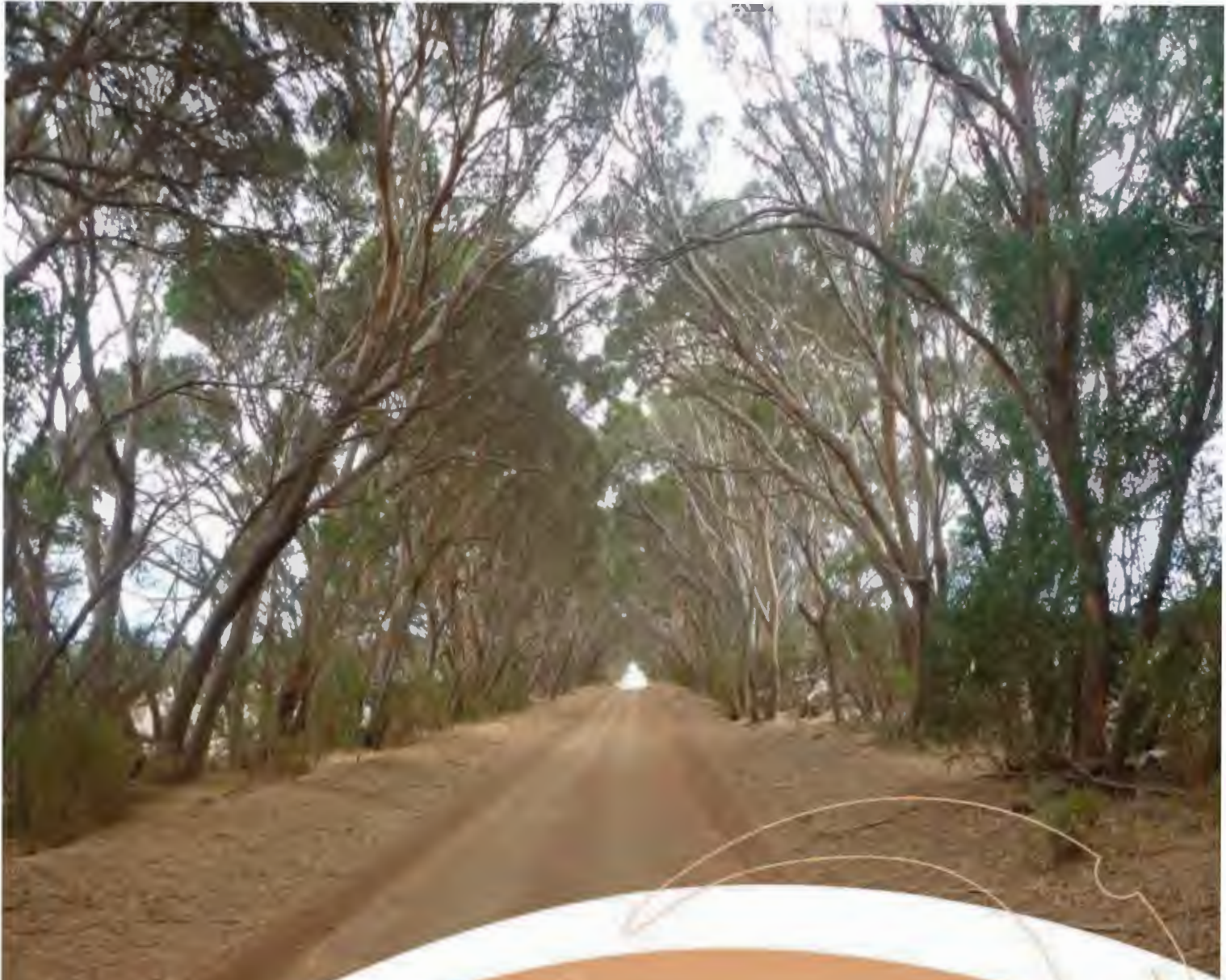


Appendix P5 –  
KIPT Transport Route  
Options – Limitations  
Summary – EBS  
Ecology



**KIPT Transport Route Options**  
**Limitations Summary**

# KIPT Transport Route Options Limitations Summary

17 April 2018

Version 2

Prepared by EBS Ecology for Environmental Projects

EBS Ecology Project Number: E10818

**COPYRIGHT:** Use or copying of this document in whole or in part (including photographs) without the written permission of EBS Ecology's client and EBS Ecology constitutes an infringement of copyright.

**LIMITATION:** This report has been prepared on behalf of and for the exclusive use of EBS Ecology's client, and is subject to and issued in connection with the provisions of the agreement between EBS Ecology and its client. EBS Ecology accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

**CITATION:** EBS Ecology (2018) KIPT Transport Route Options Limitations Summary. Report to Environmental Projects. EBS Ecology, Adelaide.

Cover photograph: *Eucalyptus cneorifolia* on Ropers Road reserve.

EBS Ecology  
3/119 Hayward Avenue  
Torrensville, South Australia 5031  
t: 08 7127 5607  
<http://www.ebsecology.com.au>  
email: [info@ebsecology.com.au](mailto:info@ebsecology.com.au)



## Table of Contents

<b>1</b>	<b>INTRODUCTION</b> .....	<b>1</b>
1.1	Objectives .....	1
<b>2</b>	<b>BACKGROUND INFORMATION</b> .....	<b>3</b>
2.1	Method to gauge sensitivity .....	3
2.2	Key findings .....	4
2.3	Other limitations.....	6
<b>3</b>	<b>LEGISLATIVE LIMITATIONS</b> .....	<b>9</b>
3.1	EPBC Act.....	9
3.1.1	Nationally threatened species and ecological communities .....	9
3.1.2	Critically endangered and endangered species .....	10
3.1.3	Critically endangered and endangered ecological communities .....	11
3.2	Native Vegetation Act 1991 .....	13
3.3	Provisional list of State threatened ecosystems.....	14

## List of Tables

Table 1.	Rating for the sensitivity assessment or consequence. ....	3
Table 2.	Ratings for the assessment of likelihood.....	3
Table 3.	Risk assessment matrix.....	4

## List of Figures

Figure 1.	Transport route options with Option 2 displayed in green.....	2
Figure 2.	Kangaroo Island Narrow leaved Mallee ( <i>Eucalyptus cneorifolia</i> ) Threatened Ecological Community likely distribution.....	5
Figure 3.	Threatened flora species locations relevant to Route Option 2. ....	7
Figure 4.	Threatened fauna species relevant to Route Option 2. ....	8

# 1 INTRODUCTION

Following the initial vegetation assessment and ecological sensitivity report, EBS Ecology has been engaged by Environmental Projects to summarise the limitations specific to Transport Route Option 2 (Figure 1), which was found to have a number of areas rated as having an extreme sensitivity under the initial assessment. This was largely due to vegetation associated with Ropers and Gap Roads where the clearance envelope requirement to enable two way heavy vehicle access ensured an almost certain likelihood of impact.

## 1.1 Objectives

The objective of this summary is to highlight the relevant limitations associated with this route option and what the legislative requirements may be in terms of gaining approval for this option.

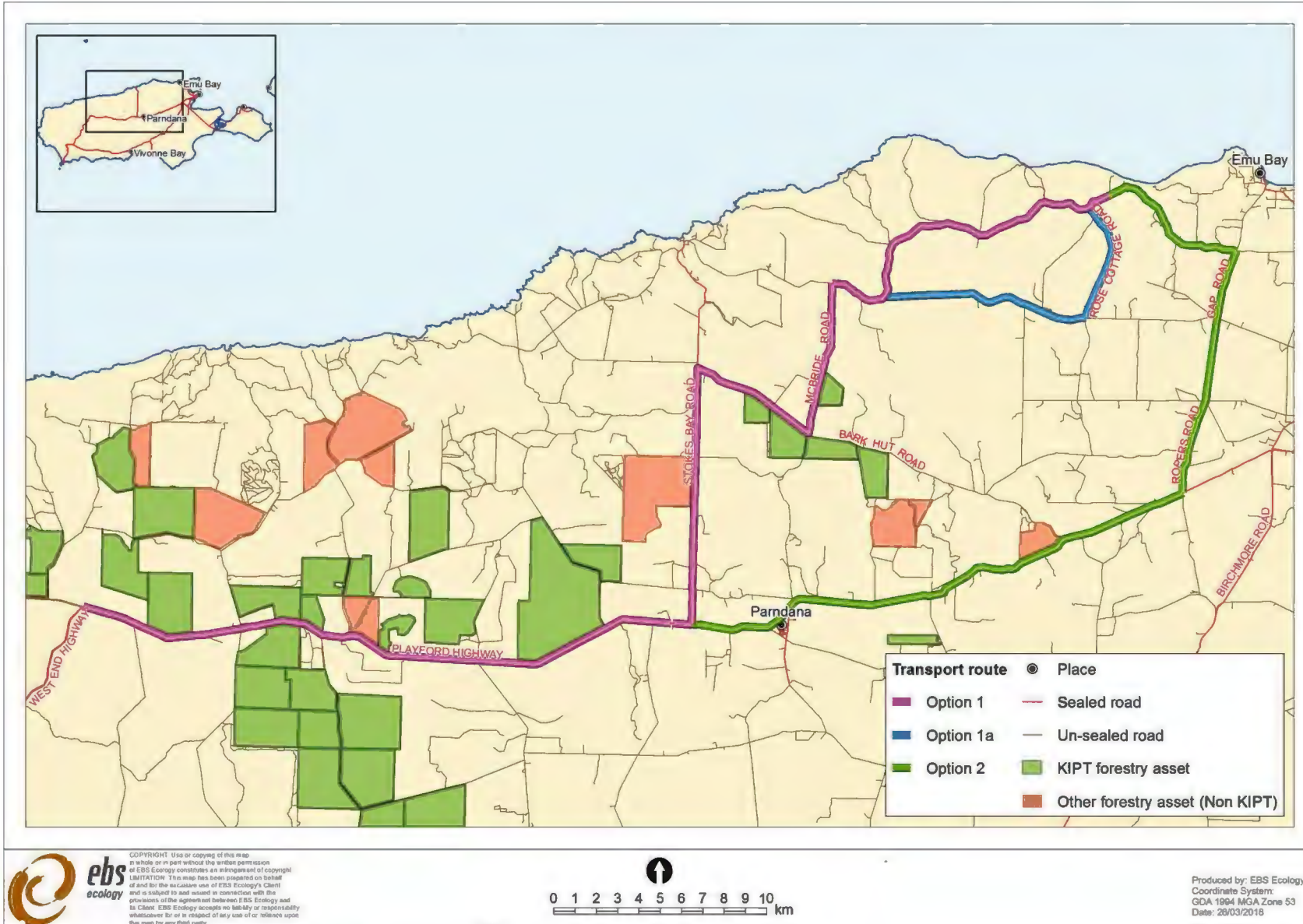


Figure 1. Transport route options with Option 2 displayed in green.

## 2 BACKGROUND INFORMATION

### 2.1 Method to gauge sensitivity

The route options were initially assessed as a desktop study of background information and literature review. Following this, an on ground assessment was conducted along the three routes as displayed in Figure 1. The on ground assessment consisted of mapping the individual vegetation associations and undertaking Bushland Condition Assessments within relevant associations and condition gradients.

Following the desktop and field assessments the following method was used to highlight the sensitivity for the initial route options;

An ecological sensitivity map of the individual route options was produced by integrating the information collected which includes assigning habitat units based on their ecological properties, potential presence of sensitive species and the Bushland Assessment Scoresheet biodiversity unit score (BUS).

The consequence and likelihood of each individual risk was analysed using the risk assessment matrix. Table 1 and Table 2 present the ratings for consequence and likelihood respectively. These tables were guided by AS/NZS ISO 31000:2009.

**Table 1. Rating for the sensitivity assessment or consequence.**

Consequence level	Communities	Species
1	No expected impact to high value ecological communities. Clearance of low value communities with biodiversity unit score (BUS) of <20. Low level trimming and isolated tree removals of degraded communities with BUS of <40	Low or no impact to terrestrial species
2	Minor impacts such as dust deposition, disturbance to habitats through vehicle noise. Clearance of ecological communities with BUS of >20 / <40. Impact Restricted to local area only.	Low impact to fauna species such as loss of nesting or other habitat requirements. Increased road kill.
3	Impact likely to have knock on effects to the wider area such as pathogen spread (Phytophthora) and increase of weeds and pests. Clearance of ecological communities with BUS of >40	Impacts to potential nesting and/or feeding habitat for conservation significant species. Disturbance to nesting / roosting habitat. Significant increase in roadkill.
4	Loss of road reserve width and fragmentation of high value communities with BUS of >60. Likely to have direct impact.	Impacts critical nesting and/or feeding habitat and nationally listed conservation significant species. Very high roadkill numbers

**Table 2. Ratings for the assessment of likelihood.**

Likelihood	Environment
Almost certain	Is expected to occur
Likely	Occurs frequently in similar projects
Possible	Could occur under unusual circumstances e.g. extreme weather events etc.
Unlikely	Unlikely to occur within the next 20 years
Rare	Unlikely to occur ever

The overall risk category was determined by the risk matrix provided below in Table 3 which considers both the consequence and probability.

**Table 3. Risk assessment matrix.**

Likelihood	Consequence			
	1	2	3	4
Almost certain	Moderate	High	Extreme	Extreme
Likely	Moderate	Moderate	High	Extreme
Possible	Low	Moderate	Moderate	High
Unlikely	Low	Low	Moderate	Moderate
Rare	Low	Low	Low	Moderate

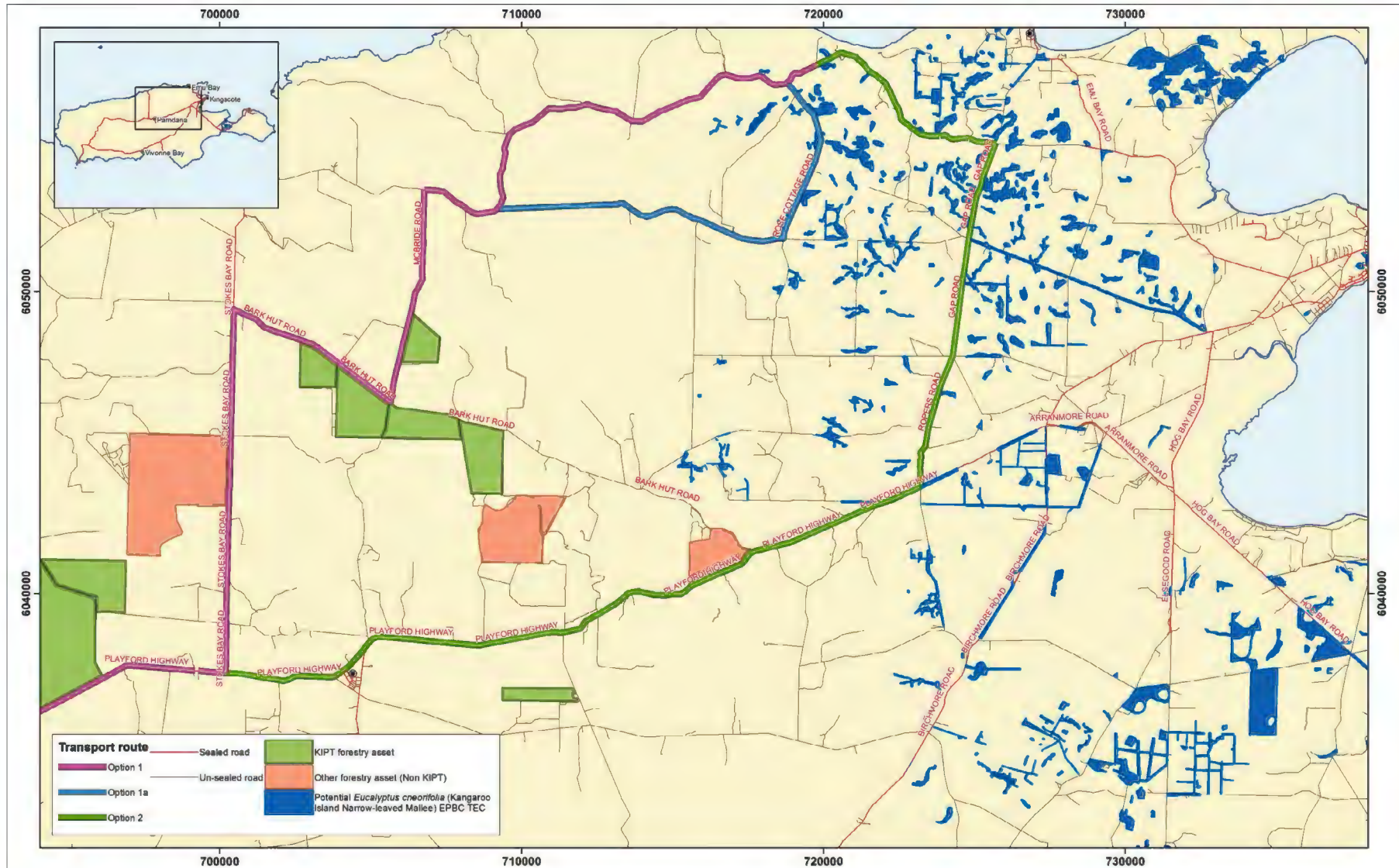
## 2.2 Key findings

The results of the sensitivity assessment showed that all route options had areas where there was some sensitivity surrounding the roadside vegetation across all route options either from a specific species perspective or as having conservation significant vegetation communities present. Areas which were adjacent to major carriageways were commonly of lower sensitivity due to already well established clearance envelopes which resulted in no clearance requirement or were deemed to be at low risk of unquantifiable risks such as noise disturbance or dust deposition.

Route Option 2 was highlighted as the least preferred option from an ecological perspective which was largely due to the following key factors;

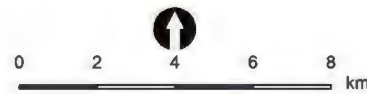
- The Route Option 2 section which included Ropers and Gap Roads is narrow which resulted in an almost certain likelihood of requiring clearance along most of its length.
- The Ropers Road alignment passes through a significant area known to be critical nesting habitat for the nationally endangered Glossy Black Cockatoo (listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*) (EPBC Act).
- The Ropers / Gap Road reserve has significant remnant populations of Kangaroo Island Narrow-leaved Mallee which is, in sections, contiguous with patches likely to be a nationally Threatened Ecological Community (TEC) under the EPBC Act (Figure 2).
- Areas of Kangaroo Island Narrow leaved Mallee not protected under the EPBC Act are listed as Endangered under the Provisional list of State Threatened Ecosystems of South Australia (DEH, (in progress) unpublished and provisional list.
- The Playford Highway section of Route Option 2 passes through areas of known critical nesting and feeding habitat for the nationally endangered Glossy Black Cockatoo.
- *Spyridium eriocephalum* var. *glabrisepalum* (McGillivray's Spyridium) is endemic to Kangaroo Island. It occurs in one large and four small sub-populations in eastern Kangaroo Island. It is known from a number of locations adjacent to the Playford Highway in the area east of Bark Hut Road and from a few locations on Gap Road. Any clearance occurring within the Gap Road area would likely have an impact on the viability of this species.





**ebs**  
ecology

COPYRIGHT: Use or copying of this map in whole or in part without the written permission of EBS Ecology constitutes an infringement of copyright. LIMITATION: This map has been prepared on behalf of and for the exclusive use of EBS Ecology's Client, and is subject to and issued in connection with the provisions of the agreement between EBS Ecology and its Client. EBS Ecology accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this map by any third party.



Produced by: EBS Ecology  
Data source:  
Coordinate System:  
GDA 1994 MGA Zone 53  
Date: 10/04/2018

Figure 2. Kangaroo Island Narrow leaved Mallee (*Eucalyptus cneorifolia*) Threatened Ecological Community likely distribution.

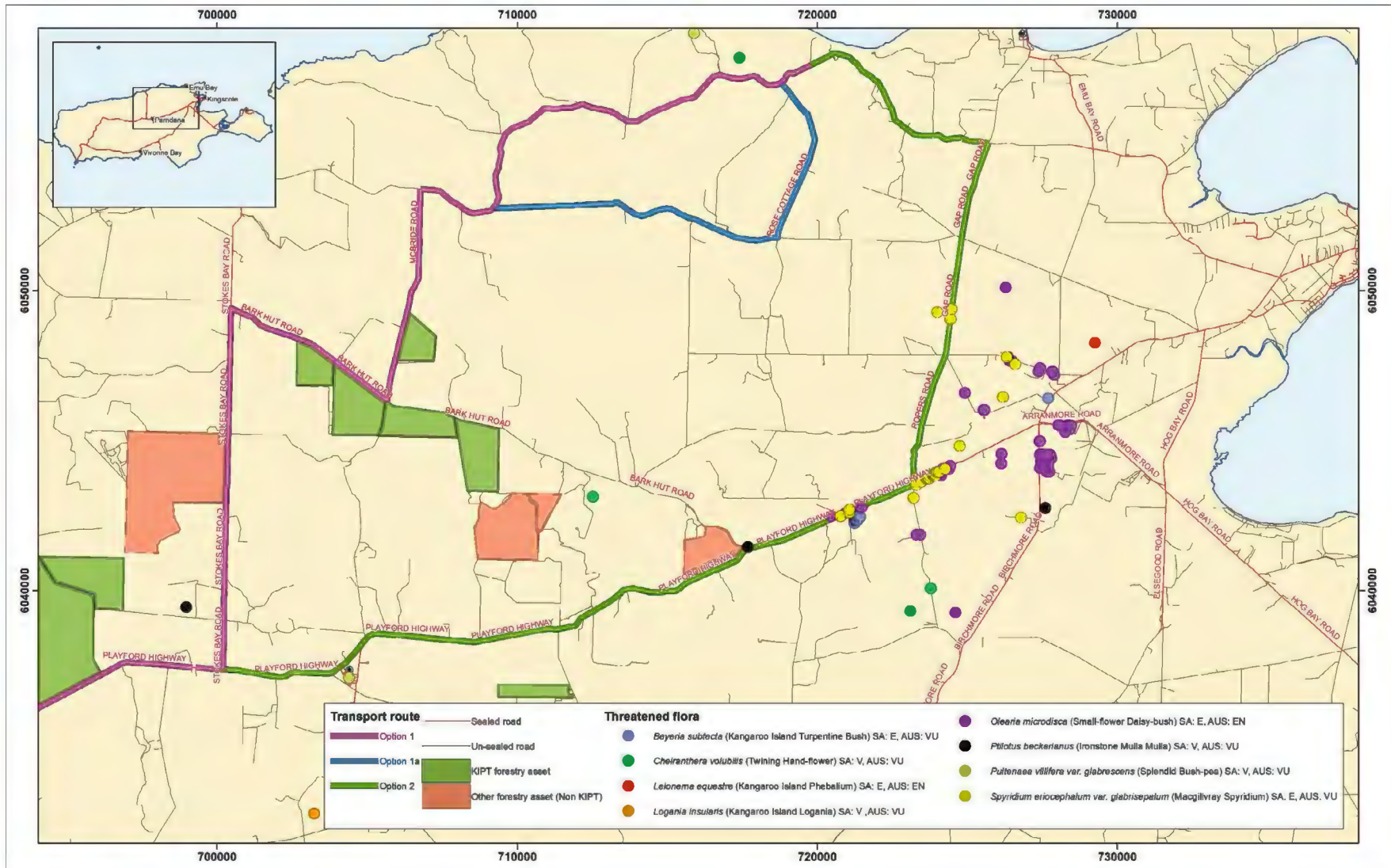
### 2.3 Other limitations

All route options had some presence of threatened species and ecosystems. Route Option 2 however had three areas of high ecological significance in terms of habitat. These were:

- Playford Highway adjacent to the Parndana Conservation Park
- Playford Highway where it crosses the upper Cygnet River catchment area of Branch Creek
- the Ropers Road crossing of the Cygnet River.

Eight nationally threatened flora species occur within 5km of Route Option 2 (Figure 3). Most of these are not likely to be impacted as part of the project under the risk assessment.

Forty-four fauna species of state or national significance are known to occur within 5km of Route Option 2 (Figure 4). Many of these species use habitat within the project area for habitat requirements however are not generally specific to this route option.



**COPYRIGHT:** Use or copying of this map in whole or in part without the written permission of EBS Ecology constitutes an infringement of copyright.  
**LIMITATION:** This map has been prepared on behalf of and for the exclusive use of EBS Ecology's Client, and is subject to and issued in connection with the provisions of the agreement between EBS Ecology and its Client. EBS Ecology accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this map by any third party.



Produced by: EBS Ecology  
 Data source:  
 Coordinate System:  
 GDA 1994 MGA Zone 53  
 Date: 10/04/2018

Figure 3. Threatened flora species locations relevant to Route Option 2.

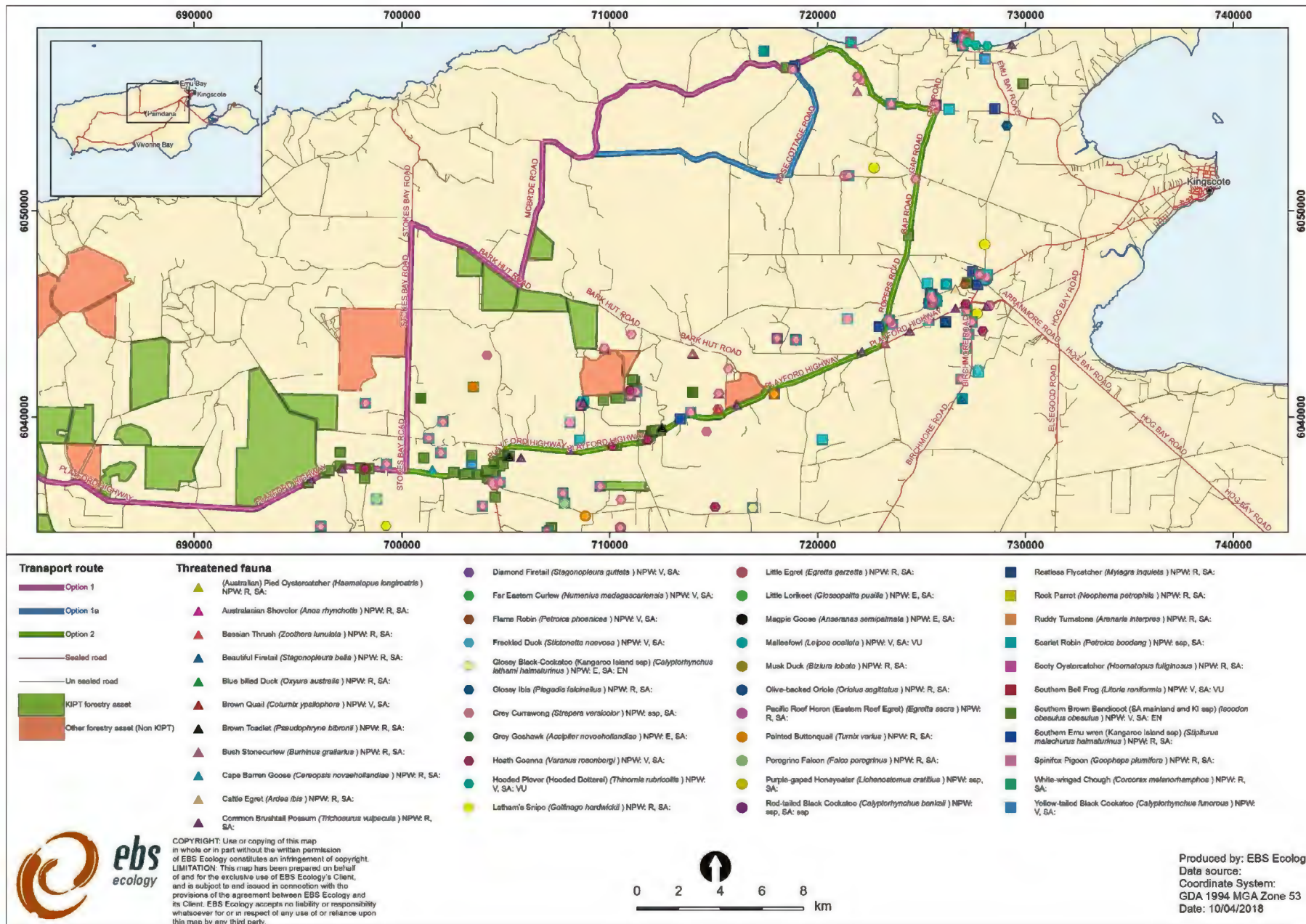


Figure 4. Threatened fauna species relevant to Route Option 2.

## 3 LEGISLATIVE LIMITATIONS

### 3.1 EPBC Act

The matters of national environmental significance (under the EPBC Act) are:

- World heritage properties
- National heritage places
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- Nationally threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development.

A person who proposes to take an action that will have, or is likely to have, a significant impact on a matter of national environmental significance must refer that action to the minister for a decision on whether assessment and approval is required under the EPBC Act.

The presence of known nesting habitat for the nationally endangered species Glossy Black Cockatoo in the immediate vicinity of the southern section of Ropers Road near the Cygnet River Crossing triggers point 4 of the matters of national significance, i.e. nationally threatened species and ecological communities

The presence of Kangaroo Island Narrow leaf Mallee in areas adjacent to the road and contiguous with areas of the Ropers and Gap Road reserve trigger point 4 of the matters of national significance.

The likely presence of *Spyridium eriocephalum* var. *glabrisepalum* triggers point 4 of the matters of national significance.

#### **3.1.1 Nationally threatened species and ecological communities**

In regards to point 4, the following applies in considering whether the project will have, or is likely to have a significant impact on a species listed in any of the following categories:

- extinct in the wild
- critically endangered
- endangered, or
- vulnerable.

An action will also require approval if the action has, will have, or is likely to have a significant impact on an ecological community listed in any of the following categories:

- critically endangered, or
- endangered.

The width of the existing road reserve on Ropers and Gap Road means that it is likely that clearance would be required to allow for the safe passage of heavy vehicles in either direction. In order to determine whether the action is likely to have a significant impact discussion is provided in the following sections for a number of criteria.

### 3.1.2 Critically endangered and endangered species

Individual species likely to be impacted as part of this action are:

- *Calyptorhynchus lathami halmaturina* (Glossy Black Cockatoo)
- *Spyridium eriocephalum* var. *glabrisepalum* (McGillivray Spyridium).

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population

It is unlikely that clearance of potential nesting trees will lead to a decrease in the population of Glossy Black Cockatoo unless active nest sites are removed (not likely). Clearance on Gap Road may impact the population size of McGillivray Spyridium

- reduce the area of occupancy of the species

This criteria may be relevant in terms of disturbance to roosting habitat by continuous flow of heavy vehicles. The large *Eucalyptus camaldulensis* potential nesting habitat trees which may be removed in the critical nesting habitat for Glossy Black Cockatoo may form roosting habitat for this species and therefore the action may reduce the occupancy for Glossy Black Cockatoo. The action would potentially reduce the area of occupancy for McGillivray Spyridium

- Fragment an existing population into two or more populations

Due to the general high density of the trees on the road reserve and surrounding areas, the wider areas would not be significantly fragmented, however an action may lead to a small spatial separation of two areas of intact vegetation. Plantations of trees in the areas specifically undertaken for the enhancement of Glossy Black Cockatoo habitat may become less effective given the possibility of some clearance of large potential roosting habitat trees such as *Eucalyptus cladocalyx* (Sugar Gum) and *Eucalyptus camaldulensis* (River Red Gum).

- Adversely affect habitat critical to the survival of a species

Any removal of large trees within this area is loss of habitat for Glossy Black Cockatoo. Large trees without suitable nesting hollows at the current point in time may become suitable over time, especially given the trunk size of the trees in question. Any narrowing of areas of road reserve containing McGillivray Spyridium would reduce the quality of the habitat. As a result, the action would definitely adversely impact the habitat critical to the species above.

- Disrupt the breeding cycle of a population

It is possible that disturbance from heavy vehicle traffic, if increased dramatically, would have an impact to the species. Scientific studies are required to quantify impacts.

- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

Disturbance may lead to a decline in habitat quality however this is not directly known.

- Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

This criteria is not likely to impact Glossy Black Cockatoo. Any increased fragmentation would be detrimental to the resilience of the intact vegetation and increase the opportunity for exotic flora species to reduce the quality of available habitat.

- Introduce disease that may cause the species to decline, or

It is unlikely that any impacts related to the project would be vectors for pathogens or diseases associated with nationally threatened species.

- Interfere with the recovery of the species.

The action may interfere with the recovery of the species if potential nesting sites are lost as a result of the action. This applies to the entire project site and not just Route Option 2.

### ***3.1.3 Critically endangered and endangered ecological communities***

Roadside vegetation is generally excluded from the EPBC listed community in road reserves. In some areas within the road reserve however, large tracts of the road reserve form parts of larger patches in adjoining paddocks, hence making these areas of very high conservation value and worthy of consideration under the EPBC Act.

#### **Significant impact criteria**

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- Reduce the extent of an ecological community

Clearance of the road reserve would most definitely reduce the overall extent of the protected communities. Even in the event of retention of narrow strips of vegetation, areas of increased fragmentation are increasingly subject to weed and pathogen invasion, loss of ecological function such as seed movement and physical effects such as breakage from increased wind velocity to individual trees.

- Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

This criteria would be directly impacted through definitive fragmentation.

- Adversely affect habitat critical to the survival of an ecological community

This community is typically low in species richness and understorey, however loss of function from species such as Ants may be critical to the long term survival and resilience of the community.

- Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns

It is unlikely that any impacts related to the project would impact the flow of surface or groundwater given adequate engineering elements such as culverts etc. that allow the existing natural events to continue unimpeded.

- Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting

It is unlikely that any impacts related to the project would cause changes in fire regimes or any other factors that would lead to a functional change in the natural ecology of the community such as nutrient cycling, infiltration or stability.

- Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
  - assisting invasive species, that are harmful to the listed ecological community, to become established, or
  - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or
- Interfere with the recovery of an ecological community.

Point one would be a direct vector for the introduction of declared and environmental weed species.



## 3.2 Native Vegetation Act 1991

In considering the clearance of native vegetation in areas not subject to the EPBC Act, we must then consider the *Native Vegetation Act 1991* and the mitigation hierarchy.

When deciding whether to consent to a proposal to clear under the Native Vegetation Regulations 2017, the Native Vegetation Council (NVC) will look at how the proponent of a project considered the Mitigation Hierarchy.

The Mitigation Hierarchy calls for proponents to plan their activity in the following order of importance:

- Avoid impacts on native vegetation. This must be the first step in your planning. It includes planning to place infrastructure, buildings or other assets in a way that completely avoids impacts to biodiversity. For example, is there a particular location or time of year that you could clear that would avoid damaging native vegetation altogether?

Avoidance is the critical first step and means to find a route that avoids the clearance of vegetation in the first instance is essential. In this case, Ropers and Gap Road fails to satisfy that option with this road likely to require clearance along most of the approximately 12 km length. There is unlikely to be significant clearance required for other sections of the route option.

- Minimise the duration, intensity and/or extent of impacts on native vegetation (including direct, indirect and cumulative impacts), if clearance cannot be avoided.

Minimising the clearance would most likely require that where possible the clearance would occur on one side of the road only to maintain the largest possible intact areas rather than finish with two very narrow strips which will struggle to maintain resilience against weeds and other impacts in comparison to a single large patch in this instance.

- Rehabilitate or restore, the ecosystems that have been degraded at the site of clearance, if adverse impacts cannot be minimised or avoided.

The road reserves are difficult to restore given the already fragmented nature in the event of clearance. Engagement with the local Natural Resources Management (NRM) agency or similar may allow for enhancement of other nearby intact patches.

- Offset to compensate for any significant residual adverse impacts that cannot be otherwise avoided, minimised and/or rehabilitated or restored, so that there is no net loss of biodiversity.

### 3.3 Provisional list of State threatened ecosystems

The following vegetation communities were identified within Route Option 2 and are listed on the provisional list of state threatened ecosystems (DEH, in progress).

**ENDANGERED** *E. cneorifolia*, *E. phenax* ssp. 'Kangaroo Island' Mallee on gilgai soils on plains  
**ENDEMIC** In lower Cygnet River catchment and MacGillivray plateau. Only conserved in Beyeria CP and an adjacent HA. Otherwise confined to roadsides where it is threatened by weed invasion and bulldozing.  
 IBRA Regions: KAN  
 Trend: declining

This was identified along the entire extent of the Ropers Road area and while it was largely in poor condition, the overstorey was well established. There was no evidence of recruitment within this area due to high levels of annual exotic grass cover which makes these areas a high threat to ongoing degradation and increased weed invasion, particularly from species such as Olive (*Olea europaea*).

**ENDANGERED** *E. cneorifolia*, *E. rugosa* Mallee over *Rhagodia candolleana* on glacial sediments on plains  
**ENDEMIC** Locally common on roadsides between Kingscote and Emu Bay. Not conserved and largely confined to roadsides, where it is threatened by weed invasion and bulldozing.  
 IBRA Regions: KAN  
 Trend: declining  
 NVIS Subgroup: mallee eucalyptus low open woodlands  
 Subregion: KAN1

This community was more representative of the communities observed at the northern end of Gap Road and along the North Coast Road west of the Emu Bay Road. This also has a declining trend. This community was prevalent along the eastern section of North Coast Road within the project area.

**VULNERABLE** *E. fasciculosa* +/- *E. leucoxylo*n Heathy Woodland on sandy loams of flats and slopes.  
 Reserved examples mostly small and in poor condition.  
 IBRA Regions: FLB, KAN, NCP, MDD  
 Trend: declining  
 NVIS Subgroup: eucalyptus forests with a heath understorey  
 Subregion: FLB1, KAN1, KAN2, NCP1, NCP3, NCP4, MDD4

This community was located along Route Option 2 on the Playford Highway however is not expected to be impacted as part of the project.

**VULNERABLE** *E. ovata* +/- *E. viminalis* ssp. *cygnetensis* +/- *E. camaldulensis* var. *camaldulensis* Low Woodland in valleys and drainage lines  
 Heavily modified and fragmented by clearance for grazing, and no examples in reserves.  
 IBRA Regions: KAN, NCP  
 Trend: declining  
 NVIS Subgroup: eucalyptus woodlands with a shrubby understorey  
 Subregion: KAN1, KAN2, NCP2, NCP3

This community was not specifically mapped, however small numbers of individuals of *Eucalyptus ovata* were recorded within the project area on the Playford Highway. This community is not expected to be impacted as part of the project.



*EBS Ecology*  
*3/119 Hayward Avenue*  
*Torrensville, SA 5031*  
*[www.ebsecology.com.au](http://www.ebsecology.com.au)*  
*t. 08 7127 5607*  
*f. 08 8352 1222*



Appendix P6 –  
KIPT Transport Route  
Options – Ecological  
Assessment – EBS  
Ecology



**KIPT Transport Route Options**  
**Ecological Assessment**

# KIPT Transport Route Options Ecological Assessment

26 July 2018

Version 3

Prepared by EBS Ecology for KIPT

EBS Ecology Project Number: E80101

**COPYRIGHT:** Use or copying of this document in whole or in part (including photographs) without the written permission of EBS Ecology's client and EBS Ecology constitutes an infringement of copyright.

**LIMITATION:** This report has been prepared on behalf of and for the exclusive use of EBS Ecology's client, and is subject to and issued in connection with the provisions of the agreement between EBS Ecology and its client. EBS Ecology accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

**CITATION:** EBS Ecology (2018) KIPT Transport Route Options Ecological Assessment. Report to KIPT. EBS Ecology, Adelaide.

Cover photograph: *Banksia marginata* (Silver Banksia) flower.

EBS Ecology  
125 Hayward Avenue  
Torrensville, South Australia 5031  
t: 08 7127 5607  
<http://www.ebsecology.com.au>  
email: [info@ebsecology.com.au](mailto:info@ebsecology.com.au)



## GLOSSARY AND ABBREVIATION OF TERMS

ALA	Atlas of Living Australia
BAM	Bushland Assessment Manual
DEW	Department of Environment and Water (State)
DOE	Department of the Environment (Federal)
EBS	EBS Ecology
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
GBC	Glossy Black Cockatoo
KI	Kangaroo Island
KIPT	Kangaroo Island Plantation Timbers
NCCSA	Nature Conservation Council of South Australia
NPW Act	<i>National Parks and Wildlife Act 1972</i>
NRM Act	<i>Natural Resources Management Act 2004</i>
NV Act	<i>Native Vegetation Act 1991</i>
NVC	Native Vegetation Council
NVF	Native Vegetation Fund
NVMU	Native Vegetation Management Unit
PMST	Protected Matters Search Tool
SA	South Australia
SEB	Significant Environmental Benefit
ssp.	Subspecies
spp.	Species (plural)
TEC	Threatened Ecological Community

## Table of Contents

<b>1</b>	<b>INTRODUCTION</b>	<b>1</b>
1.1	Objectives	1
1.2	Project area	1
<b>2</b>	<b>COMPLIANCE AND LEGISLATIVE SUMMARY</b>	<b>3</b>
2.1	Environment Protection and Biodiversity Conservation Act 1999	3
2.2	Native Vegetation Act 1991	4
2.3	National Parks and Wildlife Act 1972	4
2.4	Natural Resources Management Act 2004	5
<b>3</b>	<b>METHODS</b>	<b>6</b>
3.1	Desktop assessment	6
3.2	Field survey	6
3.2.1	Flora	6
3.2.2	Fauna	7
3.3	Sensitivity mapping and assessment	7
3.4	Relevant aspects of the project	8
3.5	Limitations	8
<b>4</b>	<b>RESULTS</b>	<b>9</b>
4.1	Matters of national environmental significance	9
4.1.1	Threatened ecological communities	10
4.2	Threatened flora	11
4.2.1	<i>Asterolasia phebalioides</i> (Downy Star-bush)	11
4.2.2	<i>Cheiranthra volubilis</i> (Twining finger Flower)	11
4.2.3	<i>Logania insularis</i> (Kangaroo Island Logania)	11
4.2.4	<i>Ptilotus beckerianus</i> (Ironstone Mulla Mulla)	12
4.2.5	<i>Pultenaea villifera</i> var. <i>glabrescens</i> (Splendid Bush-pea)	12
4.2.6	<i>Beyeria subsecta</i> (Kangaroo Island Turpentine Bush)	12
4.2.7	<i>Spyridium eriocephalum</i> var. <i>glabrisepalum</i> (McGillivray Spyridium)	12
4.2.8	<i>Thelymitra matthewsii</i> (Spiral Sun-orchid)	12
4.2.9	<i>Eucalyptus paludicola</i> (Mt. Compass Swamp Gum)	12
4.2.10	<i>Leionema equestre</i> (Kangaroo Island Phebalium)	13
4.2.11	<i>Olearia microdisca</i> (Small-flower Daisy-bush)	13
4.3	Threatened fauna	13
4.4	Threatened Fauna	13
4.4.1	<i>Calyptorhynchus lathami</i> ssp. <i>halmaturinus</i> (Glossy Black Cockatoo)	14
4.4.2	<i>Litoria raniformis</i> (Southern Bell Frog)	14
4.4.3	<i>Thinornis rubricollis</i> (Hooded Plover, Hooded Dotterel)	15
4.4.4	<i>Stipiturus malachurus halmaturinus</i> (Southern Emuwren)	15
4.4.5	<i>Sminthopsis aitkeni</i> (Kangaroo Island Dunnart)	15



4.5	Broad scale vegetation patterns .....	16
4.6	Vegetation associations.....	17
<b>5</b>	<b>SENSITIVITY ASSESSMENT .....</b>	<b>20</b>
5.1	Section 1: Playford Highway, West End Highway to Stokes Bay Road .....	23
5.2	Section 2: Stokes Bay Road, Playford Highway to Bark Hut Road Intersection .....	26
5.3	Section 3: Bark Hut Road, Stokes Bay Road to McBrides Road Intersection.....	29
5.4	Section 4: McBrides Road, Bark Hut Road to North Coast Road Intersection .....	32
5.5	Section 5: North Coast Road, McBrides Road to access track into property.....	35
5.6	Section 6: Springs Road, To Rose Cottage Road Intersection .....	38
5.7	Section 7: Rose Cottage Road from Springs Road to North Coast Road Intersection .....	41
5.8	Section 8: Playford Highway, Stokes Bay Road to Ropers Road Intersection .....	44
5.9	Section 9: Ropers / Gap Road, Playford Highway to North Coast Road .....	47
5.10	Section 10: North Coast Road, Gap Road to access track into property Intersection .....	51
5.11	Section 11: Access track into property, from North coast Road.....	53
<b>6</b>	<b>REFERENCES.....</b>	<b>55</b>
<b>7</b>	<b>APPENDICES .....</b>	<b>56</b>
	Appendix 1. Threatened flora species recorded within 5km buffer of project area. ....	56
	Appendix 2. Threatened fauna species recorded within 5km buffer of project area. ....	59
	Appendix 3. Port Lincoln Wind Rose .....	62
	Appendix 4. Bushland assessment parameters which influence the Unit Biodiversity Score .....	63
<b>List of Tables</b>		
	Table 1. Rating for the sensitivity assessment or consequence. ....	7
	Table 2. Ratings for the assessment of likelihood.....	7
	Table 3. Risk assessment matrix.....	8
	Table 4. EPBC protected matters search summary.....	9
	Table 5. EPBC listed Threatened Ecological Community highlighted from within the project area. ....	10
	Table 6. Nationally threatened flora species known as occurring within 5km of the project .....	11
	Table 7. Nationally threatened fauna species known as occurring within 5km of the project .....	13
	Table 8. Vegetation association summary .....	18
	Table 9. Route option road sections utilised for sensitivity assessment. ....	20
	Table 10. Section 1 sensitivity assessment summary.....	23
	Table 11. Section 2 sensitivity assessment summary.....	26
	Table 12. Section 3 sensitivity assessment summary.....	29
	Table 13. Section 4 sensitivity assessment summary.....	32
	Table 14. Section 5 sensitivity assessment summary.....	35
	Table 15. Section 6 sensitivity assessment summary.....	38
	Table 16. Section 7 sensitivity assessment summary.....	41

Table 17. Section 8 sensitivity assessment summary.....	44
Table 18. Section 9 sensitivity assessment summary.....	47
Table 19. Section 10 sensitivity assessment summary.....	51
Table 20. Section 11 sensitivity assessment summary.....	53

## List of Figures

Figure 1. Location of Project area.....	2
Figure 2. Individual road sections as described in Table 9.....	21
Figure 3. Overall sensitivity results map of project area.....	22
Figure 4. Image showing typical clearance envelope on Playford Highway.....	24
Figure 5. Section 1 sensitivity map.....	25
Figure 6. Stokes Bay Road typical vegetation structure.....	27
Figure 7. Section 2 sensitivity map.....	28
Figure 8. <i>Eucalyptus cosmophylla</i> (Cup Gum) Woodland on Bark Hut Road.....	30
Figure 9. Section 3 sensitivity map.....	31
Figure 10. Association 14 degraded open Woodland over Exotic and native grass species.....	33
Figure 11. Association 15 in creek crossing on McBrides Road.....	33
Figure 12. Section 4 sensitivity map.....	34
Figure 13. Section 5 sensitivity map.....	37
Figure 14. Section 6 sensitivity map.....	40
Figure 15. High value Narrow Leaf Mallee patch on Rose Cottage Road.....	42
Figure 16. Section 7 sensitivity map.....	43
Figure 17. Potential feeding habitat on Playford Highway East.....	45
Figure 18. Section 8 sensitivity map.....	46
Figure 19. Narrow Leaf Mallee overhanging ropers Road.....	48
Figure 20. <i>Eucalyptus camaldulensis</i> , <i>E. cladocalyx</i> Woodland on Ropers Road.....	49
Figure 21. Section 9 sensitivity map.....	50
Figure 22. Section 10 sensitivity map.....	52
Figure 23. Degraded patch on access track into property.....	53
Figure 24. Section 11 sensitivity map.....	54

# 1 INTRODUCTION

Kangaroo Island Plantation Timbers Ltd (KIPT) operates a number of timber plantation estates across Kangaroo Island (KI). Planning for export of the raw material from these plantations requires a wharf facility at Smith Bay on the North Coast of Kangaroo Island. Subsequently, transport routes from the various estates to the proposed wharf facility have been explored to determine the most appropriate routes from a number of perspectives. Three transport routes (the project area) have been narrowed down from preliminary studies and these have been assessed from an ecological perspective to provide guidance on circumvention of impacts on flora and fauna communities within the project area.

## 1.1 Objectives

The objectives of the transport corridor routes ecological assessment were to:

- Conduct desktop assessments to identify threatened species habitats present within the project area including a review of relevant literature and existing spatial data
- conduct a detailed flora survey which included mapping vegetation associations and conducting bushland assessment scoresheets consistent with requirements under the *Native Vegetation Regulations 2017*
- assess for the presence of critical habitat for any species of national, state or local conservation significance known or likely to occur within the project area
- produce a technical report, presenting the results of background research and the field survey including vegetation descriptions and potential impacts to native vegetation
- provide a map showing the areas of high sensitivity in regards to interactions between transport and ecological communities.

## 1.2 Project area

The project area extends from western Kangaroo Island to Smith Bay. Three route options assessed as part of the survey (Routes 1, 1a and 2) are displayed below in Figure 1. All routes assessed and described as part of this report were done so in working towards Smith Bay as the termination point.

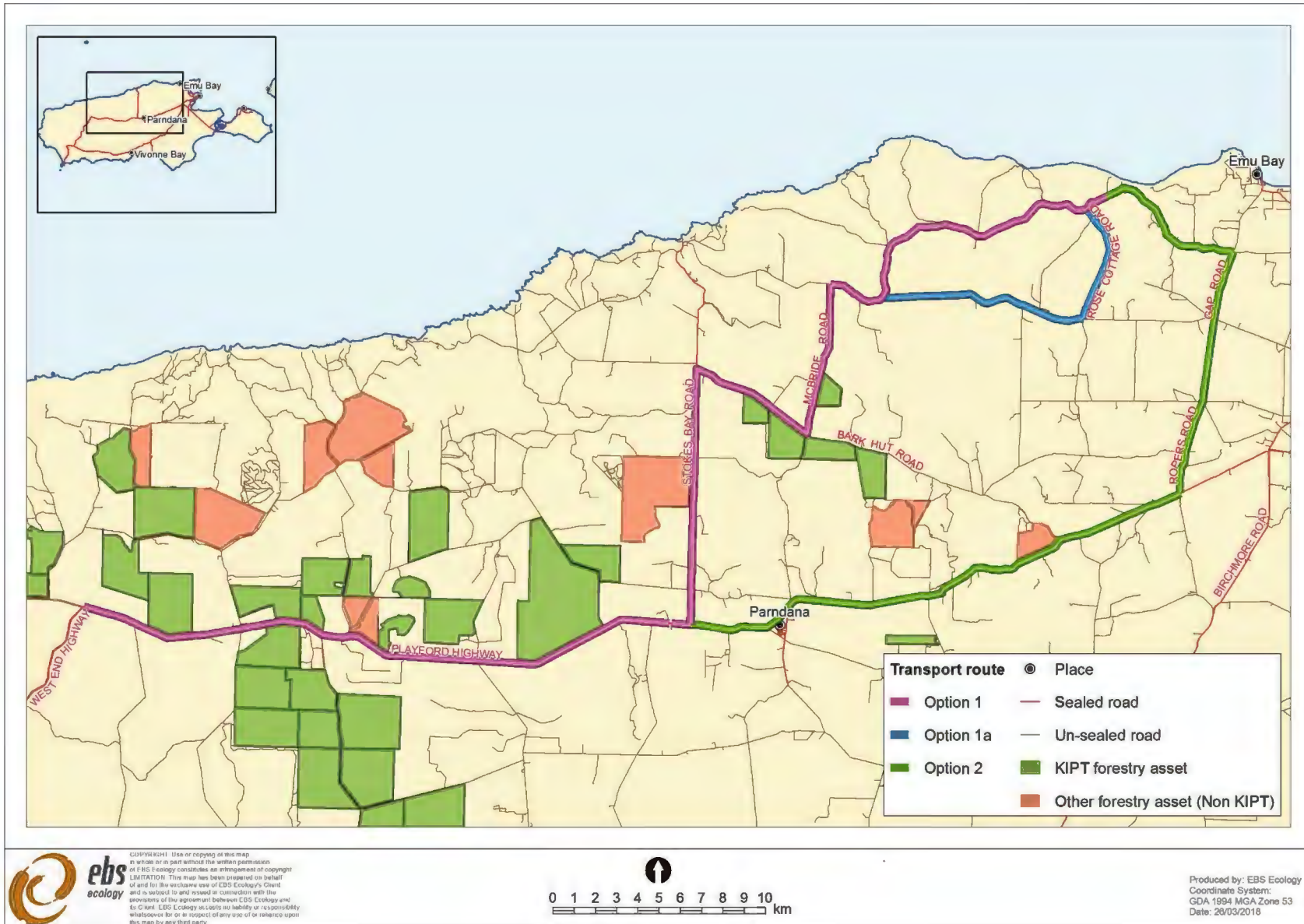


Figure 1. Location of Project area.

## 2 COMPLIANCE AND LEGISLATIVE SUMMARY

The key elements of legislation and policy relating to flora and fauna are summarized below.

### 2.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Environment Protection and Biodiversity Conservation Regulations 2000* provide a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the Act as ‘matters of national environmental significance’. There are nine matters of national environmental significance protected under the EPBC Act:

1. World Heritage properties
2. National Heritage places
3. Wetlands of international importance (listed under the Ramsar Convention)
4. Listed threatened species and ecological communities
5. Migratory species protected under international agreements
6. Commonwealth marine areas
7. The Great Barrier Reef Marine Park
8. Nuclear actions (including uranium mines)
9. A water resource, in relation to coal seam gas development and large coal mining development.

Any action that has, will have, or is likely to have a significant impact on matters of national environmental significance requires referral under the EPBC Act. Substantial penalties apply for undertaking an action that has, will have or is likely to have significant impact on a matter of national environmental significance without approval.

The EPBC Act Significant Impact Guidelines provide overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance. In terms of nationally threatened species, the guidelines define an action as likely to have a significant impact if there is a real chance or possibility that it will:

- Lead to a long term decrease in the population
- Reduce the area of occupancy of the species
- Fragment an existing population
- Adversely affect critical habitat
- Disrupt breeding cycles
- Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- Result in the establishment of invasive species that are harmful to the species
- Introduce disease that may cause the species to decline

- Interfere with the recovery of the species.

## 2.2 Native Vegetation Act 1991

The project area falls inside the area designated under the *Native Vegetation Act 1991*. Native vegetation within the project area is protected under the *Native Vegetation Act 1991* and *Native Vegetation Regulations 2017*. Any proposed clearance of native vegetation in South Australia (unless exempt under the *Native Vegetation Regulations 2017*) is to be assessed against the Principles of Clearance under the Act, and requires approval from the Native Vegetation Council (NVC). A net environmental benefit is generally conditional on an approval being granted.

Native vegetation refers to any naturally occurring local plant species that are indigenous to South Australia, from small ground covers and native grasses to large trees and water plants.

"Clearance", in relation to native vegetation, means:

- The killing or destruction of native vegetation;
- The removal of native vegetation;
- The severing of branches, limbs, stems or trunks of native vegetation;
- The burning of native vegetation;
- Any other substantial damage to native vegetation, and includes the draining or flooding of land, or any other act or activity, that causes the killing or destruction of native vegetation, the severing of branches, limbs, stems or trunks of native vegetation or any other substantial damage to native vegetation.

The principles apply in all cases, except where the vegetation has been considered exempt under the *Native Vegetation Regulations 2017* or can be classified as an 'intact stratum'. 'Intact stratum' means that applications will usually be denied when the vegetation has not been seriously degraded by human activity within the last 20 years.

All approved vegetation clearance must also be conditional on achieving a Significant Environmental Benefit (SEB) to offset the clearance. The requirement for a SEB also applies to several of the exemptions. Potential SEB offsets include:

- the establishment and management of a set-aside area to encourage the natural regeneration of native vegetation;
- the protection and management of an established area of native vegetation;
- entering into a Heritage Agreement on land where native vegetation is already established to further preserve or enhance the area in perpetuity; and
- a payment to the Native Vegetation Fund.

## 2.3 National Parks and Wildlife Act 1972

Vascular plants and vertebrate animals (e.g. mammals, birds, reptiles and amphibians) are protected in South Australia under the threatened species schedules of the *National Parks and Wildlife Act 1972* (NPW Act): Schedule 7 (endangered species), Schedule 8 (vulnerable species) and Schedule 9 (rare species).

The criteria used to define threatened species in South Australia are generally based on categories and definitions from the IUCN Red List Categories and Criteria.

The current schedules do not include non-vascular plants, fish, insects, butterflies, spiders, scorpions and other invertebrates, fungi and other life forms which do not have a current legal conservation status in South Australia.

Under the NPW Act, persons must not:

- take a native plant on a reserve, wilderness protection area, wilderness protection zone, land reserved for public purposes, a forest reserve or any other Crown land.
- take a native plant of a prescribed species on private land.
- take a native plant on private land without the consent of the owner (such plants may also be covered by the *Native Vegetation Act 1991*).
- take a protected animal or the eggs of a protected animal without approval.
- keep protected animals unless authorised to do so.
- use poison to kill a protected animal without approval.

Conservation rated flora and fauna species listed on Schedules 7, 8, or 9 of the NPW Act are known to or may occur within the KIPT Transport Route. Persons must comply with the conditions imposed upon permits and approvals.

## **2.4 Natural Resources Management Act 2004**

Under the *Natural Resources Management Act 2004* (NRM Act) landholders have a legal responsibility to manage declared pest plants and animals and prevent land and water degradation.

Key components under the Act include the establishment of regional Natural Resource Management (NRM) Boards and development of regional NRM Plans; the ability to control water use through prescription, allocations and restrictions; requirement to control pest plants and animals and activities that might result in land degradation.

A 'duty of care' is a fundamental component of this Act, i.e. ensuring one's environmental and civil obligation by taking reasonable steps to prevent land and water degradation. Persons can be prosecuted if they are considered negligent in meeting their obligations.

## 3 METHODS

### 3.1 Desktop assessment

A desktop assessment was undertaken which included examination of the following data sets:

- EPBC Act Protected Matters Search Tool (DoE 2017)
- Atlas of Living Australia (ALA 2017) fauna and flora records.
- Glossy Black Cockatoo habitat mapping analysis (DEWNR, 2017)
- Nature Maps, 2017 *Phytophthora* records.

### 3.2 Field survey

Field survey was undertaken from the 12<sup>th</sup> to 17<sup>th</sup> February 2018. The routes were traversed by car. All observations and photo point locations were recorded using a Garmin hand held GPS unit which is accurate to +/- 5m.

#### 3.2.1 Flora

Vegetation associations were mapped and assessed for condition in accordance with the Bushland Assessment Manual (BAM) methodology. The BAM was developed by the DEW Native Vegetation Management Unit (NVMU) to assess areas of native vegetation requiring clearance. The method was derived from the Nature Conservation of South Australia's (NCCSA) Bushland Assessment Methodology (Croft, Pedler and Milne, NCCSA) and endorsed by the NVC. BAM requires quantitative on ground and desktop assessments of native vegetation and ecological values including:

- size of vegetation patch;
- landscape context;
- vegetation condition;
- conservation significance score;
- mean annual rainfall; and
- area of clearance.

The factors which comprise each of these parameters are described in Appendix 4 – Bushland Assessment. The proposed clearance area was divided into different areas defined as “blocks;” based on their spatial layout across the proposed survey area (Figure 3). The various blocks were then mapped into vegetation communities with differing condition classes called ‘sites’. Due to the linear nature of the alignment individual sites were established that allowed suitable spatial distribution of sites and representative of the various conditions present within the alignment.

Site attributes were entered into a pre-designed scoresheet (NVMU) and each site proposed for clearance was assigned a Unit Biodiversity Score (UBS) which is used to calculate the Significant Environmental Benefit (SEB) requirement in hectares and the value for payments into the Native Vegetation Fund (NVF).



### 3.2.2 Fauna

Any fauna observed were recorded opportunistically. No specific targeted searches were undertaken, due to the majority of the project site being limited to narrow roadside corridors. Disturbance from vehicles as well as personnel undertaking vegetation assessment were likely to have flushed many of the more inconspicuous fauna species from the site. A general site assessment was undertaken of the habitat value of the project area for native fauna.

### 3.3 Sensitivity mapping and assessment

An ecological sensitivity map of the project area was produced by integrating the information collected as part of the bushland assessments with pre-existing background information such as locations and densities of threatened species. This includes assigning habitat units based on their ecological properties, potential presence of sensitive species and the Bushland Assessment Scoresheet Unit Biodiversity Score (UBS).

The consequence and likelihood of each individual risk was analysed using the risk assessment matrix. Table 1 and Table 2 present the ratings for consequence and likelihood respectively. These tables are guided by AS/NZS ISO 31000:2009.

**Table 1. Rating for the sensitivity assessment or consequence.**

Consequence level	Communities	Species
1	No expected impact to high value ecological communities. Clearance of low value communities with biodiversity Unit score of <20. Low level trimming and isolated tree removals of degraded communities with UBS of <40	Low or no impact to terrestrial species
2	Minor impacts such as dust deposition, disturbance to habitats through vehicle noise. Clearance of ecological communities with Unit Biodiversity Score of >20 / <40. Impact Restricted to local area only.	Low impact to fauna species such as loss of nesting or other habitat requirements. Increased road kill.
3	Impact likely to have knock on effects to the wider area such as pathogen spread (Phytophthora) and increase of weeds and pests. Clearance of ecological communities with UBS of >40	Impacts to potential nesting and/or feeding habitat for conservation significant species. Disturbance to nesting / roosting habitat. Significant increase in roadkill.
4	Loss of road reserve width and fragmentation of high value communities with Unit Biodiversity Score of >60. Likely to have direct impact.	Impacts critical nesting and/or feeding habitat and nationally listed conservation significant species. Very high roadkill numbers

**Table 2. Ratings for the assessment of likelihood.**

Likelihood	Environment
Almost certain	Is expected to occur
Likely	Occurs frequently in similar projects
Possible	Could occur under unusual circumstances e.g. extreme weather events etc.
Unlikely	Unlikely to occur within the next 20 years
Rare	Unlikely to occur ever

The overall risk category was determined by the risk matrix provided below in Table 3 which considers both the consequence and probability.

**Table 3. Risk assessment matrix.**

Likelihood	Consequence			
	1	2	3	4
Almost certain	Moderate	High	Extreme	Extreme
Likely	Moderate	Moderate	High	Extreme
Possible	Low	Moderate	Moderate	High
Unlikely	Low	Low	Moderate	Moderate
Rare	Low	Low	Low	Moderate

### 3.4 Relevant aspects of the project

The following assumptions were made when assessing the sensitivity and in making judgements on the impact to species;

- Significant increase in number of A or B-Double Heavy Vehicle utilisation along proposed routes on a daily Monday-Friday basis
- Minimum road width clearance consistent with Kangaroo Island Council Roadside Vegetation Management Plan, Minimum 8m width for unsealed roads 'Category A' and 10m width for unsealed roads not 'Category A'.

### 3.5 Limitations

Atlas of living Australia searches for flora and fauna records utilised in Bushland Assessments were limited to a 5 km buffer around the project area. The reliability of the data ranges from 100 m to over 100 km. Fauna species, in particular birds, also have the ability to traverse distances in excess of 20 km. It is also acknowledged that the presence of species may not be adequately represented by database records. Hence the results may not highlight all threatened flora and fauna species that may occur in the area.

The timing of the field survey was not optimal for the detection of many annual and herbaceous species. A number of flora recorded could only be identified to genus level due to a lack of distinguishing identification features such as flowers or fruits. It should be noted however, that the data collected is considered adequate to make an accurate assessment of bushland assessments.

## 4 RESULTS

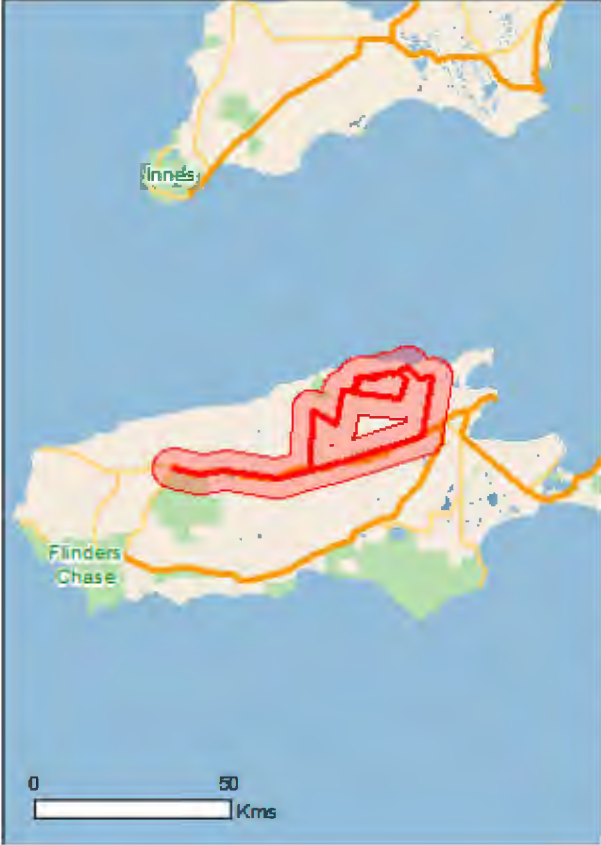
This section provides a summary of the results of database searches (EPBC database via the Protected Matters Search Tool (PMST) and the Atlas of Living Australia data analysis tool).

Flora species recorded in the ALA search within the desktop search area are presented in Appendix 1. Fauna species recorded in the ALA search within the desktop search area are presented in Appendix 2.

### 4.1 Matters of national environmental significance

The EPBC PMST results conducted by EBS (DoE 2018, extracted 27/02/2018) identified 48 nationally threatened flora / and / or fauna species, 37 migratory species and one Threatened Ecological Community (TEC) as likely or potentially occurring within the project area. A total of 75 protected marine species and 48 invasive species were also highlighted in the report. The results from the EPBC Protected Matters report are summarised in Table 4. For the purposes of this assessment, ongoing discussion of EPBC listed species is centred on terrestrial species due to a lack of relevance of marine and migratory species to this element of the project.

**Table 4. EPBC protected matters search summary.**

Search area (10 km buffer)	Matters of National Environmental Significance	Number
	World Heritage Properties	None
	National Heritage Places	None
	Wetlands of International Importance	None
	Great Barrier Reef Marine Park	None
	Commonwealth Marine Areas	None
	Listed Threatened Ecological Communities	1
	Listed Threatened Species	48
	Listed Migratory Species	37
	Listed Marine Species	75
	Whales and Other Cetaceans	12
	<b>Other Matters Protected by the EPBC Act</b>	
	Commonwealth Land	None
	Commonwealth Heritage Places	None
	Commonwealth Reserves Terrestrial	None
	Commonwealth Reserves Marine	None
	Critical Habitats	None
	<b>Extra Information</b>	
	Invasive Species	48
	Key Ecological Features (Marine)	None
	Nationally Important Wetlands	3
Regional Forest Agreements	None	
State and Territory Reserves	35	

#### 4.1.1 Threatened ecological communities

The EPBC PMST identified one Threatened Ecological Community, Kangaroo Island Narrow-leaved Mallee (*Eucalyptus cneorifolia*) Woodland, as listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as either occurring or having the potential to occur within the vicinity of the project area. Table 5 below, provides benchmark conditions for this threatened ecological community to exist and likelihood of its occurrence within the project area.

**Table 5. EPBC listed Threatened Ecological Community highlighted from within the project area.**

Threatened Ecological Community name	EPBC Act Status	Benchmarks	Likelihood of occurrence within the project area
Kangaroo Island Narrow-leaved Mallee ( <i>Eucalyptus cneorifolia</i> ) Woodland	Critically Endangered	<p>Roadside vegetation at a particular point or location must be considered for protection if:</p> <ul style="list-style-type: none"> <li>• At that point, the shortest cross-sectional mature canopy width of the vegetation is 60 metres or more. Mature canopy width is measured from canopy edge to canopy edge, ignoring canopy breaks within the vegetation of up to 20 metres. This means that strips of the ecological community along each side of a road can effectively be treated as part of a single area of vegetation where the width of the roadside break is 20 metres or less.</li> </ul> <ul style="list-style-type: none"> <li>○ Where two separate areas of the ecological community at least 60 metres wide are connected by a narrow section of the ecological community, e.g. a strip along only one side of the road, the narrow section is included in the patch if it is more than five metres wide and less than 500 metres long (i.e. the separation between the two wide areas is less than 500 metres).</li> <li>○ Where the tree canopy has been recently removed or reduced, e.g. due to pollarding or fire, then the mature canopy width should be calculated by assuming a mature canopy radius of 10 metres around the remaining tree and shrub stumps.</li> </ul> <p>Native vegetation at any point or location away from roadside verges must be considered for protection where it is an area of the ecological community if:</p> <ul style="list-style-type: none"> <li>• The shortest cross-sectional mature canopy width of the vegetation is 60 metres or more. Mature canopy width is measured from canopy edge to canopy edge, ignoring canopy breaks within the vegetation of up to 20 metres.</li> </ul> <ul style="list-style-type: none"> <li>○ Where the tree canopy has been recently removed or reduced, e.g. due to pollarding or fire, then the mature canopy width should be calculated by assuming a mature canopy radius of 10 metres around the remaining tree and shrub stumps.</li> </ul>	Known

## 4.2 Threatened flora

Twelve EPBC listed flora species were identified by the EPBC Protected Matters Search Tool as potentially occurring or having habitat potentially occurring within the vicinity of the project area (Appendix 1). Eleven nationally listed flora species were known from within 5 km of the project area and these are shown below in Table 6. An additional 83 state conservation listed species were known from within 5 km of the project area.

**Table 6. Nationally threatened flora species known as occurring within 5km of the project**

Scientific Name	Common Name	EPBC Act Status	NPW Act Status
<i>Asterolasia phebalioides</i>	Downy Star-bush	VU	V
<i>Cheiranthra volubilis</i>	Twining Hand-flower	VU	V
<i>Logania insularis</i>	Kangaroo Island Logania	VU	V
<i>Ptilotus beckerianus</i>	Ironstone Mulla Mulla	VU	V
<i>Pultenaea villifera</i> var. <i>glabrescens</i>	Splendid Bush-pea	VU	V
<i>Beyeria subsecta</i>	Kangaroo Island Turpentine Bush	VU	E
<i>Spyridium eriocephalum</i> var. <i>glabrisepalum</i>	McGillivray Spyridium	VU	E
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	VU	E
<i>Eucalyptus paludicola</i>	Mount Compass Swamp Gum	EN	E
<i>Leionema equestre</i>	Kangaroo Island Phebalium	EN	E
<i>Olearia microdisca</i>	Small-flower Daisy-bush	EN	E

### 4.2.1 *Asterolasia phebalioides* (Downy Star-bush)

The Downy Star-bush (*Asterolasia phebalioides*) is a small shrub endemic to south-eastern Australia, where it occurs in South Australia (Kangaroo Island) and western Victoria. There are estimated to be 50,000–300,000 plants occurring in 15–25 wild populations, although most known plants occur in just one extended population on Kangaroo Island in South Australia. Threats are not well known, but may include altered fire frequency, other disturbance, and *Phytophthora cinnamomeum* infection, weed invasion and browsing (DoEE, 2018). The known locations for this species are west of the project area and are not likely to be impacted as part of the project.

### 4.2.2 *Cheiranthra volubilis* (Twining finger Flower)

A weak twining perennial shrub with long linear leaves and large blue flowers at the top of the stems with the yellow anthers arranged like fingers on the hand. Flowering between October and March. Endemic to South Australia and found only on Kangaroo Island (Taylor, 2008). It is likely that this species is present in areas encompassed by the project site where intact vegetation is present.

### 4.2.3 *Logania insularis* (Kangaroo Island Logania)

*Logania insularis* is endemic to South Australia and found only on the north-eastern tip of Kangaroo Island, growing along the coast open in mallee or low shrub land on brown sandy soil overlying limestone. Very rare in South Australia. No records exist within the immediate proximity of the project area and it is considered unlikely that this species will be impacted as part of the project (Taylor, 2008).

#### **4.2.4 *Ptilotus beckerianus* (Ironstone Mulla Mulla)**

The Ironstone Mulla Mulla is endemic to SA. It occurs in the central and western regions of Kangaroo Island, from near the Eleanor River to the south coast, near Vivonne and at Hummocky on the north coast. The Ironstone Mulla Mulla occurs in association with a number of plant communities including *Eucalyptus cladocalyx* (Sugar Gum) Open Woodland, *Allocasuarina verticillata* (Drooping She-oak) Woodland and *Melaleuca uncinata* (Broombush) Shrub land on Eyre Peninsula and *Eucalyptus diversifolia* (Coastal White Mallee) Open Shrub land on Kangaroo Island (Taylor, 2008). It is possible that areas within the project site would have occurrences of this species. Therefore it is possible that the project may impact on this species.

#### **4.2.5 *Pultenaea villifera* var. *glabrescens* (Splendid Bush-pea)**

Endemic to South Australia and found only along the north coast on Kangaroo Island, growing in dry sclerophyll forests to open mallee woodlands often dominated by *Allocasuarina verticillata* (Drooping She-oak) or *Eucalyptus baxteri* (Brown Stringybark), *E. cladocalyx* (Sugar Gum) and *E. leucoxydon* (SA Blue-gum) heaths, grasslands and coastal cliffs on sandy to gravelly clay over sandstone, basalt, limestone or rhyolite (Taylor, 2008). It is unlikely based on the habitat and locations of known records that this species will be impacted as part of the project.

#### **4.2.6 *Beyeria subsecta* (Kangaroo Island Turpentine Bush)**

*Beyeria subsecta* is endemic to Kangaroo Island (Prescott 1995). It occurs within a thin strip encompassing 5 km either side of the Hog Bay Road from Min Oil Rd to Three Chain Rd, in eastern Kangaroo Island. Based on the known distribution of this species it is highly unlikely that the project will impact on this species.

#### **4.2.7 *Spyridium eriocephalum* var. *glabrisepalum* (McGillivray Spyridium)**

*Spyridium eriocephalum* var. *glabrisepalum* is endemic to Kangaroo Island (Prescott 1995). It occurs in one large and four small sub-populations in eastern Kangaroo Island. It is known from a number of locations adjacent to the Playford Highway in the area east of Bark Hut Road. It is likely that any clearance occurring within this area would have an impact on the viability of this species.

#### **4.2.8 *Thelymitra matthewsii* (Spiral Sun-orchid)**

Within South Australia *Thelymitra matthewsii* has been recorded at two locations in the western half of Kangaroo Island. *Thelymitra matthewsii* has been recorded growing in *Eucalyptus remota* tall open- shrub land on Kangaroo Island (Taylor, 2008). Based on the known occurrences of this species and preferred habitat types, it is unlikely that this species will be impacted as part of the project.

#### **4.2.9 *Eucalyptus paludicola* (Mt. Compass Swamp Gum)**

The entire Kangaroo Island population is conserved in a remote part of Cape Bouger Wilderness Park (Nicolle, 1995). It inhabits swamps and areas of poorly drained soil. It is widely considered to be a hybrid or hybrid in origin although is accepted as a distinct species at this time. It is unlikely that this species will be impacted by the project based on the existing known distribution of this species within Kangaroo Island.

#### 4.2.10 *Leionema equestre* (Kangaroo Island Phebalium)

*Leionema equestre* is endemic to Kangaroo Island. *Leionema equestre* typically occurs in shrub land and open woodland with an overstorey component dominated by *Eucalyptus diversifolia* (Coastal White Mallee) and / or *Eucalyptus cosmophylla* (Cup Gum) with *Eucalyptus cneorifolia* (Narrow-leaf Mallee) as an occasional co-dominant however is restricted to the area east of Kingscote between Hog Bay Road and American River. It is unlikely therefore to be impacted as part of the project.

#### 4.2.11 *Olearia microdisca* (Small-flower Daisy-bush)

*Olearia microdisca* is known to grow in a wide variety of sites and soil types, however the largest recorded populations have been found in low lying areas subject to seasonal waterlogging *Olearia microdisca* is typically found in open mallee woodland and shrub land with *Eucalyptus cneorifolia* (Narrow-leaf Mallee) and / or *Eucalyptus cosmophylla* (Cup Gum) as the dominant overstorey species. It is known from two areas on the Playford Highway East of Bark Hut Road and is therefore likely to be impacted as part of any works associated with this project.

### 4.3 Threatened fauna

Thirty-seven EPBC listed fauna species were identified in the EPBC Protected Matters Report as potentially occurring or having habitat potentially occurring within the vicinity of the project area (Appendix 2). Five nationally threatened species were known as occurring within 5 km of the project area (Table 7) from the Atlas of Living Australia search which also identified another 45 state conservation listed species as occurring from within 5km of the project area (Appendix 2).

**Table 7. Nationally threatened fauna species known as occurring within 5km of the project**

Scientific Name	Common Name	EPBC Act Status	NPW Act Status
<i>Litoria raniformis</i>	Southern Bell Frog	VU	V
<i>Thinomis rubricollis</i>	Hooded Plover (Hooded Dotterel)	VU	V
<i>Stipiturus malachurus</i>	Southern Emu-wren	VU	V
<i>Calyptrorhynchus lathami</i> ssp. <i>halmaturinus</i>	Glossy Black Cockatoo	EN	E
<i>Sminthopsis aitkeni</i>	Kangaroo Island Dunnart	EN	E

### 4.4 Threatened Fauna

A total of 248 mammal, avian and reptile species were determined to have distributions which overlapped with the 5 km buffer from the project area (ALA 2018). This result indicates that the project area is valuable from an ecological perspective in providing valuable links in connecting other intact patches or conservation reserves.

The majority of fauna species observed within the bushland assessment area were birds. This was due to their visible nature, audible calls, diurnal activity and overall high abundance and diversity. No targeted surveys for species which are less conspicuous or required longer term approaches, such as trapping, were undertaken. However, there is potential for such species to occur based upon the availability of suitable habitat in areas adjacent to the project area. For all fauna sightings within individual assessment areas, please refer to the Bushland Assessment Method data sheets.

#### 4.4.1 *Calyptrorhynchus lathamii* ssp. *halmaturinus* (Glossy Black Cockatoo)

The Glossy Black Cockatoo (GBC) exists as a unique subspecies on Kangaroo Island that is isolated from other populations on the east coast of Australia. The population of the KI GBC decreased to as few as 158 birds in 1995; however, has since increased to 340-360 following management actions, which have reduced the number of nests predated by Brush-tailed Possums (*Trichosurus vulpecula*) (Garnett *et al.* 2011). Mapping which detailed potential and critical feeding and nesting habitat within the project area was supplied by the Department of Environment Water and Natural Resources.

According to the GBC recovery plan (Mooney and Pedler, 2005), three long term objectives have been identified for recovery of the SA subspecies of Glossy Black-Cockatoo:

- To ensure that a viable breeding population of the Glossy Black-Cockatoo persists in South Australia;
- To reduce the status of the Glossy Black-Cockatoo from Endangered to Vulnerable within 25 years (ie. by 2030);
- To expand the current distribution of the Glossy Black-Cockatoo to include its former range on Fleurieu Peninsula.

The large old eucalypts that constitute GBC nesting habitat occur mainly along creeks and river systems across Kangaroo Island. *Eucalyptus cladocalyx* (Sugar Gum), *Eucalyptus leucoxylon* (South Australian Blue Gum) and *Eucalyptus viminalis* ssp. *cygnetensis* (Manna Gum) are known to produce hollows suitable for GBC nest sites (Garnett *et al.* 1999). Most current natural nests (>85%) occur in Sugar Gums, which also provide most of the roosting sites. Trees that develop suitable GBC nest hollows are thought to be at least 100 years old. Around 15% of the 100 nest trees located to date are dead trees (Mooney and Pedler, 2005).

Potential nesting habitat is expected to be important for the recovery of the species on Kangaroo Island. The increasing population will cause greater competition for nest sites and food resources within critical nesting habitats, and therefore, pairs seeking to breed may be required to go further afield to source potential nesting habitats with suitable hollows.

#### 4.4.2 *Litoria raniformis* (Southern Bell Frog)

The Southern Bell Frog (*Litoria raniformis*) (also known as the Growling Grass Frog) is a large frog, with females growing to at least 100 mm in length. The Mt Lofty Ranges and Adelaide plains population groups probably represent non-endemic populations originating from captive stock (Walker and Goonan 2002, in Clemann and Gillespie, 2012), and both are likely to have now died out. There were two records from the search and these may have some doubt around their accuracy as it is unlikely the species exists on the island as a non-naturalised population. Despite this, the species is usually found among vegetation within or at the edges of permanent water such as slow flowing streams, swamps, lagoons and lakes. It is unlikely that the project will have significant interactions with this species based on no impacts associated with water bodies of a permanent nature or with areas of submerged vegetation.



#### **4.4.3 *Thinornis rubricollis* (Hooded Plover, Hooded Dotterel)**

The Hooded Plover is a medium-sized sandy-brown plover. The Hooded Plover occurs on sandy, high-energy beaches between Jervis Bay, New South Wales and the Eyre Peninsula, South Australia, (Birdlife Australia, 2012). This species is likely to be recorded within the immediate vicinity of the beach. As such, the transport route is not expected to interact with this species.

#### **4.4.4 *Stipiturus malachurus halmaturinus* (Southern Emuwren)**

The Southern Emu-wren exists as a unique subspecies on Kangaroo Island that is isolated from other populations across southern Australia. The KI Southern Emu-wren primarily occurs in dense coastal cliff top mallee with dense thickets of Dryland Tea-tree. It also has been recorded in dune thickets, whipstick mallee with sclerophyllous understorey and less often in dense understorey of riparian forest (Baxter, 2015). They are resident on the island and moderately common. Given the broad habitat preferences and presence of preferred habitat present within the project area, it is likely that this species is relatively widespread within the project area. Any effort to reduce clearance of habitat known as the preferred type for this species would be beneficial given the primary threats are loss of habitat through clearance, fragmentation and inappropriate burning regimes.

#### **4.4.5 *Sminthopsis aitkeni* (Kangaroo Island Dunnart)**

The Kangaroo Island Dunnart (*Sminthopsis aitkeni*) is endemic to Kangaroo Island, South Australia. Its current distribution on Kangaroo Island is unknown, although all recent records (since 1990) have come from sites on the western end of the island, within Flinders Chase National Park and the Ravine des Cesoars Wilderness Protection Area. Extensive survey work has failed to locate the species elsewhere; and although early records came from the eastern end of the Island, clearance or modification of the habitat in these areas has reduced the likelihood of dunnarts still occurring there. Major threats include wildfire and inappropriate fire regimes, *Phytophthora cinnamomi* dieback, land clearance, degradation and fragmentation of suitable habitat and predation by Feral Cats and native predators (DoE 2012). It is unlikely that this species will be impacted by the project.

## 4.5 Broad scale vegetation patterns

Broad scale vegetation patterns across the project were summarised as more intact woodland forest associations in the western extent of the project with general disturbance and fragmentation increasing with proximity to Kingscote.

The western extent of the route options was dominated by *Eucalyptus baxteri* (Brown Stringybark) woodlands. These woodlands are typical of poor soils with low fertility and good drainage. Species such as *Eucalyptus cosmophylla* (Cup Gum), *Eucalyptus obliqua* (Messmate Stringybark) and *Banksia marginata* (Silver-leaf Banksia) formed dominant or co dominant elements of structures present within the western end of the project area.

The eastern extent of the route options transitioned to taller Woodland species with increased *Eucalyptus obliqua* (Messmate Stringybark), *Eucalyptus fasciculosa* (Pink Gum), *Eucalyptus leucoxylon* (SA Blue-gum), *Eucalyptus cladocalyx* (Sugar Gum) and *Eucalyptus camaldulensis* (River Red-gum) in wetter sites. Areas with limestone soil horizons were dominated by *Allocasuarina verticillata* (Drooping She-oak) and *Eucalyptus diversifolia* (Coastal White Mallee).

Patches of the Threatened Ecological Community (TEC) Kangaroo Island Narrow-leaved Mallee (*Eucalyptus cneorifolia*) Woodland, were prominent within the eastern section of the route options and was largely associated with Option 2.

Areas of potential Glossy Black Cockatoo nesting habitat were present across all route options primarily in the form of creek lines which were associated with large *Eucalyptus cladocalyx* (Sugar Gum) and *Eucalyptus leucoxylon* (SA Blue-gum). While many of these areas are at this point in time are not of an age structure that provides adequate of ideal nesting habitat it is highly likely that at some point in the future these areas will become crucial to the ongoing sustainability of Glossy Black Cockatoo populations. In the event of a recovery in population of this species and with loss of existing old nesting structures due to natural attrition, these sites will potentially recruit into new prime nesting habitats in the next 50 – 100 years. Given the already old age of many of these trees, retention of these is critical to ongoing nesting habitat recruitment into the landscape.

Areas of critical nesting habitat for Glossy Black Cockatoos was located within Route Option 2 with the lower reaches of the Cygnet River providing very large *Eucalyptus camaldulensis* (River Red Gum) as suitable nesting trees.

Road reserve width played an important role in determining the quality of the remnant roadside vegetation in many cases with narrow road reserves often in poorer condition than those with wider areas remaining. Many association with forestry adjacent were also represented by a general higher quality remnant patch.

## 4.6 Vegetation associations

There were 25 vegetation associations mapped across the project area. These are summarised below in Table 8.

Unit Biodiversity Scores (UBS) for associations were gained through utilising the Bushland Assessment Manual (NVBMU, 2017). This gives an overall biodiversity score based on the landscape context, Vegetation condition and the conservation significance of individual hectares assessed. There is no set score that indicates exact value as this is dependent on a number of considerations such as the wider region and existing benchmarks from within similar habitats (ie: score not based on a 0-100 or generic scale). The only given is that habitats that score the highest score are the most irreplaceable when measured against the immediate environment in which it is located.

Individual Bushland Assessment Manual scoresheets are provided separately to this report.

Table 8. Vegetation association summary

#	Description	Unit biodiversity score
1	<i>Banksia marginata</i> (Silver leaf Banksia) / <i>Banksia ornata</i> (Desert Banksia) Mixed Shrubland	64.09
2	<i>Eucalyptus cosmophylla</i> (Cup Gum) / <i>Eucalyptus baxteri</i> (Brown Stringybark) / <i>Acacia provincialis</i> (Swamp Wattle) low woodland	58.08
3	<i>Eucalyptus baxteri</i> (Brown Stringybark) Low Woodland	51.98 / 73.36 Ave. 62.67
4	<i>Eucalyptus cosmophylla</i> (Cup Gum) / <i>Eucalyptus baxteri</i> (Brown Stringybark) / <i>Banksia ornata</i> (Desert Banksia) / <i>Banksia marginata</i> (Silver leaf Banksia) Low Woodland ~ 3 m	59.22
5	<i>Lepidosperma</i> spp. (Sword Sedge) Open Mixed Sedgeland/Herb/Grassland	32.82
6	Exotic Grassland	No score, scattered tree assessment
7	<i>Eucalyptus leucoxylon</i> ssp. <i>leucoxylon</i> (South Australian Blue-gum) Woodland	78.17
8	<i>Eucalyptus obliqua</i> (Messmate Stringybark) over <i>Acacia provincialis</i> (Swamp Wattle) Woodland	55.86 / 64.60 Ave. 60.23
9	<i>Eucalyptus fasciculosa</i> (Pink Gum) Woodland	68.69
10	<i>Eucalyptus cosmophylla</i> (Cup Gum) Low Woodland	56.18
11	<i>Eucalyptus cladocalyx</i> (Sugar Gum) Mixed Woodland	58.92
12	<i>Allocasuarina striata</i> (Stalked Oak-bush) Shrubland	49.01
13	<i>Xanthorrhoea semiplana</i> ssp. (Yacca) Mixed low shrubland / grassland	7.07
14	<i>Eucalyptus</i> spp. Mixed Low Woodland over exotic and indigenous grassland	33.36
15	<i>Acacia provincialis</i> (Swamp Wattle) Shrubland +/- <i>Eucalyptus baxteri</i> (Brown Stringybark) / <i>Eucalyptus cosmophylla</i> (Cup Gum) / <i>Eucalyptus fasciculosa</i> (Pink Gum)	55.40
16	<i>Eucalyptus diversifolia</i> (Coastal White Mallee) Mixed Mallee	63.97
17	<i>Eucalyptus cneorifolia</i> (Kangaroo Island Narrow-leaf Mallee) Mixed Mallee	48.42
18	<i>Allocasuarina muelleriana</i> ssp. <i>notocolpica</i> (Kangaroo Island Oak-bush) Low Closed Shrubland	36.96
19	<i>Allocasuarina verticillata</i> (Dropping She-oak) Grassy Woodland over <i>Acacia dodonaeifolia</i> (Hop-bush Wattle)	31.65
20	<i>Eucalyptus gracilis</i> (Yorrel) Mallee over <i>Myoporum insulare</i> (Boobialla) and <i>Rhagodia candolleana</i> (Sea-berry Saltbush)	9.76
21	<i>Eucalyptus cneorifolia</i> (Kangaroo Island Narrow-leaf Mallee) Very Open Mallee over mixed grassland	14.54
22	<i>Acacia paradoxa</i> (Kangaroo Thorn) Low Open Shrubland	18.08

#	Description	Unit biodiversity score
23	<i>Eucalyptus odorata</i> (Peppermint Box) Grassy Woodland	56.29
24	<i>Eucalyptus diversifolia</i> (Coastal White Mallee) / <i>Allocasuarina verticillata</i> (Drooping She-oak) Mixed Woodland	50.76
25	<i>Eucalyptus camaldulensis</i> ssp. <i>camaldulensis</i> (River Red-gum) Tall Woodland	38.55

## 5 SENSITIVITY ASSESSMENT

The project area has been broken into 11 sections that are largely defined by road type ie; sealed / dirt minor road / track etc. and fit within the various options from a vegetation perspective. These are summarised below in Table 9 and shown in Figure 2. The sensitivity assessment is based on the overall ecological values of sections and this is summarised in Figure 3.

**Table 9. Route option road sections utilised for sensitivity assessment.**

Section #	Route Option #	Description	Road Type
1	1, 2	Playford Highway, West End Highway to Stokes Bay Road	Sealed major
2	1	Stokes Bay Road, Playford Highway to Bark Hut Road Intersection	Sealed minor
3	1	Bark Hut Road, Stokes Bay Road to McBrides Road Intersection	Unsealed major
4	1	McBrides Road, Bark Hut Road to North Coast Road Intersection	Unsealed minor
5	1	North Coast Road, McBrides Road to access track into property	Unsealed major
6	1a	Rose Cottage Road, North Coast Road to Springs Road Intersection	Unsealed minor
7	1a	Springs Road, Rose Cottage Road to North Coast Road	Unsealed major
8	2	North Coast Road, Smith Bay Driveway to Gap Road Intersection	Unsealed major
9	2	Playford Highway, Stokes Bay Road to Ropers Road Intersection	Sealed major
10	2	Ropers / Gap Road, Playford Highway to North Coast Road	Unsealed minor
11	1, 2	Access track into property from North Coast Road	Unsealed track

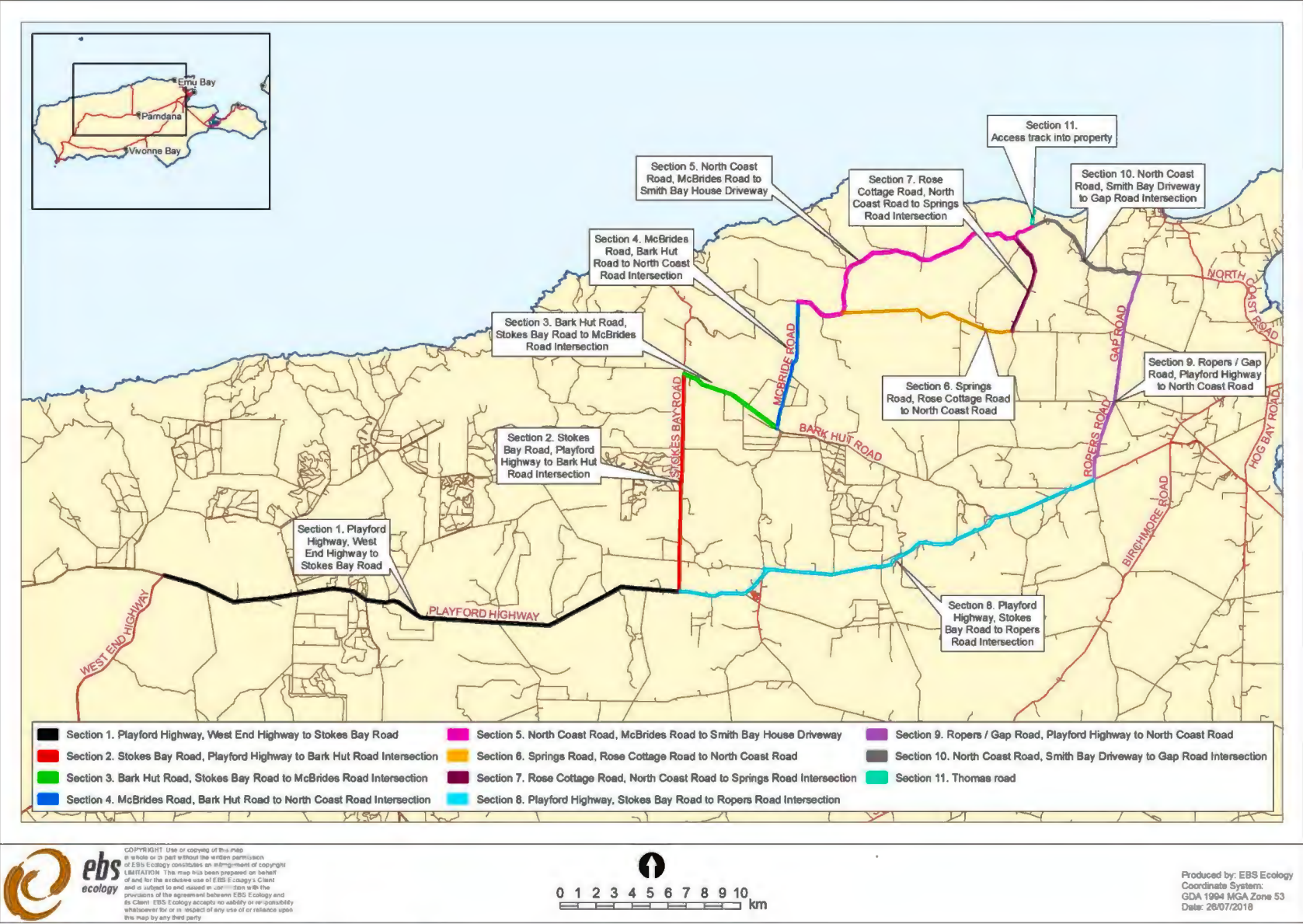


Figure 2. Individual road sections as described in Table 9.

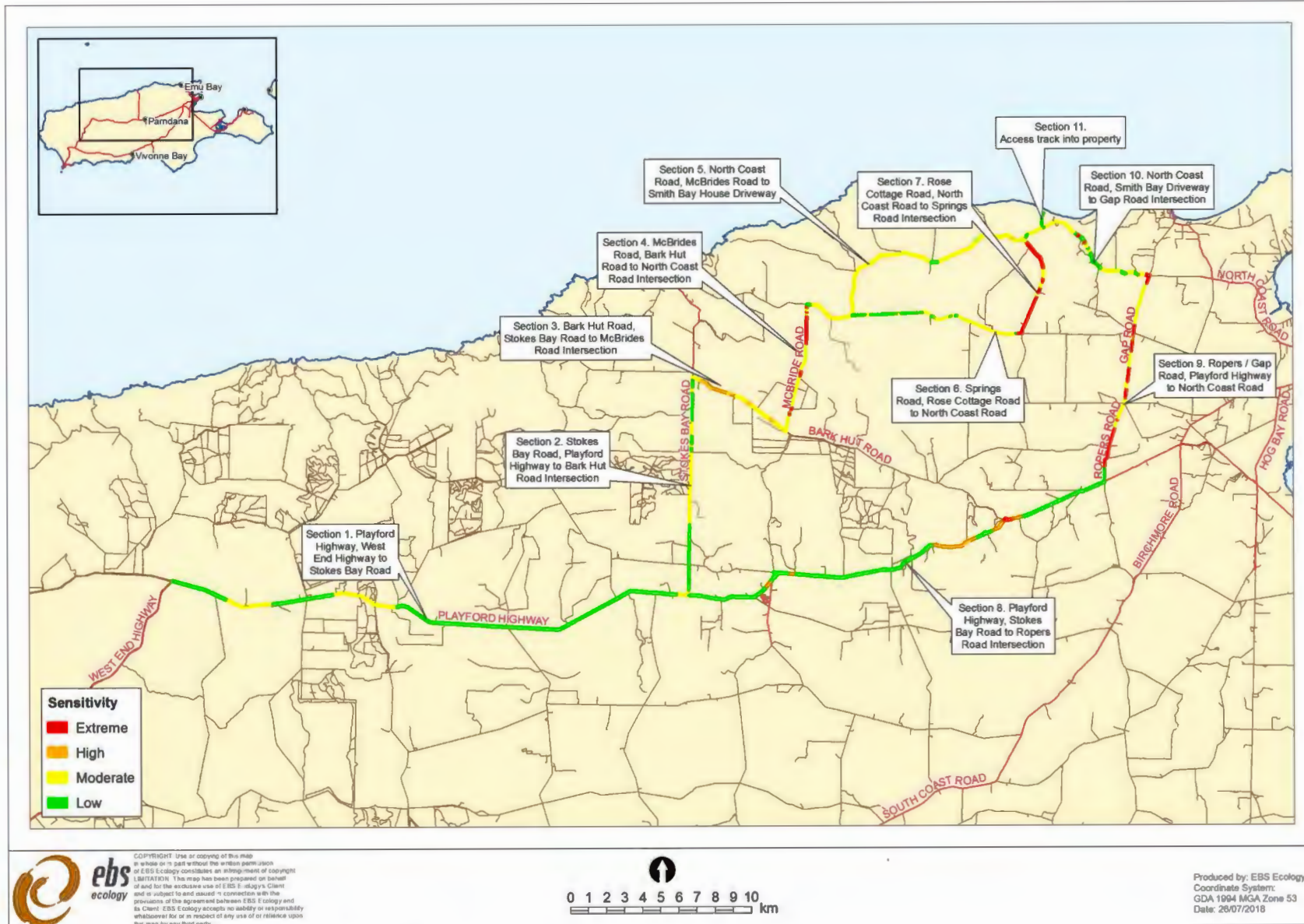


Figure 3. Overall sensitivity results map of project area.



## 5.1 Section 1: Playford Highway, West End Highway to Stokes Bay Road

Section 1 was low to moderate for impact to any communities or species. The section had largely intact vegetation for the entire length aside from areas such as house frontages and intersections. The subsequent vegetation unit score was high, however the width of the existing road means that the consequence was generally low except for possible noise disturbance at some sections where potential nesting habitat for GBC occurs adjacent to the highway (Figure 4 & Table 10). The likelihood of any impact was unlikely which gave a moderate value as the highest sensitivity for this section. The already moderate to high traffic use for this road also means that roadkill impacts on threatened species such as Common Brush tail Possum would not be expected to increase significantly given normal daytime operations. Overall it is expected that this route option is suitable for use with a generally low sensitivity (Figure 5).

**Table 10. Section 1 sensitivity assessment summary.**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
1	1	1	64.09	2	Unlikely	Low
1	2	2	58.08	2	Unlikely	Low
1	3	3	62.67	3	Unlikely	Moderate
1	4	1	64.09	3	Unlikely	Moderate
1	5	2	58.08	2	Unlikely	Low
1	6	3	62.67	2	Unlikely	Low
1	7	2	58.08	3	Unlikely	Moderate
1	8	3	62.67	3	Unlikely	Moderate
1	9	2	58.08	3	Unlikely	Moderate
1	10	2	58.08	2	Unlikely	Low
1	11	3	51.98	1	Unlikely	Low
1	12	3	73.36	2	Unlikely	Low
1	13	3	51.98	1	Unlikely	Low
1	14	3	73.36	2	Unlikely	Low
1	15	4	59.22	2	Unlikely	Low
1	16	3	73.36	2	Unlikely	Low
1	17	2	45	1	Unlikely	Low
1	18	3	62.67	2	Unlikely	Low
1	19	3	51.98	1	Unlikely	Low
1	20	3	73.36	2	Unlikely	Low
1	21	4	59.22	2	Unlikely	Low
1	22	3	62.67	2	Unlikely	Low
1	23	4	59.22	2	Unlikely	Low
1	24	3	51.98	1	Unlikely	Low
1	25	3	73.36	2	Possible	Moderate



Figure 4. Image showing typical clearance envelope on Playford Highway.

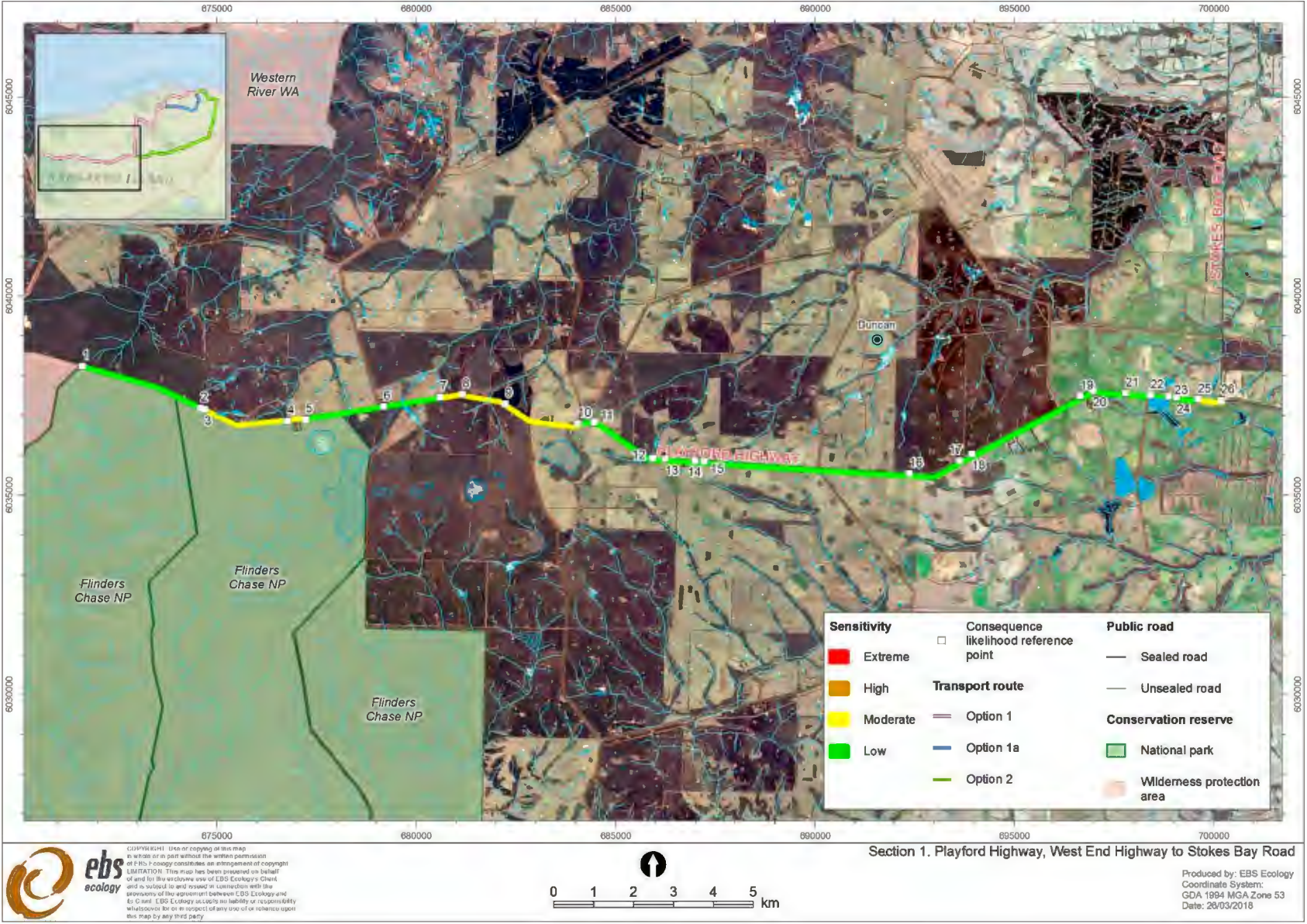


Figure 5. Section 1 sensitivity map.

## 5.2 Section 2: Stokes Bay Road, Playford Highway to Bark Hut Road Intersection

The Stokes Bay Road section of Route Option 1 is a sealed minor road that had vegetation which was somewhat degraded due to narrow road reserve width and adjacent land use. It was deemed unlikely that the existing vegetation falls within the Kangaroo Island Councils roadside vegetation management clearance envelope generally and therefore it was unlikely any clearance is required. This section had state conservation rated species such as *Eucalyptus fasciculosa* (Pink Gum, Rare SA) and *Xanthorrhoea semiplana* ssp. *tatei* (Tate's Grass Tree, Rare SA) well represented along the alignment (Figure 6) as well as creek crossings which provide potential nesting habitat for GBC.

The sensitivity assessment showed low to moderate values with no significant impact expected in terms of clearance or indirect impacts to surrounding communities or species such as noise disturbance, pathogen spread or weed invasion (Table 11 and Figure 7). Moderate values were associated with potential nesting habitats at creek crossing zones where the increased traffic on an otherwise relatively quiet road may possibly disturb GBC.

**Table 11. Section 2 sensitivity assessment summary.**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
2	26	3	51.98	2	Possible	Moderate
2	27	3	51.98	1	Unlikely	Low
2	28	2	58.08	2	Unlikely	Low
2	29	3	73.36	2	Unlikely	Low
2	30	5	32.82	1	Unlikely	Low
2	31	3	62.67	2	Unlikely	Low
2	32	2	58.08	2	Unlikely	Low
2	33	5	45	2	Unlikely	Low
2	34	2	58.08	2	Unlikely	Low
2	35	5	45	2	Unlikely	Low
2	36	2	58.08	2	Unlikely	Low
2	37	5	45	2	Unlikely	Low
2	38	2	58.08	2	Unlikely	Low
2	39	5	32.82	3	Unlikely	Moderate
2	40	5	32.82	3	Unlikely	Moderate
2	41	5	32.82	3	Unlikely	Moderate
2	42	7	78.17	3	Unlikely	Moderate
2	43	5	32.82	1	Unlikely	Low
2	44	7	78.17	3	Unlikely	Moderate
2	45	5	32.82	1	Unlikely	Low
2	46	5	32.82	3	Unlikely	Moderate
2	47	8	60.23	3	Unlikely	Moderate
2	48	5	32.82	1	Unlikely	Low
2	49	2	58.08	1	Unlikely	Low
2	50	8	60.23	1	Unlikely	Low
2	51	7	78.17	3	Unlikely	Moderate

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
2	52	9	68.69	1	Unlikely	Low
2	53	5	45	1	Unlikely	Low



Figure 6. Stokes Bay Road typical vegetation structure.

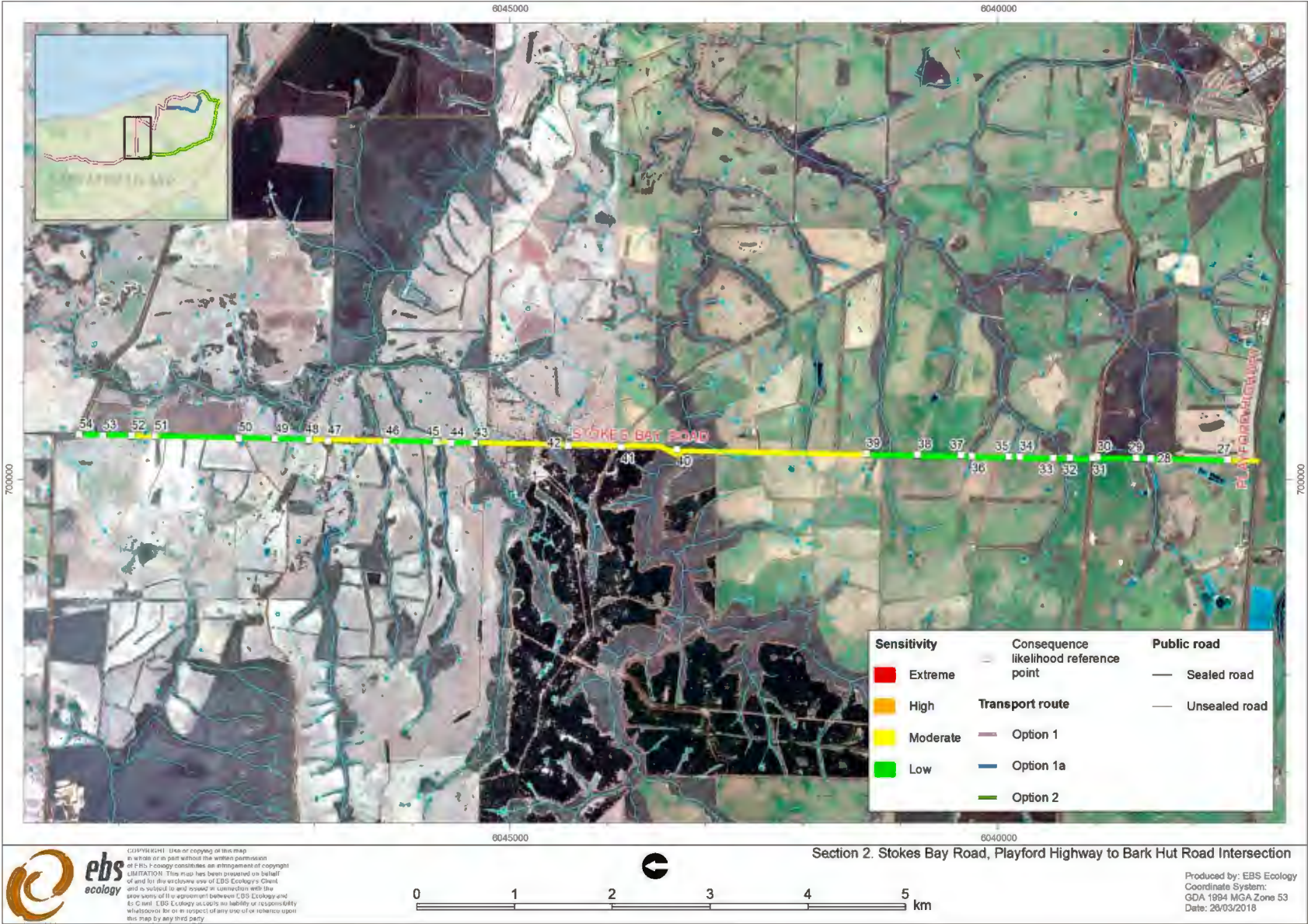


Figure 7. Section 2 sensitivity map.

### 5.3 Section 3: Bark Hut Road, Stokes Bay Road to McBrides Road Intersection

Bark Hut Road assessment resulted in a moderate to high sensitivity for the entire length (Table 12). As this road is unsealed there is some risk associated with dust accumulation on trees and plants. This is accentuated by the orientation of the road with periods during summer when dust is most likely to become airborne. As demonstrated by a wind rose for the summer period at Port Lincoln (Appendix 3) which would experience similar wind patterns to Kangaroo Island, southerly winds dominate which means that dust is distributed directly on to vegetation on the northern side of the road. It is likely that this would occur and given the high quality of vegetation within this road reserves and adjacent paddocks, may have an impact in periods where there is a large gap between rainfall events that can remove accumulated dust. Management of dust may result in a lower residual risk that makes this option more attractive especially given the moderate to high sensitivity associated with the road (Figure 9).

**Table 12. Section 3 sensitivity assessment summary**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
3	54	8	60.23	2	Likely	Moderate
3	55	6	78.17	3	Likely	High
3	56	9	68.69	3	Likely	High
3	57	10	56.18	3	Likely	High
3	58	8	60.23	3	Likely	High
3	59	7	78.17	3	Likely	High
3	60	10	56.18	2	Likely	Moderate
3	61	7	78.17	3	Likely	High
3	62	8	60.23	2	Likely	Moderate
3	63	10	56.18	2	Likely	Moderate
3	64	8	60.23	2	Likely	Moderate
3	65	11	58.92	3	Likely	High
3	66	8	60.23	2	Likely	Moderate
3	67	9	68.69	2	Likely	Moderate
3	68	10	56.18	2	Likely	Moderate
3	69	12	49.01	2	Likely	Moderate
3	70	3	62.67	2	Likely	Moderate
3	71	9	68.69	3	Likely	High



**Figure 8. *Eucalyptus cosmophylla* (Cup Gum) Woodland on Bark Hut Road**



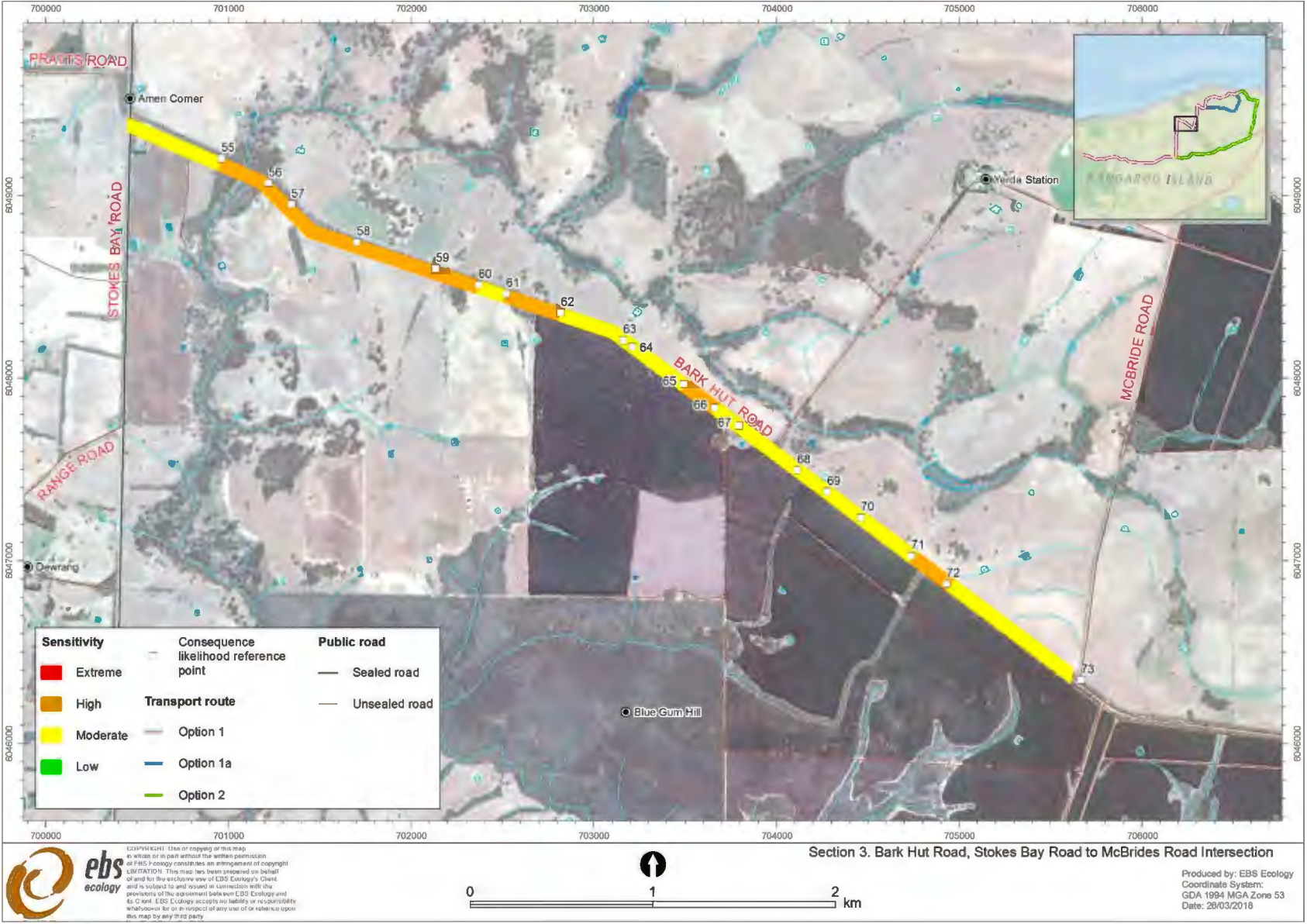


Figure 9. Section 3 sensitivity map.

## 5.4 Section 4: McBrides Road, Bark Hut Road to North Coast Road Intersection

Section 4 has a resultant sensitivity of moderate and extreme, depending on the quality of the vegetation and whether it was substantially intact or not. The moderate values suggest almost certain clearance of vegetation in poor condition, primarily represented by woodlands or scattered trees over exotic and native grasslands (Table 13 & Figure 10). Extreme values were where certain clearance of intact vegetation occurs including areas where potential GBC nesting habitat exists and may require clearance of individual trees in areas where creek crossings occur. Potential installation of culverts and associated infrastructure may require additional clearance of higher value vegetation such as Association 15 (Figure 11). This route has a number of areas of high sensitivity which is largely driven by the potential areas of nesting habitat and the almost certainty of clearance being required in road widening at creek crossings (Figure 12).

**Table 13. Section 4 sensitivity assessment summary.**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
4	73	13	7.07	1	Almost Certain	Moderate
4	74	14	33.36	1	Almost Certain	Moderate
4	75	11	58.92	3	Almost Certain	Extreme
4	76	14	33.36	1	Almost Certain	Moderate
4	77	11	58.92	3	Almost Certain	Extreme
4	78	13	7.07	1	Almost Certain	Moderate
4	79	2	58.08	3	Almost Certain	Extreme
4	80	14	33.36	1	Almost Certain	Moderate
4	81	14	33.36	1	Almost Certain	Moderate
4	82	13	7.07	1	Almost Certain	Moderate
4	83	14	33.36	1	Almost Certain	Moderate
4	84	10	56.18	3	Almost Certain	Extreme
4	85	2	45	3	Almost Certain	Extreme
4	86	10	56.18	3	Almost Certain	Extreme
4	87	14	33.36	1	Almost Certain	Moderate
4	88	10	56.18	3	Almost Certain	Extreme
4	89	14	33.36	1	Almost Certain	Moderate
4	90	10	56.18	3	Almost Certain	Extreme



**Figure 10. Association 14 degraded open Woodland over Exotic and native grass species**



**Figure 11. Association 15 in creek crossing on McBrides Road**



Figure 12. Section 4 sensitivity map.

## 5.5 Section 5: North Coast Road, McBrides Road to access track into property

Section 5 has similarities to Bark Hut Road in having potential risks associated with dust deposition on roadside vegetation however the limestone sheeting material on this road was very stable and appeared to raise limited dust at the time of the survey so was given a possible likelihood. The width of the road meant that clearance requirements were unlikely and that clearance envelopes that fit within Kangaroo Island Council Roadside Vegetation Management Guidelines (Kangaroo Island Council, 2007) are being met adequately. The majority of this section had a low to moderate sensitivity (Figure 13).

Some low level possibility of disturbance associated with GBC feeding habitat and potential nesting habitat occurs in some segments, particularly in the vicinity of Rose Cottage Road intersection which has large remnant patches within close proximity to the road (Table 14).

**Table 14. Section 5 sensitivity assessment summary.**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
5	91	9	68.69	1	Possible	Low
5	92	2	58.08	2	Possible	Moderate
5	93	10	56.18	2	Possible	Moderate
5	94	15	55.4	2	Possible	Moderate
5	95	10	56.18	3	Possible	Moderate
5	96	3	62.67	3	Possible	Moderate
5	97	12	49.01	3	Possible	Moderate
5	98	3	62.67	3	Possible	Moderate
5	99	12	49.01	3	Possible	Moderate
5	100	8	60.23	2	Possible	Moderate
5	101	12	49.01	2	Possible	Moderate
5	102	12	49.01	2	Possible	Moderate
5	103	8	60.23	2	Possible	Moderate
5	104	12	49.01	2	Possible	Moderate
5	105	15	55.4	2	Possible	Moderate
5	106	12	49.01	2	Possible	Moderate
5	107	3	62.67	2	Possible	Moderate
5	108	4	59.22	3	Possible	Moderate
5	109	3	62.67	3	Possible	Moderate
5	110	12	49.01	3	Possible	Moderate
5	111	3	62.67	3	Possible	Moderate
5	112	12	49.01	3	Possible	Moderate
5	113	3	62.67	2	Possible	Moderate
5	114	12	49.01	2	Possible	Moderate
5	115	10	56.18	2	Possible	Moderate
5	116	3	62.67	2	Possible	Moderate
5	117	12	49.01	2	Possible	Moderate
5	118	3	62.67	2	Possible	Moderate
5	119	12	49.01	2	Possible	Moderate
5	120	3	62.67	2	Possible	Moderate
5	121	12	49.01	2	Possible	Moderate

KIPT Transport Route Options Ecological Assessment

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
5	122	3	62.67	2	Possible	Moderate
5	123	12	49.01	2	Possible	Moderate
5	124	3	62.67	2	Possible	Moderate
5	125	13	7.07	1	Possible	Low
5	126	14	33.36	2	Possible	Moderate
5	127	12	49.01	2	Possible	Moderate
5	128	14	33.36	2	Possible	Moderate
5	129	14	33.36	2	Possible	Moderate
5	130	16	63.97	2	Possible	Moderate
5	131	9	68.69	2	Possible	Moderate
5	132	16	63.97	2	Possible	Moderate
5	133	10	56.18	2	Possible	Moderate
5	134	17	48.42	2	Possible	Moderate
5	135	16	56.18	1	Possible	Low
5	136	12	49.01	2	Possible	Moderate
5	137	10	56.18	3	Possible	Moderate
5	138	18	36.96	3	Possible	Moderate
5	139	16	63.97	3	Possible	Moderate
5	140	18	36.96	3	Possible	Moderate
5	141	16	63.97	3	Possible	Moderate
5	142	19	31.65	3	Possible	Moderate
5	143	11	58.92	4	Possible	High
5	144	19	31.65	3	Possible	Moderate
5	145	6	0	1	Possible	Low
5	146	19	31.65	2	Possible	Moderate
5	147	11	58.92	3	Possible	Moderate
5	148	6	0	1	Possible	Low
5	149	20	9.76	2	Possible	Moderate
5	150	17	48.42	2	Possible	Moderate

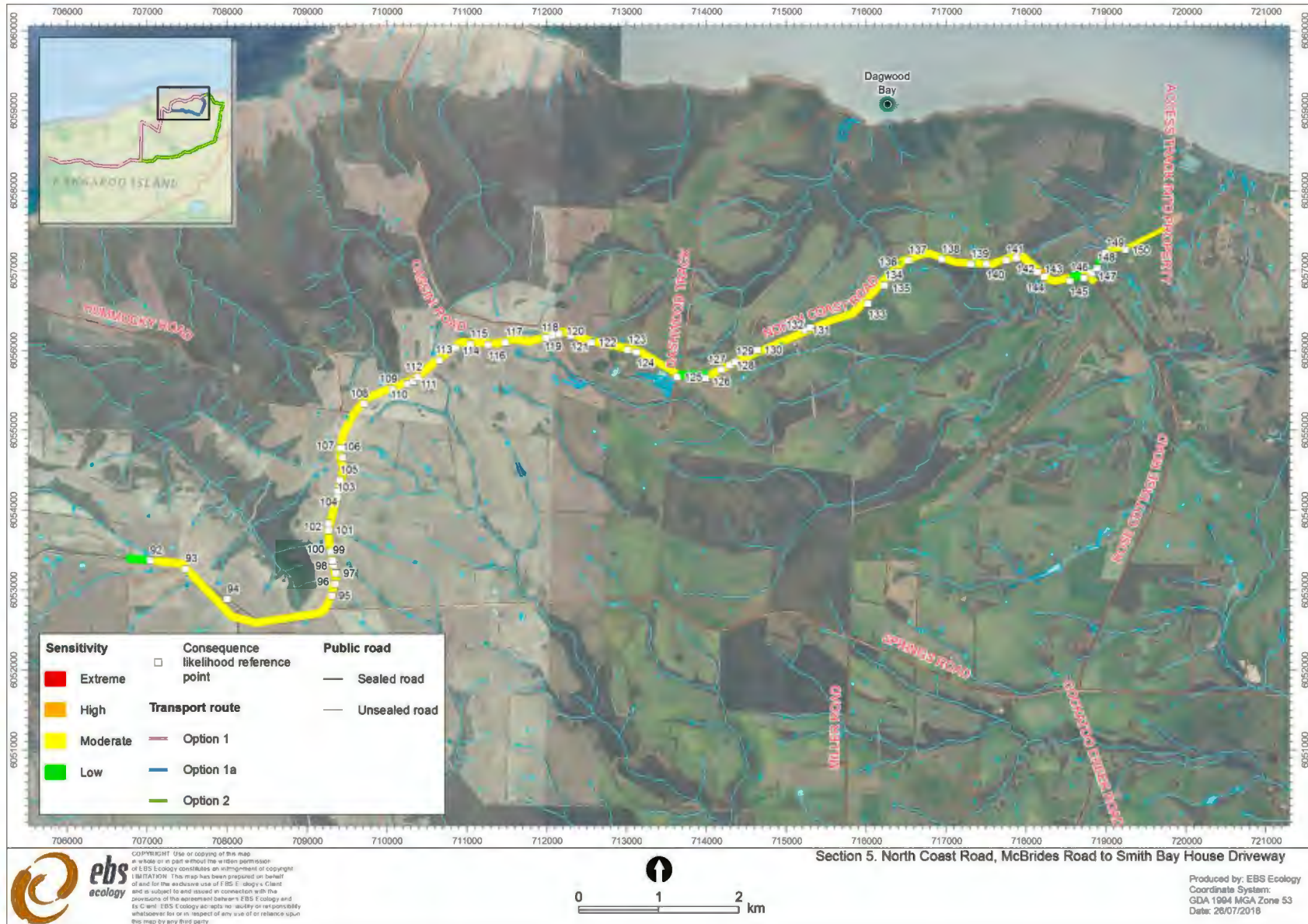


Figure 13. Section 5 sensitivity map.

## 5.6 Section 6: Springs Road, To Rose Cottage Road Intersection

This section of route 1a was generally rated as low to moderate sensitivity due to the increased width of this road and lack of high value vegetation communities (Table 15). Small sections of *Eucalyptus cladocalyx* (Sugar Gum) were present in low lying sections however the condition decreased with direction west. The road in general had a low to moderate sensitivity due to good existing road width and large areas of degraded surrounding vegetation (Figure 14).

**Table 15. Section 6 sensitivity assessment summary.**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
6	151	13	7.07	1	Possible	Low
6	152	14	33.36	2	Likely	Moderate
6	153	13	7.07	1	Possible	Low
6	154	6	0	1	Unlikely	Low
6	155	13	7.07	1	Possible	Low
6	156	6	0	1	Unlikely	Low
6	157	14	33.36	2	Likely	Moderate
6	158	6	0	1	Unlikely	Low
6	159	9	68.69	2	Likely	Moderate
6	160	13	7.07	1	Possible	Low
6	161	14	33.36	2	Likely	Moderate
6	162	13	7.07	1	Possible	Low
6	163	14	33.36	1	Unlikely	Low
6	164	9	68.69	2	Likely	Moderate
6	165	6	0	1	Unlikely	Low
6	166	14	33.36	2	Likely	Moderate
6	167	18	36.96	2	Likely	Moderate
6	168	13	7.07	1	Possible	Low
6	169	10	56.18	2	Likely	Moderate
6	170	5	32.82	2	Likely	Moderate
6	171	9	68.69	2	Likely	Moderate
6	172	3	62.67	2	Likely	Moderate
6	173	13	7.07	1	Possible	Low
6	174	8	60.23	2	Likely	Moderate
6	175	3	62.67	2	Likely	Moderate
6	176	6	0	1	Unlikely	Low
6	177	3	62.67	2	Likely	Moderate
6	178	12	49.01	2	Likely	Moderate
6	179	10	56.18	2	Likely	Moderate
6	180	12	49.01	2	Likely	Moderate
6	181	10	56.18	2	Likely	Moderate
6	182	3	62.67	2	Likely	Moderate
6	183	16	63.97	2	Likely	Moderate
6	184	10	56.18	2	Likely	Moderate
6	185	16	63.97	2	Likely	Moderate
6	186	14	33.36	2	Likely	Moderate



## KIPT Transport Route Options Ecological Assessment

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
6	187	16	63.97	2	Likely	Moderate
6	188	14	33.36	2	Likely	Moderate
6	189	16	63.97	2	Likely	Moderate
6	190	10	56.18	2	Likely	Moderate
6	191	6	0	1	Unlikely	Low
7	192	10	56.18	3	Almost Certain	Extreme



Figure 14. Section 6 sensitivity map.

## 5.7 Section 7: Rose Cottage Road from Springs Road to North Coast Road Intersection

Rose Cottage Road had some of the best patches of *Eucalyptus cneorifolia* encountered within the project area (Figure 15). Several of these patches fit within criteria as a Threatened Ecological Community (TEC) and as a result much of the area has been deemed highly sensitive (Table 16). The road is a minor unsealed surface and as such, extensive clearance may be required to accommodate heavy vehicles. Any clearance associated with these patches would require an EPBC referral. It would be likely that the clearance would be elevated to a controlled action status. The sensitivity of the road is highlighted in Figure 16.

**Table 16. Section 7 sensitivity assessment summary.**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
7	193	17	48.42	3	Almost Certain	Extreme
7	194	10	56.18	3	Almost Certain	Extreme
7	195	17	48.42	4	Almost Certain	Extreme
7	196	10	56.18	3	Almost Certain	Extreme
7	197	16	63.97	4	Almost Certain	Extreme
7	198	17	48.42	3	Almost Certain	Extreme
7	199	6	0	1	Almost Certain	Moderate
7	200	17	48.42	4	Almost Certain	Extreme
7	201	11	58.92	4	Almost Certain	Extreme
7	202	17	48.42	3	Almost Certain	Extreme
7	203	7	78.17	4	Almost Certain	Extreme
7	204	6	0	1	Almost Certain	Moderate
7	205	17	48.42	4	Almost Certain	Extreme
7	206	22	18.08	1	Almost Certain	Moderate
7	207	17	48.42	3	Almost Certain	Extreme
7	208	21	14.54	4	Almost Certain	Extreme
7	209	17	48.42	4	Almost Certain	Extreme
7	210	19	31.65	4	Almost Certain	Extreme
7	211	17	48.42	4	Almost Certain	Extreme
7	212	7	78.17	4	Possible	High
7	193	17	48.42	3	Almost Certain	Extreme
7	194	10	56.18	3	Almost Certain	Extreme
7	195	17	48.42	4	Almost Certain	Extreme
7	196	10	56.18	3	Almost Certain	Extreme
7	197	16	63.97	4	Almost Certain	Extreme
7	198	17	48.42	3	Almost Certain	Extreme
7	199	6	0	1	Almost Certain	Moderate
7	200	17	48.42	4	Almost Certain	Extreme
7	201	11	58.92	4	Almost Certain	Extreme
7	202	17	48.42	3	Almost Certain	Extreme
7	203	7	78.17	4	Almost Certain	Extreme
7	204	6	0	1	Almost Certain	Moderate

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
7	205	17	48.42	4	Almost Certain	Extreme
7	206	22	18.08	1	Almost Certain	Moderate
7	207	17	48.42	3	Almost Certain	Extreme
7	208	21	14.54	4	Almost Certain	Extreme
7	209	17	48.42	4	Almost Certain	Extreme
7	210	19	31.65	4	Almost Certain	Extreme
7	211	17	48.42	4	Almost Certain	Extreme
7	212	7	78.17	4	Possible	High



Figure 15. High value Narrow Leaf Mallee patch on Rose Cottage Road



Figure 16. Section 7 sensitivity map.

## 5.8 Section 8: Playford Highway, Stokes Bay Road to Ropers Road Intersection

The Playford Highway eastern section from Stokes Bay Road to Ropers Road had variable sensitivity that was largely driven by areas of critical feeding and nesting habitat for GBC that exist within and adjacent to the road reserve (Table 17 & Figure 17). Given the already known present level of traffic associated with general vehicles and heavy vehicles, the potential for disturbance is relatively low, however if the number of heavy vehicles is increased significantly then becomes a possibility. There is likely disturbance levels in some areas where creek crossings have particularly large critical nesting habitat trees for GBC that overhang the road. The sensitivity is heightened in the area around Bark Hut Road (Figure 18) and this would be increased further if any clearance was required due to the prevalence of nationally threatened species in the road reserves around this area.

**Table 17. Section 8 sensitivity assessment summary**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
8	213	4	59.22	1	Possible	Low
8	214	3	62.67	1	Possible	Low
8	215	4	59.22	1	Possible	Low
8	216	12	49.01	1	Possible	Low
8	217	3	62.67	1	Possible	Low
8	218	12	49.01	1	Possible	Low
8	219	<Null>	73.36	1	Possible	Low
8	220	7	78.17	4	Possible	High
8	221	8	60.23	1	Possible	Low
8	222	7	78.17	4	Possible	High
8	223	10	56.18	1	Possible	Low
8	224	8	60.23	1	Possible	Low
8	225	10	56.18	1	Possible	Low
8	226	8	60.23	1	Possible	Low
8	227	3	62.67	1	Possible	Low
8	228	10	56.18	1	Possible	Low
8	229	3	62.67	1	Possible	Low
8	230	10	56.18	1	Possible	Low
8	231	8	60.23	1	Possible	Low
8	232	3	62.67	1	Possible	Low
8	233	8	60.23	1	Possible	Low
8	234	3	62.67	1	Possible	Low
8	235	8	60.23	4	Possible	High
8	236	16	63.97	4	Possible	High
8	237	8	60.23	4	Possible	High
8	238	18	36.96	4	Possible	High
8	239	24	50.76	4	Possible	High
8	240	8	60.23	4	Possible	High
8	241	24	50.76	4	Possible	High
8	242	9	68.69	1	Possible	Low

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
8	243	18	36.96	1	Possible	Low
8	244	24	50.76	1	Possible	Low
8	245	18	36.96	4	Possible	High
8	246	24	50.76	4	Possible	High
8	247	9	68.69	4	Possible	High
8	248	11	58.92	4	Likely	Extreme
8	249	9	68.69	4	Possible	High
8	250	16	63.97	4	Possible	High
8	251	9	68.69	1	Possible	Low
8	252	16	63.97	1	Possible	Low
8	253	17	48.42	1	Possible	Low
8	254	16	63.97	1	Possible	Low
8	255	17	48.42	1	Possible	Low
8	256	16	63.97	1	Possible	Low
8	257	17	48.42	1	Possible	Low
8	258	21	14.54	1	Possible	Low



Figure 17. Potential feeding habitat on Playford Highway East.

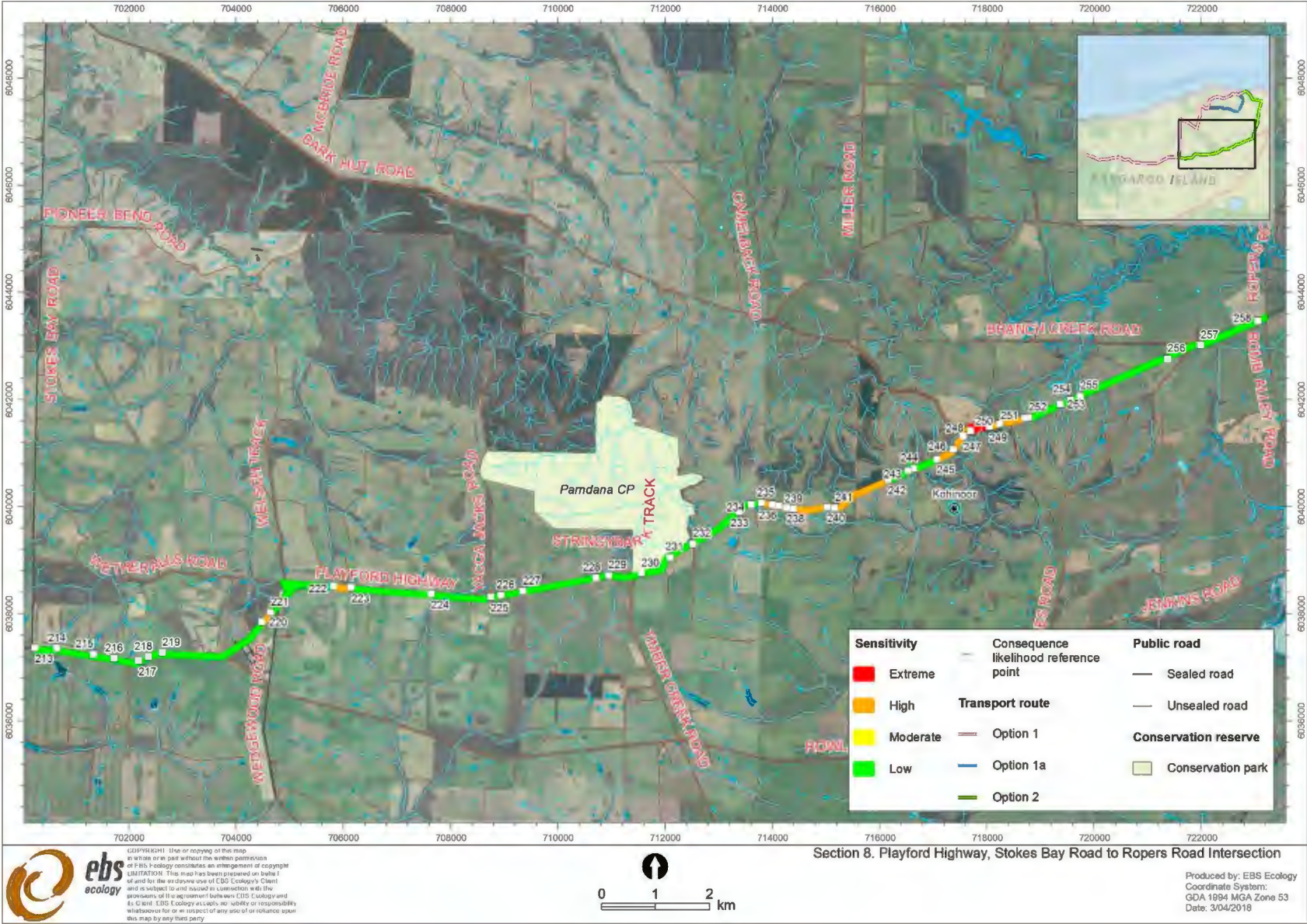


Figure 18. Section 8 sensitivity map.



## 5.9 Section 9: Ropers / Gap Road, Playford Highway to North Coast Road

The section from the Playford Highway through to the North Coast Road has a number of significant areas that provide critical and potential habitat for GBC (Figure 19) as well as numerous areas that support Kangaroo Island Narrow Leaf Mallee. Many of the *Eucalyptus cneorifolia* road reserve areas have connectivity with adjacent private patches and other large intact areas (Figure 20). The narrow width of Ropers and Gap Roads and growth habit of the Mallee vegetation means that impacts associated with transport routes are relatively certain for the entire southern extent and almost certain for all other sections of the respective roads (Table 18). The overall sensitivity trend of this road is very high as shown in Figure 21.

**Table 18. Section 9 sensitivity assessment summary.**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
8	258	21	14.54	1	Possible	Low
9	259	11	58.92	4	Almost Certain	Extreme
9	260	25	38.55	4	Almost Certain	Extreme
9	261	17	48.42	4	Almost Certain	Extreme
9	262	7	78.17	4	Almost Certain	Extreme
9	263	17	48.42	3	Almost Certain	Extreme
9	264	21	14.54	1	Almost Certain	Moderate
9	265	11	58.92	4	Almost Certain	Extreme
9	266	21	14.54	1	Almost Certain	Moderate
9	267	6	0	1	Almost Certain	Moderate
9	268	21	14.54	1	Almost Certain	Moderate
9	269	7	78.17	4	Almost Certain	Extreme
9	270	17	48.42	3	Almost Certain	Extreme
9	271	21	14.54	1	Almost Certain	Moderate
9	272	17	48.42	3	Almost Certain	Extreme
9	273	6	0	1	Almost Certain	Moderate
9	274	21	14.54	1	Almost Certain	Moderate
9	275	6	0	1	Almost Certain	Moderate
9	276	13	7.07	1	Almost Certain	Moderate
9	277	17	48.42	4	Almost Certain	Extreme
9	278	7	78.17	4	Almost Certain	Extreme
9	279	14	33.36	2	Almost Certain	High
9	280	17	48.42	3	Almost Certain	Extreme
9	281	21	14.54	1	Almost Certain	Moderate
9	282	6	0	1	Almost Certain	Moderate
9	283	21	14.54	1	Almost Certain	Moderate
9	284	6	0	1	Almost Certain	Moderate
9	285	21	14.54	1	Almost Certain	Moderate
9	286	6	0	1	Almost Certain	Moderate
9	287	21	14.54	1	Almost Certain	Moderate
9	288	6	0	1	Almost Certain	Moderate
9	289	21	14.54	1	Almost Certain	Moderate

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
9	290	6	0	1	Almost Certain	Moderate
9	291	21	14.54	1	Almost Certain	Moderate
9	292	17	48.42	3	Almost Certain	Extreme



Figure 19. Narrow Leaf Mallee overhanging ropers Road



Figure 20. *Eucalyptus camaldulensis*, *E. cladocalyx* Woodland on Ropers Road.

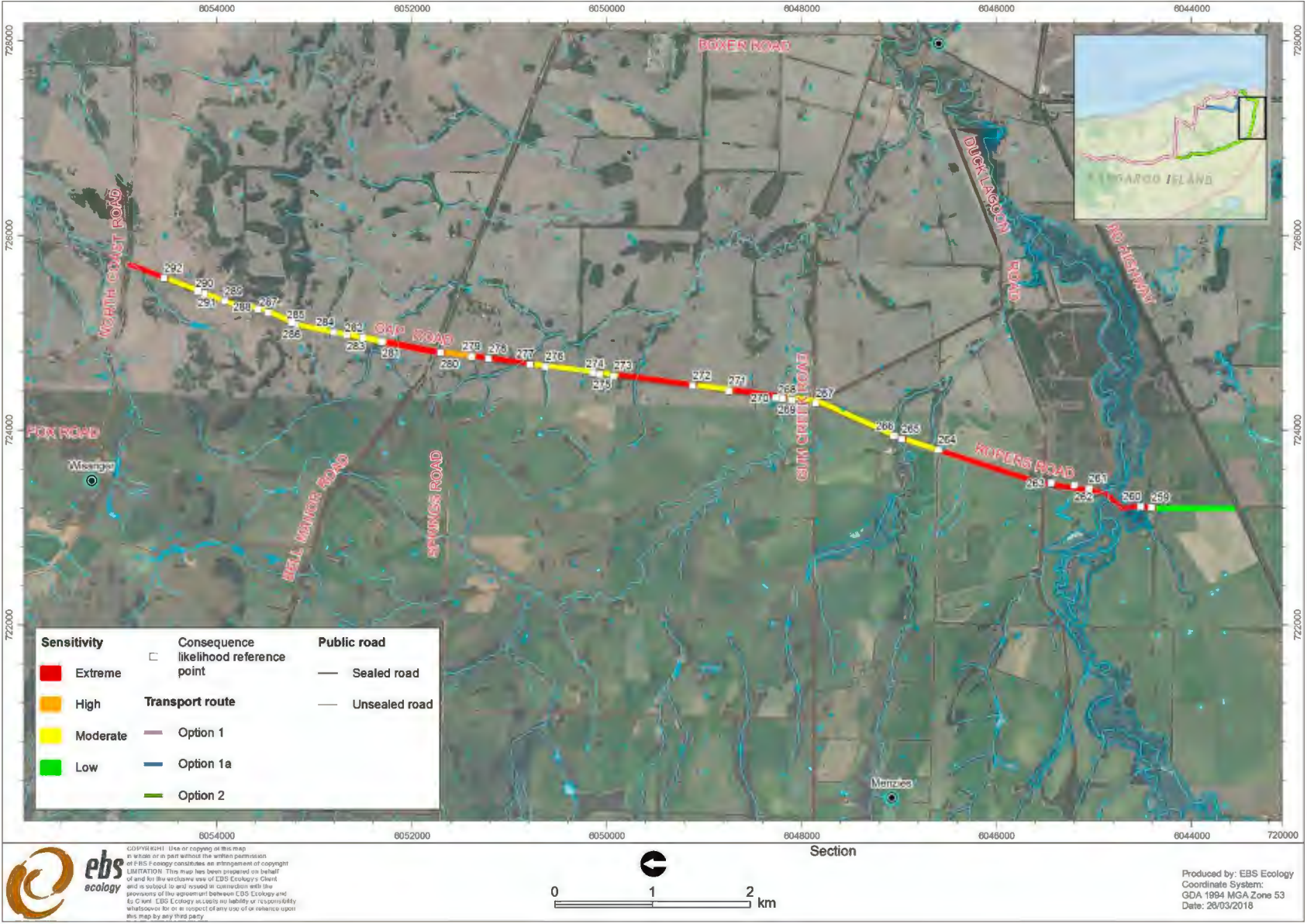


Figure 21. Section 9 sensitivity map.

## 5.10 Section 10: North Coast Road, Gap Road to access track into property Intersection

This section of road formed part of Option 2 and varied between areas of highly degraded habitat and patches of significant stands of vegetation communities which were poorly represented within the local area (Table 19). Several areas of potential TEC, *Eucalyptus cneorifolia* patches were present in this section however the width of the North Coast Road is relatively adequate and would require low level pruning type clearance at most This resulted in a patchy sensitivity for the extent of this road section with patches of low intergrading with areas of extreme sensitivity (Figure 22).

**Table 19. Section 10 sensitivity assessment summary.**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
10	298	17	48.42	4	Likely	Extreme
10	299	22	18.08	2	Likely	Moderate
10	300	21	14.54	2	Likely	Moderate
10	301	6	0	1	Unlikely	Low
10	302	17	48.42	2	Likely	Moderate
10	303	6	0	1	Unlikely	Low
10	304	17	48.42	2	Likely	Moderate
10	305	21	14.54	2	Likely	Moderate
10	306	6	0	1	Unlikely	Low
10	307	21	14.54	2	Likely	Moderate
10	308	21	14.54	2	Likely	Moderate
10	309	17	48.42	2	Likely	Moderate
10	310	6	0	1	Unlikely	Low
10	311	17	48.42	2	Likely	Moderate
10	312	6	0	1	Unlikely	Low
10	313	23	56.29	2	Likely	Moderate
10	314	17	48.42	2	Likely	Moderate
10	315	13	7.07	1	Possible	Low
10	316	23	56.29	2	Likely	Moderate
10	317	14	33.36	2	Likely	Moderate
10	318	23	56.29	4	Likely	Extreme
10	319	13	7.07	1	Possible	Low
10	320	11	58.92	4	Likely	Extreme
10	321	13	7.07	1	Possible	Low
10	322	6	0	1	Likely	Moderate
10	323	14	33.36	2	Likely	Moderate
10	324	6	0	1	Likely	Moderate
10	325	21	14.54	2	Likely	Moderate
10	326	17	48.42	2	Likely	Moderate
10	327	6	0	1	Unlikely	Low



Figure 22. Section 10 sensitivity map.

### 5.11 Section 11: Access track into property, from North coast Road

This road is a degraded narrow track that has intact overstorey in patches over exotic grassland and chenopod shrubs. While the requirement for clearance on this track to provide access for heavy vehicles is largely certain, the resultant sensitivity for this was subsequently low to moderate for these patches due to the very poor condition (Table 20). This is further demonstrated in Figure 24.

**Table 20. Section 11 sensitivity assessment summary.**

Road Section	Waypoint reference #	Association	Biodiversity unit score	Consequence	Likelihood	Sensitivity
11	293	21	14.54	1	Almost Certain	Moderate
11	294	21	14.54	1	Almost Certain	Moderate
11	295	21	14.54	1	Possible	Low
11	296	6	0	1	Possible	Low
11	297	6	0	1	Possible	Low



**Figure 23. Degraded patch on access track into property.**



Figure 24. Section 11 sensitivity map.



## 6 REFERENCES

- Atlas of Living Australia (2017) Atlas of Living Australia occurrence download at <http://www.ala.org.au>. Accessed 28 February 2018.
- Baxter (2015) Birds of Kangaroo Island. A photographic Field Guide.
- Birdlife Australia (2018) Hooded Plover *Thinornis rubricollis* Charadriidae <<http://www.birdlife.org.au/bird-profile/hooded-plover>> online resource viewed 29<sup>th</sup> March 2018
- Bureau of Meteorology (2018) Wind speed and direction rose, Port Lincoln. [http://www.bom.gov.au/cgi-bin/scripts/windrose\\_selector.cgi?period=Summer&type=9&location=18070](http://www.bom.gov.au/cgi-bin/scripts/windrose_selector.cgi?period=Summer&type=9&location=18070)
- Clemann, N. Gillespie, G.R (2012) National Recovery Plan for the Southern Bell Frog *Litoria raniformis*. Victorian Government Department of Sustainability and Environment (DSE) Melbourne, January 2012
- Department of Environment and Energy (2018) National recovery plan for the Downy Star-bush (*Asterolasia phebalioides*) <<http://www.environment.gov.au/resource/national-recovery-plan-downy-star-bush-asterolasia-phebalioides>>
- Department of the Environment (2011) Recovery Plan for the Kangaroo Island Dunnart *Sminthopsis aitkeni*. Summary <<http://www.environment.gov.au/biodiversity/threatened/recovery-plans/recovery-plan-kangaroo-island-dunnart-sminthopsis-aitkeni>>
- Department of the Environment (2017) EPBC Protected Matters Report Report created: 26/02/18 16:59:05
- Department of Water Environment and Natural Resources (2017) Glossy Black Cockatoo Habitat Mapping. Government of South Australia, Adelaide.
- Kangaroo Island Council (2007) Roadside Vegetation Management Plan.
- Mooney, PA. Pedler L.P, (2005) Recovery plan for the South Australian subspecies of the Glossy Black Cockatoo (*Calyptorhynchus lathami halmaturinus*): 2005-2010
- Native Vegetation Council (2017) Native Vegetation Council (NVC) bushland Assessment Manual. Native Vegetation Management Unit, February 2017.
- Naturemaps (2017) Phytophthora records search. Online Resource accessed 1/03/2018 <http://spatialwebapps.environment.sa.gov.au/naturemaps/?locale=en-us&viewer=naturemaps>
- Nicolle, D. (1995). A new series, Incognitae, of Eucalyptus L'Her., including a new species endemic to Fleurieu Peninsula and Kangaroo Island, South Australia. Journal of the Adelaide Botanic Gardens. 16:75.
- South Australian Seed Conservation Centre (2018) *Cheiranthra volubilis*. Twining finger-flowers Botanic Gardens of South Australia. [http://saseedbank.com.au/species\\_information.php?rid=28](http://saseedbank.com.au/species_information.php?rid=28)
- Taylor, D.A. (2008). Draft Recovery Plan for 15 Nationally Threatened Plant Species on Kangaroo Island, South Australia (2nd edn): 2003-2013. Department for Environment and Heritage, Government of South Australia.

## 7 APPENDICES

### Appendix 1. Threatened flora species recorded within 5km buffer of project area.

Scientific name	Common name	Conservation status <sup>1</sup>		Source <sup>2</sup>	Likelihood of occurrence within Project Area
		Aus	SA		
<i>Acacia dodonaeifolia</i>	Hop-bush Wattle		R	2	Known
<i>Acacia simmonsiana</i>	Hall's Wattle		R	2	Known
<i>Amphibromus archeri</i>	Pointed Swamp Wallaby-grass		R	2	Known
<i>Amphibromus recurvatus</i>	Dark Swamp Wallaby-grass		R	2	Known
<i>Anogramma leptophylla</i>	Annual Fern		R	2	Known
<i>Asterolasia muricata</i>	Lemon Star-bush		R	2	Known
<i>Asterolasia phebaloides</i>	Downy Star-bush	VU	V	1,2	Known
<i>Austrostipa densiflora</i>	Fox-tail Spear-grass		R	2	Known
<i>Austrostipa multispiculis</i>	Many-flowered Spear-grass		R	2	Known
<i>Bauera rubioides</i>	Wiry Bauera		R	2	Known
<i>Baumea acuta</i>	Pale Twig-rush		R	2	Known
<i>Baumea gunnii</i>	Slender Twig-rush		R	2	Known
<i>Baumea laxa</i>	Lax Twig-rush		R	2	Known
<i>Beyeria subsecta</i>	Kangaroo Island Turpentine Bush	VU	E	1,2	Known
<i>Blechnum nudum</i>	Fishbone Water-fern		R	2	Known
<i>Blechnum watsii</i>	Hard Water-fern		R	2	Known
<i>Boronia parviflora</i>	Swamp Boronia		R	2	Known
<i>Caladenia ovata</i>	Kangaroo Island Spider-orchid	VU		1	Possible
<i>Caladenia tensa</i>	Greencomb Spider-orchid	EN		1	Possible
<i>Calytrix smeatoniana</i>	Kangaroo Island Heath-myrtle		R	2	Known
<i>Cheiranthra volubilis</i>	Twining Finger Flower	VU	V	1,2	Known
<i>Choretrum chrysanthum</i>	Yellow-flower Sour-bush		R	2	Known
<i>Correa aemula</i>	Hairy Correa		R	2	Known
<i>Correa backhouseana</i> var. <i>orbicularis</i>	Round-leaf Correa		R	2	Known
<i>Corybas unguiculatus</i>	Small Helmet-orchid		R	2	Known
<i>Crassula exserta</i>	Large-fruit Crassula		R	2	Known
<i>Cryptostylis subulata</i>	Moose Orchid		V	2	Known
<i>Cyperus dactyloides</i>			V	2	Known
<i>Desmocladus diacolpicus</i>	Bundled Cord-rush		V	2	Known
<i>Deyeuxia densa</i>	Heath Bent-grass		R	2	Known
<i>Deyeuxia minor</i>	Small Bent-grass		V	2	Known
<i>Drosera binata</i>	Forked Sundew		R	2	Known
<i>Drosera praefolia</i>	Early Sundew		R	2	Known
<i>Echinopogon ovatus</i>	Rough-beard Grass		R	2	Known
<i>Eucalyptus fasciculosa</i>	Pink Gum		R	2	Known
<i>Eucalyptus paludicola</i>	Mount Compass Swamp Gum	EN	E	1,2	Known
<i>Eurychorda complanata</i>	Flat Cord-rush		V	2	Known
<i>Gahnia hystrix</i>	Spiky Saw-sedge		R	2	Known

Scientific name	Common name	Conservation status <sup>1</sup>		Source <sup>2</sup>	Likelihood of occurrence within Project Area
		Aus	SA		
<i>Gastrodia sesamoides</i>	Potato Orchid		R	2	Known
<i>Gleichenia microphylla</i>	Coral Fern		R	2	Known
<i>Gratiola pubescens</i>	Glandular Brooklime		R	2	Known
<i>Gratiola pumilo</i>	Dwarf Brooklime		R	2	Known
<i>Grevillea muricata</i>	Rough Spider-flower		V	2	Known
<i>Hakea aenigma</i>	Enigma Hakea		R	2	Known
<i>Hibbertia obtusibracteata</i>	Prickly Guinea-flower		V	2	Known
<i>Hypolepis rugosula</i>	Ruddy Ground-fern		R	2	Known
<i>Ireneparsus phasmatodes</i>	Kangaroo Island Cress		R	2	Known
<i>Isolepis producta</i>	Nutty Club-rush		V	2	Known
<i>Leionema equestre</i>	Kangaroo Island Phebalium	EN	E	1,2	Known
<i>Leionema microphyllum</i>	Limestone Phebalium		R	2	Known
<i>Lepidium pseudotasmanicum</i>	Shade Peppergrass		V	2	Known
<i>Lepyrodia valliculae</i>	Kangaroo Island Scale-rush		R	2	Known
<i>Leucopogon clelandii</i>	Cleland's Beard-heath		R	2	Known
<i>Leucopogon hirsutus</i>	Hairy Beard-heath		R	2	Known
<i>Logania insularis</i>	Kangaroo Island Logania	VU	V	1,2	Known
<i>Logania scabrella</i>	Rough Logania		R	2	Known
<i>Melaleuca squamea</i>	Swamp Honey-myrtle		R	2	Known
<i>Microtis rara</i>	Sweet Onion-orchid		R	2	Known
<i>Myoporum parvifolium</i>	Creeping Boobialla		R	2	Known
<i>Myriophyllum amphibium</i>	Broad Milfoil		R	2	Known
<i>Myriophyllum integrifolium</i>	Tiny Milfoil		R	2	Known
<i>Myriophyllum variifolium</i>	Varied Milfoil		R	2	Known
<i>Olearia microdisca</i>	Small-flowered Daisy-bush	EN	E	1,2	Known
<i>Phyllangium distylis</i>	Tiny Mitrewort		R	2	Known
<i>Phylloglossum drummondii</i>	Pigmy Clubmoss		R	2	Known
<i>Pilularia novae-hollandiae</i>	Austral Pillwort		R	2	Known
<i>Pomaderris halmaturina subsp. halmaturina</i>	Kangaroo Island Pomaderris	VU		1	Possible
<i>Potamogeton ochreateus</i>	Blunt Pondweed		R	2	Known
<i>Prostanthera chlorantha</i>	Green Mintbush		R	2	Known
<i>Pseudanthus micranthus</i>	Fringed Pseudanthus		R	2	Known
<i>Ptilotus beckerianus</i>	Ironstone Mulla Mulla	VU	V	1,2	Known
<i>Pultenaea dentata</i>	Clustered Bush-pea		R	2	Known
<i>Pultenaea scabra</i>	Rough Bush-pea		R	2	Known
<i>Pultenaea villifera var. glabrescens</i>	Yellow Bush-pea, Splendid Bush-pea	VU	V	1, 2	Known
<i>Rhytidosporum procumbens</i>	White Rhytidosporum		R	2	Known
<i>Schizaea fistulosa</i>	Narrow Comb-fern		V	2	Known
<i>Schoenus discifer</i>	Tiny Bog-rush		R	2	Known
<i>Schoenus laevigatus</i>			R	2	Known
<i>Schoenus sculptus</i>	Gimlet Bog-rush		R	2	Known
<i>Sphaerolobium minus</i>	Leafless Globe-pea		R	2	Known
<i>Sprengelia incarnata</i>	Pink Swamp-heath		R	2	Known

Scientific name	Common name	Conservation status <sup>1</sup>		Source <sup>2</sup>	Likelihood of occurrence within Project Area
		Aus	SA		
<i>Spyridium eriocephalum</i> var. <i>glabrisepalum</i>	MacGillivray Spyridium	VU	E	1,2	Known
<i>Spyridium scabridum</i>	Rough Spyridium		R	2	Known
<i>Spyridium spathulatum</i>	Spoon-leaf Spyridium		R	2	Known
<i>Stylidium beagleholei</i>	Beaglehole's Trigger-plant		R	2	Known
<i>Thelymitra ixioides</i>	Spotted Sun-orchid		E*	2	Known
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	VU	E	1,2	Known
<i>Veronica derwentiana</i> subsp. <i>homalodonta</i>	Mount Lofty Speedwell	CE		1	Possible
<i>Viminaria juncea</i>	Native Broom		R	2	Known
<i>Wurmbea decumbens</i>	Trailing Nancy		R	2	Known
<i>Xanthosia tasmanica</i>	Southern Xanthosia		R	2	Known
<i>Xyris operculata</i>	Tall Yellow-eye		R	2	Known

#### **1 Conservation status**

**Aus:** Australia (*Environment Protection and Biodiversity Conservation Act 1999*). **SA:** South Australia (*National Parks and Wildlife Act 1972*). **CE:** Critically Endangered. **EN/E:** Endangered. **VU/V:** Vulnerable. **R:** Rare. **ssp.:** the conservation status applies at the sub-species level. **Mi:** listed as migratory under the EPBC Act. **Ma:** listed as marine under the EPBC Act.

#### **2 Source of Information**

1. EPBC Protected Matters Search Report
2. Atlas of Living Australia data extract (ALA 2017) - 10 km buffer applied to project area.

## Appendix 2. Threatened fauna species recorded within 5km buffer of project area.

Scientific name	Common name	Conservation status <sup>1</sup>		Source <sup>2</sup>	Likelihood of occurrence within Project Area
		Aus	SA		
Birds					
<i>Actitis hypoleucos</i>	Common Sandpiper	Mi		1	Possible
<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN		1	Possible
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi		1	Possible
<i>Calidris canutus</i>	Red Knot, Knot	EN, Mi		1	Possible
<i>Calidris ferruginea</i>	Curlew Sandpiper	CE, Mi		1	Possible
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi		1	Possible
<i>Calidris ruficollis</i>	Red-necked Stint	Mi		1	Possible
<i>Diomedea antipodensis</i>	Antipodean Albatross	VU		1	Unlikely
<i>Diomedea epomophora</i>	Southern Royal Albatross	VU		1	Unlikely
<i>Diomedea exulans</i>	Wandering Albatross	VU		1	Unlikely
<i>Diomedea sanfordi</i>	Northern Royal Albatross	EN		1	Unlikely
<i>Halobaena caerulea</i>	Blue Petrel	VU		1	Unlikely
<i>Hirundapus caudacutus</i>	White-throated Needletail	Mi		1	Unlikely
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit	VU, Mi		1	Unlikely
<i>Limosa lapponica menzbieri</i>	Northern Siberian Bar-tailed Godwit,	CE		1	Unlikely
<i>Macronectes giganteus</i>	Southern Giant-Petrel, Southern Giant Petrel	EN		1	Unlikely
<i>Macronectes halli</i>	Northern Giant Petrel	VU		1	Unlikely
<i>Motacilla cinerea</i>	Grey Wagtail	Mi		1	Unlikely
<i>Motacilla flava</i>	Yellow Wagtail	Mi		1	Unlikely
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Mi		1	Unlikely
<i>Pachyptila turtur subantarctica</i>	Fairy Prion (southern)	VU		1	Unlikely
<i>Pandion haliaetus</i>	Osprey	Mi		1	Unlikely
<i>Pterodroma mollis</i>	Soft-plumaged Petrel	VU			Unlikely
<i>Rostratula australis</i>	Australian Painted Snipe	EN			Unlikely
<i>Sternula nereis nereis</i>	Australian Fairy Tern	VU		1	Unlikely
<i>Thalassarche cauta cauta</i>	Shy Albatross, Tasmanian Shy Albatross	VU		1	Unlikely
<i>Thalassarche cauta steadi</i>	White-capped Albatross	VU		1	Unlikely
<i>Thalassarche impavida</i>	Campbell Albatross, Campbell Black-browed Albatross	VU		1	Unlikely
<i>Thalassarche melanophris</i>	Black-browed Albatross	VU, Mi		1	Unlikely
Mammals					
<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot	EN		1	Possible
<i>Neophoca cinerea</i>	Australian Sea-lion, Australian Sea Lion	VU		1	Unlikely
<i>Tachyglossus aculeatus multiaculeatus</i>	Kangaroo Island Echidna	EN		1	Likely

Scientific name	Common name	Conservation status <sup>1</sup>		Source <sup>2</sup>	Likelihood of occurrence within Project Area
		Aus	SA		
Reptiles					
<i>Accipiter novaehollandiae</i>	Grey Goshawk		E	2	Known
<i>Anseranas semipalmata</i>	Magpie Goose		E	2	Known
<i>Calyptorhynchus lathami</i>	Glossy Black Cockatoo	EN	E	1,2	Known
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		E	2	Known
<i>Ornithorhynchus anatinus</i>	Platypus		E	2	Known
<i>Sminthopsis aitkeni</i>	Kangaroo Island Dunnart	EN	E	1,2	Known
<i>Ardea ibis</i>	Cattle Egret		R	2	Known
<i>Arenaria interpres</i>	Ruddy Turnstone	Mi	R	1,2	Known
<i>Biziura lobata</i>	Musk Duck		R	2	Known
<i>Burhinus grallarius</i>	Bush Stonecurlew		R	2	Known
<i>Corcorax melanorhamphos</i>	White-winged Chough		R	2	Known
<i>Egretta garzetta</i>	Little Egret		R	2	Known
<i>Egretta sacra</i>	Pacific Reef Heron (Eastern Reef Egret)		R	2	Known
<i>Falco peregrinus</i>	Peregrine Falcon		R	2	Known
<i>Falcunculus frontatus</i>	Crested Shriketit		R	2	Known
<i>Gallinago hardwickii</i>	Latham's Snipe	Mi	R	1,2	Known
<i>Geophaps plumifera</i>	Spinifex Pigeon		R	2	Known
<i>Haematopus longirostris</i>	(Australian) Pied Oystercatcher		R	2	Known
<i>Myiagra inquieta</i>	Restless Flycatcher		R	2	Known
<i>Neophema elegans</i>	Elegant Parrot		R	2	Known
<i>Neophema petrophila</i>	Rock Parrot		R	2	Known
<i>Oriolus sagittatus</i>	Olive-backed Oriole		R	2	Known
<i>Oxyura australis</i>	Blue-billed Duck		R	2	Known
<i>Plegadis falcinellus</i>	Glossy Ibis		R	2	Known
<i>Pluvialis fulva</i>	Pacific Golden Plover		R	2	Known
<i>Porzana tabuensis</i>	Spotless Crake		R	2	Known
<i>Stagonopleura bella</i>	Beautiful Firetail		R	2	Known
<i>Turnix pyrrhothorax</i>	Red-chested Buttonquail		R	2	Known
<i>Turnix varius</i>	Painted Buttonquail		R	2	Known
<i>Zoothera lunulata</i>	Bassian Thrush	VU	R	1, 2	Known
<i>Macropus giganteus</i>	Eastern Grey Kangaroo		R	2	Known
<i>Rattus lutreolus</i>	Swamp Rat		R	2	Known
<i>Trichosurus vulpecula</i>	Common Brushtail Possum		R	2	Known
<i>Pseudophryne bibronii</i>	Brown Toadlet		R	2	Known
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater		ssp	2	Known
<i>Melithreptus gularis</i>	Black-chinned Honeyeater		ssp	2	Known
<i>Microeca fascinans</i>	Jacky Winter		ssp	2	Known
<i>Petroica boodang</i>	Scarlet Robin		ssp	2	Known
<i>Stipiturus malachurus</i>	Southern Emuwren	ssp	ssp	2	Known
<i>Strepera versicolor</i>	Grey Currawong		ssp	2	Known
<i>Calyptorhynchus funereus</i>	Yellow-tailed Black Cockatoo		V	2	Known
<i>Coturnix ypsilophora</i>	Brown Quail		V	2	Known

Scientific name	Common name	Conservation status <sup>1</sup>		Source <sup>2</sup>	Likelihood of occurrence within Project Area
		Aus	SA		
<i>Lewinia pectoralis</i>	Lewin's Rail		V	2	Known
<i>Numenius madagascariensis</i>	Far Eastern Curlew	CE, Mi	V	1,2	Known
<i>Petroica phoenicea</i>	Flame Robin		V	2	Known
<i>Phoebastria fusca</i>	Sooty Albatross	VU	V	1	Unlikely
<i>Stagonopleura guttata</i>	Diamond Firetail		V	2	Known
<i>Stictonetta naevosa</i>	Freckled Duck		V	2	Known
<i>Thinornis rubricollis</i>	Hooded Plover (Hooded Dotterel)	VU	V	1,2	Known
<i>Litoria raniformis</i>	Southern Bell Frog	VU	V	1,2	Known
<i>Varanus rosenbergi</i>	Heath Goanna		V	2	Known

<sup>1</sup> Conservation status

Aus: Australia (*Environment Protection and Biodiversity Conservation Act 1999*). SA: South Australia (*National Parks and Wildlife Act 1972*). CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. ssp.: the conservation status applies at the sub-species level. Mi: listed as migratory under the EPBC Act. Ma: listed as marine under the EPBC Act.

<sup>2</sup> Source of Information

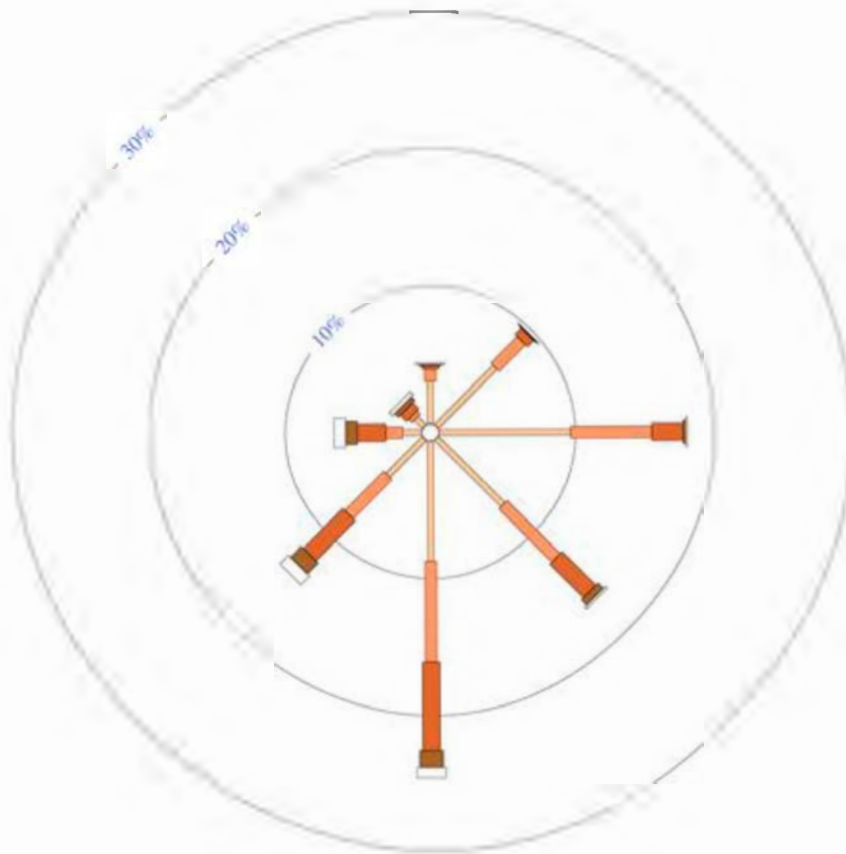
3. EPBC Protected Matters Search Report
4. Atlas of Living Australia data extract (ALA 2017) - 10 km buffer applied to project area.

### Appendix 3. Port Lincoln Wind Rose



3 pm Summer  
9464 Total Observations

Calm 3%



Australian Government  
Bureau of Meteorology



## Appendix 4. Bushland assessment parameters which influence the Unit Biodiversity Score

Parameter	Factors
Landscape context	<ul style="list-style-type: none"> <li>• Percentage vegetation cover within 5 km</li> <li>• Block shape</li> <li>• Distance to remnant of &gt;50 ha</li> <li>• Remnancy of IBRA Association</li> <li>• Percentage of vegetation protected within the IBRA Association</li> <li>• The presence of riparian vegetation, swamps or wetlands</li> </ul>
Vegetation condition	<ul style="list-style-type: none"> <li>• Native species diversity</li> <li>• Number of native lifeforms and their cover</li> <li>• Number of regenerating species</li> <li>• Weed cover and the level of invasiveness of dominant species</li> <li>• Cover of bare ground, fallen timber, exotic species in the understorey</li> <li>• Tree health and the number of individuals supporting hollows</li> </ul>
Conservation significance score	<ul style="list-style-type: none"> <li>• The presence of federal or state listed threatened ecological communities, and their conservation rating.</li> <li>• Number of threatened plant species recorded at the site, and their conservation rating</li> <li>• Number of threatened fauna species for potential habitat occurs within the site, and their conservation rating.</li> </ul>
Mean annual rainfall	The mean annual rainfall for the site.
Area of clearance	The area of native vegetation (ha) to be cleared for the project.



*EBS Ecology*  
*125 Hayward Avenue*  
*Torrensville, SA 5031*  
*[www.ebsecology.com.au](http://www.ebsecology.com.au)*  
*t. 08 7127 5607*  
*f. 08 8352 1222*

Appendix P7 –  
KI Seaport Traffic  
Impact Assessment  
– HDS Australia



## Environmental Projects

---

### KI SEAPORT

### Traffic Impact Assessment

---

#### **HDS Australia Pty Ltd**

277 Magill Road  
Trinity Gardens SA 5068

**telephone** +61 8 8333 3760

**email** [sa@hdsaustralia.com.au](mailto:sa@hdsaustralia.com.au)

[www.hdsaustralia.com.au](http://www.hdsaustralia.com.au)

**September 2018**

## CONTENTS

<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	Purpose of Report .....	1
1.2	Outline of Scope .....	1
1.3	Guidelines for Environmental Impact Statement .....	1
1.4	Traffic and Transport Guidelines.....	1
1.5	Infrastructure Guidelines.....	2
<b>2.0</b>	<b>CONTEXT .....</b>	<b>3</b>
2.1	Proposed KI Seaport Development.....	3
2.2	Background Work .....	3
2.3	Smith Bay Wharf Site.....	6
2.4	Construction Transport Requirements .....	6
2.5	KIPT Freight Task.....	6
2.6	Light Vehicle Access to Smith Bay Wharf .....	8
2.7	Smith Bay Wharf – Other Activities .....	8
<b>3.0</b>	<b>EXISTING ENVIRONMENT.....</b>	<b>9</b>
3.1	Traffic Volumes.....	9
3.2	Crash History.....	11
<b>4.0</b>	<b>TRAFFIC IMPACT ASSESSMENT – EXISTING ROAD NETWORK .....</b>	<b>12</b>
4.1	Surrounding Land Use - Community Access .....	12
4.2	Surrounding Land Use – Farmer Access .....	12
4.3	Surrounding Land Use - Agricultural Interaction.....	12
4.4	Surrounding Land Use - Residents .....	12
4.5	Tourist Traffic.....	13
4.6	Bus Routes.....	13
4.7	Vulnerable Road Users.....	13
4.8	Ecological Impact .....	13
4.9	Condition of Existing Kangaroo Island Roads .....	14
<b>5.0</b>	<b>OPTIONS TO MITIGATE IMPACTS OF USING EXISTING ROAD NETWORK.....</b>	<b>16</b>
5.1	Surrounding Land Use – Community Access.....	16
5.2	Surrounding Land Use – Farmer Access .....	16
5.3	Surrounding Land Use – Agricultural Interaction .....	16
5.4	Surrounding Land Use – Residential .....	16
5.5	Tourist Traffic.....	16
5.6	Bus Routes.....	17
5.7	Vulnerable Road Users.....	17
5.8	Ecological Impact .....	17
5.9	Conditions of Existing Roads .....	17
5.10	Vehicle Type – Use of Higher Productivity Vehicles.....	18
5.11	Defined Route.....	21

<b>6.0</b>	<b>DEFINED ROUTE FRAMEWORK.....</b>	<b>22</b>
6.1	Vehicle Options .....	22
6.2	Route Options.....	23
6.3	Complementary Measures.....	26
6.4	Approach for Use of Restricted Access Vehicles .....	27
6.5	Management of Road Upgrades.....	38
6.6	Construction of Road Upgrades.....	38
6.7	Feeder Routes.....	38
6.8	Funding Arrangements .....	39
<b>7.0</b>	<b>CONCLUSION .....</b>	<b>40</b>

## APPENDICES

- A. Smith Bay Wharf Concept Design Drawings, WGA Reference AAD140312 Sheet SK305 To SK307 Rev A
- B. Southern and Hills Local Government Association 2020 Transport Plan – Regionally Significant Routes, Kangaroo Island Council
- C. School Bus Routes
- D. Map of Routes and Updated Route Numbers
- E. DPTI Risk Calculator

## REFERENCES

- A. Forestry Access Route Assessment Revision E, Wallbridge & Gilbert, February 2017
- B. KIPT Road Freight Options Assessment, Osman Solutions, September 2017
- C. Recommended road safety policies and practices for Kangaroo Island Plantation Timbers, The University of Adelaide, November 2017
- D. KIPT Freight Access Route Options – PBS Level 2B Heavy Vehicle Route Assessment, HDS Australia, March 2018
- E. KIPT Transport Route Options, Limitation Summary, Rev 2, EBS Ecology, April 2018
- F. KIPT Transport Route Options – Ecological Assessment, Rev 3, EBS Ecology, May 2018

## **1.0 INTRODUCTION**

### **1.1 Purpose of Report**

Environmental Projects has engaged HDS Australia to prepare a Traffic Impact Assessment (TIA) on the proposed KI Seaport development at Smith Bay, Kangaroo Island to be undertaken, if approved, by Kangaroo Island Plantation Timbers Ltd (KIPT). This TIA will support the overall environmental impact statement (EIS) which is being prepared by Environmental Projects. This TIA focuses on the roads and traffic items related to the proposed development, specifically in relation to the movement of timber from plantations to the wharf development site at Smith Bay, in accordance with relevant guidance provided in:

- Guidelines for the preparation of an Environmental Impact Statement, Deep water port facility at Smith Bay, Kangaroo Island, proposed by Kangaroo Island Plantation Timbers Ltd, June 2017 issued by the Development Assessment Commission (DAC).

### **1.2 Outline of Scope**

The aim of this TIA is to investigate the higher level social, environmental and economic impacts that haul vehicles transporting timber between forestry plantations and the proposed Smith Bay wharf development will have along the road network on Kangaroo Island. This TIA will inform more detailed assessments required for further transport studies associated with the KI Seaport development.

### **1.3 Guidelines for Environmental Impact Statement**

The specific transport and traffic aspects of the Guidelines (DAC 2017), liaison with government officers and assessments previously completed for traffic-related aspects of the proposed development has informed HDS Australia in completing the TIA.

A summary is provided below of the specific Guidelines and the associated sections of the TIA in which their consideration has been presented.

### **1.4 Traffic and Transport Guidelines**

#### **1.4.1 Guideline 10.1 – Traffic impacts on local roads**

Details of the predicted increased volumes of traffic on the local roads are provided in Sections 3.1.3, and 4.1 to 4.3.

#### **1.4.2 Guideline 10.2 – Full Traffic Impact Assessment**

The requested full TIA has been undertaken below as the main body of this report in Sections 3.0 to 7.0.

#### **1.4.3 Guideline 10.3 – Traffic mitigation for construction**

Comments have been provided on the measures associated with construction in Section 6.6.

## **1.5 Infrastructure Guidelines**

### **1.5.1 Guideline 15.2 – Requirements for supply of distribution networks**

Details have been provided for existing road networks and for the required and recommended upgrades for roads identified as preferred (haulage) route/s in Section 6.4.2 and 6.4.4. This report only focuses on the road related aspects of Guideline 15.2.

### **1.5.2 Guideline 15.3 – Infrastructure upgrades to existing distribution networks**

Management and funding issues associated with the road upgrades have been discussed in Section 6.5 of this report. This report only focuses on the road related aspects of Guideline 15.3.

### **1.5.3 Guideline 15.5 – Road infrastructure upgrades summary**

Road infrastructure upgrades have been detailed in Section 6.4.2 and 6.4.4 of this report and funding discussion has been discussed in Section 6.8.

### **1.5.4 Guideline 15.6 – Best practice infrastructure design**

Opportunities to incorporate best practice have been mentioned throughout the report however more specific details have been mentioned in Sections 6.5 and 6.6.



## **2.0 CONTEXT**

### **2.1 Proposed KI Seaport Development**

The KI Seaport Development will allow timber harvested on Kangaroo Island to be exported via ships at the proposed Smith Bay wharf, known as the KI Seaport development. The development is detailed in the 'Project Description' prepared by Environmental Projects, which also provides details of other aspects of KIPT's proposed operation which are not part of the EIS assessment, such as:

- Harvesting and maintaining plantation forests for a sustainable timber industry;
- Log and woodchip operations;
- Haulage of log and woodchip to the wharf for storage and transfer to Panamax sized vessels;
- Export of log and woodchip via Panamax vessels from Smith Bay wharf to international markets.

This TIA focuses on the haulage task, i.e. getting the logs and woodchip from the plantations to the KI Seaport development at Smith Bay, at a level of detail required to satisfy Guidelines for the EIS (see sections 1.4 and 0).

### **2.2 Background Work**

Substantial work has been undertaken previously for transport and traffic aspects of this project, and this TIA draws on available information from previous assessments, identifies and fills any gaps, and structures the discussion to meet outcomes for the purpose of the EIS, being:

- understand the traffic impacts for operating under the existing road network i.e. based on the semi-trailer volumes required to be transported from plantations to the wharf site;
- identify, based on current knowledge and industry practice, management measures or controls that could be implemented to minimise impacts;
- discuss potential flow-on effects and specific requirements that need to be considered, with implementation of recommended management measures or controls.

Previous assessments and studies used for completing this TIA include:

- Forestry Access Route Assessment Revision E, Wallbridge & Gilbert, February 2017;
- KIPT Road Freight Options Assessment, Osman Solutions, September 2017;
- Recommended road safety policies and practices for Kangaroo Island Plantation Timbers, The University of Adelaide, November 2017;
- KIPT Freight Access Route Options – PBS Level 2B Heavy Vehicle Route Assessment, HDS Australia, March 2018;
- KIPT Transport Route Options, Limitation Summary, Rev 2, EBS Ecology, April 2018;
- KIPT Transport Route Options – Ecological Assessment, Rev 3, EBS Ecology, May 2018.

A summary of these reports and the reasons for commissioning them is provided in Table 1, with the full reports provided in appendices of Chapter 21 Traffic and Transport of the EIS.

**Table 1: Previous Traffic and Transport Related Reports**

<b>Title</b>	<b>Date</b>	<b>Author</b>	<b>Commissioned by</b>	<b>Purpose of the Report</b>	<b>Outcome</b>
Forestry Access Route Assessment Revision E	February 2017	Wallbridge & Gilbert (WGA)	KIPT	To understand the implications of the moving timber products to Smith Bay by road from the various plantation estates.	Identifies five transport route options using 19m semi-trailers as the haul vehicle.
KIPT Road Freight Options Assessment	September 2017	Osman Solutions	KIPT (scope agreed with Andy Boardman, CEO of Kangaroo Island Council)	To consider route options using high productivity vehicles (HPVs), in order to provide benefits to all stakeholders including Council and the community.  Osman Solutions was engaged for this assessment for the following reasons: <ul style="list-style-type: none"> <li>• Extensive local knowledge</li> <li>• Excellent understanding of Council's priorities</li> <li>• Supported by Council.</li> </ul>	<ol style="list-style-type: none"> <li>1. The assessment criteria was initially agreed Council.</li> <li>2. Following an initial review of nine route options, a short list of options was agreed for consideration in more detail.</li> <li>3. A preferred route was selected following detailed assessment based on the agreed criteria.</li> <li>4. It is understood that Council CEO agreed with both the process and the outcomes</li> </ol>
Recommended road safety policies and practices for Kangaroo Island Plantation Timber	November 2017	Centre for Automotive Safety Research, The University of Adelaide	KIPT	KIPT has an aspiration to be the national exemplar in terms of a safe and efficient haulage operation. The purpose of this report is to identify methods to operate a safe and efficient haulage operation on Kangaroo Island.	The report presents options which complement the work done by Osman Solutions and WGA. It identifies a number of cost-effective strategies, including a number of alternatives to road upgrades, including use of safer vehicles such as HPVs and safer speeds.
KIPT Freight Access Route Options – PBS Level 2B Heavy Vehicle Route Assessment	March 2018	HDS Australia	Kangaroo Island Council	Independent assessment requested by Council of the two preferred heavy vehicle route options based on upgrade cost estimates required to reduce hazards to acceptable risk levels.	Option 2 was recommended as the preferred route based upgrade cost estimates. Note that HDS Australia was not engaged to consider the native vegetation issues, and was not provided the earlier reports, including the EBS Ecology report.

<b>Title</b>	<b>Date</b>	<b>Author</b>	<b>Commissioned by</b>	<b>Purpose of the Report</b>	<b>Outcome</b>
KIPT Transport Route Options, Limitation Summary, Rev 2,	April 2018	EBS Ecology	Environmental Projects	Summary of key findings of the assessment of ecology along two routes, being the preferred route identified in the Osman Solutions report (Option 1), and the second ranked route in that report (Option 2).	A number of ecological impacts were identified, with the preferred option based on ecological impacts identified as being the same as the Osman Solutions report (Option 1). The second option was identified as being unsuitable.
KIPT Transport Route Options – Ecological Assessment, Rev 3	May 2018	EBS Ecology	Environmental Projects	Assessment of ecology along two routes, being the preferred route identified in the Osman Solutions report (Option 1), and the second ranked route in that report (Option 2).	A number of ecological impacts were identified, with the preferred option based on ecological impacts identified as being the same as the Osman Solutions report (Option 1). The second option was identified as being unsuitable. Limitations Summary report prepared. See EBS Ecology, April 2018.

### **2.3 Smith Bay Wharf Site**

Concept designs (WGA reference AAD140312 Sheet SK305 to SK307 Rev A) of the Smith Bay wharf were provided to HDS Australia. Turning templates as part of the concept designs (refer to Appendix A) have been completed for semi-trailer and B-double vehicles at a single access point via the intersection of an unnamed road (latitude -35.601615, longitude 137.426207) and North Coast Road. Design work will be completed following approval of the Smith Bay wharf project.

### **2.4 Construction Transport Requirements**

During construction it is expected that there will be 45 FTE workers on the Smith Bay site, not all accessing site at once, over the construction period.

Construction of the wharf will require quarried rock to be transported to the wharf from sources on Kangaroo Island. Minor movements of plant and equipment (such as amenities and office buildings (if not stick-built on site), conveyor sections, steelwork and concrete) will also be required. It is expected that this impact will not be significant, and the task will be undertaken by un-restricted access vehicles mainly using North Coast Road over short periods as distinct campaigns during phased construction. No further details have been provided at this stage.

### **2.5 KIPT Freight Task**

The freight task associated with moving the timber from the plantations to the Smith Bay wharf is expected to average 600,000 tonnes per year (and up to 730,000 tonnes per year) during the first 11-year rotation. Figure 1 shows the locations of the various plantations in relation to Kangaroo Island's open road network and highlights that for the various plantations different routes can be utilised by the haul vehicles, and specific routes could be utilised to minimise transport times, and hence transport costs. A significant proportion of the roads on the centre and northern parts of the island will be impacted by these movements.

KIPT Plantation Management  
Locality map of plantation properties Kangaroo Island S.A.

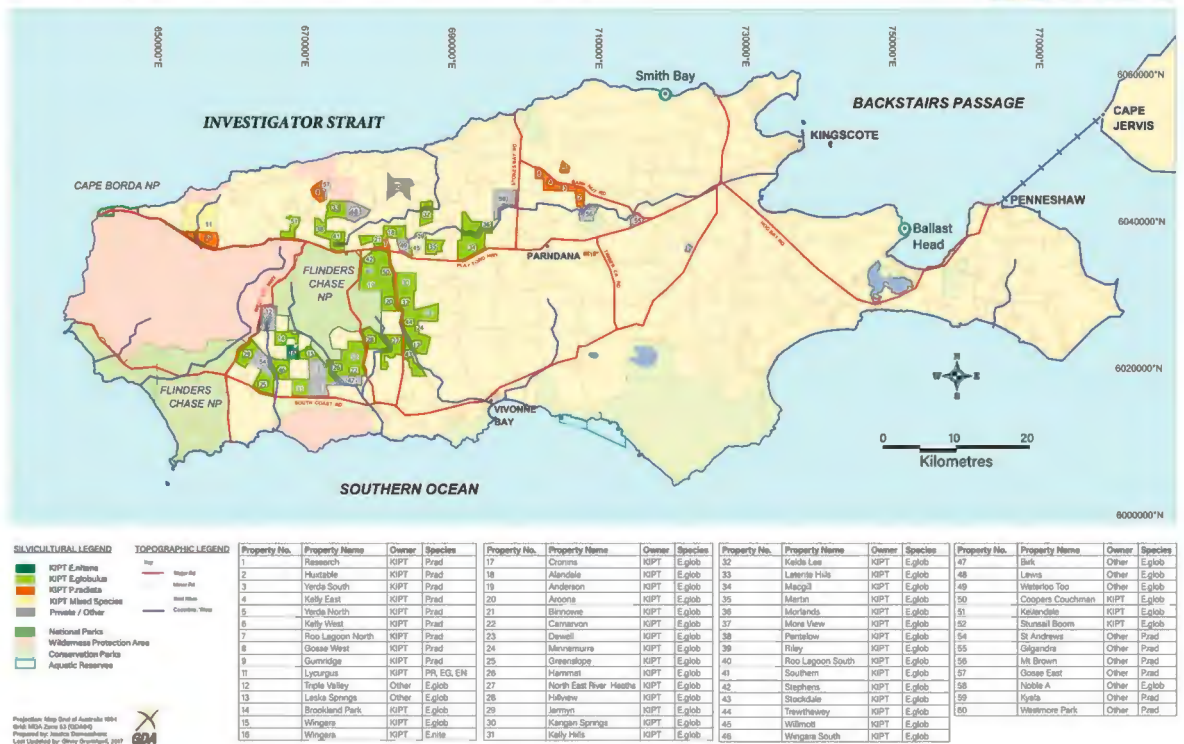


Figure 1: Timber Plantations and Potential Freight Routes

Table 2 shows a year by year breakdown of the estimated timber tonnages that will be moved by the haul vehicles to Smith Bay from plantations over the first 11-year harvest rotation. It is expected that during the second harvest rotation (after 2032) the yearly average tonnages will be between 400,000-450,000 tonnes.

Table 2: Timber Freight Tonnages to Smith Bay

Financial Year	Green tonnes
2020	443,000
2021	590,000
2022	480,000
2023	609,000
2024	638,000
2025	672,000
2026	662,000
2027	633,000
2028	661,000
2029	723,000
2030	730,000
2031	682,000

## 2.6 Light Vehicle Access to Smith Bay Wharf

It is expected that there will be light vehicles (operated by site workers and visitors) accessing the wharf site to work at the storage facility. These workers and visitors may come from anywhere on Kangaroo Island however they are most likely to come from the eastern end of the island and hence from the eastern approach along North Coast Road via the intersection at the unnamed road to the Smith Bay wharf site.

The maximum direct employment at KIPT will be 175 FTE in 2022-23, with up to 14 of these expected to be employed at the Smith Bay wharf facility, depending on activities, such as ship loading, occurring at the time. Car parking (approximately 20 car parks) is expected to be provided to meet the work force demand.

## 2.7 Smith Bay Wharf – Other Activities

The Smith Bay wharf may be utilised by other industries and companies once completed, pending appropriate approvals. It is possible that other commodities such as grain and livestock could be exported from the wharf. The volumes and frequency of these shipments is currently unclear along with associated vehicle movements to the wharf. It would be expected that any vehicle movements could be from all over the island, accessing the site from North Coast Road from either the east or west. It can be assumed, at this time, that the majority of these trips would be undertaken by semi-trailer. It could also be assumed that while this would increase traffic volumes on routes to the Smith Bay site, it may reduce volumes on other roads currently being utilised to transport the commodities via the ferry service to the mainland, thereby potentially reducing the impact on other road networks, should export volumes stay the same, and potentially reducing transport costs for farmers closer to Smith Bay.

Tourist/cruise ships that visit Kangaroo Island on a regular basis could potentially, pending appropriate approvals and upgrades to on-shore facilities, utilise Smith Bay wharf in the future. The season for cruise ships is November to March and for the 2018/19 season, there are 30 cruise ships (of total capacity 60,000) booked to visit Kangaroo Island, 12 of them during February. It is expected that up to 85% of passengers and 15% of the ships' crew disembark at Penneshaw (*pers comm* Tourism KI). It would be expected that many who disembark would travel to tourist destinations on the island.

Tourism on Kangaroo Island is strong, a growing industry and is expected to grow over the next decade. An increase in the current number of cruise ship passengers choosing to disembark and opting for day trips will result in an increase traffic volumes and heavy vehicle movements around the Smith Bay area, but only on a select number of days per year.

### 3.0 EXISTING ENVIRONMENT

#### 3.1 Traffic Volumes

##### 3.1.1 Current Traffic Distribution

Table 3 shows current traffic volumes based on data provided by the Department of Planning, Transport and Infrastructure (DPTI) and Kangaroo Island Council for roads within two haul road routes considered for heavy vehicles, as part a study undertaken for Kangaroo Island Council (HDS 2018).

Raw data (provided by Council) has not been seasonally adjusted. Kangaroo Island has a high number of tourist traffic within the summer months, and therefore it is expected that the Annual Average Daily Traffic (AADT) will be considerably lower for some of the roads shown in Table 3, given the representative period for available data.

**Table 3: Existing Traffic Volumes**

Road	Traffic Count Per day	Period
Playford Highway (near Stokes Bay Rd)	470	2015
Ropers Road	48	Spring 2017
Gap Road	53	Spring 2017
Stokes Bay Road	150	Summer 2017
Bark Hut Road	55	Winter 2017
McBrides Road	13	Spring 2017
North Coast Road	160	Summer 2017

(source: HDS 2018)

Volumes presented in Table 3 shows that Playford Highway has the most significant traffic volumes. Stokes Bay Road and North Coast Road have similar volumes to each other, and it is expected that these volumes include a high percentage of tourists given that these roads are shown as 'tourist routes' in the Southern & Hills Local Government Association 2020 Transport Plan. The combination of tourists and heavy vehicles on the same roads is discussed in Section 4.5.

##### 3.1.2 Haul Vehicle Movements

Table 4 shows the total number of vehicle movements for the first timber rotation and the annual average daily traffic freight movements based on the peak year and based on a 19-metre semi-trailer usage, based on expected timber volumes. Several assumptions have been made in order to estimate expected traffic movements, such as a 230-day working year and an average of 600,000 tonnes per annum harvest.

**Table 4: Estimated freight movements based on 19-metre semi-trailer, 230-day working year and average 600,000 tonnes per annum harvest**

Road Name	Total Traffic Movements (2019–2030)	Peak Annual Traffic Movements (AADT)
Jump Off Road	40,150	80
Snug Cove Road/Colmans Road	47,450	68
West End Highway	11,680	32
Baxters Road	44,530	44
South Coast Road	35,040	94
North Coast Road/Berrymans Road	39,420	64
Gosse-Ritchie Road	46,720	42
Turkey Land/Johncock Road	88,330	136
Coopers Road	16,060	44
Tin Hut Road	16,790	40
Mount Taylor Road	159,870	120
Stokes Bay Road/North Coast Road	27,740	60
McBrides Road	8,760	24
Bark Hut Road	42,340	54
Yacca Jacks Road	7,300	10
Timber Creek Road	2,920	8
Church Road	24,820	42
Playford Highway	45,250	120

Harvesting is expected to happen year-round, however, it is acknowledged that volumes may be impacted by seasonal weather leading to isolated days of limited movements and by variations in harvest tonnage from year to year and daily variations depending on shipping schedules, storage space and forest access.

### 3.1.3 Increase in Traffic Volumes

Based on the existing traffic volumes provided in Table 3 and estimated freight movements provided in Table 4, percentage increases are estimated and provided in Table 5. Without a defined route identified an accurate estimate of traffic volume increases for individual roads is not possible.

Calculated estimates provided in Table 5 shows that traffic increases are significant, particularly on minor roads, such as McBrides Road and Bark Hut Road, which are not frequently used. It is also noted that these increases assume that the current volumes are AADT, whereas as discussed in Section 3.1.1, current AADT volumes are likely to be significantly lower than seasonal counts currently shown, resulting in a much higher percentage increases, particularly on tourist roads, due to freight volumes.



**Table 5: Estimated traffic volume increase based on semi-trailer freight movements**

Road	Current Volumes	Additional Semi-Trailer Trips	Ultimate Volumes	% Increase
Playford Highway	470	120	590	26
Stokes Bay Road	150	60	210	40
Bark Hut Road	55	54	109	98
McBrides Road	13	24	37	185
North Coast Road	160	64	224	40

### 3.2 Crash History

Crash data from the last five reported years (i.e. 2012 to 2016) was provided by DPTI on 28 December 2017 for the HDS Australia Heavy Vehicle Route Assessment. Crash data was only provided for the two routes assessed for that report.

The Playford Highway had five recorded crashes between Stokes Bay Road and Gosse-Ritchie Road. Two crashes were recorded as 'hit fixed object,' with one each to 'right angle,' 'side swipe' and 'roll over'. The right angle crash occurred at the junction with Smith Street. The apparent error was put down to driving under the influence (DUI) in three cases, with one each to 'fail to give way' and 'inattention'.

North Coast Road between McBrides Road and Smith Bay has had three recorded crashes in this period. Two were recorded as 'hit fixed object' while one was a 'roll over' crash type. All three crashes had the apparent error recorded as 'inattention.'

One crash was recorded on Gap Road. The crash type was 'hit fixed object' and the apparent error was 'inattention.'

Bark Hut Road had two recorded crashes. The crash types were put down to 'hit fixed object' and 'hit animal.' The apparent error was only recorded for one crash and that was labelled as 'inattention.'

Stokes Bay Road between the Playford Highway and Bark Hut Road had one crash. The crash type was 'left road – out of control' and the apparent error was 'inattention.'

Mount Taylor Road had one recorded crash. The crash type was 'roll over' and the apparent error DUI.

Recently media reported that a fatality crash occurred at the junction of Emu Bay Road and North Coast Road in April 2018. The crash is outside of the current DPTI reporting period referred to above, and limited details are available.

The sample of roads crash data mentioned above is considered typical of low volume rural roads whereby a majority of the crashes relate to drivers leaving the road in single car crashes. Inattention has been labelled as the main error of drivers however it also appears drink driving is over represented. It can be expected that similar crash trends would be seen across Kangaroo Island. The haul vehicle movements associated with KIPT operations is not expected to increase the likelihood or frequency of these types of crashes.

#### **4.0 TRAFFIC IMPACT ASSESSMENT – EXISTING ROAD NETWORK**

Based on the current approved road network, KIPT are required to use 19-metre semi-trailers to haul timber from the plantations to the Smith Bay wharf. The open network model allows unrestricted vehicles, such as the 19-metre semi-trailer (30-tonne), to operate without conditions on the entire road network. The 19-metre semi-trailers are able operate 24 hours a day, seven days a week, 52 weeks a year. It is likely that as timber is harvested from various plantations the semi-trailers will use the most convenient route to the wharf rather than a defined route. It is likely that these routes may change (and a number of times) depending on road conditions.

The initial work undertaken on this project by WGA focused on using semi-trailers as the haul vehicle.

#### **4.1 Surrounding Land Use - Community Access**

The Southern and Hills Local Government Association 2020 Transport Plan (refer to Appendix B) shows several community access routes on Kangaroo Island. Revision of this plan is due in the next few years, however the community access routes are not expected to significantly change by that time. Community access routes link communities of 100 people or more to essential services such as education, health, finance, recreation and emergency services.

Stokes Bay Road and the Playford Highway are regionally significant community access routes that are most likely to be impacted by the additional haul movements expected as a result of KIPT's activities.

#### **4.2 Surrounding Land Use – Farmer Access**

Many farms are located on the proposed haul roads. Based on current traffic volumes and crash data, road use by light vehicles are not considered a major concern to the farms however the increased volumes and larger vehicles expected as a result of the proposed development are likely to increase the hazard making it more dangerous for farm vehicles and machinery turning onto and off of these roads. There are numerous farm gates along the routes which do not have good sight distance for approaching vehicles.

#### **4.3 Surrounding Land Use - Agricultural Interaction**

The movement and herding of livestock occurs at particular locations within the open network. Haulage is likely to be hindered for periods of time as animals are herded across or along roads or alternatively, timeliness of livestock movements may be impacted as a result of higher volumes of haul truck movements, limiting farmer access to roads.

Risks to the safety of animals, haul truck operators and other road users are also increased with increased traffic, and increased haul truck movements.

#### **4.4 Surrounding Land Use - Residents**

Increased traffic, and heavy vehicle movements, along the open road network will increase the occurrence (frequency and duration) of residents, who live adjacent to roads subject to haul truck movements, experiencing road noise, dust and vibration,

depending on whether roads are sealed or unsealed. Based on the use of semi-trailers, the requirement to run haul trucks 24 hours a day, 7 days a week, all year round (based on the freight task and use of semi-trailers), will likely result in significant impacts to residents.

#### **4.5 Tourist Traffic**

There are many regionally significant tourist routes identified in the Southern and Hills Local Government Association 2020 Transport Plan (refer to Appendix B). It should be noted this plan is due for an update and it is not expected that tourist routes will be altered. These roads have tourists using them year-round, however a higher proportion is during the summer months, and are defined tourist routes on published tourism information.

#### **4.6 Bus Routes**

School bus routes exist within the open road network. Bus and haul trucks will interact and the risk of impact in terms of safety and travel times may be impacted. Appendix C shows the current school bus routes on Kangaroo Island. Playford Highway, Stokes Bay Road and North Coast Road are the main school bus routes which are likely to be impacted by haul vehicles. Haul vehicles will be required to slow to 25 km/h when passing buses stationed to pick up / drop of passengers, which may result in hazardous road situations for the truck, bus and other users. There is potential for children to attempt to cross the road in front of a haul vehicle. Additionally the bus can act as an obstacle reducing visibility for both pedestrians crossing and drivers. The potential ad-hoc nature of haul tracks using the open network does not allow for children or drivers to become familiar with the haul vehicles or the routes they chose to use.

#### **4.7 Vulnerable Road Users**

Vulnerable road users are defined as road users with limited protection such as pedestrians and cyclists.

Relatively few vulnerable road users are present on the regional roads of Kangaroo Island. There are, however, some cyclists and this number is likely to increase through popularity of cycling tourism.

#### **4.8 Ecological Impact**

Ecological studies undertaken (EBS 2018a, EBS 2018b) as part of determining preferred haulage road routes for KIPT have identified areas of ecological sensitivity in terms of the presence of native vegetation and species with state and federal protection listing.

Where roads would require widening for heavy vehicle access, the main impacts are associated with clearance of native vegetation, and in more severe case, where vegetation supports state or federally listed protected species.

For example, Cygnet River on the southern section of Ropers Road, is habitat for the nationally endangered Glossy Black Cockatoo.

EBS 2018b (Refer to Reference F) which shows ecologically sensitive areas.

Increased road traffic movements would also increase native fauna strike, and as a consequence, increase the occurrence of fauna injury and fatality.

#### **4.9 Condition of Existing Kangaroo Island Roads**

Most of the roads currently on the Island are deficient for use by high volumes of heavy vehicles. Deficiencies are discussed further below.

Kangaroo Island Council has an asset management policy stating that all roads should be 'fit-for-purpose.' Given the proposed change in purpose of the roads and significant haul movements and volumes of timber, it could be expected that Council will need to invest significant funds to meet the fit-for-purpose standards across the whole network.

##### **4.9.1 Unsealed Roads and Pavement Design Life**

There is a high percentage of unsealed roads within Kangaroo Island's road network. Unsealed roads currently experience relatively low traffic volumes compared to that predicted with the addition of KIPT activities.

With a significant increase in traffic volumes and axle loadings it is expected that pavements and surface condition of all roads (both sealed and unsealed) will degrade at an increased rate given that they would not necessarily be designed to withstand high volumes of heavy vehicles, all year round.

It is expected that significant damage will occur, particularly over the winter months, to pavements and surface condition of sealed and unsealed, roads due they are used by the expected number of heavy vehicles for KIPT's operations, which will lead to high maintenance and reconstruction costs, and delays to traffic overall.

During dry periods, an increase of traffic along unsealed roads will result in an increase of airborne dust levels to that currently experienced, which may lead to increased nuisance issues, safety hazards and impacts to roadside vegetation.

##### **4.9.2 Carriageway Width**

With a significant increase in traffic volumes, the likelihood of vehicles encountering oncoming traffic is expected to increase. The ARRB Unsealed Roads Manual, Guidelines to Good Practice, specifically Table 4.14, recommends a typical minimum carriageway width of 7.0m for a two-lane, two-way road, to allow vehicles to pass without the need to stop. Currently, the majority of local unsealed roads that will be used for plantation access and haulage have carriageway widths less than 7.0m, either in sections or along their entire lengths. Consequently, there is the possibility that heavy vehicles may meet in opposite directions on the roadway, potentially leading to obstructions due to the difficulty in passing.

##### **4.9.3 Road Geometry**

Much of the road network has substandard horizontal and vertical road geometry for the use of high volumes of heavy vehicles.

#### 4.9.4 Stormwater Drainage

Poor stormwater drainage is common throughout Kangaroo Island's open road network. Increased road traffic, particularly heavy vehicle traffic, will put further strain on the performance of lacking stormwater management controls, leading to increased occurrence of inundation, delays in travel time and events of road closure.

#### 4.9.5 Roadside Native Vegetation

Roadside vegetation overhangs the roadway throughout much of Kangaroo Island's open road network. While the level of encroachment is typically not sufficient to impact upon light vehicle movements, it is anticipated that heavy vehicles may collide with overhanging vegetation. Roadside vegetation also inhibits sightlines at curves and intersections throughout the network.

#### 4.9.6 Intersection Deficiencies

Sight distance requirements are not achieved at numerous intersections throughout Kangaroo Island's open road network, often due to vegetation being present too close to the road carriageway.

Signage at intersections and on approach to intersections is also considered deficient at numerous intersections.

## **5.0 OPTIONS TO MITIGATE IMPACTS OF USING EXISTING ROAD NETWORK**

### **5.1 Surrounding Land Use – Community Access**

Roads should be upgraded to meet current design standards based on expected traffic volumes and usage. Roads that are designated as regionally significant should be upgraded accordingly to provide safe and efficient access for the community along with the expected freight usage.

### **5.2 Surrounding Land Use – Farmer Access**

Additional controls are needed to ensure farmers are given appropriate warning and notice of increased haul truck movements for locations where farmers access/exit properties. Truck drivers should also be aware of potentially hazardous locations along haul routes, in particular when to expect potential for turning vehicles.

Safety controls, such as early warning systems, and driver training, should also be implemented for the haul fleet crew and equipment.

It is expected that increased signage and communications will be necessary to ensure safe traffic conditions where farm access/exit occurs.

### **5.3 Surrounding Land Use – Agricultural Interaction**

The Government of South Australia's Guidelines for Using Stock on Road Signs outlines correct use of road signs to alert drivers to the presence of livestock on roads. KIPT should work with Kangaroo Island Council and farmers to ensure the installation and use of 'Stock on Road' signs is a requirement on key freight routes.

KIPT should also liaise with Kangaroo Island Council and farmers to ensure a protocol is developed and implemented for clear and timely communications between KIPT and farmers to ensure seamless interactions between forestry haulage trucks and livestock.

### **5.4 Surrounding Land Use – Residential**

Route selection, traffic volumes and operating hours are all key factors in considering the impact on residents in close proximity to the roadside. In the open network model there is no restrictions for these factors. Up-front and regular communication between KIPT and residents, to develop and maintain a harmonious relationship, may alleviate many resident concerns.

For unsealed roads, regular road maintenance should be undertaken to reduce the impacts of dust and road noise for residents. Sealing short lengths of road in the vicinity of residents should also be considered.

### **5.5 Tourist Traffic**

KIPT should collaborate with Kangaroo Island Council and Tourism KI to ensure a protocol and program is developed and implemented for clear communications, information sharing and notifications of haul truck movements, to ensure ongoing awareness and safety, in relation to tourist traffic.

Given the expected difficulty for awareness and safety of tourists with a dynamic open road network model for haul trucks (for example, it will be difficult for tourism information providers to keep up with current haul routes), it is suggested that haul trucks travel along a preferred road route that minimises interactions with tourists. Given the location of tourist attractions and where tourists arrive at the island (either via the ferry at Penneshaw or via aircraft at the Kingscote Airport), the majority of tourist traffic is along southern roads, such as Playford Road and South Coast Road.

## **5.6 Bus Routes**

Interaction between heavy vehicles and school busses is not desirable. Impacts would be reduced if haul trucks use routes away from bus routes, or are able to time haulage movements around bus timetables to avoid interaction with buses.

## **5.7 Vulnerable Road Users**

Haul trucks should avoid routes where a higher volume of vulnerable road users are expected, such as near community centres (e.g. schools), and where tourist cyclists are likely to be traveling.

KIPT should cooperate and collaborate with Kangaroo Island Council and Tourism KI to ensure tourist cyclists are informed of current haul routes and have alternate options recommended. General information on haulage routes, trucks, time of operations and the dangers to pedestrians and cyclists should be made readily available to tourists and the general public.

## **5.8 Ecological Impact**

Ecologic impact should be minimised by avoiding haulage in areas with the highest ecological importance i.e. to avoid bird strike with the nationally endangered Glossy Black Cockatoo.

Vegetation clearance for road upgrades must be approved by the relevant authorities prior to road works.

## **5.9 Conditions of Existing Roads**

Road upgrades within the open road network will be necessary to ensure fit-for-purpose and safety requirements are met for haul trucks. Timing of road upgrades, if any, will be dependent on a number of factors including, but not limited to:

- Immediate needs for access to Smith Bay;
- Location of first plantation harvest;
- Whether roads are currently considered fit-for-purpose;
- Community access, bus routes and other constraints identified.

### **5.9.1 Unsealed Roads and Pavement Design Life**

Roads will need to be upgraded to meet fit-for-purpose and safety requirements.

### **5.9.2 Carriageway Width**

Road upgrades will need to consider suitable carriageway widths.

### 5.9.3 Road Geometry

Signage across the open road network should be reviewed to advise haul truck drivers of substandard horizontal and vertical curves and any other hazards. Roads upgrades will need to consider improving road geometry for haul vehicles.

### 5.9.4 Stormwater Drainage

Best practice stormwater design will need to be considered for any road upgrades required.

### 5.9.5 Roadside Vegetation

Clearance of roadside vegetation will be required for roads which are unsafe. Consideration to native vegetation legislation and regulations, as well as whether vegetation is habitat for protected species (plant or animal) must also be considered for approvals purposes.

### 5.9.6 Intersection Deficiencies

Signage at intersections and on approach to intersections, including intersections where priority of movement is unclear, within routes to be used by haul trucks, should be reviewed in detail to ensure appropriate installation or upgrade of signage is undertaken, prior to intersections being used.

## 5.10 Vehicle Type – Use of Higher Productivity Vehicles

In addition to the impact mitigation strategies discussed above in Section 5.1 to 5.9, the use of higher productivity vehicles such as B-Doubles or road trains as discussed in the following sections of this report, will offer significant improvements over the use of semi-trailers, which has been the basis of this traffic impact assessment up to this point (refer Section 4.0). The use of higher productivity vehicles has a direct impact in reducing the volume of heavy vehicles, which mitigates all of the impacts discussed above such as impact to residents.

The use of higher productivity vehicles, which are restricted access vehicles, also requires that they are used only on approved routes, which requires an assessment of safety, and for KI Seaport will also consider all other haulage which have been considered in detail in the various assessments undertaken by KIPT (refer to Section 2.2).

The use of higher productivity vehicles and a defined route is considered to be the major factor in mitigating haulage impacts, and is discussed in detail through the remainder of this traffic impact assessment.

### 5.10.1 Economic Considerations

The following discussion of economic considerations is an excerpt from a submission recently prepared by HDS Australia on behalf of Murraylands and Riverland LGA and RDA Murraylands & Riverland Inc. in response to a federal government inquiry into National Freight and Supply Chain Priorities.



The freight transport industry is constantly striving to improve productivity and thereby lower unit costs, with three of the most significant opportunities arising from:

- (1) **Use of higher productivity vehicles** on the existing road network, from semi-trailers to 26m B-Doubles (PBS Level 2A), short road trains (PBS Level 2B – 30m), road trains Type 1 (PBS Level 3 – 36.5m) or road trains Type 2 (PBS Level 4 – 53.5m);
- (2) **More efficient freight movement** through use of both rural and urban routes optimised for heavy freight movement (particularly by reduction in the number of traffic lights in urban areas and the realignment of rural intersections to prioritise the heavy freight movement); and
- (3) **More efficient freight handling** at intermodal facilities (e.g. grain silos, bunkers and port facilities, container terminals and intermodal road/rail terminals) including the “last mile” access to these facilities.

Traditional use of semi-trailers as the “workhorse” for road freight transport has now been surpassed by B-Doubles and the reason is clear based on a comparison of typical vehicle operating cost (VOC) on a \$/km basis against payload. Typically a B-Double offers a 61% increase in payload for a 13% increase in VOC. On a cost per tonne km basis, this means a potential reduction from 5.1 cents/km/tonne to 3.6 cents/km/tonne (a 30% saving).

It is clear that all medium and long haul freight cartage, where travel costs (rather than load/unload costs) are the significant component, should be undertaken using B-Doubles as a minimum size, provided the quantity of freight to be carried will fill the larger vehicle (which is not always the case). For road infrastructure managers (particularly at local government level) the challenge is to ensure that B-Doubles can access all desired locations in a safe and sustainable manner.

The economic justification for using vehicles larger than B-Doubles is more selective. On a generalised basis, a 30m road train (PBS Level 2B) offers a typical VOC of \$1.53/km which equates to 3.5 cents/km/tonne. A 36.5m road train (PBS Level 3) offers a typical VOC of \$1.65/km which equates to 3.45 cents/km/tonne. These VOC improvements are marginal over that of a B-Double, meaning that use of PBS Level 2B and above vehicles on the road network can really only be justified on a case by case basis, taking into account the unique freight situation for a given commodity travelling on a given route.

#### 5.10.2 Vehicle Safety Requirements

The University of Adelaide ‘Recommended road safety policies and practices for Kangaroo Island Plantation Timber’ (November 2017) report contains some specific safety recommendations for the haul vehicles and other heavy vehicles utilised in the project. Some of the key points related to vehicle safety that should be followed include:

- Utilisation of high productivity vehicles;
- Trucks to be fitted with latest state of the art technology such as autonomous emergency braking and electronic stability control; and,
- Require trucks to be fitted with under-run protection.

The following is an excerpt from Research Report AP-R559-18 titled “Local Road Access for High Productivity Freight Vehicles” Section 5.2.1 – Perceived risks to safety, infrastructure or amenity.

Stakeholder engagement suggested that there is a perception that PBS vehicles, by definition, bring with them an increased risk to public safety, infrastructure integrity and amenity. Consequently, the default position taken in many cases is that this perceived increase in risk must be contained, monitored, compensated for, or avoided altogether. Refusing access to PBS vehicles limits the uptake of newer, safer heavy vehicles and puts upward pressure on the average age of the Australian heavy vehicle fleet. PBS vehicles are proven to be less likely to be involved in a crash (Austroads, 2014). A key finding of Austroads (2014) was that PBS vehicles were responsible for 66 per cent fewer crashes than conventional vehicles per unit of distance travelled. When considering only serious and major crashes, PBS vehicles were responsible for 76 per cent fewer crashes than conventional vehicles per unit of distance travelled.

Elected local councillors acting in the interests of their local community can face challenges when considering road access for larger vehicles, even if their own understanding is sufficient to support access. It can be difficult to communicate the benefits of certain access decisions to the broader community.

Such restrictions on PBS vehicle access are inconsistent with the actual risk faced. Targeted communications with residents regarding the safety and productivity improvements offered by PBS vehicles may assist road managers in more readily approving access for these combinations.

### 5.10.3 Pavement Loadings

It is important to acknowledge that the use of restricted access vehicles will not have a greater impact on the pavement life than semi-trailers. The pavement will be impacted by overall tonnage rather than the size or number of vehicle movements when comparing GML (general mass limits) vehicles. Typically, GML vehicles have been considered however there is potential for higher mass limit (HML) vehicles to be utilised. They can carry approximately 10% more payload and are fitted with improved suspension such that the axle loading on the pavement is equivalent to GML.

The following is an excerpt from Research Report AP-R559-18 titled “Local Road Access for High Productivity Freight Vehicles” Section 5.2.6 – Axle group loads are the same.

The maximum mass permitted to be carried by each axle or axle group of a PBS vehicle is the same as that permitted for the same type of axle or axle group of a prescriptive vehicle. For example, whether a vehicle is PBS or prescriptive, a triaxle group is permitted to carry 20 tonnes (General Mass Limits). The gross combination mass of a PBS combination may however be higher than that of a prescriptive combination if it has more axles. Individual axle or axle group loads can actually be less for a PBS combination because some PBS combinations are limited to lower axle loads for compliance with safety or infrastructure standards. A good example is high-mass combinations operating at ‘Tier 1’ axle loads, which are reduced axle loads satisfying the bridge formulae. The combination may only

be approved at the maximum axle loads on a specific route, and may have Tier 1 axle loads approved for other roads.

If the gross combination mass is higher, this will increase the loading on some types of bridges, typically those with continuous spans or those with long, simply-supported spans. Short-span bridges and culverts will not be affected because they do not need to support all axles of the combination at once. Nevertheless, where bridge loading is increased, a road manager should determine whether that additional loading can be accommodated within the bridge's capacity and not refuse access due to 'increased bridge loading'.

By virtue of the fact that the axle group loads are the same as for prescriptive vehicles, a PBS vehicle cannot cause more damage to a pavement than the equivalent prescriptive vehicle.

## **5.11 Defined Route**

There are significant advantages in having a defined haul route from the KIPT's plantations from the centre of Kangaroo Island to the Smith Bay wharf. It is acknowledged additional short sections of feeder roads will be required to link the scattered plantations to a defined route.

The open network model allows haul vehicles to use a road until the pavement of that road deteriorates significantly and then the vehicles can move to another road, again damaging the pavement and then moving on. This approach is not good for either the road manager or local residents.

A defined route will provide for:

- Focused funding to ensure improvements on the appropriate infrastructure to enhance safety and meet fit-for-purpose standards
- Concentrated or limited impacts to that defined road route, rather than to a wider road network, resulting in easier mitigation of impacts
- Direction and strategy for planning and economic decisions for all stakeholders including Kangaroo Island Council, emergency services, local business and government agencies
- Transparency to the community, investors and tourism
- Confidence for the forestry and other industries on Kangaroo Island

Where the defined route includes roads that have an existing regionally significant purpose, such as for community access or tourism, these roads can be upgraded to meet the fit-for-purpose standard of the joint purpose. In addition, local residents will be become familiar with the main route and may choose alternate routes whilst traveling. Tourists can also be encouraged to avoid these routes.

## 6.0 DEFINED ROUTE FRAMEWORK

### 6.1 Vehicle Options

Currently the only road on Kangaroo Island gazetted for restricted access vehicles is Playford Highway between Penneshaw, Kingscote and half way to Parndana. The route is gazetted for 23-metre B-Doubles (HML) and is also marked as a commodity route. No larger vehicles are therefore able to access the island (unless under permit), which includes the more common 26-metre B-Double.

To assist with understanding vehicle types see Table 6.

**Table 6: Heavy Vehicle Classifications**

<b>Performance Based Standard (PBS) Classification</b>	<b>Description</b>	<b>Maximum Length (m)</b>	<b>Restricted Access</b>
PBS Level 1A	Semi-trailer	19.0	No
PBS Level 2A	B-Double	26.0	Yes
PBS Level 2B	Short Road Train	30.0	Yes
PBS Level 3A	Road Train	36.5	Yes

#### 6.1.1 Semi-Trailers – Unrestricted Access to Existing Road Network

The initial work undertaken on this project by WGA focused on using semi-trailers as the haul vehicle. As previously discussed the major benefit of this is that a 19m semi-trailer is an unrestricted vehicle meaning there is no limit on the movements, volumes or times these trucks can be on the road. This would provide significant flexibility for KIPT and remove the need to apply for permit or gazettal notices as will be required for B-Doubles or larger vehicles. However, the downside to semi-trailers is the lack of volume they can transport per trip. This leads to significantly more vehicle movements, more trucks on the road and longer working hours. The logistics at both ends also becomes significantly more complex. This has a significant impact to the project and other stakeholders as detailed in Section 4.0 of this report. Therefore, larger haul vehicles are preferred.

#### 6.1.2 26-metre B-Doubles

B-Double (26-metre) vehicles are restricted access vehicles. They can also be classified as PBS Level 2A vehicles and as discussed there are currently no gazetted routes for these vehicles on Kangaroo Island. The HDS Australia Heavy Vehicle Route Assessment provides commentary regarding the required upgrades for a PBS Level 2B vehicle (30-metre A-Double) for both Options 1 and 2.

Note that a PBS Level 2B performs very similarly to a PBS Level 2A vehicle and therefore it can be assumed that similar upgrades and costs are required to gain 26-metre B-Double gazettal.

#### 6.1.3 30-metre A-Doubles (Short Road Train)

A-Doubles (30-metre), also known as short road trains, are restricted access vehicles, and can also be classified as PBS Level 2B vehicles. There is often confusion between these vehicles and a standard 36.5-metre A-Double.

HDS Australia Heavy Vehicle Route Assessment report on the 30-metre A-Double covers both Options 1 and 2 routes and highlights the existing risk profiles and required upgrades.

#### 6.1.4 36.5-metre A-Doubles (Road Train)

A-Doubles (36.5-metre), also known as road trains, are restricted access vehicles, and can also be classified as PBS Level 3A vehicles. Road standards for these vehicles are significantly higher than PBS Level 2B vehicles and use of these vehicles would require extensive upgrades to meet the gazettal requirements. The additional cost of road upgrades is unlikely to be financially viable. The additional carriageway width requirements are also likely to impact significantly on native vegetation clearance.

## 6.2 Route Options

The routes discussed in this report are identified as Option 1 and Option 2 and are presented in Figure 2 and Appendix D. It should be noted that through the evolution of previous assessment work on transport haulage routes, naming of routes options has not been consistent.

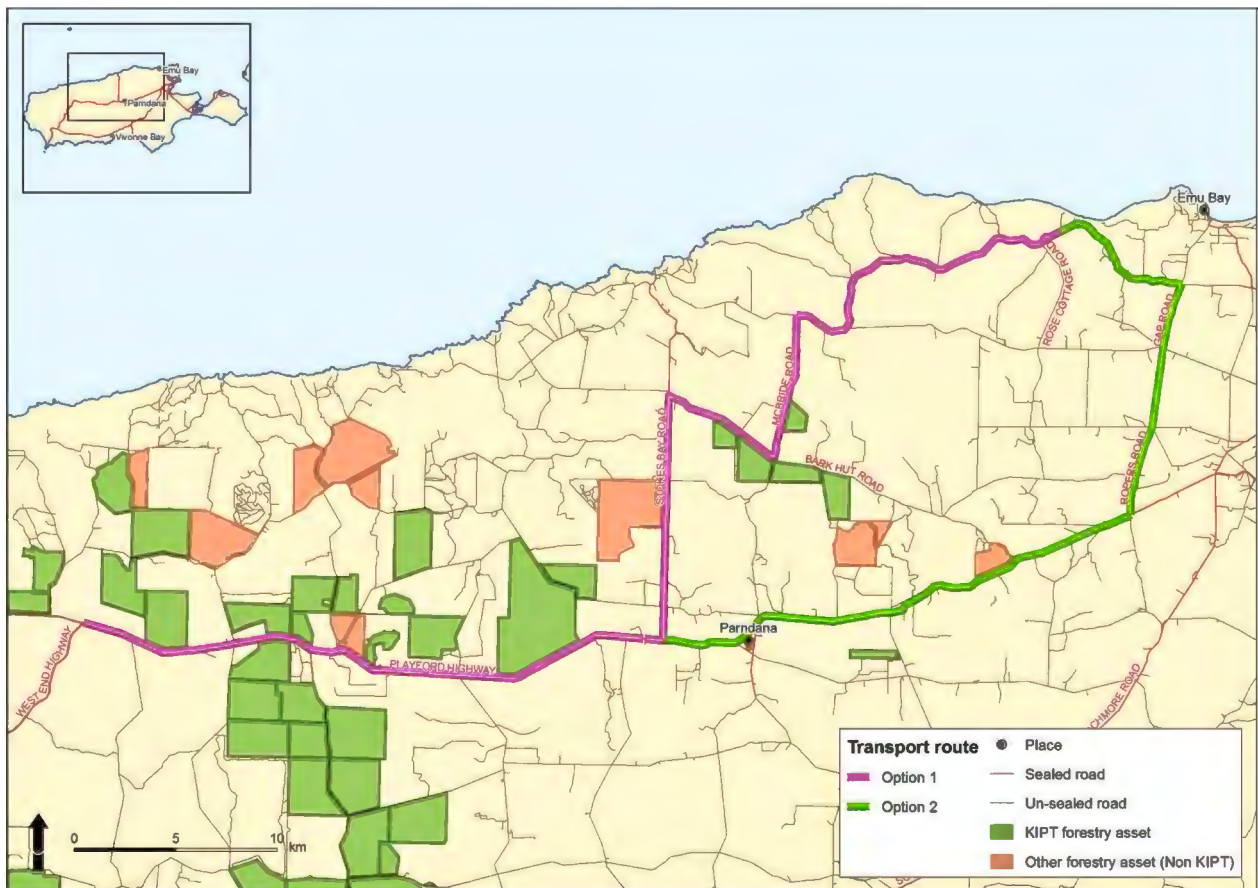


Figure 2 – Route Options

Details of Option 1 route are:

1. Begin at the intersection of Playford Highway and West End Highway;
2. Travel east along Playford Highway to the junction with Stokes Bay Road (29.8 km);
3. Travel north along Stokes Bay Road to the junction with Bark Hut Road (11.9 km);
4. Turn right onto Bark Hut Road and travel south-east to the intersection with McBrides Road (6.0 km).
5. Turn left onto McBrides Road and travel north to North Coast Road (7.1 km).
6. Turn right onto North Coast Road and travel north-east to Smith Bay (18.0 km).
7. Turn left into Smith Bay – Junction (unnamed road) to be advised (note this junction does not currently exist and therefore has not been reviewed in this report).

The route will also be used in reverse and has a total length of approximately 72 km.

Details of Option 2 route are:

1. Begin at the intersection of Playford Highway and West End Highway;
2. Travel east along Playford Highway to the junction with Ropers Road (54.7 km).
3. Turn left onto Ropers Road and travel north to the intersection with Gum Creek Road (4.4 km).
4. Head straight across the intersection with Gum Creek Road onto Gap Road and continue north to North Coast Road (7.1 km).
5. Turn left onto North Coast Road and head north-west to Smith Bay (5.9 km).
6. Turn right into Smith Bay – Junction (unnamed road) to be advised (note this junction does not currently exist and therefore has not been reviewed in this report).

The route will also be used in reverse and is approximately 71.9 km long.

### 6.2.1 History of Assessment of Preferred Routes

Original work undertaken by Wallbridge Gilbert Aztec (WGA 2017) investigated a number of route options on the assumption that the haul vehicle would be a 19-metre semi-trailer. The result was the recommendation of two preferred routes, being the current Option 2 (referred to as Option 5 on page 59 of the report – Reference A of this TIA) and a route similar to the current Option 1 (referred to as Option 1 of the report), with the difference being that the route went all the way to the end of Stokes Bay Road before turning right onto North Coast Road. The current Option 1 (referred to as Option 2 of the report) was also investigated by WGA and was not preferred due to the longer journey times and the existing pavement condition of the roads, resulting in higher upgrade costs. The major upgrade cost was associated with the pavement condition and lack of drainage along McBrides Road.

Follow-on work undertaken by Osman Solutions, 'KIPT Road Freight Options Assessment' (September 2017), focussed on the use of higher productivity vehicles (HPVs). The route assessment criteria were determined, with Kangaroo Island Council,

as the first step in the assessment scope. Following an initial review of nine route options, a short list of options was agreed with Kangaroo Island Council for more detailed consideration.

The current Option 1 was identified as the preferred route following detailed assessment based on the agreed criteria. The current Option 2 ranked second. Option 1 ranked first for the evaluation criteria of distance, journey time and cost of upgrade estimates. The only section that Option 2 outranked Option 1 was in maintenance estimates. The report does mention the drainage issues and lack of drainage infrastructure on McBrides Road.

HDS Australia were commissioned by Kangaroo Island Council to undertake a heavy vehicle route assessment of Options 1 and 2, to provide a second opinion (HDS Australia 2018). HDS Australia recommended a staged Option 2 based on funding and risk profiling, with Option 2 having a lower capital cost to reduce Priority 1 and Priority 2 issues (refer to Section 6.3.3 for Priority 1 and 2 descriptions).

Note that HDS Australia's scope did not include assessing ecological considerations and was focussed on road safety with the use of restricted access heavy vehicles and pavement considerations.

It is recognised that ecological issues must also be considered for assessing road route options. Ecologists' assessment of road-side vegetation, habitats and species with state/federal protection listing (EBS 2018a, 2018b) identified a number of potential constraints with Option 2. Additionally, there is conjecture regarding the cost estimates for the bridge upgrade on Ropers Road (Option 2) given the large extent of the flood plain.

Despite many issues being identified along Option 1 (EBS 2018a, 2018b), including a resultant sensitivity rating of 'moderate and extreme' along McBrides Road, which appears to be the most sensitive area on this route, the assessment also identified significantly more issues for concern on Option 2 on the section of Ropers Road and Gap Road. No overall rating for this section of road was explicitly provided, however it appears to rate 'moderate and extreme.' The Limitations Summary (EBS 2018a) assesses Option 1 and 2 in more detail and identifies Option 2 has having significantly higher risk to Glossy Black Cockatoo (GBC), as a result of the loss of the nesting habitat with roadside vegetation clearance, a likely requirement given the need for road upgrades along this section of road. Ecological issues are further summarised in Section 6.2.2.

## 6.2.2 Environmental Issues

A summary of the findings for each road from the KIPT Transport Route Options Ecological Assessment by EBS (May 2018) is provided below;

- The Playford Highway is part of both Options 1 and 2. It is not expected that significant clearance would be required along this section of the route.
- Stokes Bay Road is part of Option 1. Some road widening would be required however the communities are considered to be largely degraded and of low significance. The areas of GBC nesting habitat are small and well off the road.
- Bark Hut Road is part of Option 1. Only moderate clearance is expected along Bark Hut Road due to a previous upgrade. The vegetation is largely intact on

both sides of the road and dominated by trees that are well represented on the Island.

- McBrides Road is part of Option 1. It is a narrow road that would require significant clearance. There are some degraded patches of She-oak which are potential feeding habitat for GBC. There is also an understory of Hop bush Wattle which is rare in South Australia.
- North Coast Road has sections on both Option 1 and 2. There is an area of Peppermint Box that is poorly represented on the Island, however it does not form a Nationally Threatened Ecological community.
- Gap Road / Ropers Road is part of Option 2. Significant clearance would be required due to the narrow widths of the road. There is significant stands of *Eucalyptus cneorifolia* which is borderline for the Threatened Ecological Communities. The southern section of Ropers Road includes the Cygnet River which provides critical habitat to the GBC.

In summary, Option 1 would be referred to the minister under the Environment Protection and Biodiversity Conservation Act as a precaution, given the low volume of clearing and lack of significant vegetation and wildlife.

Option 2 would require referral and further works, including off-sets, due to the loss of critical nesting and feeding habitat for the nationally endangered GBC, the loss of significant populations of Kangaroo Island Narrow-Leaved Mallee which is likely to be nationally Threatened Ecological Community (TEC), and the reduced viability of Macgillivray Spyridium which is endemic to Kangaroo Island. Additionally, the route is likely to impact three areas of high ecological significance; the Parndana Conservation Park, and the Cygnet River crossings on Ropers Road and Branch Creek.

This summary highlights the additional work and high impact on the environment associated with Option 2 it can therefore be considered highly unlikely to proceed.

### 6.2.3 Community Impact Considerations

Option 1 has fewer houses close to the route than Option 2 reducing the impact on local residents. Option 1 and Option 2 have similar impacts on school bus routes, however a defined route will allow for measures to be made such as off-road bus stops to minimise risk. Option 1 has fewer farm gates than Option 2 which is of significant benefit as they have been identified as high risk areas. Overall the traffic volumes on Option 1 are lower which reduces risk to exposure making this route a safer route.

## 6.3 Complementary Measures

### 6.3.1 Restricted Vehicle Access

Restricted access vehicles require permission from the road authority to use any roads.

Operators will apply via the National Heavy Vehicle Regulator (NHVR) who will then forward the application to the road manager (Kangaroo Island Council, in this case) to make the decision. A permit application is the more 'basic' request which is typically used for one off movements such as a crane accessing a building site. They tend to be granted with restrictions and have a defined period of use. Deficiencies associated with the road are managed by risk profiling and conditions such as speed restrictions and lead vehicles. Capital works upgrades are not typically undertaken for permitted access.



### 6.3.2 Gazetted Vehicle Access

Gazettal of a route allows for open access along that route for the specified vehicle and smaller vehicles (i.e. a PBS Level 2 vehicle can generally travel on a PBS Level 3 gazetted route). To identify and manage risk, a heavy vehicle route assessment is typically undertaken that includes risk profiling to assess what capital works upgrades are required to minimise risk to operators and general road users.

Gazettal is therefore the preferred option as it has an overall lower risk profile and requires no conditions.

### 6.3.3 Risk Profile

The risk assessment calculator in the DPTI Route Assessment for Restricted Access Vehicles book is used in the tables to calculate the risk associated with the items identified. The extract of the risk assessment calculator can be seen in Appendix E.

Risk management measures have been prioritised from P1 to P4, defined as below:

**P1** (Priority 1) *Very high risk* required to be treated prior to the designated route being gazetted.

**P2** (Priority 2) *High risk* conditional on risk acceptance by senior management to the approval process.

**P3** (Priority 3) *Moderate risk* management responsibility to be specified.

**P4** (Priority 4) *Low risk*

Current practice requires P1 risks to be improved immediately on a route aiming to use restricted access vehicles. P2 risks can be managed by the road authority accepting a permit with conditions to mitigate the existing P2 risk. A route is typically only gazetted when all P1 and P2 risks have been treated and have a residual risk rating of P3 or lower.

## 6.4 Approach for Use of Restricted Access Vehicles

### 6.4.1 Permit for Restricted Access Vehicles

The main deficiencies with Option 1 route are detailed in the HDS Australia 'KIPT Freight Access Route Options' (March 2018) report. As recommended in that report it is recommended that initially all Priority 1 (P1) risks are resolved and then the route can be run under permit with operational controls. The P1 risks identified with Option 1 are detailed in the table below from Section 19.2 of the HDS Australia report.

**Table 7: P1 Risks – Option 1**

Item	Issue and Risk Rating	Cost (\$)	Residual Risk
3	Guardfence P1	200,000	P3
10	Junction P1	200,000	P3
19	Junction P1	200,000	P3
20	Carriageway P1	420,000	P4
27	Junction P1	200,000	P3
	<b>Total Cost</b>	<b>1,220,000</b>	

This would require an estimated \$1,220,000 upfront cost to have the route upgraded to a level acceptable to allow 30m A-Double vehicles to operate under permit on it. Permit conditions for haul vehicles are subject to DPTI and Council approval, however suggestions would include;

- Speed limit for restricted access vehicles;
- Operation times/hours of vehicles to be limited;
- Driver education/induction on haul route and remaining high risk (P2) sites;
- Driver communication between vehicles will be mandatory when approaching identified tight junctions or curves; and
- Up to date safety features as mentioned in Section 5.10.2.

#### 6.4.2 Design Recommendations

Further details of the above five P1 very high risk sites requiring upgrades from the HDS Australia 'Heavy Vehicle Route Assessment' (March 2018) report are shown in the table below, extracted from the report;

**Table 8: P1 Very High Risk Sites**

Item	Audit Findings	Risk Assessment	Recommendations	Cost/ Residual Risk
3.	<p>There are numerous locations along Stokes Bay Road where guardfence has been used close to the road to protect culverts. Examples are:</p> <ul style="list-style-type: none"> <li>• Ch 1.0 – guardfence 1.6m and 1.2m from edgeline</li> <li>• Ch 1.9 – guardfence 1.7m and 1.1m from edgeline</li> <li>• Ch 2.2 and 2.3 sections of guardfence</li> <li>• Ch 2.8 – guardfence 1.1m and 0.9m from edgeline protecting large culvert</li> <li>• Ch 3.6 more guardfence</li> <li>• Ch 9.7 – guardfence 1.3m to 1.5m from edgelines</li> </ul> <p>Guardfence will not stop heavy vehicles and generally the headwalls of the culverts that the guardfence is protecting are very close behind and deep.</p>	<p><b>Possibility</b> Likely <b>Exposure</b> Frequent <b>Consequences</b> Fatality <b>Risk Score</b> P1</p>	<p>Serious consideration needs to be given to widening the culverts outside of the clear zone so the guardfence can be removed. Guardfence will not stop heavy vehicles such as PBS Level 2B trucks.</p> <p>Extend culvert to 3m from edge of carriageway as a minimum.</p>	<p>\$200,000 Residual Risk P3</p>

Item	Audit Findings	Risk Assessment	Recommendations	Cost/ Residual Risk
10.	<p>Turning templates at the Stokes Bay Road and Bark Hut Road junction for a PBS Level 2B vehicle are shown on Drawing SK04 in Reference E-Appendix B. They show that the junction is not wide enough to accommodate the movements. Significant junction widening is required.</p> <p>Sight distance for vehicles exiting Bark Hut Road to the right is sufficient, provided some vegetation is removed. Sight distance to the left is poor and drivers can only see approximately 100m. This is important since if PBS Level 2 vehicles could see properly, they would be much safer crossing the centreline on Stokes Bay Road. However this is not the case.</p> <p>The throat of Bark Hut Road is sealed.</p>	<p><b>Possibility</b> Likely</p> <p><b>Exposure</b> Frequent</p> <p><b>Consequences</b> Fatality</p> <p><b>Risk Score</b> P1</p>	<p>A significant upgrade is required for this junction to be able to accommodate PBS Level 2B turning movements safely. Considerable widening is required.</p>	<p>\$200,000</p> <p>Residual Risk P3</p>
19.	<p>Turning templates at the Bark Hut Road and McBrides Road junction for a PBS Level 2B vehicle are shown on Drawing SK05 in Reference E-Appendix B. The templates show the junction is not wide enough for the movements to be completed. Sight distances from McBrides Road are good, 13s to the right and 10s to the left were observed for vehicles.</p> <p>There is a hazard board missing at this junction.</p>	<p><b>Possibility</b> Unusual but Possible</p> <p><b>Exposure</b> Frequent</p> <p><b>Consequences</b> Fatality</p> <p><b>Risk Score</b> P1</p>	<p>A significant upgrade is required for this junction to be able to accommodate PBS Level 2B turning movements safely. Considerable widening is required.</p>	<p>\$200,000</p> <p>Residual Risk P3</p>

Item	Audit Findings	Risk Assessment	Recommendations	Cost/ Residual Risk
20.	<p>Table 4 in the PBS Guidelines indicates that for Level 2B vehicles on a road with an AADT fewer than 100 vehicles a carriageway of 7.2m must be provided. McBrides Road is well below this width, examples are provided below:</p> <ul style="list-style-type: none"> <li>• Ch 0.6 – 5.0m wide carriageway</li> <li>• Ch 2.0 – 5.1m wide carriageway</li> <li>• Ch 4.2 – 5.6m wide carriageway</li> <li>• Ch 5.6 – 5.4m wide carriageway</li> <li>• Ch 6.2 – 5.0m wide carriageway</li> </ul> <p>It should be noted that the AADT on McBrides Road is 13 vehicles, which is very low. However, with gazettal the numbers are expected to increase and the tight geometry and lane widths combined with poor sight distance lead to many instances where head on type crashes are likely.</p>	<p><b>Possibility</b> Very Likely <b>Exposure</b> Frequent <b>Consequences</b> Very Serious <b>Risk Score</b> P1</p>	<p>Widening of the road as recommended will ensure vehicles are able to travel on the appropriate side of the road and avoid head on crashes.</p> <p>If McBrides Road was to be used as a one way option the road width on areas with good sight distance would only require an additional 1m widening. Areas with sight distance issues would require full widening to 7.2m.</p>	<p>Average 2m widening over 7km at a rate of \$30/m2 14,000 m2 of pavement required \$420,000 Residual Risk P4</p> <p>1m widening over 7km plus additional 1m widening over 1km 8,000 m2 of pavement required \$240,000</p>
27.	<p>Turning templates at the McBrides Road and North Coast Road junction for a PBS Level 2B vehicle are shown on Drawing SK06 in Reference E-Appendix B. It shows that the vehicles cannot complete the movements and significant road widening is required.</p> <p>Sight distance was measured at 15s to the left and is excellent to the right for vehicles on McBrides Road.</p>	<p><b>Possibility</b> Unusual but Possible <b>Exposure</b> Frequent <b>Consequences</b> Fatality <b>Risk Score</b> P1</p>	<p>A significant upgrade is required for this junction to be able to accommodate PBS Level 2B turning movements safely. Considerable widening is required.</p>	<p>\$200,000 Residual Risk P3</p>

These design suggestions are very basic and initial concept work is required to be undertaken to better determine the associated issues and cost estimates.

### 6.4.3 Gazettal of Restricted Access Vehicles

As recommended in the KIPT Freight Access Route Options report it is recommended that, in addition to all P1 risk, all P2 risks are resolved prior to gazettal of the route.

The P2 risks are summarised in the table below.

**Table 9: P2 Risks – Option 1**

Item	Issue and Risk Rating	Cost (\$)	Residual Risk
1	Junction P2	300,000	P3
2	Carriageway P2	25,000	P4
4	Alignment P2	250,000	P3
7	Batters P2	100,000	P4
9	Crossing P2	150,000	None
12	Culvert P2	50,000	P3
21	Alignment P2	10,000	P4
28	Carriageway P2	500,000	P4
33	Alignment P2	15,000	P4
35	Alignment P2	10,000	P4
43	Guardfence P2	30,000	P3
44	Alignment P2	15,000	P3
	<b>Total Cost</b>	<b>1,455,000</b>	

Further funds would need to be raised to undertake these existing high-risk items. These funds have a high chance of being subsidised through previously mentioned grants such as the Special Local Roads Program and National Heavy Vehicle Safety and Productivity Program.

Once these upgrades have been undertaken the route can be gazetted for 30m A-Doubles. Consideration should also be given to the increased maintenance required for the route. It should also be noted these cost estimates have been undertaken without concept designs being completed and are therefore indicative estimates. It is strongly recommended a full concept and cost estimate for P1 and P2 risk items be undertaken in the near future.

### 6.4.4 Design Recommendations

Further details of the above P2 high risk sites requiring upgrades from the HDS Australia 'Heavy Vehicle Route Assessment' (March 2018) report are shown in the table below, extracted from the report;

**Table 10: P2 High Risk Sites**

Item	Audit Findings	Risk Assessment	Recommendations	Cost/ Residual Risk
1.	<p>The 30m A-Double Short Road Train PBS Level 2B turning movement at the intersection of Playford Highway and Stokes Bay Road is shown on Drawing SK03 in Reference E-Appendix B. It identifies that this junction has insufficient width to accommodate all turning movements.</p> <p>There is a culvert close to the junction on Stokes Bay Road which may need to be widened to accommodate the movements. Currently there is only 9.6m between the headwalls of the culverts.</p> <p>Sight distance along Playford Highway from Stokes Bay Road is reasonable in both directions at approximately 17s to the right and similar to the left, vegetation clearance would improve it.</p>	<p><b>Possibility</b> Unusual but Possible <b>Exposure</b> Frequent <b>Consequences</b> Very Serious <b>Risk Score</b> P2</p>	<p>A significant upgrade is required for this junction to be able to accommodate PBS Level 2B turning movements safely. Considerable widening is required, along with the lengthening of culverts.</p>	<p>\$300,000 Residual Risk P3</p>
2.	<p>Table 3 in the PBS Guidelines indicates that for a L2 vehicle on a road with an AADT of between 150 and 500 vehicles (Stokes Bay Road has an AADT of 150 vehicles), 2.8m lanes are required and 1.0m shoulders for straight sections. The shoulder width requirement includes sealed and unsealed portions. It is strongly recommended that a 0.5m sealed shoulder is provided in line with Austroads guidelines.</p> <p>There is a short section along Stokes Bay Road from Ch 0.0 to 1.5 where the seal width is between 6.4m and 6.3m. This is below the required 6.6m.</p> <p>Along the rest of the road, the required seal width is met but the lane widths are generally 3m plus, meaning insufficient sealed shoulder is provided.</p>	<p><b>Possibility</b> Unusual but Possible <b>Exposure</b> Frequent <b>Consequences</b> Very Serious <b>Risk Score</b> P2</p>	<p>Shoulder sealing is required for the initial 1.5km section of road to bring the width up to the required seal.</p> <p>Consideration should be given to re-linemarking the remainder of the road to provide consistent lane width and shoulder widths.</p>	<p>\$25,000 Residual Risk P4  0.2m x 1.5km = 300m<sup>2</sup> shoulder sealing</p>

Item	Audit Findings	Risk Assessment	Recommendations	Cost/ Residual Risk
4.	<p>Ch 5.1 there is a large slope and tight vertical curve. There is warning signs and the slope is posted at 6%. The downhill section is approximately 400m long. There is a culvert at the bottom with only 8m between the guardfence. The culvert is 3m deep and there are steep batters either side of the culvert.</p> <p>The vertical curve is very tight and it is unclear if PBS L2B vehicles will be able to undertake the curve at speed.</p>	<p><b>Possibility</b> Likely <b>Exposure</b> Rare <b>Consequences</b> Fatality <b>Risk Score</b> P2</p>	<p>Consideration should be given to improving the vertical alignment of this section of road. The gradient should be lowered or additional lanes added to allow for heavy vehicles to use low gears.</p> <p>A trial run may be required to see if the vertical curve at the bottom can handle PBS Level 2B vehicles.</p>	<p>\$250,000 Residual Risk P3</p>
7.	<p>Ch 11.8 there is a cut batter with 1:1 slope for approximately 100m on both sides of the road, it is 1.5m high. The batter is only 2m from the edge of the seal.</p>	<p><b>Possibility</b> Likely <b>Exposure</b> Rare <b>Consequences</b> Serious <b>Risk Score</b> P2</p>	<p>Consideration should be given to flattening out these batters to make them traversable for heavy vehicles.</p>	<p>\$100,000 Residual Risk P4</p>
9.	<p>Currently stock and farm machinery regularly cross Stokes Bay Road. One farm in particular has raised concerns with 4 or 5 crossings per day. This conflict is not safe with heavy haulage trucks.</p>	<p><b>Possibility</b> Likely <b>Exposure</b> Rare <b>Consequences</b> Serious <b>Risk Score</b> P2</p>	<p>Consideration should be given to providing a tunnel under Stokes Bay Road. This will eliminate the risk entirely.</p> <p>An alternative option may be to consider operational controls such as two way communication between farm workers and truck drivers however it is not clear how reliable or effective this will be.</p>	<p>\$150,000 Residual Risk - none</p>



Item	Audit Findings	Risk Assessment	Recommendations	Cost/ Residual Risk
12.	At Ch 0.6 there is a steep gradient downhill to a culvert, where there is 8.6m between the guardfence protecting the culvert. The guardfence is low and the 4m deep culvert headwall is located just behind it.	<b>Possibility</b> Likely <b>Exposure</b> Frequent <b>Consequences</b> Serious <b>Risk Score</b> P2	The culvert should be extended so the headwalls are outside of the clear zone.  If this is not to be improved, the height of the guardfence should be checked for standard vehicles.	\$50,000  Residual Risk P3
21.	The horizontal alignment of McBrides is generally good. Two curves with radii less than or equal to 400m were recorded. At Ch 3.7 a horizontal curve with an estimated radius of 180m and at Ch 4.2 another horizontal curve with an estimated radius of 160m was recorded. The carriageway is 5.6m wide at this location. Curve widening of 0.6m and 0.5m per lane is required for each lane, therefore on top of the recommended width the carriageway should be 8.4m and 8.2m respectively. No warning signage is provided for these curves.	<b>Possibility</b> Unusual but Possible <b>Exposure</b> Frequent <b>Consequences</b> Very Serious <b>Risk Score</b> P2	Widening of the pavement by 2.8m is required on this curve to provide required curve widening.	\$10,000  Residual Risk P4

Item	Audit Findings	Risk Assessment	Recommendations	Cost/ Residual Risk
28.	<p>Table 4 in the PBS Guidelines indicates for a Level 2 vehicle on a road with an AADT over 100 vehicles (North Coast Road has an AADT of 160 vehicles) a 7.7m carriageway should be provided. The width of North Coast Road is generally below this, examples of the road width are:</p> <ul style="list-style-type: none"> <li>• Ch 0.7 – 7.2m carriageway</li> <li>• Ch 2.5 – 7.8m carriageway</li> <li>• Ch 3.1 – 6.2m carriageway</li> <li>• Ch 4.1 – 5.4m carriageway</li> <li>• Ch 6.1 – 6.9m carriageway</li> <li>• Ch 7.5 – 7.4m carriageway</li> <li>• Ch 10.0 – 7.4m carriageway</li> <li>• Ch 12.1 – 8.1m carriageway</li> <li>• Ch 16.0 – 8.3 carriageway</li> <li>• Ch 18.0 – 8.0m carriageway</li> </ul> <p>The first 12km of this section is under the required 7.7m width. It did appear that some sections were not graded to full width however.</p>	<p><b>Possibility</b> Unusual but Possible <b>Exposure</b> Frequent <b>Consequences</b> Very Serious <b>Risk Score</b> P2</p>	<p>The first 12km of this section should have the pavement widened to 7.7m to meet minimum standards.</p> <p>Given the high tourist volumes on this road consideration should be given to widening it to Austroads standards of 8.2m which would give a residual risk of P4 for an additional cost of \$100,000.</p>	<p>\$500,000 Residual Risk P3</p> <p>Average 1.4m widening over 12km = 16,800m<sup>2</sup> of pavement</p>
33.	<p>There is a series of reverse horizontal curves between Ch 4.1 and 4.8, estimated tightest radius 180m, with 5.9m carriageway. Table 5 in the PBS Guidelines indicates a 0.5m curve widening per lane, therefore an 8.7m carriageway width should be provided around this curve.</p>	<p><b>Possibility</b> Possible <b>Exposure</b> Rare <b>Consequences</b> Very Serious <b>Risk Score</b> P2</p>	<p>Widening of the pavement by 2.8m is required on this curve to provide required curve widening.</p>	<p>\$15,000 Residual Risk P4</p> <p>2.8m x 0.7km = 1,960m<sup>2</sup> of pavement</p>

Item	Audit Findings	Risk Assessment	Recommendations	Cost/ Residual Risk
35.	There is a horizontal curve at Ch 6.8, estimated radius 100m, with 7.1m carriageway. Table 5 in the PBS Guidelines indicates a 0.9m curve widening per lane, therefore a 9.5m carriageway width should be provided around this curve. The curve is very short.	<b>Possibility</b> Possible <b>Exposure</b> Rare <b>Consequences</b> Very Serious <b>Risk Score</b> P2	Widening of the pavement by 2.4m is required on this curve to provide required curve widening.	\$10,000 Residual Risk P4 2.4m x 300m = 720m <sup>2</sup>
43.	At Ch 15.5 there is a bridge that is protected by guardfence. The carriageway is 7.2m and the distance between the guardfence is 8.1m. The guardfence does not cover the batters and no delineators are provided.	<b>Possibility</b> Possible <b>Exposure</b> Occasional <b>Consequences</b> Very Serious <b>Risk Score</b> P2	Either appropriate bridge barrier needs to be installed or the culverts widened to reduce the risk. Guardfence will not stop heavy vehicles.	\$30,000 Residual Risk P3
44.	There is a horizontal curve at Ch 16.0, estimated radius 80m (worst section), with 8.3m carriageway. Table 5 in the PBS Guidelines indicates a 1.15m curve widening per lane, therefore a 10.0m carriageway width should be provided around this curve. This is a dangerous curve with a crest also present, trees 2.5m from the edge and some CAMs provided.	<b>Possibility</b> Possible <b>Exposure</b> Rare <b>Consequences</b> Very Serious <b>Risk Score</b> P2	Widening of the pavement by 1.7m is required on this curve to provide required curve widening.  Consideration should be given to improving the alignment along this section of road, this is a very tight radius.	\$15,000 Residual Risk P3 1.7m x 300m = 510m <sup>2</sup>

These design suggestions are very basic and initial concept work is required to be undertaken to better determine the associated issues and cost estimates.

#### 6.4.5 Pavement Upgrades

Regardless of the type of vehicle used for haulage, or the route used, it is highly likely that road pavements will also require upgrades. The proposed details and cost estimates for the Option 1 route are detailed below.

##### Option 1 Cost Estimate

- Bark Hut Road – 6.0 km at \$ 120,000/km = \$ 720,000 (pavement overlay & 6.2m seal).
- McBrides Road – 7.1 km at \$ 150,000/km = \$ 1,065,000 (full construction & 6.2m seal).
- North Coast Road – 18.0 km at \$ 150,000/km = \$ 2,700,000 (pavement widening, overlay and 7.2m seal).

**Total Cost – \$ 4,485,000**

The \$4.5million required to upgrade the pavement would generally come from several sources. Funding grants may be available to assist. Availability of funding grants and amounts awarded will influence timing of upgrades. Additional pavement investigation will be required with a full pavement design to be undertaken. Cost estimates will then be able to be completed more accurately.

#### 6.5 Management of Road Upgrades

It is expected Kangaroo Island Council will review design drawings and oversee the upgrades as the asset owner.

The upgrade of the route and associated designs will be undertaken to meet PBS Level 2B requirements. Road safety audits should be undertaken on the design stages with a pre-opening road safety audit/heavy vehicle route assessment undertaken to ensure all P1 and P2 high risk elements have been mitigated. In line with the DPTI directive the 'safe system' principles should be incorporated into the design to provide a more forgiving road system that takes human errors into account.

#### 6.6 Construction of Road Upgrades

The WHS Act 2012 should be considered during the design to ensure that workers are not exposed to any unreasonable risk during construction. During construction of the road upgrades traffic management plans should be undertaken and utilised on the worksites. As a minimum desktop road safety audits should be undertaken on the traffic management plans. It will be important to stage the works so local access, tourist traffic and haul vehicles are still able to safely use the route.

#### 6.7 Feeder Routes

As noted the timber is spread across many sections of the island. It is expected that as a plantation is being harvested the feeder route from the forest to the haul road will operate under permit or as a commodity route. These permits will need to be requested by KIPT to Kangaroo Island Council who will then review them and may approve them with conditions. It is likely an independent heavy vehicle route assessor will be used to review the minor haul routes and make suggestions for using them safely with the intention of using minor improvements rather than capital works upgrades.

KIPT intends to work with Council and have a two and five-year plan in place related to the feeder routes that will be used to ensure upgrades and permits are confirmed well before the feeder route is required. It is expected they will be dealt with on a case by case basis.

Forest access to and from the minor haul roads will be a particular safety concern and some work will be required to be undertaken to ensure the safest location is selected for the access point.

The HDS Australia 'Heavy Vehicle Route Assessment' (March 2018) report also reviewed Mount Taylor Road and the extension of Playford Highway between Stokes Bay Road and Burgess Lagoon. The Playford Highway extension has been constructed to a high standard and consideration should be given to including this in the overall main haul route permit/gazettal as minimal work is required. Mount Taylor Road requires significant upgrades which have been detailed in the Heavy Vehicle Route Assessment report, and is a good example of a route which can be used under permit when required.

## **6.8 Funding Arrangements**

Section 6.0 of the Osman Solutions report provides commentary on the funding options available to undertake the required upgrades. Several schemes and models are suggested, including;

- Special Local Roads Program;
- National Heavy Vehicle Safety and Productivity Program;
- Black Spot Funding;
- Bridges Renewal Program;
- Regional Growth Fund;
- Building Better Regions Fund;
- Council Contribution Funding Options;
- DPTI \$2m Funding;
- Borrowing Additional Fund; and,
- Upfront Capital Contribution.

The Osman Solutions report should be read for a more detailed analysis of each funding program or model. While these funding programmes are all potential sources of funding there is no guarantee that applications will be successful or how long it may take to raise all of the funds. An example of this is SLRP funding, which generally gives preference to routes included on The Southern & Hills Local Government Association 2020 Transport Plan (Appendix B). Significant sections of the haul route are not currently included in this transport plan, with the next revision likely to be undertaken in 2019. It is then likely to be another year until SLRP funding can be applied for in mid-2020.

In order to gain the required funding for road upgrades, there will need to be agreement from the major stakeholders in relation to the preferred route. Once KIPT, DPTI and Kangaroo Island Council are in agreement on the preferred route, funding strategies can be put agreed and grant funding applications are more likely to be approved. Following agreement, it is recommended that an upfront sum is raised to undertake the key items required to be upgraded to have the route running under permit (refer to Section 6.4.1) and then look to the grant-based schemes to upgrade further problem sites in the next three to eight years.

## 7.0 CONCLUSION

The aim of this Traffic Impact Assessment has been to summarise the impacts of the haulage of timber on the local Kangaroo Island traffic. While the movement of the timber will have significant impact on the roads it is seen as necessary. Several key outcomes are proposed:

- The existing road network allows KIPT to use 19m semi-trailers across Kangaroo Island 24 hours a day, seven days a week, 365 days a year on any road without a defined route;
- This unrestricted use of semi-trailers is not desirable due to the issues discussed such as safety, traffic disruption to residents and damage to the road network;
- The mitigating option is to utilise high performance vehicles on a designated haul route to allow for concentrated upgrades to the network and some restrictions on operations;
- Utilise 30m A-Double short road trains as the haul vehicle;
- Undertake construction to resolve P1 and P2 risks, with an option to do this as a staged approach. Addressing P1 risks would allow for operation under permit, and further resolution of P2 risks and upgrade pavement would allow the route to be gazetted for 30m A-Doubles.
- Conceptual work should be undertaken immediately on the route for P1 and P2 risk items to gain a better understanding of design issues and cost estimates.
- A funding model should be developed out of the concept work to ensure appropriate initial funding is available for road upgrades and to determine if a staged approach is required, along with expected yearly maintenance costs.



**Timothy Viner Smith**  
Senior Traffic and Transport Engineer  
HDS Australia Pty Ltd  
September 2018

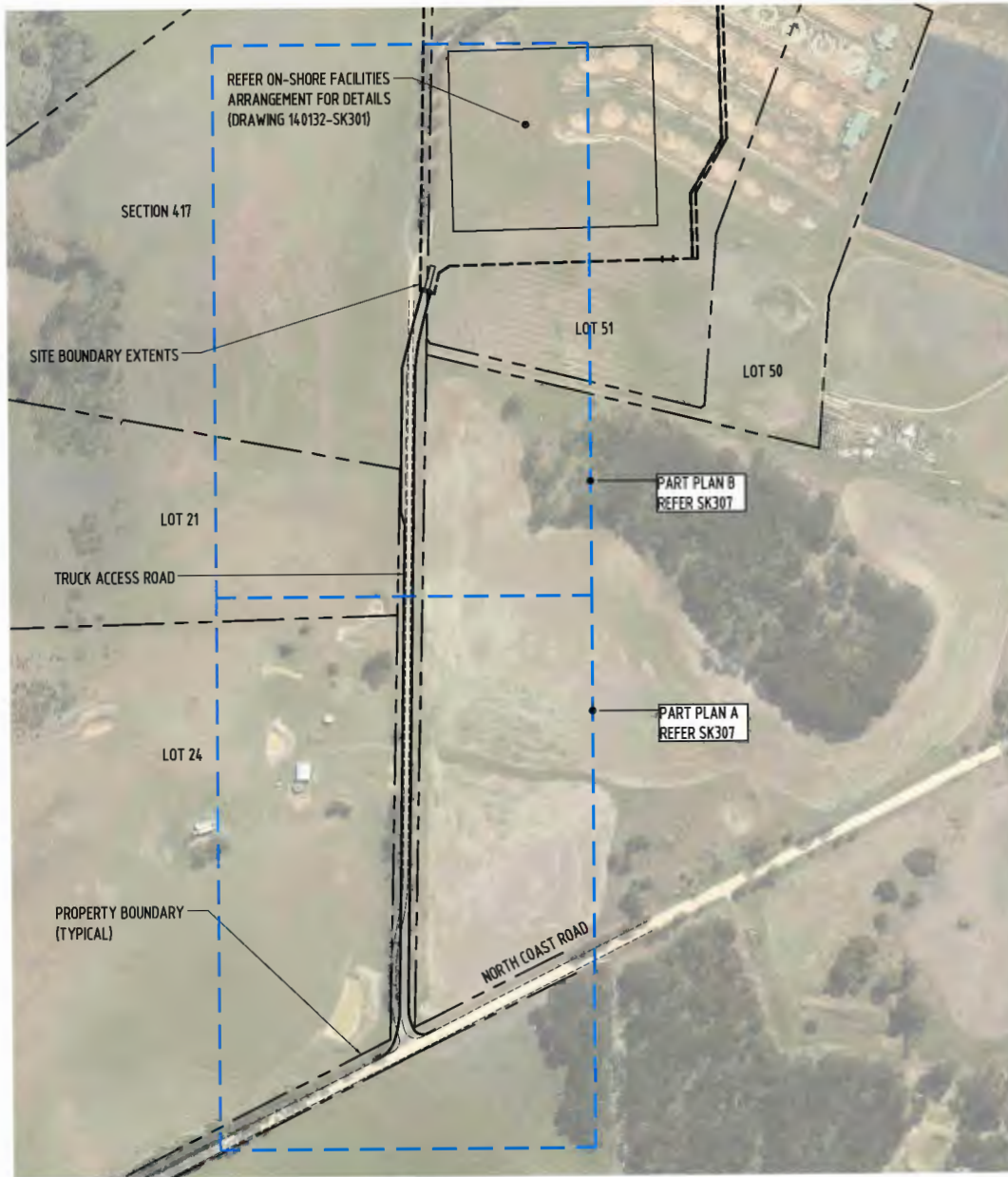


**Daniel Ahrens**  
Principal Engineer, Roads & Infrastructure  
HDS Australia Pty Ltd  
September 2018

## **Appendix A**

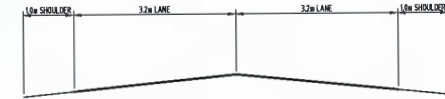
---

Smith Bay Wharf Concept Design Drawings,  
WGA Reference AAD140312 Sheet SK305  
To SK307 Rev A

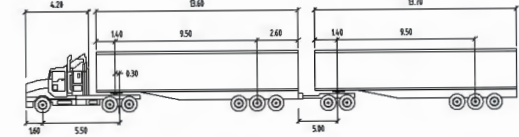


PLAN - NORTH COAST ROAD INTERSECTION AND SITE ACCESS GA

SCALE 1:2000

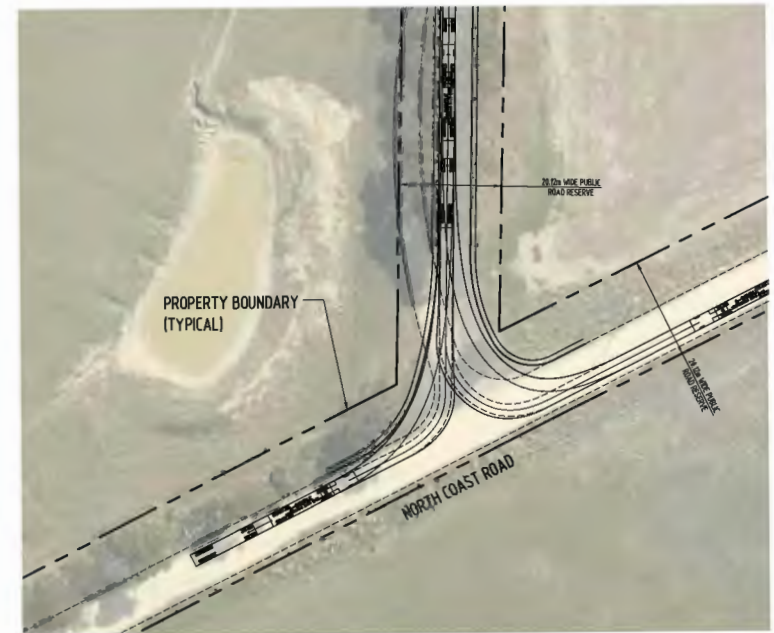


TYPICAL ROAD CROSS SECTION  
SCALE 1:50



A - DOUBLE		meters	
Tractor Width	: 2.50	Lock to Lock The	: 6.0
Trailer Width	: 2.50	Steering Angle	: 23.4
Tractor Track	: 2.50	Articulating Angle	: 70.8
Trailer Track	: 2.50		

TURNPATH VEHICLE  
RTS



PLAN - NORTH COAST ROAD INTERSECTION

SCALE 1:500



13091642001 - 14220041414133 - Kangaroo Island Port Facility for New Forests A141332 SK305 A - 17/06/2018 10:08 PM - A:\work\13091642001 - 142200414133 - Kangaroo Island Port Facility for New Forests A141332 SK305 A.dwg

When sheet printed full size, the scale bar is 100mm.



PRELIMINARY ISSUE  
NOT FOR CONSTRUCTION

REV.	DATE	DESCRIPTION	DRAFT	ENGR.	CHKD.
A	10.05.18	PRELIMINARY ISSUE	TF	TH	DK

**WGA**  
WALLBRIDGE GILBERT  
A27C  
37 West Street, Adelaide  
South Australia 5000  
Telephone 08 8223 7433  
Email edward@wga.com.au

KANGAROO ISLAND, SA  
K.I PLANTATION TIMBERS  
PROPOSED EXPORT FACILITY AT SMITH BAY  
**SITE ACCESS PLAN - A DOUBLE**

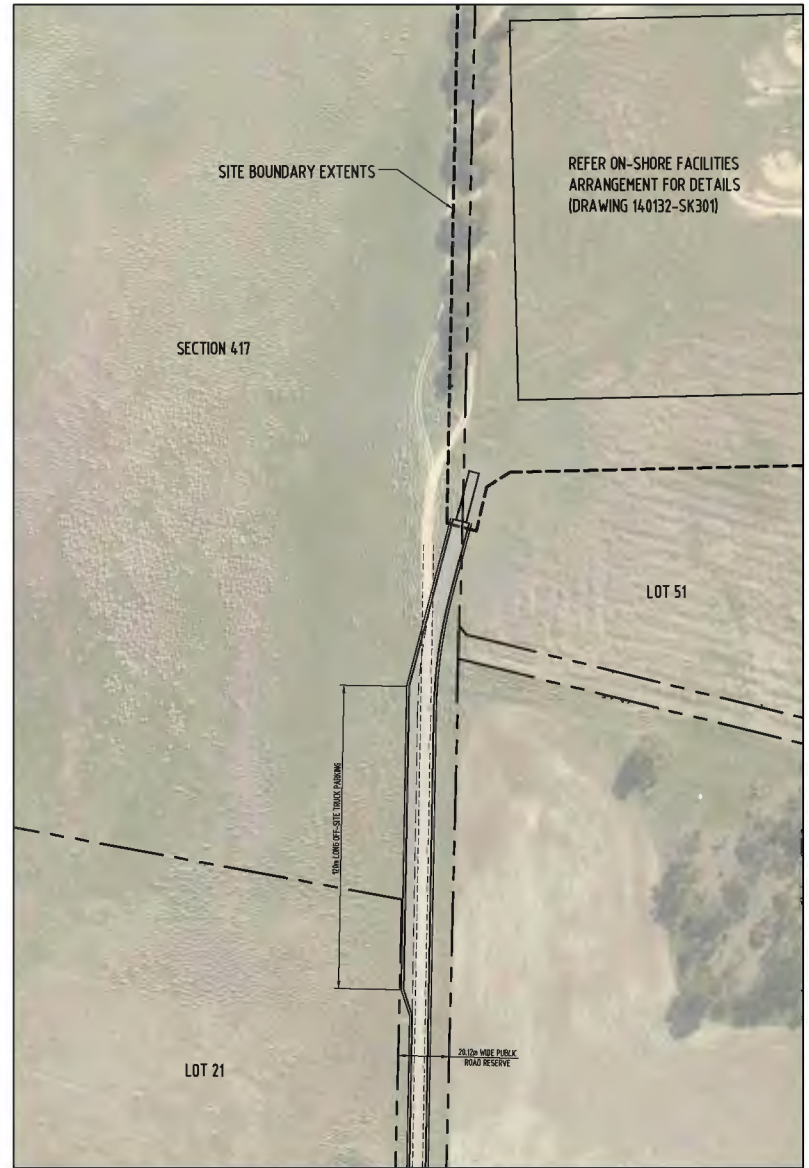
A1 DRAWING NUMBER  
A141332 SK305 A





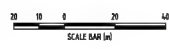
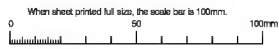


**PART PLAN - A**  
 (REFER SK305 - SK306)  
 SCALE 1:1000



**PART PLAN - B**  
 (REFER SK305 - SK306)  
 SCALE 1:1000

1:00:16.42:01 - 14:02:00:00:00:00 - Kangaroo Island Timbers for Wallbridge Gilbert Aztec, A. 17/05/2018 8:51:17 PM, A:\b\m



**PRELIMINARY ISSUE**  
NOT FOR CONSTRUCTION

REV.	DATE	DESCRIPTION	DRAFT	ENGL.	CHWD
A	17.05.18	PRELIMINARY ISSUE	TF	TH	DM

**WGA**  
 WALLBRIDGE GILBERT  
 AZTEC  
 60 Wyatt Street, Adelaide  
 South Australia 5000  
 Telephone 08 8228 7433  
 Email wga@wga.com.au

**KANGAROO ISLAND, SA**  
 K.I. PLANTATION TIMBERS  
 PROPOSED EXPORT FACILITY AT SMITH BAY  
**SITE ACCESS PLAN**

















**A1** DRAWING NUMBER  
 Job Number  
 Design: TF  
 Drawn: TF  
 AAD140132 SK307 A

## **Appendix B**

---

Southern and Hills Local Government  
Association 2020 Transport Plan –  
Regionally Significant Routes, Kangaroo  
Island Council

### Legend

-  Primary Tourism Route (including DPTI)
-  Secondary Tourism Route
-  Local Tourism Route
-  DPTI Route
-  Local Route
-  Rail Tourism Route
-  Primary Tourism Destination
-  Secondary Tourism Destination
-  Visitor Information Centre
-  Tourist Drive Marker
-  Fleurieu Way Sign
-  Onkaparinga Scenic Drive
-  Torrens Valley Scenic Drive
-  Mount Lofty Scenic Drive
-  Angas River Scenic Drive
-  Adelaide Hills Wine Tour



### Road Index

KIC	T 1	Playford Highway
KIC	T 2	West End Highway
KIC	T 3	South Coast Road
KIC	T 4	Seal Bay Road
KIC	T 5	Birchmore Road
KIC	T 6	Starrs Road
KIC	T 7	Willsons Road
KIC	T 8	Arranmore Road
KIC	T 9	North Coast Road
KIC	T 10	Emu Bay Road
KIC	T 11	Stokes Bay Road
KIC	T 12	North Coast Road (West of Stokes Bay)
KIC	T 13	Cape Borda Road
KIC	T 14	Cape Willoughby Road
KIC	T 15	Hanson Bay Road
KIC	T 16	Jetty Road
KIC	T 17	Emerald Road
KIC	T 18	Pennington Bay Road

Prepared by  
 277 Magill Road  
 Trinity Gardens SA 5068  
 Telephone: 08 8333 3760  
 Facsimile: 08 8333 3079  
 Email: sa@hdsaustralia.com.au



John C Olson  
 FIEAust  
 Chartered Professional Engineer  
 Member No. 506394












Approved  
 \_\_\_\_\_  
 Date \_\_\_\_\_

**Southern & Hills Local Government Association**  
**2020 Transport Plan**

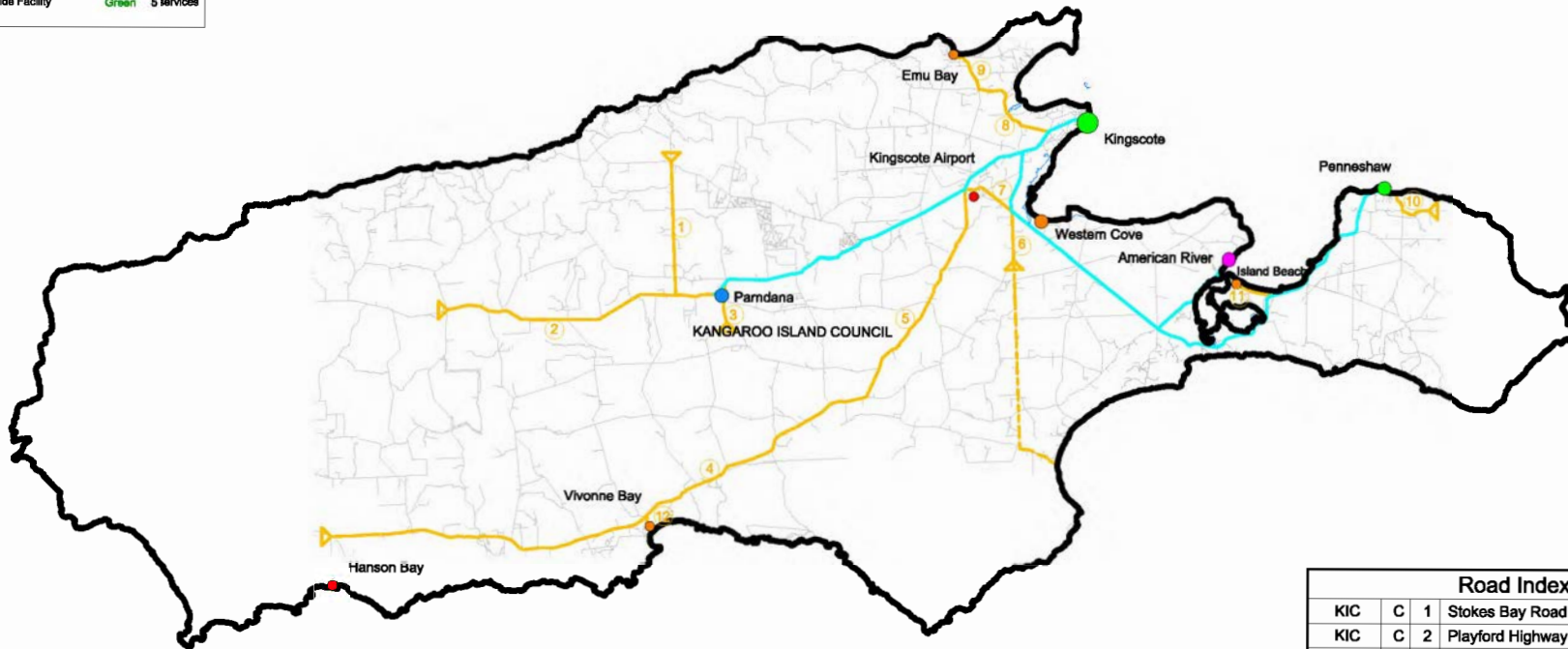
**Regional Tourism Routes**  
**Kangaroo Island Council**

Drawing No.  
**2020TP-T-C-04**  
 REVISION B

**Legend**

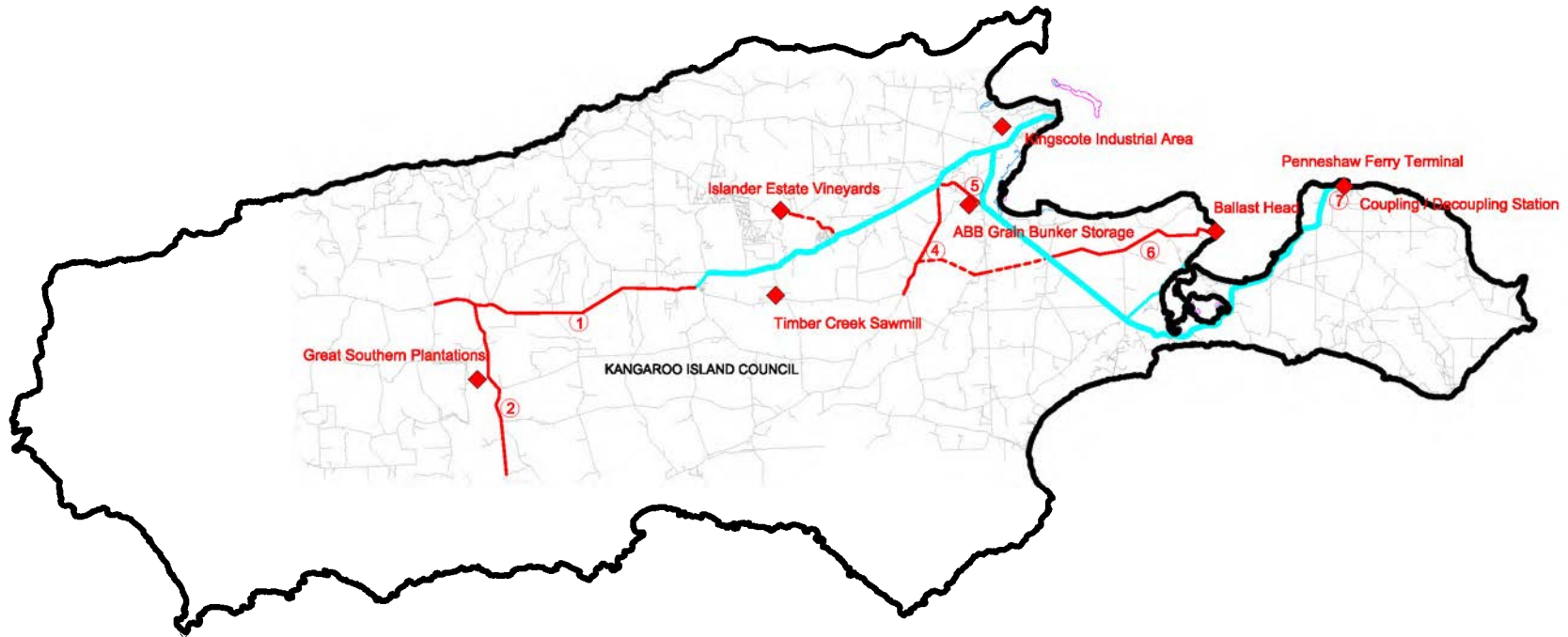
-  Regionally Significant Community Access Route
-  Locally Important Community Access Route / Fire Safety Route
-  DPTI Route
-  Local Route
-  Rail Corridor
-  Key Town (>3000)
-  Important Centre (1000 - 3000)
-  Large Community (100 - 1000)
-  Small Community (50 - 100)
-  Concentration Point (>100)
-  Park and Ride Facility

-  Red 0 services
-  Orange 1 services
-  Magenta 2 services
-  Yellow 3 services
-  Blue 4 services
-  Green 5 services



Road Index			
KIC	C 1	Stokes Bay Road	
KIC	C 2	Playford Highway	
KIC	C 3	Wedgewood Road	
KIC	C 4	South Coast Road	
KIC	C 5	Birchmore Road	
KIC	C 6	Eisegood Road	
KIC	C 7	Arranmore Road	
KIC	C 8	North Coast Road	
KIC	C 9	Emu Bay Road	
KIC	C 10	Cape Willoughby Road	
KIC	C 11	Island Beach Road	
KIC	C 12	Knofel Drive	

Legend	
	Regionally Significant Freight Route
	Locally Important Freight Route
	DPTI Major Freight Route
	DPTI Other Route
	Local Route
	Rail Freight Route
	Major Regional Industry / Logistics Centre
	Minor Industry Centre



Road Index			
KIC	F	1	Playford Highway
KIC	F	2	Mount Taylor Road
KIC	F	4	Birchmore Road
KIC	F	5	Arranmore Road
KIC	F	6	Redbanks Road / Ballast Head Road
KIC	F	7	The Lane

Prepared by  
  
 277 Magill Road  
 Trinity Gardens SA 5088  
 Telephone: 08 8333 3760  
 Facsimile: 08 8333 3079  
 Email: sa@hdsaustralia.com.au



John C Olson  
 FIEAust  
 Chartered Professional Engineer  
 Member No. 506394

Approved \_\_\_\_\_  
 Date \_\_\_\_\_

**Southern & Hills Local Government Association**  
**2020 Transport Plan**

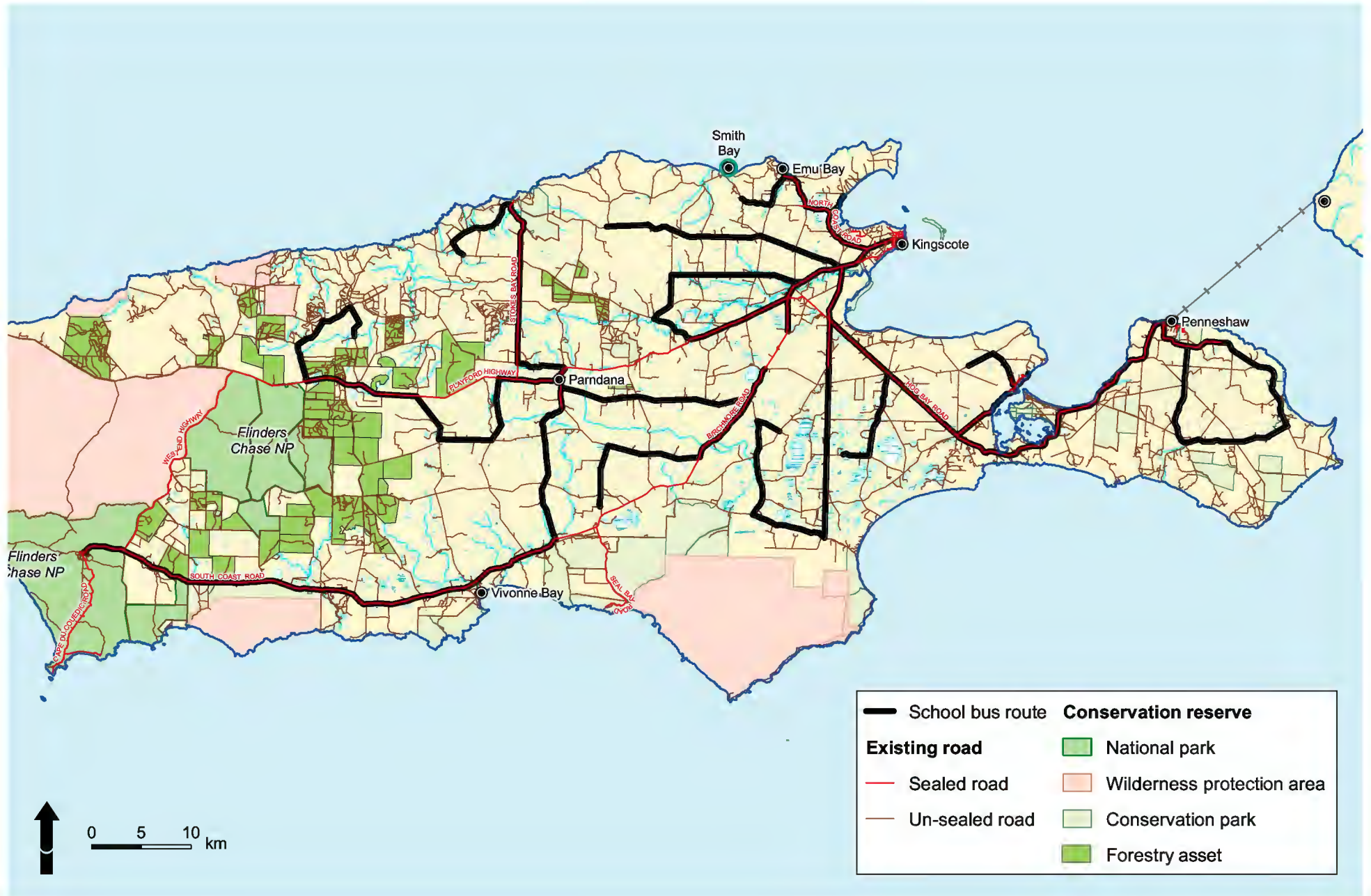
**Regional Freight Routes**  
**Kangaroo Island Council**

Drawing No.  
**2020TP-F-C-04**  
 REVISION B

## **Appendix C**

---

School Bus Routes

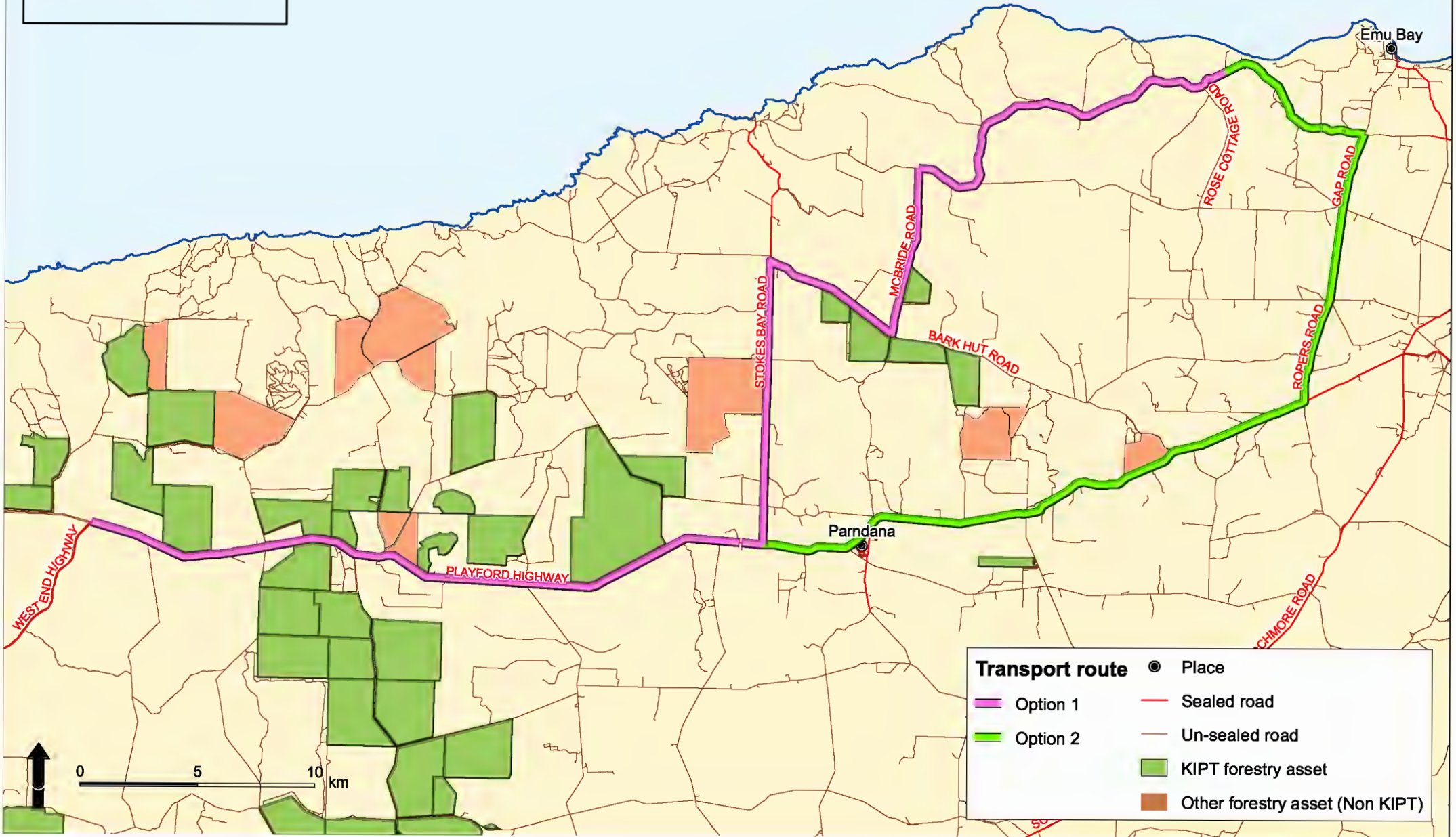
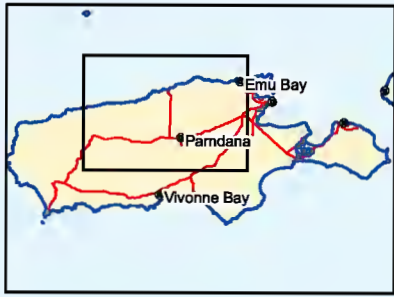




## **Appendix D**

---

Map of Routes and Updated Route Numbers



Transport route	
	Option 1
	Option 2

	Place
	Sealed road
	Un-sealed road
	KIPT forestry asset
	Other forestry asset (Non KIPT)

## **Appendix E**

---

DPTI Risk Calculator

RISK ASSESSMENT CALCULATOR

