SMITH BAY WHARF

DRAFT ENVIRONMENTAL IMPACT STATEMENT

APPENDIX P

PREPARED FOR KANGAROO ISLAND PLANTATION TIMBERS BY ENVIRONMENTAL PROJECTS

JANUARY 2019

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APPENDIX **P**

APPENDIX P – TRAFFIC AND TRANSPORT

Appendix P1 – KIPT Forestry Access Route Assessment – Wallbrige & Gilbert

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Kangaroo Island Plantation Timber

FORESTRY ACCESS ROUTE ASSESSMENT

TRAFFIC ENGINEERING

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1 INTRODUCTION

1.1 Background

Wallbridge and Gilbert (W&G) has been engaged by Kangaroo Island Plantation Timbers Ltd (KIPT) to undertake a route assessment for forestry plantation access on Kangaroo Island. The purpose of the assessment is to examine the condition of the existing road network and its suitability to accommodate heavy vehicle movements.

KIPT and other owners manage 58 plantations on Kangaroo Island, which are either already mature or will begin to reach maturity in the coming years and will be harvested between 2019 and 2030. A map provided by KIPT illustrating the assessed plantations is included in Appendix A.

As the plantations are harvested, timber will be shipped directly to overseas markets. Currently, all shipping to the island is via the Sealink ferry terminal in Penneshaw, which is used for both passenger and freight movements. Penneshaw, for a variety of economic, logistical, social and safety reasons, is unsuitable as a site for a deep water wharf.

KIPT is currently planning to construct a new multi-user deep-water wharf at Smith Bay on the island's north coast to handle the shipping of harvested timber. The wharf will include a storage area for a total of 30 kilotons of timber plus other non-forestry cargoes. Usage of the new wharf will locate forestry haulage vehicles further from the more heavily trafficked roads leading to Kingscote and Penneshaw. The location of Smith Bay is illustrated in Figure 1.

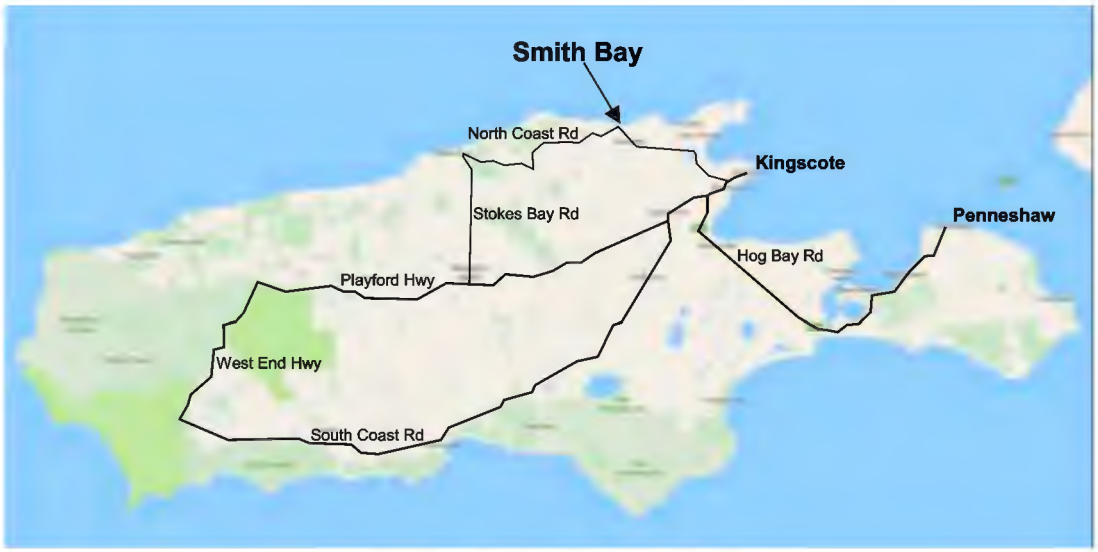


Figure 1. Smith Bay Locality Plan

The transportation of harvested timber will lead to a large increase in the number of heavy vehicles on the island road network. KIPT is seeking to ensure that the network is in a suitable condition to accommodate the anticipated volumes and that the impact on current road safety standards is minimised.

Timber transportation will be by 19m semi-articulated vehicle. This is a general access vehicle and does not require permits to access any roads.

1.2 Scope of the Assessment

The route assessment incorporates the following elements:

- Section 2 details the calculation of heavy vehicle volumes generated by forestry plantations and the anticipated haulage periods required for each route.
- Section 4 reviews the local, collector and arterial roads that will be used for haulage between forestry plantations and the Smith Bay wharf. The current condition of roads is assessed, identifying hazards and impediments to heavy vehicle movements. Road upgrades to facilitate heavy vehicle access are recommended.
- Section 5 assesses junctions accessed by heavy vehicles and identifies any hazards. Junction upgrades are recommended where required.
- Section 6 identifies and reviews potential routes to the proposed Smith Bay Wharf and recommends a preferred route.

1.3 Supporting Information

A site assessment was undertaken on 30th and 31st August and 26th September 2016, reviewing each of the impacted roads. Information on plantation locations and annual yields was provided by KIPT.

1.4 Assessed Plantations and Routes

The assessment included a total of 58 forestry plantations, primarily located to the west of the island. The plantations are typically clustered around local roads, which provide access to the wider road network. Access to the plantations is provided via a total of 17 roads, each of which was assessed to identify hazards and determine the impact of heavy vehicle traffic. A number of plantations have direct access to Playford Highway.

The hierarchies of the assessed roads are as follows:

- DPTI-controlled arterial road: Playford Highway east of Parndana
- Council-controlled collector road: Playford Highway (West End Highway to Parndana), West End Highway, South Coast Road
- Council-controlled local road: all other assessed roads

West End Highway, South Coast Road and Stokes Bay Road are sealed roads. Playford Highway is sealed eastwards from the junction with West End Highway. All other assessed roads are unsealed. The roads most frequently used by tourists are generally sealed, while North Coast Road also accommodates some tourist traffic. The unsealed local roads were observed to accommodate a minimal amount of traffic and it is considered that the majority of these roads are infrequently used by tourists.

A map illustrating the assessed roads is included in Appendix B, while Table 1 outlines each road and the number of plantations accessed from that road.

Table 1: Assessed Roadways and Plantations

Road No.	Road Name	No. of Plantations Accessed	Projected Total Harvest (Tonnes)
1	Jump Off Road	5	421,442
2	Snug Cove Road / Colmans Road	3	486,987
3	West End Highway	1	121,768
4	Baxters Road	5	455,305
5	South Coast Road	3	360,589
6	North Coast Road / Berrymans Road	3	404,780
7	Gosse-Ritchie Road	5	479,413
8	Turkey Lane / Johncock Road	3	910,647
9	Coopers Road	1	165,675
10	Tin Hut Road	2	200,430
11	Mount Taylor Road	12	1,650,500
12	Stokes Bay Road / North Coast Road	1	286,830
13	McBrides Road	1	87,444
14	Bark Hut Road	5	431,192
15	Yacca Jacks Road	1	69,000
16	Timber Creek Road	1	30,467
17	Church Road	2	261,572
18	Playford Highway	4*	457,549

*The four plantations that have direct access to Playford Highway are distributed over a large area.

2 HEAVY VEHICLE VOLUMES

2.1 Forestry Yield and Generated Volumes

Information supplied by KIPT provided a breakdown of the expected tonnage yield for each plantation, covering harvest years from 2019 to 2030. Based on the yields and the roads used to access the plantations, the volume of heavy vehicles anticipated to use each road was calculated. KIPT provided the following information regarding vehicle movements:

- The largest vehicle used will be a 19m semi articulated vehicle. Maximum load for a 19m semi is 30 tonnes.
- Harvesting will occur year-round.
- There will be some variation from year to year in total harvest tonnage.
- The daily frequency of haulage movements will be influenced by shipping schedules and storage capacity at the Smith Bay wharf.
- It is acknowledged that haulage may be affected by flooding and fire risks. Harvesting and haulage will be scheduled according to local conditions, with areas prone to flooding being harvested during summer months and drier areas harvested in winter months.
- Timber transportation will occur Monday – Friday to avoid peak tourist traffic on weekends.
- In the interests of safety, heavy vehicles will only operate during daylight hours. Consequently, haulage times will vary between seasons.

KIPT has highlighted that schedules for the harvesting and shipping of timber will be dependent on demand and other external factors. Consequently, the project harvest volumes for the assessed years may change in response to prevailing conditions at the time. For the purposes of this assessment, the existing projections have been adhered to.

Based on the above, projected annual and daily heavy vehicle volumes have been calculated for each of the harvest years. A typical year includes approximately 250 working days, which excludes weekends and public holidays.

Table 2 summarises the annual trip rate projections for the assessed harvest years. The use of the term 'Trip' represents a one-way vehicular movement from one point to another but excluding the return journey. Therefore, a vehicle entering and leaving the plantation or wharf corresponds to two trips.

Table 2: Harvest Year Total and Daily Heavy Vehicle Volumes

Harvest Year	Annual HV trips	Average Daily HV Trips
2019	33,000	130
2020	30,000	120
2021	44,000	180
2022	48,000	190
2023	41,000	160
2024	39,000	160
2025	46,000	180
2026	49,000	200
2027	44,000	180
2028	45,000	180
2029	40,000	160
2030	27,000	110

The data indicates that total annual heavy vehicle movements will range from 33,000 in 2019, the first year of harvest, to a peak of 49,000 in 2026, before decreasing gradually to 27,000 in 2030, the final assessed year.

The frequency of haulage movements will also depend on the season and on weather conditions, with flooding and fire risks potentially halting operations. Depending on the number and duration of disruptions, it may be necessary to undertake haulage on weekends, to ensure that harvest and shipping projections are achieved. Alternatively, haulage periods may need to be extended beyond the projected years.

A detailed breakdown of trip generation for each plantation and each year is provided in Appendix C.

2.2 Assessed Roadway Volumes

Table 3 details the average daily volume of heavy vehicle trips for each of the assessed years on the access roads.

Table 3: Minor Road Maximum Annual and Daily Heavy Vehicle Volumes

Access Road	Harvest Year Average Daily Haulage Trips												Road Total
	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
Jump Off Road	-	-	20	-	10	-	-	-	80	-	-	-	**110**
Snug Cove Road / Colmans Road	68	32	-	-	-	-	-	-	-	-	16	14	**130**
West End Highway	-	-	-	-	32	-	-	-	-	-	-	-	**30**
Baxters Road	20	20	22	-	-	16	-	-	-	44	-	-	**120**
South Coast Road	-	-	-	-	94	-	2	-	-	-	-	-	**100**
North Coast Rd / Berrymans Rd	-	-	-	64	-	4	-	40	-	-	-	-	**110**
Gosse-Ritchie Road	-	-	-	40	-	-	38	8	-	-	-	42	**130**
Turkey Lane / Johncock Road	-	-	-	-	-	136	-	16	-	-	46	44	**240**
Coopers Road	-	-	-	44	-	-	-	-	-	-	-	-	**40**
Tin Hut Road	-	-	-	40	-	-	-	6	-	-	-	-	**50**
Mount Taylor Road	6	8	56	-	-	-	108	-	70	120	62	8	**440**
Stokes Bay Rd / North Coast Rd	-	-	-	-	-	-	-	60	-	16	-	-	**80**
McBrides Road	-	-	24	-	-	-	-	-	-	-	-	-	**20**
Bark Hut Road	30	8	54	4	-	-	-	20	-	-	-	-	**120**
Yacca Jacks Road	10	10	-	-	-	-	-	-	-	-	-	-	**20**
Timber Creek Road	-	-	-	-	-	-	-	-	8	-	-	-	**10**
Church Road	-	42	-	-	26	-	-	-	-	-	-	-	**70**
Playford Highway	-	-	-	-	-	-	34	36	16	-	36	-	**120**
Annual Total	**130**	**120**	**180**	**190**	**160**	**160**	**180**	**200**	**180**	**180**	**160**	**110**	

Table 3 indicates that Mount Taylor Road will be the most commonly used route, with harvesting occurring in eight of the 12 assessed years. The majority of roads will be used less frequently, with two roads used for five harvest years and four roads only used during one harvest year.

The data indicates that Turkey Lane / Johncock Road will experience the highest heavy vehicle volumes during a single harvest year, with 135 days of haulage required in 2024 to transport all harvested timber. Timber Creek Road and Yacca Jacks Road will experience the lowest volumes, with 8 and 10 days' haulage respectively anticipated during their peak harvest years.

In each of the assessed years, harvesting will occur at a number of different locations with the number of roads used in a year ranging from three to seven. Depending on the haulage schedules adopted, the roads could be used for shorter periods with a higher haulage frequency, or over longer periods with reduced volumes.

2.3 Network Traffic Impact

Annual Average Daily Traffic (AADT) counts for Kangaroo Island indicate that existing volumes on the major road network are relatively low. Playford Highway at the easternmost extent to be used by haulage vehicles has the highest volume of the utilised routes, with 500 vehicles per day (vpd). West End Highway accommodates 85vpd. Counts are not available for the unsealed local roads, but based counts for the major road network and on-site observations it is considered that volumes would be below 50vpd.

The Table 4 outlines the anticipated increases in traffic volumes on the network resulting from the addition of haulage vehicles. The forestry traffic volumes relate to the year when the highest volumes will be experienced on that section, rather than a single year being adopted for all roads, when some roads may not be utilised. Forestry volumes will increase with proximity to Smith Bay, as traffic from the various merge onto the same route.

Table 4: Projected Road Network Traffic Volume Increases

Road Name	Existing Daily Volume	Max. Forestry Traffic and Harvest Year	Projected Daily Volume	% Change
Playford Highway (East of Parndana)	500	200	700	+40%
Playford Highway (East of West End Hwy	120	130	250	+110%
South Coast Road (at West End Hwy)	240	90	330	+40%
West End Highway (at Playford Hwy)	85	120	205	+140%
North Coast Road (at Smith Bay)*	160	200	360	+125%

*The available traffic volumes relate to the eastern end of North Coast Road, near Kingscote. It is anticipated that volumes in the vicinity of Smith Bay would be lower.

The table indicates that traffic volumes on a majority of routes will more than double with the addition of haulage vehicles. South Coast Road and the western end of Playford Highway are at the periphery of the assessed area and therefore service fewer plantations.

West End Highway will experience the greatest percentage increase in traffic; however, this is primarily due to the low existing volumes. The increase on North Coast Road is due to all haulage vehicles using the road to access the wharf at Smith Bay.

While the addition of haulage vehicles will result in significant increases in traffic volumes on the network compared to the existing situation, overall volumes will remain relatively low. For context, volumes on Hog Bay Road at Penneshaw are 1,400vpd, while volumes on Playford Highway at Kingscote are 3,500vpd. These volumes are two and five times greater than the maximum daily volume anticipated on the haulage route. For comparison with other forestry areas, Riddoch Highway in the State's south east is a two-lane undivided highway similar to Playford Highway and accommodates 3,900vpd, including 600 heavy vehicles. The volumes exceed those anticipated on Playford Highway following the commencement of haulage operations. It is noted also that the typical capacity of two lane undivided highways is in the region of 12,000vpd, more than 17 times greater than the anticipated volume.

3 ROADWAY ASSESSMENT

The majority of forestry plantations are accessed via local unsealed roads. Investigations revealed that the condition of these roads varied greatly, with significant differences in surface condition observed along the same roads. It is noted that the condition of an unsealed pavement is more readily impacted by weather, traffic volumes and other factors than a sealed pavement.

Consequently, while areas of poor surface quality were identified on all roads during the assessment, specific details have not been included in this breakdown of findings. General pavement treatment recommendations have instead been included, recommending the resurfacing of areas of poor pavement quality and for regrading of all local unsealed roads prior to the commencement of haulage activities. During the haulage period the condition of the pavement should be assessed regularly, with regrading undertaken when required.

It is noted that a number of the roads used for haulage access are currently used by heavy vehicles. Tourist buses travel the island year-round, while high volumes of grain vehicles are understood to use many local roads during agricultural harvest seasons. The condition of local roads is currently affected by the presence of these vehicles, so the impacts on pavement condition discussed below will not be solely caused by forestry haulage vehicles.

As outlined in Table 3, all of the local unsealed roads will not be used throughout the 12 year assessment period. Usage will depend on harvest schedules and some roads may only be used during one year. Consequently, the maintenance and upgrade of roads will only be required during usage periods.

It is considered that a Traffic Management Plan (TMP) detailing the traffic approach would assist in streamlining the haulage process. The TMP could be tailored to each harvest area and would outline the haulage routes, traffic control measures and operational procedure. Potential risks and hazards would be outlined and mitigating measures detailed. The Plan would facilitate the operation of haulage activities and assist in minimising the impact on the network and on other road users.

3.1 General Network Issues

It is anticipated that a number of potential issues will affect all of the assessed roads. The following issues are considered to apply to all of the assessed roads that will be used for forestry haulage. For each issue, a recommended treatment has been proposed.

3.1.1 Impact on Local Residents

Issue

It is noted that domestic property accesses are present on the majority of the assessed roads. The volume of heavy vehicles using the routes during harvesting periods may impact upon local residents.

Treatment
It is recommended that local residents are consulted in advance of all haulage activities, with further communication prior to commencement on specific roads. Efforts should be made to address residents' concerns and mitigating measures may be implemented where necessary.

3.1.2 Environmental Impact

Issue
During dry periods, airborne dust may be generated by heavy vehicles using unsealed roads, creating an environmental hazard.

Treatment
During dry periods, it is recommended that a water truck is employed on haulage routes to dampen the surface and reduce the creation of airborne dust.

Issue
Noise generated by the projected heavy vehicle volumes may impact upon local residents.

Treatment
It is proposed that haulage will only be undertaken during daylight hours. This arrangement will assist in minimising disruption outside of those periods.

General Recommendation
It is recommended that an environmental policy is developed for haulage operations. The policy should outline measures to be implemented to minimise the environmental impact of haulage operations.

3.1.3 Native Vegetation Impact

Issue
At a number of locations on the majority of the assessed roads, vegetation was observed to overhang the roadway. While the level of encroachment was typically not sufficient to impact upon light vehicle movements, it is anticipated that heavy vehicles may collide with overhanging vegetation.

Treatment
On all roads, it is recommended that overhanging vegetation is trimmed to avoid impacting on heavy vehicle movements. It is noted, however, that native vegetation may be impacted by the trimming. In areas where native vegetation is impacted, it is recommended that the level of trimming is minimised. Consultation with Council would assist in identifying native species and determining a suitable level of trimming.

3.1.4 Agricultural Interaction

Issue
It is understood that in some areas of the island agricultural machinery and livestock are transported across major roads, including Playford Highway and North Coast Road in the vicinity of Smith Bay. The movement of livestock in particular is likely to hinder through traffic due to the time required to herd animals.

Those in charge of animals are responsible for ensuring a reasonable standard of care for the animals, including warning other road users of the hazard. The Government of South Australia document Guidelines for Using Stock on Road Signs outlines correct use of road signs to alert drivers to the presence of livestock on roads. It is noted that use of the signs does not place any legal requirement on drivers.

Treatment

The use of Stock on Road signage was observed on some roads during on-site assessments. The use of these signs and adherence to the Guidelines by stock managers assists in alerting drivers to the presence of animals on the road. While there is no legal requirement for the use of signs, their use by local farmers should be encouraged, as the increase in traffic volumes resulting from forestry haulage will increase the likelihood of interaction between vehicles and livestock. To provide further notice of livestock movements, an online registry could be created outlining when farmers intend to move stock across roads. This could potentially be combined with the online notifications for haulage movements discussed below.

To account for incidences where signage is not used by farmers, haulage drivers should be educated as to the hazards posed by stock on roads and instructed to drive accordingly. Driver awareness of the issue would assist in improving safety.

3.1.5 Roadway Advance Warning

During haulage periods from each plantation, heavy vehicle volumes on the access roads will be significant, with in the region of 140 vehicles per day (vpd) projected. As roads will also be used by local residents and some tourists, it is recommended that advance warning methods are implemented to alert drivers to the presence of heavy vehicles.

On-Road Warning

It is considered that a portable variable message sign (VMS) would be suitable for providing advance warning on operational haulage routes. The VMS should be placed at junctions with major roads either side of the plantation access (particularly at the junction with Playford Highway when this route is being used). The display should warn of heavy vehicles using the road and hours of operation. In addition to the VMS, temporary signage should be placed at the plantation access points during haulage periods. It is considered that the use of VMS on haulage routes and signage at plantation access points will assist in improving safety for all road users during haulage periods.

Websites / Social Media

Council's website and social media pages could be used to provide advance warning of haulage operations. Advance notice could also be posted on the Tourism Kangaroo Island, Sealink and airport websites, while information could also be provided to REX airline and car hire customers. These measures would assist in alerting tourists to heavy vehicle operations, as tourists may be less likely to access the Council website.

Posting the projected haulage schedule for each access road would inform road users of when particular roads will experience high heavy vehicle volumes. It is considered that the provision of advance notice would assist in improving safety, as car drivers would anticipate encounters with heavy vehicles.

3.2 Carriageway Width

Forestry haulage on local plantation roads will result in a significant increase in traffic volumes on those roads, with an additional 140 heavy vehicle trips daily. This volume of traffic will increase the likelihood of vehicles encountering oncoming traffic. The ARRB Unsealed Roads Manual, Guidelines to Good Practice, 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 the local unsealed roads which 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. Road widths for each assessed section are discussed in the individual route assessments in Sections 3.7 – 3.20. A number of options are available to address the issue of heavy vehicles passing on narrow roads:

Carriageway Widening
Widening of the local roads to provide a minimum 7.0m carriageway would facilitate heavy vehicle movement by allowing vehicles to pass without the need to stop or reverse. The arrangement would lead to time savings and minimise the risk of disruption to haulage services.

The majority of local roads are lined with trees along some or all of their length. Road widening may in many cases require tree removal to achieve the necessary width, which is likely to incur significant expense and may be opposed by Council or local residents. Furthermore, some roads will only accommodate haulage for one year of the 12-year harvest cycle and undertaking road widening for one year of operation is not considered to be a suitable solution due to the impacts on vegetation.

Traffic Management
Austroads Guide to Road Design, Part 3: Geometric Design, Section 4.2.6, states that for roads where volumes are less that 150vpd a single-lane two-way carriageway may be suitable. The anticipated traffic generation during haulage periods is in line with this volume. However, the possibility for obstructions caused by oncoming vehicles remains. The use of VMS signage would assist in providing advance warning to drivers of heavy vehicle movements on the roads, while additional measures would further facilitate movement.

It is considered that the adoption of suitable traffic management arrangements could prevent or minimise the likelihood of obstructions on local roads. Potential arrangements include:

- Driver Coordination. Regular radio contact between heavy vehicle drivers when departing plantations or approaching local roads would assist in coordinating vehicle movements. Drivers could instruct each other on their movements and instruct approaching vehicles to wait at the plantation access or local road junction until the route is clear. This approach would minimise the likelihood of opposing heavy vehicles on single-lane two-way roads. With this arrangement, plantation vehicles may still encounter private vehicles on the local roads. However, the ARRB Manual, Section 4.6.3, states that a 5.5m single-lane two-way road width is sufficient to allow two large vehicles to pass at low speeds using the shoulders.
- Employment of a Traffic Controller. In order to minimise the likelihood of encounters between plantation and private vehicles, a traffic controller could be stationed at the junction between the single-lane local road and the two-lane collector road. The controller would maintain contact with the heavy vehicles and instruct drivers on when the route is clear. The controller would also instruct private vehicles to wait for a heavy vehicle to exit the local road before proceeding, minimising the risk of oncoming vehicle obstruction.

One-Way Operation

A number of the local roads used to access plantations have connections to other local roads and the collector road network. In order to minimise or remove the risk of obstructions caused by oncoming vehicles a one-way system could be implemented for haulage vehicles, by which they would enter the plantation from one direction and leave from the other. As well as removing oncoming heavy vehicle traffic, the system would also reduce journey times, as vehicles would not be required to wait at junctions for the road to clear, as would be the case with the above options. Plantation vehicles may still encounter private vehicles under the one-way system, but the number of encounters is expected to be minimal.

Figure 2 illustrates a number of potential one-way routes on the assessed roadways. The one-way system could operate in either direction. Opportunities for additional one-way routes should be investigated prior to the commencement of haulage on each road.

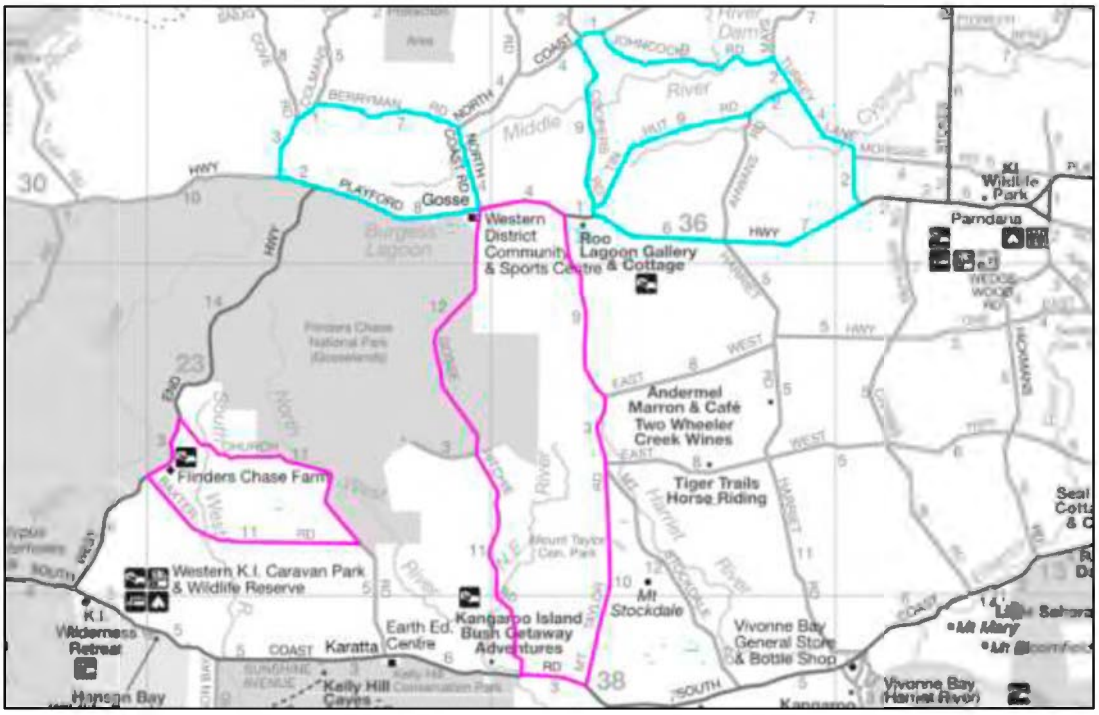


Figure 2. One-Way Haulage Route Opportunities

3.3 Playford Highway Overtaking Opportunities

During haulage periods, heavy vehicle traffic volumes will increase, with approximately 140 additional vehicles travelling to the Smith Bay wharf daily. The busiest section of Playford Highway to be used to access the wharf currently accommodates in the region of 500vpd, with up to 17% heavy vehicle traffic, so the addition of forestry haulage traffic may increase heavy vehicle volumes to approximately 35%.

Due to the increase in heavy vehicles, the warrants for the inclusion of overtaking lanes on Playford Highway has been investigated. Austroads Guide to Road Design, Part 3, Section 9.4, specifies the warrants for the introduction of overtaking lanes.

The basis for adopting an overtaking lane is the traffic volume, the percentage of slow vehicles such as heavy vehicles, and the availability of overtaking opportunities on adjoining sections. The following conditions will exist on Playford Highway following the commencement of forestry haulage activities:

- **Traffic Volume:** When haulage activities commence, traffic volumes on Playford Highway are expected to range from 250vpd at the western end of the haulage route 650vpd at the eastern end.
- **Heavy Vehicle Percentage:** HV percentage is anticipated to range from 35% in the east to 60% in the west.
- **Availability of Overtaking Opportunities:** Availability is calculated based on road operating speed, vehicle type and sight distance. According to Section 5.6.4 of the Guide, to overtake a semi-trailer, the vehicle which will be used for forestry haulage, a minimum sight distance of 1,070m is required on a 110km/h road.

The above factors are used to determine the warrants for the introduction of overtaking lanes, in combination with Table 9.1 of the Guide, below:

Table 9.1: Traffic volume guidelines for providing overtaking lanes

Overtaking opportunities over the preceding 5 km [1]		Current-year design volume (AADT)		
Description	Percent length providing overtaking [2]	Percentage of slow vehicles [3]		
		5	10	20
Excellent	70 – 100	5,670	5,000	4,330
Good	30 – 70	4,330	3,670	3,330
Moderate	10 – 30	3,130	2,800	2,470
Occasional	5 – 10	2,270	2,000	1,730
Restricted	0 – 5	1,530	1,330	1,130
Very Restricted [4]	0	930	800	670

1. Depending on road length being evaluated, this distance could range from 3 to 10 km.
2. See Section 5.6.4.
3. Including light trucks and cars towing trailers, caravans and boats.
4. No overtaking for 3 km in each direction.

Figure 3. Guidelines for Providing Overtaking Lanes

A 55km section of Playford Highway will be used for haulage. The section extends from the commencement of the sealed road at the West End Highway in the west, to the Ropers Road intersection in the east, beyond which haulage vehicles are not anticipated to travel. Within this section, a total of 25km is considered to be suitable for overtaking, equating to approximately 45% of the route.

Based on the above table, overtaking opportunities on the subject section of Playford Highway are classed as 'Good' and a volume of 3,330vpd would be required for overtaking lanes to be warranted. As volumes are anticipated to be in the order of 650vpd, overtaking lanes are not warranted on Playford Highway.

3.4 North Coast Road Pavement Treatment

Currently, North Coast Road is unsealed, with a crushed limestone surface treatment. As discussed in Section 2, North Coast Road will accommodate the highest volume of haulage vehicles and will accommodate forestry traffic through each of the assessed years. It is projected that an average of 40,000 vehicles will use North Coast Road annually, with approximately 480,000 vehicles anticipated over the assessed 12-year harvest period. The high heavy vehicle volumes using North Coast Road are likely to have a significant impact on pavement condition, with regular maintenance required to keep the road surface in a useable condition.

It is recommended that a Benefit-Cost Analysis is undertaken to assess the merits and drawbacks of upgrading the section of North Coast Road used for haulage movements to a sealed pavement, versus retaining the existing unsealed pavement and regularly maintaining the surface.

3.5 Stormwater Drainage

Flooding was observed on a number of local unsealed roads and at junctions during on-site investigations. It is understood that in many cases drainage upgrades would have little or no impact on road flooding as there is nowhere for the water to be dispersed to. A potential treatment option would be to raise the road level in areas of localised flooding to reduce the period where a road would be underwater.

It is noted that harvesting and haulage will be scheduled according to local conditions, with haulage areas prone to flooding occurring during summer and drier areas harvested in winter months. However, it is recommended that further investigations are undertaken by a stormwater engineer to determine if there are any treatments which may be effective in mitigating flooding issues.

3.6 Bridge Crossings

A number of the assessed local roads include bridge crossings, notably Johncock Road, Coopers Road, Ropers Road and North Coast Road. Bridge load limit signage is not included at any of the bridges, indicating that all general access vehicles are permitted to use the bridges. While limits are not in place, it is recommended that assessments of all bridges on affected routes are undertaken by a structural engineer prior to the commencement of haulage operations. This will ensure that the bridges are in suitable condition to accommodate the anticipated heavy vehicle traffic. It is also recommended that an assessment is undertaken upon completion of haulage on the affected routes, to ensure that there has not been a detrimental impact to the structural integrity.

3.7 Arterial and Collector Road Summary

Sealed roads included in the assessment include Playford Highway, West End Highway and South Coast Road. Typical features are outlined below. The suitability of the pavement to accommodate projected plantation haulage heavy vehicle volumes has not been assessed as part of this review.

3.7.1 Playford Highway

Playford Highway is a two-lane undivided highway under the care and control of DPTI (east of Parndana) and Council (west of Parndana). Typical cross-section consists of two 3.5m traffic lanes with 2.0m unsealed shoulders on both sides.

Pavement condition was observed to be good, with minimal potholing, cracking or corrugations. Hazards are typically well signposted; as are junction approaches (exceptions are included in the individual junction assessment sections). Existing heavy vehicle volumes are in the region of 85 trips per day.

3.7.2 West End Highway

West End Highway is a two-lane undivided highway under the care and control of Council. Typical cross-section consists of two 3.5m traffic lanes with 1.0m unsealed shoulders on both sides. Pavement condition was observed to be good, with minimal potholing, cracking or corrugations. Hazards and junction approaches are typically well signposted. Existing heavy vehicle volumes are in the region of 15 trips per day.

3.7.3 South Coast Road

South Coast Road is a two-lane undivided highway under the care and control of Council. Typical cross-section consists of two 3.5m traffic lanes with 1m – 2m unsealed shoulders on both sides. Pavement condition was observed to be good, with minimal potholing, cracking or corrugations. Hazards and junction approaches are typically well signposted. Existing heavy vehicle volumes are in the region of 35 trips per day.

3.8 Major Findings Summary

The following sections detail the assessment findings and recommended upgrades for the local unsealed roads used for plantation access. Table 5 summarises key details and major findings relating to existing deficiencies on the network, and provides recommendations for each road. It does not include items such as tree pruning or drainage investigations, which apply to the majority of assessed roads and are detailed in the individual findings. All signage recommendations have been developed in accordance with Australian Standard 1742 Part 2: Traffic Control Devices for General Use.

Table 5: Assessed Routes Findings Summary

Jump Off Rd	**Typical Carriageway Width**		6.0m
	Overall Pavement Condition		Good
Snug Cove Rd / Colmans Rd	**Typical Carriageway Width**		6.5m
	Overall Pavement Condition		Good
Baxters Rd	**Typical Carriageway Width**		8.0m – 10.0m
	Overall Pavement Condition		Good
	RRD	**Finding**	**Recommendation**
	3.5	Long steep descent	Install Trucks Use Low Gear signage
	3.8	Ford crossing	Install depth indicators and Road Subject to Flooding Indicators Show Depth signage
	9.0	Steep descents either side of dip, no warning signage	Install Steep Descent and Trucks Use Low Gear signage
Berrymans Rd / North Coast Rd	**Typical Carriageway Width**		7.0m – 10.0m
	Overall Pavement Condition		Good
	RRD	**Finding**	**Recommendation**
	2.6	Steep fill batter	Consider widening verge
	5.4	Steep descent, no warning signage on eastbound approach	Install Steep Descent and Trucks Use Low Gear signage on eastbound approach
Gosse-Ritchie Rd	**Typical Carriageway Width**		9.0m
	Overall Pavement Condition		Moderate

Table 4 (cont.): Assessed Routes Findings Summary

Turkey Ln / Johncock Rd	**Typical Carriageway Width**		6.0m
	Overall Pavement Condition		Good
	RRD	**Finding**	**Recommendation**
	3.0	Floodway, no warning signage on southbound approach	Install Floodway and Road Subject to Flooding Indicators Show Depth signage on southbound approach
	10.8	Bridge crossing, no width markers on approaches	Install Width Marker signage on both sides of road on both approaches
Coopers Rd	**Typical Carriageway Width**		7.0m
	Overall Pavement Condition		Moderate
Tin Hut Rd	**Typical Carriageway Width**		6.5m – 8.0m
	Overall Pavement Condition		Moderate
Mount Taylor Rd	**Typical Carriageway Width**		6.5m – 8.0m
	Overall Pavement Condition		Good
	RRD	**Finding**	**Recommendation**
	9.0	Steep descents either side of crest, no warning signage	Install Steep Descent and Trucks Use Low Gear signage
	14.5	Moderate radius curve	Install Curve signage on both approaches
McBrides Rd	**Typical Carriageway Width**		3.5m – 6.0m
	Overall Pavement Condition		Poor
Bark Hut Rd	**Typical Carriageway Width**		8.0m
	Overall Pavement Condition		Poor to moderate
Yacca Jacks Rd	**Typical Carriageway Width**		5.0m – 6.0m
	Overall Pavement Condition		Moderate to good

Table 4 (cont.): Assessed Routes Findings Summary

Timber Creek Rd	**Typical Carriageway Width**		10.0m
	Overall Pavement Condition		Good

Church Rd	**Typical Carriageway Width**		6.0m – 8.0m
	Overall Pavement Condition		Moderate to good
	RRD	**Finding**	**Recommendation**
	8.1	Crest with steep descents either side	Install Trucks Use Low Gear signage

3.9 Jump Off Road

RRD for Jump Off Road commences at the Playford Highway junction and travels northbound for 6.6km.

The road has a typical width of 6.0m. Overall pavement condition is good. Grading is recommended prior to the commencement of haulage activities, with the condition of the road assessed every six weeks during this period. Upon completion of the haulage period on Jump Off Road, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 3.3. Moderate curve. Advance warning signage provided on both approaches. Trees and vegetation close to roadway.

Recommendation
Consider trimming back trees and vegetation close to roadway on curve approaches to improve sight lines.

Finding
RRD 4.0 – 4.5. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 5.2 – 6.6. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

3.10 Snug Cove Road / Colmans Road

RRD for Snug Cove Road and Colmans Road commences at the Playford Highway junction and travels northbound for 6.6km.

The road has a typical width of 6.5m. Overall pavement condition is good, however some water pooling was observed on verges. Drainage investigations are recommended in areas where pooling occurs. Grading is recommended prior to the commencement of haulage activities, with the condition of the road assessed every six weeks during this period. Upon completion of the haulage period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 1.0. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 1.3. Tight S-bend. Advance warning signage provided on both approaches. Trees and vegetation close to roadway.

Recommendation
Trim back trees to ensure that advance warning signage is not obscured.

3.11 Baxters Road

RRD for Baxters Road commences at the South Coast Road junction and travels eastbound for 10.7km.

The road has a typical width of 8.0m – 10.0m. Overall pavement condition is good. Grading is recommended prior to the commencement of haulage activities, with the condition of the road assessed every six weeks during this period. Upon completion of the haulage period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 0.7. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 3.5. Long, steep descent, with ford crossing at bottom. Advance warning signage provided on both approaches for both descent and ford.

Recommendation
Consider installation of Trucks Use Low Gear G9-23 signage on both approaches to encourage lower speeds for heavy vehicles.

Finding
RRD 3.8. Ford crossing. Road narrows.

Recommendation
Install depth indicators and Road Subject to Flooding Indicators Show Depth G9-21-2 signage on both east and westbound approaches to provide advance warning for drivers.

Finding
RRD 9.0. Long, steep descent. No advance warning signage provided on either approach.

Recommendation
Consider installation of the following signage on both approaches to encourage lower speeds for heavy vehicles and to alert drivers to the presence of the ford:

- Steep Descent W5-12
- Trucks Use Low Gear G9-23

3.12 Berrymans Road / North Coast Road

RRD for Berrymans Road commences at the junction of Colmans Road and Berrymans Road and travels eastbound for 6.7km, where it forms a junction with North Coast Road.

Berrymans Road has a typical width of 7.0m – 10.0m. Overall pavement condition is good. Grading is recommended prior to the commencement of haulage activities.

RRD for North Coast Road commences at 6.7km, at the Berrymans Road junction, and terminates at 10.5km, at the Playford Highway junction.

North Coast Road has a typical width of 6.0m – 8.0m. Rutting was observed along the subject length the road, with some water pooling was observed on verges. Drainage investigations are recommended in areas where pooling occurs. An upgrade of the pavement is recommended prior to the commencement of haulage activities.

For both roads, the condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Berrymans Road

Finding
RRD 1.5 – 2.5. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 1.5 – 2.5. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 2.6. Steep fill batter on southern side of roadway, as shown below (left of frame).

Figure 4. Steep Batter Slope

Recommendation
Consider widening verge to provide greater separation between carriageway and batter slope.

Finding
RRD 5.4. Long, steep descent, no advance warning signage on eastbound approach.

Recommendation
Consider installation of Steep Descent W5-12 and Trucks Use Low Gear G9-23 signage on eastbound approach to encourage lower speeds for heavy vehicles.

Finding
RRD 6.4. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

North Coast Road

Finding
RRD 7.8, 9.3. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

3.13 Gosse-Ritchie Road

RRD for Gosse-Ritchie Road commences at the Playford Highway junction and travels southbound for 23.3km, to the junction with South Coast Road.

The road has a typical width of 9.0m. Overall pavement condition is moderate. There are some boggy sections (discussed below) and areas of rutting. In areas of severe rutting an upgrade of the pavement is recommended prior to the commencement of haulage activities, with grading undertaken on the remainder of the roadway. The condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 0 – 1.0, 2.0 – 3.0, 3.5 – 3.8. Boggy road surface, indicating poor drainage.

Recommendation
Undertake drainage investigations in areas of boggy surface to determine if any workable options exist to improve drainage.

Finding
RRD 3.5, 12.8. Trees and vegetation overhanging roadway.

Recommendation
Trim back trees and vegetation to facilitate heavy vehicle movement.

Finding
RRD 19.7. River crossing, road narrows. Advance warning signage for road narrowing on both approaches to crossing.

Recommendation
Comment only.

3.14 Turkey Lane / Johncock Road

RRD for Turkey Lane commences at the Playford Highway junction and travels northbound for 8.3km, to the junction with Johncock Road.

Turkey Lane has a typical width of 6.0m. Overall pavement condition is poor, with soft, rutted surfaces and potholes along the majority of its length. An upgrade of the pavement is recommended prior to the commencement of haulage activities.

RRD for Johncock Road commences at 8.3km, at the Turkey Lane junction and travels northbound to RRD 18.2km, to the junction with North Coast Road.

Johncock Road has a typical width of 6.0m. Overall pavement condition is average, with potholes along some sections. Grading is recommended prior to the commencement of haulage activities.

For both roads, the condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Turkey Lane

Finding
RRD 2.7, 3.8. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 3.0. Floodway. Advance warning signage on northbound approach only. No depth indicators at floodway.

Recommendation
Install Floodway W5-7-1 signage on southbound approach. Install depth indicators and Road Subject to Flooding Indicators Show Depth G9-21-2 signage on both approaches to provide advance warning for drivers.

Johncock Road

Finding
RRD 9.7 – 10.0, 10.5, 11.3, 12.4, 13.4. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 10.8. Middle River Bridge Crossing. Light railing on both sides. No width markers on either approach.

Figure 5. Middle River Bridge Crossing

Recommendation
Install Width Marker D4-3 signage on both sides of the road on both bridge approaches to assist in delineating bridge width.

Finding
RRD 16.4 – 16.8. Flooding on southern side of road, extending into carriageway.

Figure 6. Flooding Extending onto Roadway

Recommendation
Undertake drainage investigations in areas of boggy surface to determine if any workable options exist to improve drainage.

3.15 Coopers Road

RRD for Coopers Road commences at the junction with North Coast Road and travels southbound for 8.4km, to the Playford Highway junction.

The road has a typical width of 7.0m. Overall pavement condition is moderate. The surface is corrugated along most of its length, with areas of potholing. Grading of the pavement is recommended prior to the commencement of haulage activities. The condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 0.7, 2.0, 4.5, 4.8. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 3.0. Middle River Bridge Crossing. Railing and Width Marker D4-3 signage on both sides and both approaches.

Recommendation
Comment only.

3.16 Tin Hut Road

RRD for Tin Hut Road commences at the Playford Highway junction and travels northbound for 11.5km, to the junction with Turkey Lane.

The road has a typical width of 6.5m – 8.0m. Overall pavement condition is moderate. The road has soft edges along most of its length, indicating poor drainage. It is recommended that drainage investigations are undertaken in areas of boggy surface to determine if any workable options exist to improve drainage.

Grading of the pavement is recommended prior to the commencement of haulage activities. The condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 1.6, 3.3 – 3.5, 3.8 – 4.0, 4.6, 4.8, 5.4, 6.5 – 7.0, 9.3 – 9.5. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 3.1. Flooding on both sides of the road, extending through the curve.

Figure 7. Flooding Extending onto Roadway through Curve

Recommendation
Assess condition and functionality of existing drainage channels. Upgrade where necessary and consider construction of additional channels.

Finding
RRD 10.0. Flooding on both sides of the road, extending through the curve.

Recommendation
Assess condition and functionality of existing drainage channels. Upgrade where necessary and consider construction of additional channels.

3.17 Mount Taylor Road

RRD for Mount Taylor Road commences at the South Coast Road junction and travels northbound for 22.0km, to the junction with Playford Highway.

The road has a typical width of 6.5m – 8.0m. Overall pavement condition is good, although there are a number of soft sections from RRD 9.5 onwards, indicating poor drainage. It is recommended that drainage investigations are undertaken in areas of boggy surface to determine if any workable options exist to improve drainage.

Grading of the pavement is recommended prior to the commencement of haulage activities, with resurfacing recommended for some sections, as discussed below. The condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 1.7. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 9.0. Crest, with long descents in both sides. No advance warning signage provided on either approach.

Recommendation
Consider installation of the Steep Descent W5-12 and Trucks Use Low Gear G9-23 signage on both approaches to encourage lower speeds for heavy vehicles.

Finding
RRD 13.5 – 14.5, 17.0 – 17.3, 19.0 – 19.6. Soft surface with rutting and potholes

Recommendation
Resurface affected sections. Assess condition and functionality of existing drainage channels and upgrade where necessary.

Finding
RRD 14.5. Moderate radius curve. Loose surface, no advance warning signage.

Recommendation
Consider installation of curve W1-3 signage on both north and southbound approaches to provide advance warning for drivers.

3.18 McBrides Road

RRD for McBrides Road commences at the Bark Hut Road junction and travels northbound for 3.1km, to the plantation access.

The road has a typical width of 6.0m for the first 1.5km, narrowing to approximately 3.5m at some sections from 1.5km to the end. Overall pavement condition is poor, with a soft, boggy surface along most of its length, indicating poor drainage. It is recommended that drainage investigations are undertaken in areas of boggy surface to determine if any workable options exist to improve drainage.

Resurfacing of the pavement along the entire length of roadway is recommended prior to the commencement of haulage activities. The condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 0.8 – 2.8. Soft, muddy surface

Recommendation
Review and assess existing drainage. Upgrade where necessary.

Finding
RRD 0.7. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

3.19 Bark Hut Road

RRD for Bark Hut Road commences at the Playford Highway junction and travels northbound for 19.5km, to the junction with Stokes Bay Road.

The road has a typical width of 8.0m. Overall pavement condition is moderate to poor, although it was noted that a grader was operating on the road at the time of the inspection and the first 1.0km was in good condition. A number of soft, boggy and rutted sections were observed along the entire road length, indicating poor drainage. It is recommended that drainage investigations are undertaken along Bark Hut Road to determine if any workable options exist to improve drainage.

Resurfacing of the pavement along the entire road length is recommended prior to the commencement of haulage activities. The condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 1.9. Cygnet River crossing. W-Beam barrier on both sides of roadway. Road width maintained across bridge.

Recommendation
Comment only.

Finding
RRD 7.5, 10.6, 16.8, 18.8. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 7.7. River crossing, road narrows. Advance warning signage for single lane road narrowing on both approaches to crossing. Width Marker D4-3 signage on both sides of the road on both approaches.

Recommendation
Comment only.

3.20 Yacca Jacks Road

RRD for Yacca Jacks Road commences at the Playford Highway junction and travels northbound for 3.6km, to the plantation access.

The road has a typical width of 5.0m – 6.0m. Overall pavement condition is good, deteriorating to moderate from RRD 2.7 onwards, with a wet, rutted surface. It is recommended that drainage investigations are undertaken along this section to determine if any workable options exist to improve drainage.
It is recommended that regrading is undertaken from the Playford Highway junction to RRD 2.7, with resurfacing of the pavement from RRD 2.7 to the forestry access prior to the commencement of haulage activities. The condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 0.8 – 1.5, 2.7. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 1.4. Standing water on both sides of the roadway. Soft, boggy surface.

Recommendation
Undertake drainage investigations in areas of boggy surface to determine if any workable options exist to improve drainage.

Finding
RRD 1.4.Heavy camber and soft, rutted, boggy surface through curve.

Recommendation
Regrade road through curve to reduce camber.

3.21 Timber Creek Road

RRD for timber Creek Road commences at the Playford Highway junction and travels southbound for 3.6km, to the plantation access.

The road has a typical width of 10.0m. Overall pavement condition is good and it appeared that the road had recently been regraded. It is considered that no immediate upgrades are required to Timber Creek Road to accommodate heavy vehicle movements. However, the condition of the road should be assessed prior to the commencement of haulage activities and every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

3.22 Church Road

RRD for Church Road commences at the South Coast Road junction and travels north and westbound for 16.8km to the junction with West End Highway.

The road has a typical width of 6.0m – 8.0m. Overall pavement condition is good, with some moderate sections, as discussed below.

It is recommended that regrading is undertaken on Church Road prior to the commencement of haulage activities. The condition of the road should be assessed every six weeks during the haulage period. Upon completion of this period, grading should be undertaken to leave the road in a suitable condition.

Finding
RRD 0.0 – 0.2. Standing water on eastern side of the roadway.

Recommendation
Undertake drainage investigations in areas of boggy surface to determine if any workable options exist to improve drainage.

Finding
RRD 3.2, 5.0 – 6.0. Soft surface with some rutting.

Recommendation
Undertake drainage investigations in areas of boggy surface to determine if any workable options exist to improve drainage.

Finding
RRD 7.9 – 8.5, 11.0. Trees overhanging roadway.

Recommendation
Trim back trees to facilitate heavy vehicle movement.

Finding
RRD 8.1. Crest with Steep Descent W5-12 advance warning signage provided. Curve at bottom of long, steep descent, with Curve W1-3 signage provided in advance.

Recommendation
Consider installation of Trucks Use Low Gear G9-23 signage at the crest to encourage lower speeds for heavy vehicles.

Finding
RRD 7.7. River crossing. Width Marker D4-3 signage on both sides of the road on both approaches. Signage is partially obscured by overgrowing vegetation.

Recommendation
Prune vegetation to ensure visibility of signage.

4 JUNCTION ASSESSMENT

Junctions to be used by heavy vehicles during forestry haulage have been reviewed to identify deficiencies with the existing arrangements, to assess the suitability of the junctions to accommodate heavy vehicles and to determine whether any upgrades are recommended. Factors included as part of the junction assessment include pavement condition, speed and sight distance. The parameters used and the basis for their selection are discussed in the following sections.

It is noted that in many cases where existing deficiencies have been identified, the issues affect all road users. Similarly, the recommended upgrades would benefit all road users.

4.1 Speed Limits

The default rural speed limit in South Australia is 100km/h. The limit applies to both sealed and unsealed roads, however driver's speed choices are self-regulating on unsealed roads due to factors such as loose surface, narrow width, poor alignment or undulating conditions.

DPTI Operational Instruction 4.10: Maximum 80 km/h Advisory Sign on Unsealed Roads, states that on unsealed roads with varying width, alignment and surface condition, a maximum speed of 80km/h may be appropriate. In such cases Gravel Roads - Maximum 80 km/h W1-SA101 advisory signage, as illustrated below, may be used to encourage lower speeds and assist in improving safety. The sign is an advisory sign only and is not a regulatory speed limit sign.

Figure 8. Gravel Roads - Maximum 80 km/h W1-SA101Sign

The Operational Instruction states that the sign may be used on unsealed roads when one of the following factors occurs:

- Crashes attributed to a speed unsuited to the conditions
- The speed environment is not self-regulating
- Variability in road alignment, road width or road surface conditions
- A maximum speed of 100 km/h is inappropriate for the level of safety

It is considered that, with the exception of Timber Creek Road North Coast Road and the unsealed section of Playford Highway, all of the assessed unsealed roads experience variability in alignment, width or surface conditions. Furthermore, it is considered that with the addition of approximately 140 daily heavy vehicle trips, a maximum speed of 100 km/h would be inappropriate for the level of safety. Consequently, it is recommended that the signs are installed on all roads used for forestry haulage. Signs could be installed on individual roads immediately prior to the commencement of haulage activities. Council have delegated authority to install the signs without approval from DPTI.

Based on the above recommendation, for the purposes of the analysis an 80km/h vehicle speed has been adopted for unsealed roads. In addition, it is noted that heavy vehicle drivers will traverse the routes from the plantations to Smith Bay a number of times per day. Consequently, drivers will be familiar with the routes and will adapt their speed accordingly.

Exceptions to the 80km/h vehicle speed are Timber Creek Road North Coast Road and Playford Highway, as the condition of these roads was observed to be of a high standard and consequently they are considered to be capable of accommodating higher vehicle speeds.

4.2 Sight Distance Requirements

Sight distance requirements for the assessed junctions have been based on Austroads Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections. Approach Sight Distance (ASD) has been used for the minor road approaches and Safe Intersection Sight Distance (SISD) used for the major road approaches:

- ASD is the minimum level of sight distance which must be available on the minor road approaches to all junctions to ensure that drivers are aware of the presence of a junction.
- SISD provides sufficient distance for a driver of a vehicle on the major road to observe a vehicle on a minor road approach moving into a collision situation and to decelerate to a stop before reaching the collision point.

Austroads Guide to Road Design, Part 3: Geometric Design, states that unsealed road surfaces are highly variable and friction coefficients vary depending on the type of surface material, the moisture environment and vehicle types. The Guide states that when calculating sight distance requirements, an allowance should be made for a reduction in friction factor, with reference to those specified in the ARRB Unsealed Roads Manual, Guidelines to Good Practice.

The Unsealed Roads Manual, Section 4.2.6, provides coefficient of friction values for cars. For heavy vehicles the Manual states that while values for trucks are not known to provide an approximate allowance for friction factor reduction, 30m should be added to the unsealed road values for cars.

Based on the above, the following sight distance requirements have been applied to the analysis:

- **ASD, Unsealed Road: 200m.** Based on a design speed of 90km/h and a reaction time of 2.0 seconds, plus 30m for trucks.
- **SISD, Unsealed Road with Advisory Signage: 260m.** Based on a design speed of 90km/h and a reaction time of 2.0 seconds, plus 30m for trucks.
- **SISD, Unsealed Road No Advisory Signage: 350m.** Based on a design speed of 110km/h and a reaction time of 2.0 seconds, plus 30m for trucks.
- **SISD, Sealed Road 100km/h Limit: 330m.** Based on a design speed of 110km/h and a reaction time of 2.5 seconds. Applies to West End Highway and Stokes Bay Road.
- **SISD, Sealed Road 110km/h Limit with Advisory Signage: 330m.** Based on a design speed of 120km/h and a reaction time of 2.0 seconds as the presence of advisory signage will assist in increasing drivers' awareness. Applies to Playford Highway and South Coast Road.
- **SISD, Sealed Road 110km/h Limit No Advisory Signage: 370m.** Based on a design speed of 120km/h and a reaction time of 2.5 seconds. Applies to Playford Highway and South Coast Road.

Table 6 summarises the sight distance requirements for the assessed junctions, as well as proposed treatments to mitigate any shortfalls. Detailed breakdowns are provided in the individual findings, along with other issues identified during on-site investigations.

Table 6: Junction Sight Distance Summary

Playford Highway / Jump Off Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Jump Off Road	Yes	N/A
SISD Playford Highway (Western Approach)	Yes	N/A
SISD Playford Highway (Eastern Approach)	Yes	N/A

Playford Highway / Snug Cove Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Snug Cove Road	Yes	N/A
SISD Playford Highway (Western Approach)	Yes	N/A
SISD Playford Highway (Eastern Approach)	Yes	N/A

Snug Cove Road / Colmans Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Colmans Road (Northern Approach)	Yes	N/A
SISD Snug Cove Road (Southern Approach)	Yes	N/A
SISD Colmans Road (Eastern Approach)	Yes	N/A

Colmans Road / Berrymans Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Berrymans Road	Yes	N/A
SISD Colmans Road (Northern Approach)	No	Trim vegetation on approach
SISD Colmans Road (Southern Approach)	Yes	N/A

North Coast Road / Berrymans Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Berrymans Road	Yes	N/A
SISD North Coast Road (Northern Approach)	Yes	N/A
SISD North Coast Rd (Southern Approach)	No	Trim vegetation on approach

Table 5 (cont.): Junction Sight Distance Summary

Playford Highway / North Coast Road / Gosse-Ritchie Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD North Coast Road	Yes	N/A
ASD Gosse-Ritchie Road	No	Due to advance warning signage available sight distance is considered to be sufficient
SISD Playford Highway (Western Approach)	No	Due to advance warning signage available sight distance is considered to be sufficient
SISD Playford Highway (Eastern Approach)	Yes	Relocate existing road sign to improve sight distance

South Coast Road / Gosse-Ritchie Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Gosse-Ritchie Road	No	Due to advance warning signage available sight distance is considered to be sufficient
SISD South Coast Rd (Western Approach)	No	Trim vegetation and install signage warning of presence of junction
SISD South Coast Rd (Eastern Approach)	No	Install signage providing advance warning of presence of junction

South Coast Road / Church Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Church Road	Yes	N/A
SISD South Coast Rd (Western Approach)	Yes	N/A
SISD South Coast Rd (Eastern Approach)	Yes	N/A

West End Highway / Church Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Church Road	Yes	N/A
SISD West End Hwy (Northern Approach)	No	Trim vegetation to improve sightlines
SISD West End Hwy (Southern Approach)	No	Due to advance warning signage available sight distance is considered to be sufficient

West End Highway / Baxters Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Baxters Road	Yes	N/A
SISD West End Hwy (Northern Approach)	No	Install signage providing advance warning of presence of junction
SISD West End Hwy (Southern Approach)	No	Install signage providing advance warning of presence of junction

Table 5 (cont.): Junction Sight Distance Summary

Church Road / Baxters Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Baxters Road	No	Install Give Way signage to highlight priority at junction. Realign junction to rationalise approach
SISD Church Road (Northern Approach)	Yes	N/A
SISD Church Road (Southern Approach)	Yes	N/A

South Coast Road / Mount Taylor Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Mount Taylor Road	No	Due to advance warning signage available sight distance is considered to be sufficient
SISD South Coast Rd (Western Approach)	No	Install signage providing advance warning of presence of junction
SISD South Coast Rd (Eastern Approach)	Yes	N/A

Playford Highway / Mount Taylor Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Mount Taylor Road	No	Trim vegetation to improve sightlines
SISD Playford Highway (Western Approach)	Yes	N/A
SISD Playford Highway (Eastern Approach)	No	Due to advance warning signage available sight distance is considered to be sufficient

Playford Highway / Turkey Lane		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Turkey Lane	Yes	N/A
SISD Playford Highway (Western Approach)	No	Install signage providing advance warning of presence of junction
SISD Playford Highway (Eastern Approach)	Yes	N/A

Turkey Lane / Johncock Road / Mays Road		
Approach	**Meets Requirement**	**Recommended Treatment**
SISD Turkey Lane	No	Junction priority arrangement is not clear. Rationalise arrangement to highlight minor and major approaches
SISD Johncock Road	No	
SISD Mays Road	Yes	

North Coast Road / Coopers Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Coopers Road	Yes	N/A
SISD North Coast Rd (Western Approach)	Yes	N/A
SISD North Coast Rd (Eastern Approach)	Yes	N/A

Table 5 (cont.): Junction Sight Distance Summary

North Coast Road / Coopers Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Coopers Road	Yes	N/A
SISD North Coast Rd (Western Approach)	Yes	N/A
SISD North Coast Rd (Eastern Approach)	Yes	N/A

Playford Highway / Coopers Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Coopers Road	Yes	N/A
SISD Playford Highway (Western Approach)	No	Due to advance warning signage available sight distance is considered to be sufficient
SISD Playford Highway (Eastern Approach)	No	Due to advance warning signage available sight distance is considered to be sufficient

Coopers Road / Tin Hut Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Tin Hut Road	Yes	N/A
SISD Coopers Road (Northern Approach)	Yes	N/A
SISD Coopers Road (Southern Approach)	Yes	N/A

Playford Highway / Yacca Jacks Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Yacca Jacks Road	Yes	N/A
SISD Playford Highway (Western Approach)	No	Due to advance warning signage available sight distance is considered to be sufficient
SISD Playford Highway (Eastern Approach)	No	Install signage providing advance warning of presence of junction

Playford Highway / Timber Creek Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Timber Creek Road	Yes	Seal apron for a minimum of 10m from the junction
SISD Playford Highway (Western Approach)	No	Due to advance warning signage available sight distance is considered to be sufficient. Install physical barrier to prevent informal left turn manoeuvres
SISD Playford Highway (Eastern Approach)	No	Due to advance warning signage available sight distance is considered to be sufficient

Table 5 (cont.): Junction Sight Distance Summary

Playford Highway / Bark Hut Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Bark Hut Road	Yes	N/A
SISD Playford Highway (Western Approach)	No	Install portable VMS signage when Bark Hut Road is being used for haulage
SISD Playford Highway (Eastern Approach)	No	Trim vegetation to improve sightlines

Stokes Bay Road / Bark Hut Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Bark Hut Road	Yes	N/A
SISD Stokes Bay Road (Northern Approach)	Yes	Due to advance warning signage available sight distance is considered to be sufficient
SISD Stokes Bay Road (Southern Approach)	No	

Bark Hut Road / McBrides Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD McBrides Road	Yes	N/A
SISD Bark Hut Road (Western Approach)	Yes	N/A
SISD Bark Hut Road (Eastern Approach)	Yes	N/A

Playford Highway / Stokes Bay Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Stokes Bay Road	No	Due to advance warning signage available sight distance is considered to be sufficient
SISD Playford Highway (Western Approach)	Yes	N/A
SISD Playford Highway (Eastern Approach)	Yes	N/A

North Coast Road / Stokes Bay Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Stokes Bay Road	Yes	N/A
SISD North Coast Rd (Western Approach)	Yes	N/A
SISD North Coast Rd (Eastern Approach)	Yes	N/A

Playford Highway / Ropers Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Ropers Road	Yes	N/A
SISD Playford Highway (Western Approach)	No	Trim vegetation and install signage warning of presence of junction
SISD Playford Highway (Eastern Approach)	No	Trim vegetation and install signage warning of presence of junction

Table 5 (cont.): Junction Sight Distance Summary

Gum Creek Road / Ropers Road / Gap Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Ropers Road	Yes	N/A
ASD Gap Road	Yes	Install physical barrier to prevent informal left turn manoeuvres
SISD Gum Creek Road (Western Approach)	No	Due to advance warning signage available sight distance is considered to be sufficient
SISD Gum Creek Road (Eastern Approach)	Yes	Trim vegetation to improve sightlines

Springs Road / Gap Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Gap Road (Northern Approach)	Yes	N/A
ASD Gap Road (Southern Approach)	Yes	N/A
SISD Springs Road (Western Approach)	Yes	N/A
SISD Springs Road (Eastern Approach)	Yes	N/A

North Coast Road / Gap Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD Gap Road (Northern Approach)	Yes	N/A
ASD Gap Road (Southern Approach)	Yes	N/A
SISD North Coast Rd (Western Approach)	Yes	N/A
SISD North Coast Rd (Eastern Approach)	No	Trim vegetation to improve sightlines

North Coast Road / McBrides Road		
Approach	**Meets Requirement**	**Recommended Treatment**
ASD McBrides Road (Northern Approach)	Yes	N/A
SISD North Coast Rd (Western Approach)	Yes	N/A
SISD North Coast Rd (Eastern Approach)	Yes	N/A

4.3 Playford Highway / Jump Off Road

Approach	Required ASD	Available ASD	Meets Requirement
Jump Off Road	200	300	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	350	360	Yes
Playford Highway (Eastern Approach)	350	360	Yes

Finding

Flooding on both corners and on Playford Highway opposite the junction.

Figure 9. Jump Off Road Flooding at Junction

Recommendation

Undertake drainage investigations in areas of boggy surface to determine if any workable options exist to improve drainage.

4.4 Playford Highway / Snug Cove Road

Approach	Required ASD	Available ASD	Meets Requirement
Snug Cove Road	200	400	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	360	400	Yes
Playford Highway (Eastern Approach)	360	460	Yes

4.5 Snug Cove Road / Colmans Road

Approach	Required ASD	Available ASD	Meets Requirement
Colmans Road (Northern Approach)	200	250	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Snug Cove Road (Southern Approach)	260	500	Yes
Colmans Road (Eastern Approach)	260	260	Yes

Finding

The Snug Cove Road northern approach is the minor junction arm; however, the junction arrangement means that priority is ambiguous. Priority is indicated with Give Way R1-2 signage.

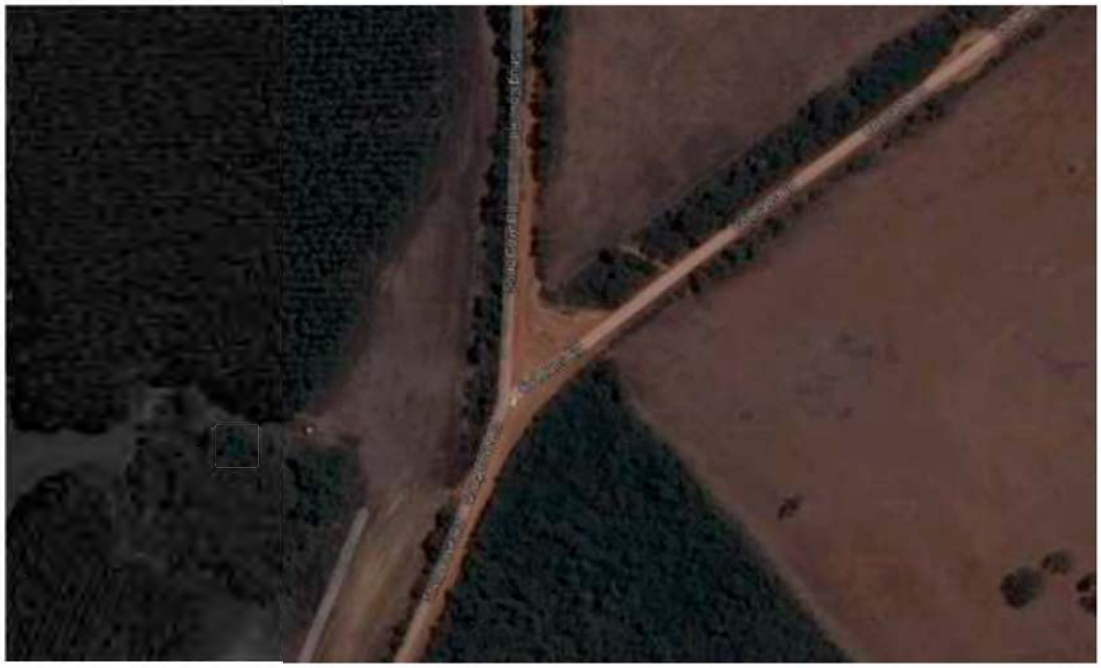


Figure 10. Snug Cove Road / Colmans Road Junction Alignment

Recommendation

Consider junction realignment to highlight priority arrangement.

Reinforce priority arrangement through installation of Give Way Sign Ahead W3-2 signage

4.6 Colmans Road / Berrymans Road

Approach	Required ASD	Available ASD	Meets Requirement
Berrymans Road	200	400	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Colmans Road (Northern Approach)	260	160	No
Colmans Road (Southern Approach)	260	280	Yes

SISD on the Colmans Road northern approach is compromised by the presence of vegetation in close proximity to the roadway. It is recommended that the vegetation on the eastern side is trimmed back to improve sightlines.

Finding
Water pooling on both corners of the junction.

Recommendation
Undertake drainage investigations in areas of boggy surface to determine if any workable options exist to improve drainage.

4.7 North Coast Road / Berrymans Road

Approach	Required ASD	Available ASD	Meets Requirement
Berrymans Road	200	240	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
North Coast Road (Northern Approach)	260	500	Yes
North Coast Road (Southern Approach)	260	210	No

SISD on the North Coast Road southern approach could be compromised by the presence of vegetation in close proximity to the roadway if the vegetation is not trimmed. It is recommended that the vegetation on the eastern side is removed to ensure that the required sight distance is achieved.

4.8 Playford Highway / North Coast Road / Gosse-Ritchie Road

Approach	Required ASD	Available ASD	Meets Requirement
North Coast Road	200	400	Yes
Gosse-Ritchie Road	200	180	No
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	370	340	No
Playford Highway (Eastern Approach)	370	450	Yes

SISD on the Playford Highway western approach is compromised by a crest. However, signage highlighting the presence of the junction is visible from a distance exceeding the required SISD. Consequently, the available sight distance is considered to be sufficient.

Sight distance to the east on Playford Highway for vehicles at the North Coast Road junction is compromised by the location of a road sign. It is recommended that the sign is relocated to improve sightlines.

Figure 11. Sightlines Obscured by Sign

ASD on the Gosse-Ritchie Road approach is compromised by a crest. However, advance warning signage alerts drivers to the presence of the junction and clear sightlines are available to the sign. Consequently, the available sight distance is considered to be sufficient.

4.9 South Coast Road / Gosse-Ritchie Road

Approach	Required ASD	Available ASD	Meets Requirement
Gosse-Ritchie Road	200	140	No
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
South Coast Road (Western Approach)	310	130	No
South Coast Road (Eastern Approach)	310	150	No

SISD on the South Coast Road western approach is compromised by horizontal curves and by vegetation in close proximity to the roadway. It is recommended that the vegetation on the northern side is trimmed back to improve sightlines, however it is anticipated that the required sightlines will still not be achieved. While warning signage is in place advising of curves, there is no advance warning signage on the approach highlighting the presence of the junction. It is recommended that T-Intersection W2-3 signage is installed to alert drivers to the presence of the junction.

SISD on the South Coast Road eastern approach is compromised by horizontal curves. Warning signage is in place advising of curves and posting an advisory speed limit of 70km/h, however there is no advance warning signage on the approach. It is recommended that T-Intersection W2-3 signage is installed to alert drivers to the presence of the junction.

ASD on the Gosse-Ritchie Road approach is compromised by horizontal curves. However, advance warning signage alerts drivers to the presence of the junction and clear sightlines are available to the sign. Consequently, the available sight distance is considered to be sufficient.

4.10 South Coast Road / Church Road

Approach	Required ASD	Available ASD	Meets Requirement
Church Road	200	320	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
South Coast Road (Western Approach)	330	420	Yes
South Coast Road (Eastern Approach)	330	500	Yes

4.11 West End Highway / Church Road

Approach	Required ASD	Available ASD	Meets Requirement
Church Road	200	500	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
West End Highway (Northern Approach)	330	150	No
West End Highway (Southern Approach)	330	210	No

SISD on the West End Highway northern approach is compromised by horizontal curves and by vegetation in close proximity to the roadway. It is recommended that the vegetation on the western side is trimmed back to improve sightlines, however it is anticipated that the required sightlines will still not be achieved. Advance warning signage is in place on the approach highlighting the presence of the junction. It is considered that the signage, combined with the recommended vegetation removal, provide sufficient sightlines and advance warning of the junction.

SISD on the West End Highway southern approach is compromised by horizontal curves. However, advance warning signage alerts drivers to the presence of the junction and clear sightlines are available to the sign. Consequently, the available sight distance is considered to be sufficient.

4.12 West End Highway / Baxters Road

Approach	Required ASD	Available ASD	Meets Requirement
Baxters Road	200	500	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
West End Highway (Northern Approach)	330	260	No
West End Highway (Southern Approach)	330	240	No

SISD on the West End Highway northern and southern approaches is compromised by horizontal curves. There is no advance warning signage on either approach. It is recommended that T-Intersection W2-3 signage is installed on both approaches to alert drivers to the presence of the junction.

4.13 Church Road / Baxters Road

Approach	Required ASD	Available ASD	Meets Requirement
Baxters Road	200	100	No
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Church Road (Northern Approach)	260	300	Yes
Church Road (Southern Approach)	260	260	Yes

ASD on the Baxters Road approach is compromised by a dip and crest. Advance warning signage alerts drivers to the presence of the junction; however, no Give Way signage is installed at the junction. It is recommended that Give Way signage is installed to highlight priority movements.

The junction arrangement effectively splits the Baxters Road approach in two, providing separate roads for those approaching / departing to the north and south on Church Road. This arrangement creates the potential for confusion for drivers. It is recommended that the alignment is reviewed and junction upgrades considered to provide a typical T-junction arrangement.

4.14 South Coast Road / Mount Taylor Road

Approach	Required ASD	Available ASD	Meets Requirement
Mount Taylor Road	200	140	No
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
South Coast Road (Western Approach)	330	250	No
South Coast Road (Eastern Approach)	330	500	Yes

SISD on the South Coast Road western approach is compromised by horizontal curves. Warning signage is in place advising of curves and posting an advisory speed limit of 85km/h, however there is no advance warning signage on the approach. It is recommended that T-Intersection W2-3 signage is installed to alert drivers to the presence of the junction.

ASD on the Mount Taylor Road approach is compromised by a horizontal curve. However, advance warning signage alerts drivers to the presence of the junction and clear sightlines are available to the sign. Consequently, the available sight distance is considered to be sufficient.

4.15 Playford Highway / Mount Taylor Road

Approach	Required ASD	Available ASD	Meets Requirement
Mount Taylor Road	200	90	No
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	370	500	Yes
Playford Highway (Eastern Approach)	330	270	No

SISD on the South Coast Road eastern approach is compromised by horizontal curves. Warning signage is in place advising of curves and posting an advisory speed limit of 75km/h. advance warning signage highlighting the presence of the junction is also included. It is considered that as a result of the advance warning signage and advisory speed limit, the available sight distance is sufficient.

ASD on the Mount Taylor Road approach is compromised by a horizontal curve and by trees and vegetation in close proximity to the roadway. It is recommended that the trees and vegetation on the eastern side are trimmed back to improve sightlines, however it is anticipated that the required sightlines will still not be achieved. Advance warning signage is in place on the approach highlighting the presence of the junction. It is considered that the signage, combined with the recommended vegetation removal, provide sufficient sightlines and advance warning of the junction.

4.16 Playford Highway / Turkey Lane

Approach	Required ASD	Available ASD	Meets Requirement
Turkey Lane	200	500	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	370	260	No
Playford Highway (Eastern Approach)	370	500	Yes

SISD on the Playford Highway western approach is compromised by a crest. No advance warning signage is installed on the approach. It is recommended that T-Intersection W2-3 signage is installed to alert drivers to the presence of the junction.

4.17 Turkey Lane / Johncock Road / Mays Road

Approach	Required SISD	Available SISD	Meets Requirement
Turkey Lane	260	200	No
Johncock Road	260	220	No
Mays Road	260	260	Yes

Y-Junction signage is provided on all approaches, but the priority arrangement is not clear. This signage is now obsolete. It is recommended that the priority arrangement is established by Council. It is recommended that the existing signage is removed and replaced on the minor approach with T-Intersection W2-3 and Give Way R1-2 signage. It is recommended that T-Intersection W2-3 signage is placed on one or both major approaches if they do not meet the SISD requirement.

4.18 North Coast Road / Coopers Road

Approach	Required ASD	Available ASD	Meets Requirement
Coopers Road	200	270	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
North Coast Road (Western Approach)	260	400	Yes
North Coast Road (Eastern Approach)	260	280	Yes

Finding
Water pooling on North Coast Road opposite the junction.

Recommendation
Undertake drainage investigations in areas of boggy surface to determine if any workable options exist to improve drainage.

4.19 Playford Highway / Coopers Road

Approach	Required ASD	Available ASD	Meets Requirement
Coopers Road	200	500	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	370	280	No
Playford Highway (Eastern Approach)	370	200	No

SISD on the Playford Highway eastern and western approaches is compromised by horizontal curves. Advance warning signage is provided on both approaches and clear sightlines are available to the sign. Consequently, the available sight distance is considered to be sufficient.

4.20 Coopers Road / Tin Hut Road

Approach	Required ASD	Available ASD	Meets Requirement
Tin Hut Road	200	450	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Coopers Road (Northern Approach)	260	260	Yes
Coopers Road (Southern Approach)	260	310	Yes

Finding
Water pooling on junction corners and on Coopers Road opposite the junction.

Recommendation
Review and assess existing drainage. Upgrade where necessary.

4.21 Playford Highway / Yakka Jacks Road

Approach	Required ASD	Available ASD	Meets Requirement
Yakka Jacks Road	200	500	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	330	180	No
Playford Highway (Eastern Approach)	370	190	No

SISD on the Playford Highway western approach is compromised by a horizontal curve. Advance warning signage highlighting the presence of the junction is provided on the approach and clear sightlines are available to the sign. Consequently, the available sight distance is considered to be sufficient.

SISD on the Playford Highway eastern approach is compromised by a crest. No advance warning signage highlighting the presence of the junction is installed on the approach. It is recommended that T-Intersection W2-3 signage is installed to alert drivers to the presence of the junction.

Finding
Yakka Jacks Road is unsealed to the junction. This increases the likelihood of loose material being carried onto Playford Highway, creating a hazard.

Recommendation
Seral apron on Yakka Jacks Road for a minimum of 10m from the junction

4.22 Playford Highway / Timber Creek Road

Approach	Required ASD	Available ASD	Meets Requirement
Timber Creek Road	200	500	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	330	160	No
Playford Highway (Eastern Approach)	330	160	No

SISD on the Playford Highway eastern and western approaches is compromised by horizontal curves. On both approaches, warning signage is in place advising of curves and posting advisory speed limits. Advance warning signage highlighting the presence of the junction is also provided on the approaches and clear sightlines are available to all signage. Consequently, the available sight distance on both approaches is considered to be sufficient.

Finding
Vehicles cutting the corner when turning left from Playford Highway onto Timber Creek Road has resulted in the creation of an informal channelised left turn arrangement, with a vegetated area between the informal left turn and the formal Timber Creek Road approach. The arrangement may cause confusion among drivers, increasing the likelihood of collisions.

Figure 12. Informal Left Turn Arrangement, Playford Highway Western Approach

Recommendation
Remove informal channelised left turn arrangement and install fencing or vegetation to create a physical barrier to cutting the corner.

Finding
Timber Creek Road is unsealed to the junction. This increases the likelihood of loose material being carried onto Playford Highway, creating a hazard.

Recommendation
Seal apron on Timber Creek Road for a minimum of 10m from the junction

4.23 Playford Highway / Bark Hut Road

Approach	Required ASD	Available ASD	Meets Requirement
Bark Hut Road	200	200	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	330	160	No
Playford Highway (Eastern Approach)	370	250	No

SISD on the Playford Highway eastern approach is compromised by the vertical alignment of the roadway and by trees overhanging the roadway. Advance warning signage highlighting the presence of the junction is provided on the approach and clear sightlines are available to the sign. Trucks Crossing or Entering W5-22 signage is also installed, indicating that Bark Hut Road is an existing heavy vehicle route. It is recommended that the trees overhanging the roadway are trimmed to improve sightlines on approach to the junction.

The Playford Highway western approach to the junction is on a steep descent, with the junction located on a curve. Signage on the approach includes T-Intersection W2-3, curve W1-3 with an 85km/h Advisory Speed W8-2 sign, Trucks Crossing or Entering W5-22, and four Temporary Hazard Marker T5-5 signs (it is noted that this sign type is incorrect and that Unidirectional Hazard Marker D4-1-2 signage should be installed in its place). While it is considered that the current level of signage is satisfactory, it is considered that the addition of high volumes of heavy vehicles may create an increased likelihood of crashes. It is recommended that when Bark Hut Road is being used for haulage, portable VMS signage should be installed on the Playford Highway western approach to provide advance warning to drivers.

4.24 Stokes Bay Road / Bark Hut Road

Approach	Required ASD	Available ASD	Meets Requirement
Bark Hut Road	200	300	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Stokes Bay Road (Northern Approach)	330	370	Yes
Stokes Bay Road (Southern Approach)	330	200	No

SISD on the Stokes Bay Road southern approach is compromised by a crest. Advance warning signage highlighting the presence of the junction is provided on the approach and clear sightlines are available to the sign. Consequently, the available sight distance is considered to be sufficient.

4.25 Bark Hut Road / McBrides Road

Approach	Required ASD	Available ASD	Meets Requirement
McBrides Road	200	300	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Bark Hut Road (Western Approach)	260	300	Yes
Bark Hut Road (Eastern Approach)	260	260	Yes

4.26 Playford Highway / Stokes Bay Road

Approach	Required ASD	Available ASD	Meets Requirement
Stokes Bay Road	330	300	No
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	370	460	Yes
Playford Highway (Eastern Approach)	370	420	Yes

SISD on Stokes Bay Road is compromised by a crest. However, advance warning signage highlighting the presence of the junction is provided on the approach and clear sightlines are available to the sign. Consequently, the available sight distance is considered to be sufficient.

4.27 North Coast Road / Stokes Bay Road

Approach	Required ASD	Available ASD	Meets Requirement
Stokes Bay Road	330	350	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
North Coast Road (Western Approach)	160	210	Yes
North Coast Road (Eastern Approach)	160	180	Yes

A lower SISD has been adopted for the North Coast Road approaches, as both have narrow, one lane bridges on approach to the junction. Due to the bridges, an 85th percentile speed of 60km/h has been adopted for the analysis. Both approaches include Narrow Bridge W4-1 signage.

4.28 Playford Highway / Ropers Road

Approach	Required ASD	Available ASD	Meets Requirement
Ropers Road	200	300	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Playford Highway (Western Approach)	370	260	No
Playford Highway (Eastern Approach)	370	220	No

SISD on both Playford Highway approaches is compromised by vegetation in close proximity to the roadway. It is recommended that the vegetation on the northern side is trimmed back to improve sightlines. There is no advance warning signage on either approach highlighting the presence of the junction. It is recommended that T-Intersection W2-3 signage is installed to alert drivers to the presence of the junction.

4.29 Gum Creek Road / Ropers Road / Gap Road

Approach	Required ASD	Available ASD	Meets Requirement
Ropers Road	200	400	Yes
Gap Road	200	300	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Gum Creek Road (Western Approach)	260	140	No
Gum Creek Road (Eastern Approach)	260	380	Yes

SISD on the Gum Creek Road western approach is compromised by a crest. However, advance warning signage highlighting the presence of the intersection is provided on the approach and clear sightlines are available to the sign. Consequently, the available sight distance is considered to be sufficient.

SISD on the Gum Creek Road eastern approach is compromised by vegetation in close proximity to the roadway. It is recommended that the vegetation on the northern side is trimmed back to improve sightlines.

Finding

Vehicles cutting the corner when turning left from Gap Road onto Gum Creek Road has resulted in the creation of an informal channelised left turn arrangement, with vehicles passing either side of the Give Way sign on Gap Road. The arrangement creates a hazard and may increase the likelihood of collisions.

Figure 13. Path of Travel Both Sides of Sign, Gap Road Approach

Recommendation

Install fencing or vegetation to create a physical barrier to cutting the corner.

4.30 Springs Road / Gap Road

Approach	Required ASD	Available ASD	Meets Requirement
Gap Road (Northern Approach)	200	350	Yes
Gap Road (Southern Approach)	200	250	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
Springs Road (Western Approach)	260	260	Yes
Springs Road (Eastern Approach)	260	350	Yes

4.31 North Coast Road / Gap Road

Approach	Required ASD	Available ASD	Meets Requirement
Gap Road (Northern Approach)	200	280	Yes
Gap Road (Southern Approach)	200	250	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
North Coast Road (Western Approach)	260	290	Yes
North Coast Road (Eastern Approach)	260	220	No

SISD on the North Coast Road eastern approach is compromised by vegetation in close proximity to the roadway. Advance warning signage highlighting the presence of the junction is provided on the approach. It is recommended that the vegetation on the southern side of the road on the approach is trimmed back to improve sightlines.

4.32 North Coast Road / McBrides Road

Approach	Required ASD	Available ASD	Meets Requirement
McBrides Road (Northern Approach)	200	380	Yes
Approach	**Required SISD**	**Available SISD**	**Meets Requirement**
North Coast Road (Western Approach)	260	400	Yes
North Coast Road (Eastern Approach)	260	500	Yes

5 SMITH BAY WHARF ACCESS

5.1 Background

There is an existing proposal to construct a new wharf and storage area at Smith Bay to ship harvested timber to overseas customers. As part of the route assessment, suitable routes to access Smith Bay were investigated. KIPT advised that to the most practical degree, heavy vehicle movements should be routed via the western side of the island, to minimise the impact on resident and tourist traffic.

Through consultation with Kangaroo Island Council, it was stated that Council would not be supportive of the adopted route to Smith Bay using Stokes Bay Road. Council advised that Stokes Bay Road experiences high volumes of tourist traffic and that they wish to minimise interaction between forestry heavy vehicles and tourist traffic. Council also indicated that they have safety concerns regarding the North Coast Road / Stokes Bay Road junction – and in particular the Stokes Bay Road approach – due to the long, steep descent towards the junction.

5.2 Assessed Routes

Based on an initial desktop review, three routes were considered suitable for assessment:

- Option 1 – Stokes Bay Road / North Coast Road
- Option 2 – Stokes Bay Road / Bark Hut Road / McBrides Road / North Coast Road
- Option 3 – Stokes Bay Road / right of way access / McBrides Road / North Coast Road
- Option 4 – Bark Hut Road / McBrides Road / North Coast Road
- Option 5 – Ropers Road / Gap Road / North Coast Road

Figure 14 highlights each of the assessed routes, while the advantages and disadvantages of each route are detailed in Table 7.

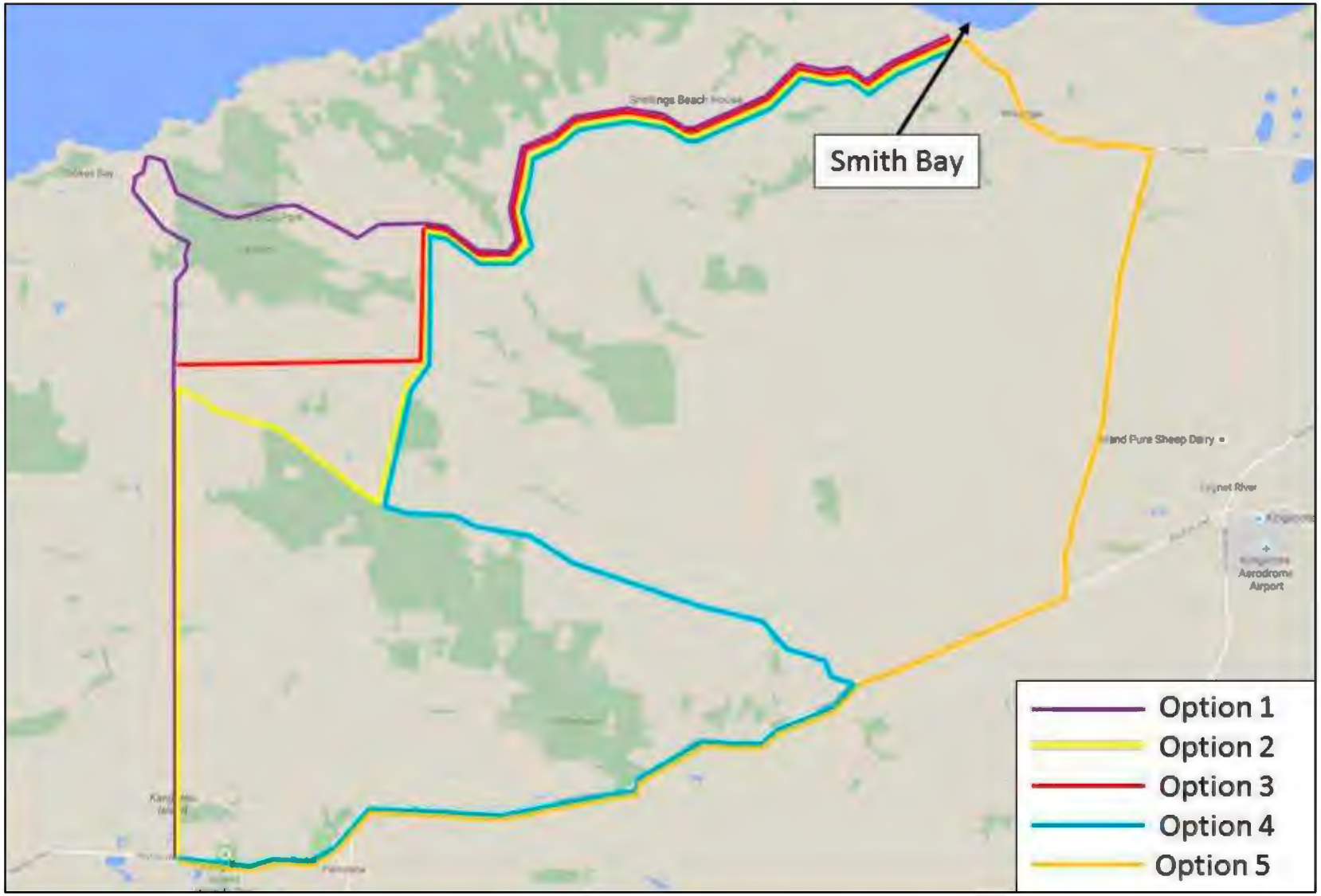


Figure 14. Smith Bay Access Route Options

Table 7: Smith Bay Access Route Option Assessment Summary

	Option 1	Option 2	Option 3	Option 4	Option 5
Distance / Journey Time*	45km / 40 mins	40km / 55 mins	37km / 55 mins	57km / 80 mins	45km / 35 mins
Pavement Type	Sealed, unsealed	Sealed, unsealed	Sealed, unsealed	Unsealed	Unsealed
Typical Pavement Condition	- Stokes Bay Rd - Good - N. Coast Rd - Good	- Stokes Bay Rd - Good - Bark Hut Rd - Poor - McBrides Rd - Poor - N. Coast Rd - Good	- Stokes Bay Rd - Good - Right of way access - Poor - McBrides Rd - Poor - N. Coast Rd - Good	- Bark Hut Rd – Moderate to poor - McBrides Rd - Poor - N. Coast Rd - Good	- Ropers Rd – Good - Gap Rd -Good - N. Coast Rd - Good
Advantages	- Short distance - 2nd shortest journey time - Uses sealed road - Minimal pavement upgrades required	- Avoids Coast Rd / Stokes Bay Rd junction - Short distance - Route is close to a number of plantations, reducing travel distance	- Avoids Coast Rd / Stokes Bay Rd junction - Shortest distance - Route is close to a number of plantations, reducing travel distance	- Route is close to a number of plantations, reducing travel distance	- Shortest journey time - Good pavement condition on all roads - Council's preferred route
Disadvantages	- Council do not support use of Stokes Bay Rd due to safety concerns - Steep approach on Stokes Bay Rd to N. Coast Rd junction poses safety concerns - Higher cost and time to repair sealed pavement - Higher volumes of tourist traffic	- Council do not support use of Stokes Bay Rd due to safety concerns - Steep grades on McBrides Rd - Significant upgrades required to improve pavement quality - Higher volumes of tourist traffic on Stokes Bay Rd	- Council do not support use of Stokes Bay Rd due to safety concerns - New road required to make right of way access suitable for HV movements - Steep grades on McBrides Rd - Significant upgrades required to improve pavement quality - Higher volumes of tourist traffic on Stokes Bay Rd	- Longest journey time - Longest distance - Significant upgrades required to improve pavement quality - Playford Hwy / Bark Hut Rd junction is considered to be hazardous	- Narrow width of first 2km of Ropers Rd not suitable for two-way movement - Ropers Rd prone to flooding

*Distance and journey time to Smith Bay has been measured from the Playford Highway / Stokes Bay Road junction.

5.3 Preferred Routes

Based on the assessments of each of the proposed routes, Options 1 and 5 are considered to be the most suitable routes. Options 2 and 4 are not considered to be suitable, primarily due to the longer journey times involved and the condition of the roadways, while Option 3 would require the construction of a new roadway to make the right of way access suitable for heavy vehicle use. Options 2 – 4 use McBrides Road, which was observed to have been significantly affected by stormwater or runoff. During haulage periods this road would likely require frequent maintenance and may at times be unusable, causing disruptions to haulage activities. Based on the above, Options 2, 3 and 4 have been discounted from the assessment.

Options 1 and 5 are considered to be the most suitable options. However, both routes present issues which would require to be addressed prior to their adoption as primary haulage routes. The benefits and drawbacks associated with each route are discussed below.

Option 1

Council has indicated that they would be unsupportive of the use of Stokes Bay Road to access Smith Bay. They have highlighted safety concerns associated with heavy vehicles negotiating the North Coast Road / Stokes Bay Road junction.

The descent on Stokes Bay Road on the approach to North Coast Road commences approximately 3.0km south of the junction. The road descends through a series of curves, with varying grades. The final 1km of the approach has an average grade of 7% - 8%. Advance warning signage is installed to alert drivers to the curves and the steep grades, while Trucks Use Low Gear advisory signage is also included. Stokes Bay Road terminates as the minor arm at a 90° T-junction with North Coast Road.

It is considered that the long, steep descent and junction may present hazards for approaching heavy vehicles, particularly as the vehicles would be fully-loaded with 30 tonnes of timber. A failure to sufficiently slow for the junction could result in crashes. Frequent descents throughout the day would place increased stress on vehicle brakes, which may increase the likelihood of brake failure.

Stokes Bay Road is sealed along its entire length, from the Playford Highway junction in the south, to the North Coast Road junction to the north. A sealed pavement offers a superior alternative to an unsealed pavement, requiring less maintenance and accommodating higher vehicle speeds, reducing journey time. A sealed pavement would also be less impacted by weather events, potentially avoiding road closures and associated haulage disruptions.

However, it is unclear whether the pavement has been designed to accommodate projected levels of heavy vehicle traffic. If the pavement has not been designed for the anticipated loads, utilisation of the road as the primary wharf access route would be likely to result in significant pavement deterioration. Compared to unsealed roads, the costs and time involved in repairing the sealed pavement are likely to be significant.

Option 5

Option 5 is Council's preferred option. The route would avoid the use of Stokes Bay Road and the risks associated with the North Coast Road / Stokes Bay Road junction. Potential issues of pavement deterioration would also be avoided. The route offers a shorter journey time than Option 1, with a similar distance. The shorter journey time would offer efficiency gains to the haulage operation.

The majority of the route along Ropers Road, Gap Road and North Coast Road is considered to be suitable for haulage operations, with good unsealed pavement condition and a width sufficient to accommodate two-lane two-way vehicle movement. The exception is the first 2km of Ropers Road from the Playford Highway junction, which has a typical width of 5.0m, below the 5.5m width recommended by the ARRB Unsealed Roads Manual for a one-lane two-way road.

Section 3.2 of this report discusses options to deal with a narrow road width, including road widening, traffic management and one-way operation. The benefits and drawbacks of each option for the Ropers Road route include:

- **Carriageway Widening.** While not considered feasible for local roads providing forestry access, as the Ropers Road route would be in constant use for over 20 years, road widening is considered to be a more feasible option. Providing sufficient width for two-way operation without the need for vehicles to stop or reverse would lead to time savings and minimise disruption risks. However, widening would require substantial tree removal, incurring significant expense. Tree removal may also be opposed by Council or local residents.
- **Traffic Management.** Contact between drivers would assist in coordinating vehicle movements, minimising the likelihood of opposing heavy vehicles on the single-lane section. However, private vehicles may still be encountered. Employment of traffic controllers by KIPT would minimise the likelihood of private vehicles being encountered, as the controllers would coordinate traffic movements from either end of the single-lane section. Employment of two traffic controllers over the 20 year haulage period would incur additional expense, while both traffic management options would increase journey time to Smith Bay due to the need for vehicles to wait for a clear route before proceeding.
- **One-Way Operation.** The introduction of a one-way route for haulage vehicles would minimise the risk of obstructions caused by oncoming vehicles and would also reduce journey times as there would be no need to wait for a clear route before proceeding. Oncoming private vehicles may still be encountered, however.

During the on-site assessment flooding was observed in fields on both sides of Ropers Road and Gap Road, while Gap Road was closed to through traffic. This indicates that the road may have recently been flooded. If the road is partial to flooding, haulage activities could be disrupted during periods of heavy rain.

Alternative Option

An alternative route to access Smith Bay is a combination of Options 1 and 5 with the introduction of a one-way system for haulage vehicles. Under this arrangement heavy vehicles would approach Smith Bay via Ropers Road and Gap Road and to depart via Stokes Bay Road. The one-way arrangement would bring the following benefits:

- Vehicles would not enter the North Coast Road / Stokes Bay Road junction via the steep downhill Stokes Bay Road approach.
- Vehicles on the return journey from the wharf would be empty, with the unloaded vehicle weight reducing the impact on the Stokes Bay Road pavement.
- Haulage vehicles would not encounter each other on narrow sections of roadway.
- Vehicles would not need to wait for a clear route on narrow sections before proceeding, reducing journey times.

While there are benefits to the route, the issue of flooding on Ropers Road remains, while the ability of the Stokes Bay Road sealed pavement to accommodate the projected levels of heavy vehicle traffic would need to be determined. Council's opposition to the use of Stokes Bay Road would also need to be considered.

6 REFERENCES

Austroads, 2009. Guide to Road Design, Part 3: Geometric Design
Austroads, 2009. Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections
ARRB Group, 2009. Unsealed Roads Manual, Guidelines to Good Practice 3rd Edition
DPTI, 2105. Operational Instruction 4.10: Maximum 80 km/h Advisory Sign on Unsealed Roads
Standards Australia, 2009. Australian Standard 1742 Manual of Uniform Traffic Control Devices, Part 2: Traffic Control Devices for General Use

APPENDIX A – PLANTATION MAP

RURALAUS PLANTATION MANAGEMENT
LOCALITY MAP OF PLANTATION PROPERTIES
KANGAROO ISLAND S.A.

RuralAus INVESTMENTS

SILVICULTURAL LEGEND

- RAPM E.nitens
- RAPM E.globulus
- RAPM P.radiata
- New Forests E.globulus
- NEC Mixed species
- Viento E.globulus
- Treecorp MIS / Primary Sec. E.globulus
- Private / Other Mixed Species
- National Parks
- Wilderness Protection Area
- Conservation Parks
- Aquatic Reserves

TOPOGRAPHIC LEGEND

Key
- Major Rd
- Minor Rd
- Grid 10km
- Coastline / River

Projection: Map Grid of Australia 1994
Grid: MGA Zone 53 (GDA94)
Prepared by: Jessica Domeschenz
Last Updated: 24 Nov 2011

GDA

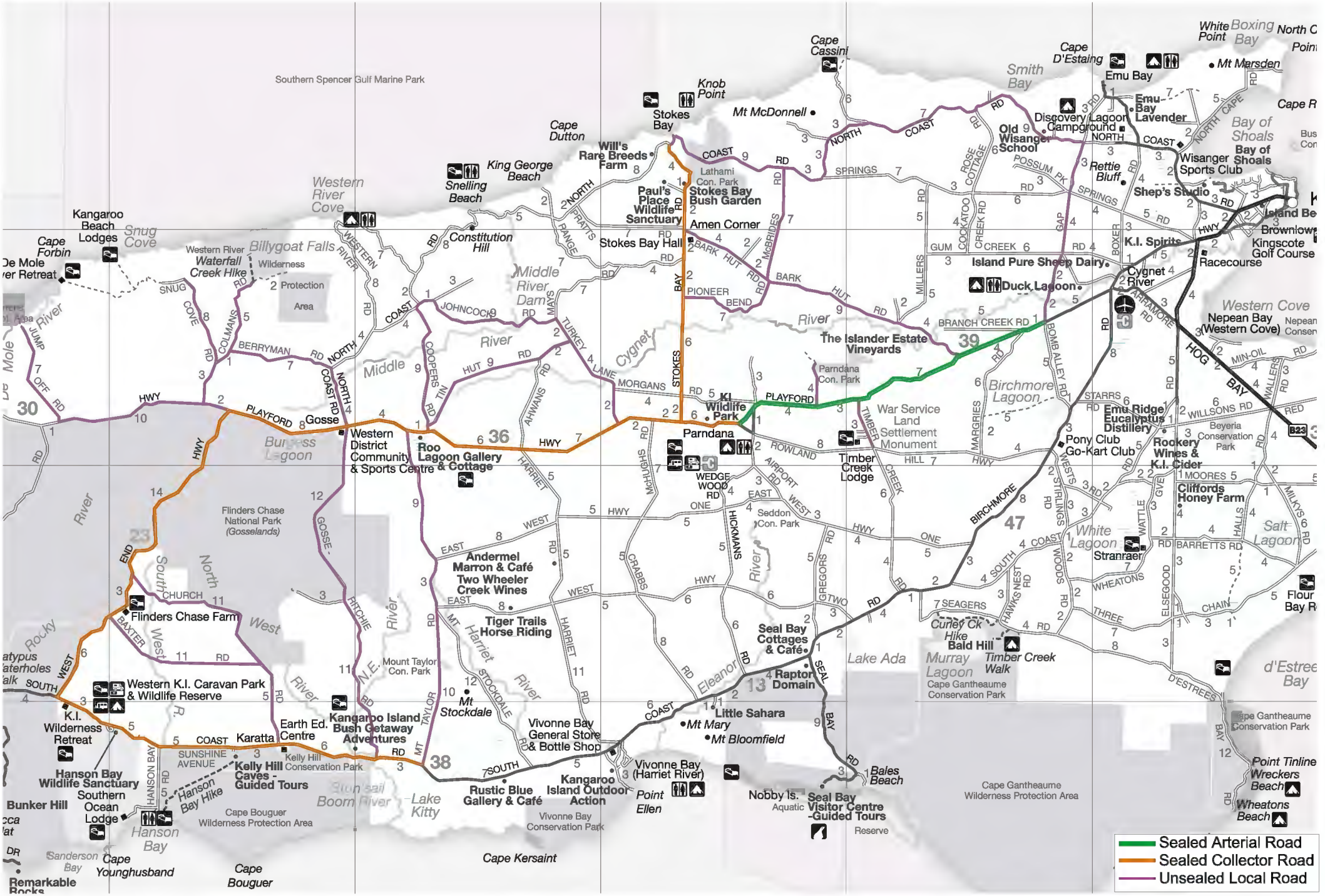
Propery No	Forest Name	Owner	Species
1	Research	RAPM	P.rad
2	Huxtable	RAPM	P.rad
3	Yerda Sth	RAPM	P.rad
4	Kelly East	RAPM	P.rad
5	Yerda Nth	RAPM	P.rad
6	Kelly West	RAPM	P.rad
7	Roo Lagoon	RAPM	P.rad
8	Gosse West	RAPM	P.rad
9	Gumridge	RAPM	P.rad
10	St Andrews	RAPM	P.rad
11	Lycurgus	RAPM	P.rad
12	Lycurgus	RAPM	E.nitens
13	Lycurgus	RAPM	E.glob
14	Brookland Park	RAPM	E.glob
15	Wingara	RAPM	E.glob
16	Wingara	RAPM	E.nitens
17	Cronins	RAPM	E.glob

Propery No	Forest Name	Owner	Species
18	Alandale	NF	E.glob
19	Anderson	NF	E.glob
20	Aroona	NF	E.glob
21	Binnowie	NF	E.glob
22	Carnarvon	NF	E.glob
23	Dewell	NF	E.glob
24	Minnamurra	NF	E.glob
25	Greenslope	NF	E.glob
26	Hammat	NF	E.glob
27	Heaths	NF	E.glob
28	Hillview	NF	E.glob
29	Jarmyn	NF	E.glob
30	Kangari Sp	NF	E.glob
31	Kelly Hills	NF	E.glob
32	Keida Lea	NF	E.glob
33	Laterite Hills	NF	E.glob
34	MacGill	NF	E.glob

Propery No	Forest Name	Owner	Species
35	Martin	NF	E.glob
36	Morlands	NF	E.glob
37	More View	NF	E.glob
38	Pentelow	NF	E.glob
39	Riley	NF	E.glob
40	Roo Lagoon	NF	E.glob
41	Southern	NF	E.glob
42	Stephens	NF	E.glob
43	Stockdale	NF	E.glob
44	Trethewey	NF	E.glob
45	Willmott	NF	E.glob
46	Wingara	NF	E.glob
~~47~~	~~Wyndemar~~	~~NF~~	~~E.glob~~

Propery No	Forest Name	Owner	Species
~~48~~	~~Yinkepas~~	~~NEC~~	~~E.glad, Mixed~~
~~49~~	~~Thistleton~~	~~NEC~~	~~Mixed~~
50	Coopers Couchman	NEC	E.glob
51	Kellendale	Viento	E.glob
52	Sunstail Boom	Viento	E.glob
53	Gumridge	Prim Sec	P.rad
54	St Andrews	Prim Sec	P.rad
55	Gilgandra	Other	P.rad
56	Mt Brown	Other	P.rad
57	Gosse West	Other	P.rad
58	NER Takla	Takla	E.glob
59	Noble A	Other	E.glob

APPENDIX B – ASSESSED ROUTES MAP


Sealed Arterial Road
Sealed Collector Road
Unsealed Local Road

APPENDIX C – TRIP GENERATION BREAKDOWN

Harvest plan in Tonnes

	Property name	Access Road	Access Road No.	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
9 Gumridge	Gumridge MIS	Jump Off Road	1	0	0	0	0	0	0	0	0	204930	0	0	0
11 Lycurgus	Lycurgus Blue gum	Jump Off Road	1	0	0	47440	0	0	0	0	0	0	0	0	0
12 Lycurgus	Lycurgus Shining gum	Jump Off Road	1	0	0	29610	0	0	0	0	0	0	0	0	0
13 Lycurgus	Lycurgus Shining gum	Jump Off Road	1	0	0	0	0	40723	0	0	0	0	0	0	0
53 Gumridge	Gumridge	Jump Off Road	1	0	0	0	0	0	0	0	0	98739	0	0	0
	Total Roadway Tonnage			0	0	77050	0	40723	0	0	0	303669	0	0	0
	Total Roadway Trucks (30t per Truck)			0	0	2568	0	1357	0	0	0	10122	0	0	0
	Loaded Trucks per Day (250 Working Days)			0	0	10	0	5	0	0	0	40	0	0	0
8 Gosse West	Gosse West Total	Snug Cove Road / Colmans Road	2	87145	121136	0	0	0	0	0	0	0	0	0	0
51 Kellendale	Kellendale	Snug Cove Road	2	167906	0	0	0	0	0	0	0	0	0	0	0
57 Gosse East	Gosse East	Snug Cove Road / Colmans Road	2	0	0	0	0	0	0	0	0	0	0	58000	52800
	Total Roadway Tonnage			255051	121136	0	0	0	0	0	0	0	0	58000	52800
	Total Roadway Trucks (30t per Truck)			8502	4038	0	0	0	0	0	0	0	0	1933	1760
	Loaded Trucks per Day (250 Working Days)			34	16	0	0	0	0	0	0	0	0	8	7
29 Jarmyn	Jarmyn	West End Highway	3	0	0	0	0	121768	0	0	0	0	0	0	0
	Total Roadway Tonnage			0	0	0	0	121768	0	0	0	0	0	0	0
	Total Roadway Trucks (30t per Truck)			0	0	0	0	4059	0	0	0	0	0	0	0
	Loaded Trucks per Day (250 Working Days)			0	0	0	0	16	0	0	0	0	0	0	0
10 St Andrews	St Andrews	Baxters Road	4	74250	76500	0	0	0	0	0	0	0	0	0	0
15 Wingara	Wingara Blue gum	Baxters Road	4	0	0	81320	0	0	0	0	0	0	0	0	0
16 Wingara	Wingara Shining gum	Baxters Road	4	0	0	0	0	0	61849	0	0	0	0	0	0
46 Wingara	Wingara	Baxters Road	4	0	0	0	0	0	0	0	0	0	161386	0	0
54 St Andrews		Baxters Road	4												
	Total Roadway Tonnage			74250	76500	81320	0	0	61849	0	0	0	161386	0	0
	Total Roadway Trucks (30t per Truck)			2475	2550	2711	0	0	2062	0	0	0	5380	0	0
	Loaded Trucks per Day (250 Working Days)			10	10	11	0	0	8	0	0	0	22	0	0
25 Greenslope	Greenslopes Total	South Coast Road	5	0	0	0	0	98568	0	9455	0	0	0	0	0
31 Kelly Hills	Kelly Hills	South Coast Road	5	0	0	0	0	78938	0	0	0	0	0	0	0
59 Noble A	Noble A	South Coast Road	5	0	0	0	0	173628	0	0	0	0	0	0	0
	Total Roadway Tonnage			0	0	0	0	351134	0	9455	0	0	0	0	0
	Total Roadway Trucks (30t per Truck)			0	0	0	0	11704	0	315	0	0	0	0	0
	Loaded Trucks per Day (250 Working Days)			0	0	0	0	47	0	1	0	0	0	0	0
21 Binnowie	Binnowie Total	North Coast Road / Berrymans Road	6	0	0	0	96082	0	14253	0	0	0	0	0	0
33 Laterite Hills	Laterite Hills	North Coast Road / Berrymans Road	6	0	0	0	143245	0	0	0	0	0	0	0	0
38 Pentelow	Pentelow	North Coast Road / Berrymans Road	6	0	0	0	0	0	0	0	151200	0	0	0	0
	Total Roadway Tonnage			0	0	0	239327	0	14253	0	151200	0	0	0	0
	Total Roadway Trucks (30t per Truck)			0	0	0	7978	0	475	0	5040	0	0	0	0
	Loaded Trucks per Day (250 Working Days)			0	0	0	32	0	2	0	20	0	0	0	0
22 Carnarvon	Carnarvon	Gosse-Ritchie Road	7	0	0	0	92167	0	0	0	0	0	0	0	0
28 Hillview	Hillview	Gosse-Ritchie Road	7	0	0	0	0	0	0	0	0	0	0	0	156821
40 Roo Lagoon	Roo Lagoon Total	Gosse-Ritchie Road	7	0	0	0	27662	0	0	0	16328	0	0	0	0
42 Stephens	Stephens	Gosse-Ritchie Road	7	0	0	0	0	0	0	71222	0	0	0	0	0
52 Sunstall Boom	Sunstall Boom Total	Gosse-Ritchie Road	7	0	0	0	27662	0	0	71222	16328	0	0	0	0
	Total Roadway Tonnage			0	0	0	147492	0	0	142443	32656	0	0	0	156821
	Total Roadway Trucks (30t per Truck)			0	0	0	4916	0	0	4748	1089	0	0	0	5227
	Loaded Trucks per Day (250 Working Days)			0	0	0	20	0	0	19	4	0	0	0	21
34 MacGill	MacGill	Turkey Lane / Johncock Road	8	0	0	0	0	0	512573	0	0	0	0	0	0
36 Morlands	Morelands	Turkey Lane / Johncock Road	8	0	0	0	0	0	0	0	61725	0	0	0	0
61 Westmore Park	Westmore Park	Turkey Lane / Johncock Road	8	0	0	0	0	0	0	0	0	0	0	174348	162000
	Total Roadway Tonnage			0	0	0	0	0	512573	0	61725	0	0	174348	162000
	Total Roadway Trucks (30t per Truck)			0	0	0	0	0	17086	0	2058	0	0	5812	5400
	Loaded Trucks per Day (250 Working Days)			0	0	0	0	0	68	0	8	0	0	23	22
18 Alandale	Alandale	Coopers Road	9	0	0	0	165675	0	0	0	0	0	0	0	0
	Total Roadway Tonnage			0	0	0	165675	0	0	0	0	0	0	0	0
	Total Roadway Trucks (30t per Truck)			0	0	0	5522	0	0	0	0	0	0	0	0
	Loaded Trucks per Day (250 Working Days)			0	0	0	22	0	0	0	0	0	0	0	0
32 Kelda Lea	Kelda Lea	Tin Hut Road	10	0	0	0	153714	0	0	0	0	0	0	0	0
39 Riley	Riley	Tin Hut Road	10	0	0	0	0	0	0	0	46716	0	0	0	0
	Total Roadway Tonnage			0	0	0	153714	0	0	0	46716	0	0	0	0
	Total Roadway Trucks (30t per Truck)			0	0	0	5124	0	0	0	1557	0	0	0	0
	Loaded Trucks per Day (250 Working Days)			0	0	0	20	0	0	0	6	0	0	0	0
17 Cronins	Cronins	Mount Taylor Road	11	0	0	88830	0	0	0	0	0	0	0	0	0
19 Anderson	Anderson	Mount Taylor Road	11	0	0	0	0	0	0	181318	0	0	0	0	0
20 Aroona	Aroona	Mount Taylor Road	11	0	0	0	0	0	0	0	0	0	0	173628	0
27 Heaths	Heaths Total	Mount Taylor Road	11	3386	0	0	0	0	0	0	0	0	0	62524	0
30 Kangari Sp	Kangari Springs	Mount Taylor Road	11	0	0	0	0	0	0	0	0	265083	0	0	0
37 More View	More View	Mount Taylor Road	11	0	0	0	0	0	0	0	0	0	214798	0	0
43 Stockdale	Stockdale Total	Mount Taylor Road	11	0	28544	0	0	0	0	0	0	0	86452	0	0
44 Trethewey	Trethewey	Mount Taylor Road	11	0	0	0	0	0	0	163806	0	0	0	0	0
50 Coopers Couchman	Coopers Couch	Mount Taylor Road	11	0	0	83326	0	0	0	0	0	0	0	0	0
58 NER Takla	NER Total	Mount Taylor Road	11	17184	0	40423	0	0	0	62604	357	0	0	0	0
23 Dewell	Dewell	E W One Road	11	0	0	0	0	0	0	0	0	0	149194	0	0
24 Minnamurra	Minnamurra	E W Two Road	11	0	0	0	0	0	0	0	0	0	0	0	29044
	Total Roadway Tonnage			20569	28544	212579	0	0	0	407728	357	265083	450444	236152	29044
	Total Roadway Trucks (30t per Truck)			686	951	7086	0	0	0	13591	12	8836	15015	7872	968
	Loaded Trucks per Day (250 Working Days)			3	4	28	0	0	0	54	0	35	60	31	4
60 Kyala	Kyalla Total	Stokes Bay Road	12	0	0	0	0	0	0	0	226800	0	60030	0	0
	Total Roadway Tonnage			0	0	0	0	0	0	0	226800	0	60030	0	0
	Total Roadway Trucks (30t per Truck)			0	0	0	0	0	0	0	7560	0	2001	0	0
	Loaded Trucks per Day (250 Working Days)			0	0	0	0	0	0	0	30	0	8	0	0
5 Yerda North	Yerda North	McBrides Road	13	0	0	87444	0	0	0	0	0	0	0	0	0
	Total Roadway Tonnage			0	0	87444	0	0	0	0	0	0	0	0	0
	Total Roadway Trucks (30t per Truck)			0	0	2915	0	0	0	0	0	0	0	0	0
	Loaded Trucks per Day (250 Working Days)			0	0	12	0	0	0	0	0	0	0	0	0
2 Huxtable	Huxtable Total	Bark Hut Road	14	68513	0	0	0	0	0	0	0	0	0	0	0
3 Yerda South	Yerda South	Bark Hut Road	14	0	0	113818	0	0	0	0	0	0	0	0	0
4 Kelly East	Kelly East Total	Bark Hut Road	14	0	0	35921	11880	0	0	0	77080	0	0	0	0
6 Kelly West	Kelly West	Bark Hut Road	14	0	0	50421	0	0	0	0	0	0	0	0	0
55 Gilgandra	Gilgandra	Bark Hut Road	14	40800	32760	0	0	0	0	0	0	0	0	0	0
	Total Roadway Tonnage			109313	32760	200159	11880	0	0	0	77080	0	0	0	0
	Total Roadway Trucks (30t per Truck)			3644	1092	6672	396	0	0	0	2569	0	0	0	0
	Loaded Trucks per Day (250 Working Days)			15	4	27	2	0	0	0	10	0	0	0	0
56 Mt Brown	Mt Brown	Yacca Jacks Road	15	34000	35000	0	0	0	0	0	0	0	0	0	0
	Total Roadway Tonnage			34000	35000	0	0	0	0	0	0	0	0	0	0
	Total Roadway Trucks (30t per Truck)			1133	1167	0	0	0	0	0	0	0	0	0	0
	Loaded Trucks per Day (250 Working Days)			5	5	0	0	0	0	0	0	0	0	0	0
1 Research	Research Total	Timber Creek Road	16	874	0	0	0	0	0	0	0	29594	0	0	0
	Total Roadway Tonnage			874	0	0	0	0	0	0	0	29594	0	0	0
	Total Roadway Trucks (30t per Truck)			29	0	0	0	0	0	0	0	986	0	0	0
	Loaded Trucks per Day (250 Working Days)			0	0	0	0	0	0	0	0	4	0	0	0
14 Brookland Park	Brookland Park	Church Road	17	0	160877	0	0	0	0	0	0	0	0	0	0
26 Hammat	Hammat	Church Road	17	0	0	0	0	100696	0	0	0	0	0	0	0
	Total Roadway Tonnage			0	160877	0	0	100696	0	0	0	0	0	0	0
	Total Roadway Trucks (30t per Truck)			0	5363	0	0	3357	0	0	0	0	0	0	0
	Loaded Trucks per Day (250 Working Days)			0	21	0	0	13	0	0	0	0	0	0	0
7 Roo Lagoon	Roo Lagoon	Playford Highway	107	0	0	0	0	0	0	124750	0	0	0	0	0
41 Southern	Southern	Playford Highway	141	0	0	0	0	0	0	0	0	0	0	136888	0
45 Willmott	Willmott	Playford Highway	145	0	0	0	0	0	0	0	0	62189	0	0	0
35 Martin	Martin	Ahwans Road	135	0	0	0	0	0	0	0	133722	0	0	0	0
	Total Roadway Tonnage			0	0	0	0	0	0	124750	133722	62189	0	136888	0
	Total Roadway Trucks (30t per Truck)			0	0	0	0	0	0	4158	4457	2073	0	4563	0
	Loaded Trucks per Day (250 Working Days)			0	0	0	0	0	0	17	18	8	0	18	0

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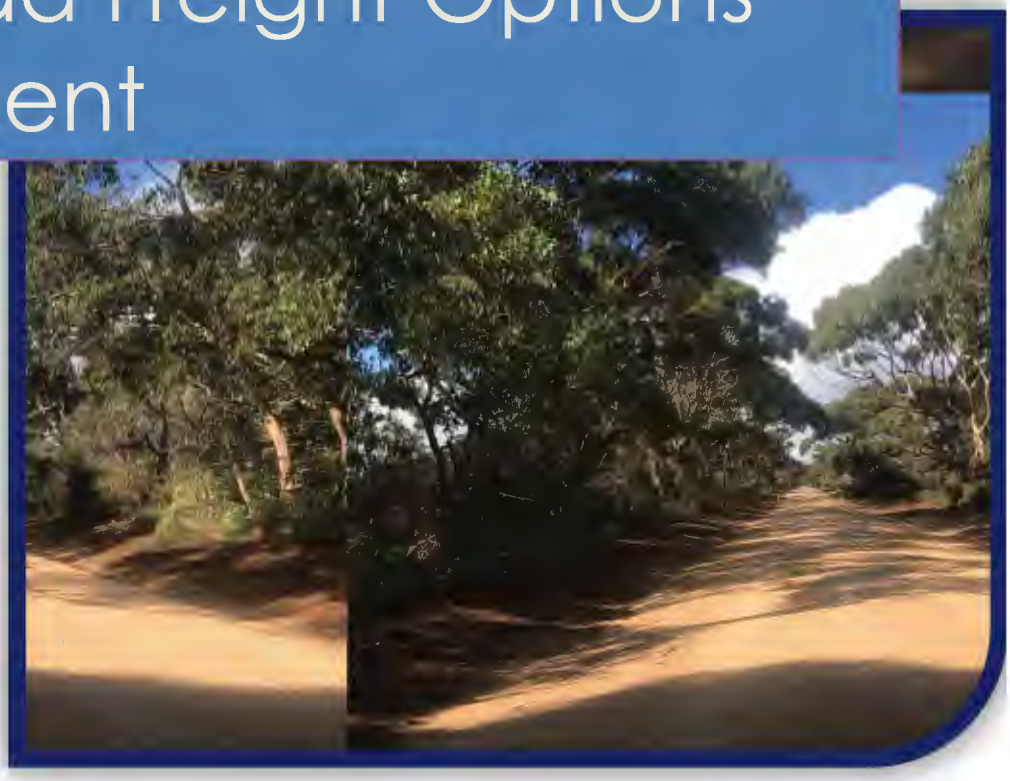
Appendix P2 – KIPT Road Freight Options Assessment – Osman Solutions

KIPT Road Freight Options Assessment



Osman Solutions

September 2017

Contents

1.0 Overview

Osman Solutions has been engaged by Kangaroo Island Plantation Timbers Ltd (KIPT) to undertake evaluations of the shortlisted road access routes for the mobilisation of timber freight on Kangaroo Island.

The routes assessed are based on the freight port being approved for Smith Bay.

Walbridge & Gilbert (W&G) undertook a Route Assessment in October 2016 with the purpose of that assessment being to examine the condition of the existing road network and its suitability to accommodate heavy vehicle movements. The assessment by W&G was based on timber transportation being by 19m semi-articulated vehicles which are general access vehicles which do not require permits to access public roads.

In June 2017 a Discussion Paper, prepared by Osman Solutions, was prepared based on B-Double vehicles which are Restricted Access vehicles to:-

- Engage in formal discussions with Kangaroo Island Council (KIC) to establish timber freight access routes.
- Provide an overview of the evaluation of all options identified in the W&G Route Assessment (October 2016) and subsequently identified on further discussions and assessment.
- Provide a short list of access route options for Smith Bay along with roads required to access plantations for the first five years of harvest operations.
- Establish a framework to evaluate short listed options.
- Establish freight road specifications for two way freight movement based on a road access hierarchy for timber freight.

Department of Planning, Transport and Infrastructure (DPTI's) Heavy Vehicle Access Framework (HVAF) is the basis for the evaluation of freight routes. The HVAF provides policy and direction for meeting the main objectives in SA's Strategic Plan for heavy vehicle operations including development of road freight networks and corridors for heavy vehicles which take into account environmental and social issues.

Heavy Vehicle Operations are divided into three (3) categories

- General Access (ie Semi articulated vehicles)
- Restricted Access by Gazette Notice
- Restricted Access by Permit

Based on the W&G assessment and subsequent discussions the following options were reviewed:-

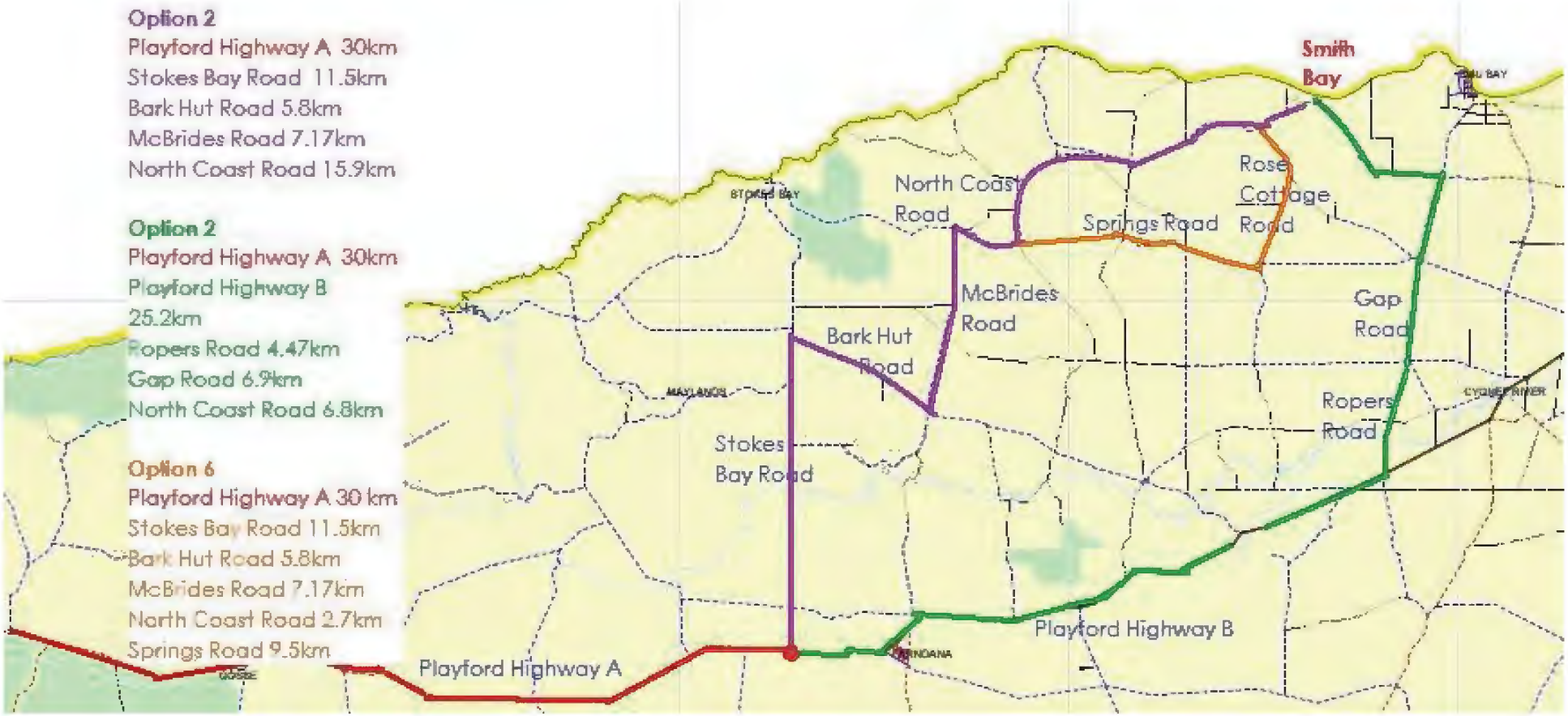
- Option 1 – Stokes Bay Road / North Coast Road
- Option 2 – Stokes Bay Road / Bark Hut Road / McBrides Road / North Coast Road
- Option 3 – Stokes Bay Road / right of way access / McBrides Road / North Coast Road
- Option 4 – Bark Hut Road / McBrides Road / North Coast Road
- Option 5 – Ropers Road / Gap Road / North Coast Road
- Option 6 – Stokes Bay Road / Bark Hut Road / McBrides / Springs Road / Rose Cottage Road / North Coast Road
- Option 7 – Stokes Bay Road / Pioneer Bend Road / McBrides Road / North Coast Road
- Option 8 – Boxer Road / North Coast Road
- Option 9 – Unmade Road Reserves

Based on those assessments and as agreed with Kangaroo Island Council (KIC) the route options shortlisted for assessment are:-

- Option 2 – Playford Highway / Stokes Bay Road / Bark Hut Road / McBrides Road / North Coast Road
- Option 5 – Playford Highway / Ropers Road / Gap Road / North Coast Road
- Option 6 – Playford Highway / Stokes Bay Road / Bark Hut Road / McBrides Road / North Coast Road / Springs Road / Rose Cottage Road / North Coast Road.

The Evaluation Framework used in undertaking assessments of the shortlisted options is contained in **Appendix A.**

The assessments are based on existing conditions, acknowledging that there will be investment into upgrading the roads to ensure the freight task is done safely and efficiently.


Option 2
Playford Highway A 30km
Stokes Bay Road 11.5km
Bark Hut Road 5.8km
McBrides Road 7.17km
North Coast Road 15.9km
Option 2
Playford Highway A 30km
Playford Highway B 25.2km
Ropers Road 4.47km
Gap Road 6.9km
North Coast Road 6.8km
Option 6
Playford Highway A 30 km
Stokes Bay Road 11.5km
Bark Hut Road 5.8km
McBrides Road 7.17km
North Coast Road 2.7km
Springs Road 9.5km
Smith Bay
North Coast Road
Springs Road
Rose Cottage Road
McBrides Road
Bark Hut Road
Gap Road
Ropers Road
Stokes Bay Road
Playford Highway A
Playford Highway B

2.0 Heavy Vehicle Volumes

Forestry yield and generated volumes of heavy vehicles was supplied in W&Gs assessment based on semi articulated vehicles with a maximum load of 30 tonnes gross which are general access vehicles. This report is based on B Double vehicles with a maximum load of 42.5 tonnes gross which are restricted access vehicles. For the purpose of looking at heavy vehicle volumes, calculations have also been done for A Double vehicles with a maximum load of 60 tonnes.

It is considered with the projected volumes of timber to be harvested and mobilised to the proposed freight port facility that the use of B-Double or possibly larger Restricted Access Vehicles on a Gazetted Restricted Access route as opposed to semi-trailer movements which are General Access Vehicles (no approvals required) would be preferred due to:-

- Reduced number of truck vehicle movements resulting in less impact on the road network, amenity and environment.
- Improved safety for all road users by way of upgrading the roads and intersections where required.
- Improved efficiencies for the freight task.

As per the W&G assessment, KIPT provided the following information regarding vehicle movements

- Harvesting will occur year-round.
- There will be some variation from year to year in total harvest tonnage.
- The daily frequency of haulage movements will be influenced by shipping schedules and storage capacity at the Smith Bay wharf.
- It is acknowledged that haulage may be affected by flooding and fire risks. Harvesting and haulage will be scheduled according to local conditions, with areas prone to flooding being harvested during summer months and drier areas harvested in winter months.
- Timber transportation will occur Monday – Friday.

KIPT has highlighted that schedules for the harvesting and shipping of timber will be dependent on demand and other external factors. For the purposes of this assessment, the projections summarised in the table below have been assumed.

Daily Heavy Vehicle Volumes

Tonne	Semi Trips (30 t GML) Annual Trips	Semi Trips (30 t GML) Daily Trips	B Double (42.5 t GML) Annual Trips	B Double (42.5 t GML) Daily Trips	A Double (60 t GML) Annual Trips	A Double (60 t GML) Daily Trips
400,000	26,667	107	18,824	75	13,333	53
500,000	33,333	133	23,529	94	16,667	67
600,000	40,000	160	28,235	113	20,000	80
700,000	46,667	187	32,941	132	23,333	93

Trip represents a two-way vehicluar movement and includes an empty return journey

A typical year for freight movement is 250 working days, which excluded weekends and public holidays

Based on the table above, during an average 12 hour freight movement day there would be a Semi Trailer making the journey to Smith Bay every 14 minutes if transporting 400,000 to Smith Bay per annum. If B-Doubles make that journey the frequency is reduced to every 19 minutes and reduced further again if A Doubles are used.

The estimates are based on General Mass Limits (GML) however Higher Mass Limits (HML) for vehicles fitted with Road Friendly Suspensions could be applied for which could further increase the allowable load and therefore reduce vehicle movements further.

3.0 Forestry Freight Road Hierarchy & Specifications

Due to the nature of forestry practices, being that year round access will be required to the proposed Smith Bay Wharf and seasonal access during harvest operations to the various plantations it is recommended that there be a Forestry Freight Road Hierarchy with fit for purpose specifications.

Smith Bay Wharf Access (Core Roads)	Year round, ongoing access done under Restricted Access by Gazette Notice
Seasonal Plantation Access (Local Access Roads)	During harvest operations under Restricted Access by Permit

The primary purpose of a road hierarchy is to ensure that appropriate management, engineering design, construction standards and maintenance practices are applied to a road based on its function. It also enables more efficient use of limited resources by allocating funding to those roads that are in greater need and on which expenditure is better justified and higher returns obtained. Special purpose roads ie quarry, logging or tourist roads should be made to fit existing classifications rather than establish a separate classification[1].

In accordance with Council's Transport Infrastructure Asset Management Plan, the highest classification for unsealed rural roads is C1 (Bark Hut Road, Springs Road, North Coast Road) and for sealed rural roads are A (Arterial) and B (Collector).

It is recommended that the Smith Bay Wharf Access route be constructed and maintained to a Class B unsealed standard (previously not required by Council for unsealed rural roads) with Seasonal Plantation Access roads be maintained to their existing standard where it is safe for two heavy vehicles, such as B-Doubles, to pass safely.

Smith Bay Wharf Access **(Core Roads)**	8m wide carriageway 0.75m shoulders (each side) 80km speed limit for heavy vehicle operations
Seasonal Plantation Access **(Local Access Roads)**	6m wide carriageway 0.75m shoulders (each side 60kkm speed limit for heavy vehicle operations

[1] ARRB Unsealed Road Manual, Guidelines to Good Practice P 4.2

4.0 Road Assessments

DPTI's Heavy Vehicle Access Framework (HVAF) is the basis for the evaluation of freight routes. The framework is designed to demonstrate the ability of the proposed Restricted Access Vehicle to be physically and safely accommodated along the proposed route. The effect on amenity, the environment and impact on local communities will be considered.

The framework also reflects KIPT's route selection criteria being:-

- Safety
- Efficiency of the freight task (cost per tonne)
- Minimise impact on other road users and property owners
- Timelines to enable an approved route to be operational
- Cost implications

The evaluation framework was presented to Kangaroo Island Council for review and approval as part of the options shortlisting process. The scoring applied is based on a 1 – 5 approach, whereby:-

1	Excellent – satisfies prescribed criteria for the length of the assessed road section
2	Good – meets prescribed criteria with either some constraints or minority section that is only 'fair' to 'poor'
3	Fair – not at prescribed criteria that can be addressed
4	Poor – multiple issues that could impact safety, environment or community which can be addressed
5	Very poor – significant issues that will impact either safety, environment or community

The Evaluation Framework used in undertaking assessments of the shortlisted options is contained in **Appendix A.**

Below is an overview of the areas being assessed and the relevant criteria.

Existing Road Conditions

The existing road conditions including width, shoulders, clearances, condition (surface & pavement) and geometry were assessed to enable upgrade requirements to be determined.

The upgrade standard will provide for an 8m wide carriageway with 0.75m shoulders which will enable a 9.5m clearance for two heavy vehicles to pass at 80km/hr. The sealed roads assessed (Stokes Bay Road and Playford Highway) both have sealed carriageways of 6m with 1m shoulders (unsealed) which will require the shoulders to be sealed to enable two heavy vehicles to pass safely. There are some sections along both sealed roads assessed that

will only provide for a 7m total width without extensive and expensive upgrades, predominantly over rivers and waterways.

Geometry is an important consideration, particularly as the nature of the terrain through to Smith Bay has multiple rolling valleys and rises. These changes in grade lead to speed variations, breaking and gear changes. In the case of haulage roads, a flatter grade will enable a more constant speed, demand less of both vehicle and driver and generally lower vehicle operating costs. Also grades create speed disparities between vehicle types. This can lead to queuing and overtaking requirements[2].

Drainage & Bridges

Drainage is an important consideration to ensure year round operation. The drainage assessment considered provision of table/side drains, mitre drains, cross drains, floodways and any roadside dams. All of the lower class (D Class) unsealed roads being McBrides, Ropers, Gums and Rose Cottage Roads require drainage upgrades including building the road up where currently the road 'dips' into waterways that can become inundated during heavy rain events. Hydrology studies would be required to determine the catchment and therefore capacity requirements for upgrade to the cross drains to mitigate the risk of water inundation on the haulage route.

To access Smith Bay from central Kangaroo Island, the Cygnet River needs to be crossed (via a bridge) regardless of what option is selected. Of the three options being assessed, the crossing point is either on Stokes Bay Road over a bridge that is 8m wide at the bottom of a steep approach and subsequent rise or Ropers Road that is a single lane bridge that is 3.2m wide that would require replacement. Further the same section on Ropers Road that abuts the Cygnet River would need to be built up some 2m and widened with batter slops for some 600m, with significant vegetation and amenity impact.

Roadside Native Vegetation

Roadside Native Vegetation assessments have also included any Water Affecting Activities (linked with Drainage & Bridges) and any known habitats. Roadside vegetation was assessed for any clearance requirements to provide 2m back behind white marker posts and 4m overhead clearance along with line of sight for corners and intersections.

Preliminary discussions have been held with Department of Environment, Water and Natural Resources (DEWNR) and Natural Resource Management (NRM) staff including a field trip driving the proposed routes.

Preliminary roadside vegetation clearance requirements were provided to relevant staff prior to site visits. A formal, independent roadside vegetation

[2] ARRB Unsealed Roads Manual, Guidelines to Good Practice P 4.7.

assessment will be commissioned when the preferred route is selected as part of the approval process. This will identify any protected and endangered plants along with SEB off set requirements.

There is a Glossy Black habitat at the intersection of Rose Cottage Road and North Coast Road that could impact any road works at that intersection. As identified in the previous section, Ropers Road has a section that abuts the Cygnet River that is both low and narrow with a single lane bridge. There is also another know Glossy Black habitat to the east of that same section on Ropers Road. Any road works in that area would require removal of multiple large trees to enable the road to be built up to provide all weather access.

Right of Way and Intersections

Right of way for the proposed freight routes were assessed as part safety to all road users and efficiency of the freight task. The majority of the routes assessed were only non-right of way when turning right onto a connecting road, with the exception of Ropers and Gap which both have 'give way' points along their length (Gum Creek and Springs Roads).

Intersections were assessed based on line of sight, swept path provisions (turning movement for long heavy vehicles) and vertical alignment. All intersections will require some form of upgrade, particularly vegetation removal and widening.

Site distances were based on Austroads Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections. For the give way roads (minor) along the assessed routes Approach Sight Distance (ASD) was used and Safe Intersection Sight Distance (SISD) used for the intersections navigated along the assessed routes. As per ARRB Unsealed Road Manual (page 4.9) 'no longitudinal friction values for trucks on unsealed roads are known at this stage. As a rough guide stopping sight distances for trucks should be at least 30m greater than for cars'[3].

The following site distances were used in the assessment[4]

	ASD	SISD[5]
80km/hr	185	220
100km/hr	230	307

[3] ARRB Unsealed Roads Manual, Guidelines to Good Practice P 4.9.
[4] ARRB Unsealed Roads Manual, Guidelines to Good Practice P 4.25
[5] Department of Transport Infrastructure and Planning 'Route Assessment Guidelines for Restricted Access Vehicles; Appendix A.

Land Uses & Residential Impacts

It is acknowledged that the impacts of a freight route of the proposed volumes will impact road users and particularly residents along the route. Although the roads will be upgraded and maintained to a high standard which residents will enjoy the benefits of, the frequency of heavy vehicle movement will impact residents to some degree, particularly for those who reside close to the road.

Identifying the number and proximity of residences along the assessed routes has been included. Roads like McBrides, although currently in poor condition, have no residences along its length unlike Playford Highway or North Coast Road.

Traffic & Safety

This part of the assessment included traffic counts, school bus routes, traffic composition, crash history, speed environment and overtaking provisions.

Roads with a low traffic count (<10 vehicles per day) have been scored higher than those with high traffic counts (>150 vpd) as the risk of accident is reduced on road with low traffic counts. It is also acknowledged that generally when a road is upgraded, traffic counts increase.

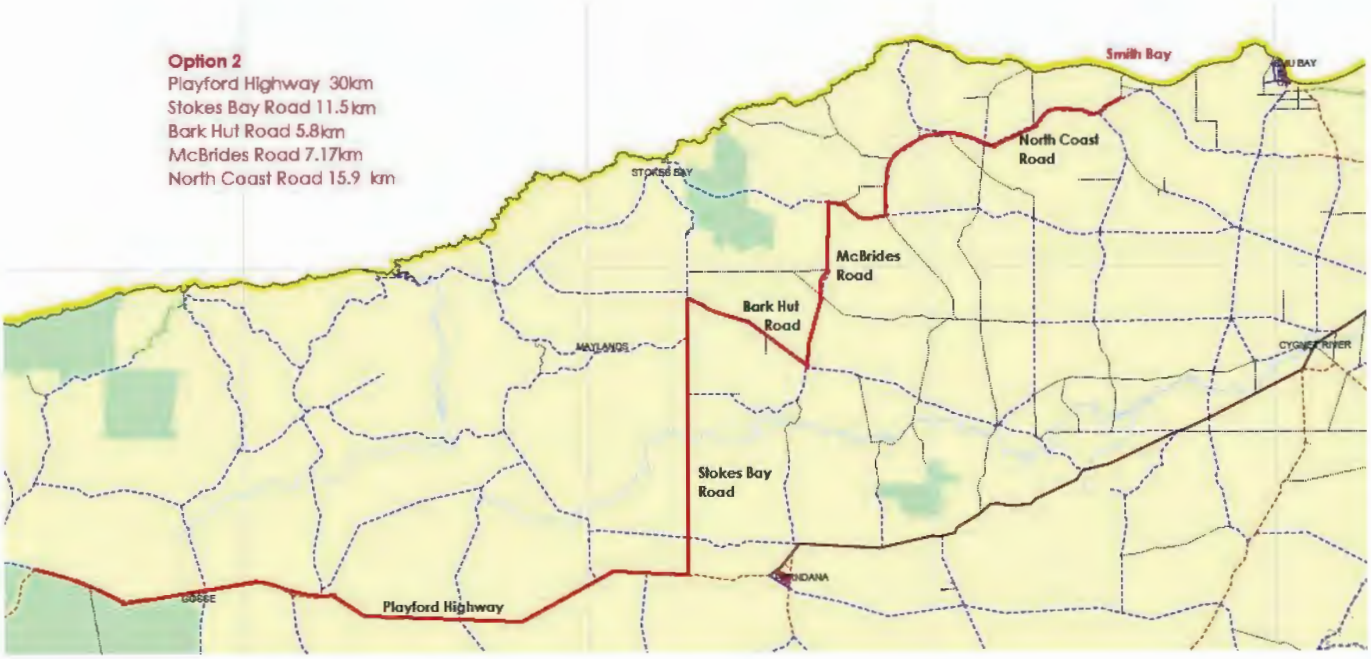
Kangaroo Island has relatively low traffic counts which increase significantly during the peak summer tourist season. The impact of approximately 90 heavy vehicle return trip movements per day will have an impact on other road users in the short to mid-term. Safety and impact on other road users is integral in the route assessments including overtaking provisions. As forestry trucks will be travelling at 80km or slower where required, it is important that safe overtaking opportunities are provided for where appropriate.

Traffic composition including current school bus routes, Regionally Significant Tourist, Community Access and Freight Roads[6] and locally significant freight routes have been included. Any conflict in traffic composition has been scored accordingly.

Crash history has also been reviewed (available on DPTI website). None of the crashes on the assessed roads resulted in personal injury, only property damage. With 2 exceptions of hitting wildlife, the other crashes were attributed to driver inattention. It must be noted that many crashes on Kangaroo Island are never reported, nor are the near misses. Incidents involving wildlife are numerous according to locals, with the majority having being involved at some time.

[6] Southern & Hills Local Government Association 2020 Transport Plan

4.1 **Option 2** – Playford Highway A, Stokes Bay Road, Bark Hut Road, McBrides Road, North Coast Road



4.1.1 Playford Highway A (30km assessed)

Playford Highway A for the purpose of this options assessment is from West Highway through to Stokes Bay Road. This assessed section of Playford Highway is under the care and control of Kangaroo Island Council.

Existing Road Conditions

Playford Highway A 1 – typical clearances

Sealed road 7m wide from West Highway intersection through to Ahwans Road and 6.0m – 6.5m wide through to Stokes Bay Road and is in good condition. There are some sections of the seal west of Mt Taylor road where stripping and delamination of the seal is evident. Based on the assessment, seal has been scored at 3 with pavement at 4. Playford Highway from Ahwans Road to Rowland Hill Highway is

scheduled for re-seal in 2021/22 in Kangaroo Island Council's Transport Infrastructure Asset Management Plan[7].

The shoulders are unsealed and range from 1.0 – 2.0m along the assessed length with clearance back at least 2m which has resulted in a score of 5 in the assessment criteria.

Playford Highway A 1 - typical condition and clearances

Geometry of the assessed length has good cross fall at an average of 3 – 4% and is predominantly at grade with some gradual rises and falls. Geometry has been scored 5 overall in the assessment with predominantly flat and straight sections of road with good cross fall and batter slopes.

Drainage& Bridges

The cross drains along the assessed length of Playford Highway are in good condition, 2m clear of the carriage way and suitable capacity to capture and distribute water run of. Drainage has been scored 5 overall in the assessment.

Roadside Native Vegetation

The Roadside vegetation is currently 2 – 3 m back from the carriageway along the majority of the assessed length of road. Pruning maintenance is required along sections of the assessed length to get the vegetation back 2m behind the white marker posts. Height clearance is good (3 – 4 m clearance) with vegetation being scored at 5 overall in the assessment criteria.

[7] www.kangarooislandcouncil.sa.gov.au

Right of Way & Intersections

Along the assessed length, there is one (1) non right of way intersection being

- Playford Highway A and Stokes Bay Road which is a right hand turn from Stokes Bay Road onto Playford Highway when heading away from Smith Bay.

The other intersections along the assessed length that are right of way to Playford Highway are

- Gosse Ritchie Road & North Coast Road (110km speed zone) which provides adequate Safe Intersection Site Distance (SIDS).
- Mt Taylor Road (110km speed zone) which provides adequate SIDS.
- Coopers Road (110km speed zone) which provides adequate SIDS.
- Harriet Road & Ahwans Road (110km speed zone) which provides adequate SIDS. Harriet Road services the Marron Farm which generates tourist traffic.
- Turkey Lane (110km speed zone) which provides adequate SIDS.
- McHughes Road (110km speed zone) which provides adequate SIDS.

Based on the assessment criteria, right of way has been scored as 5.

Playford Highway A 2 - Harriet Road intersection

The intersection that is non right of way will require widening to cater for heavy vehicle swept path and some vegetation removal, to enable the vehicle to turn without encroaching on the outgoing lane. It should be noted that SA Water main runs along the southern side of Playford

Highway (east of Turkey Lane) which will need to be considered when designing the intersection upgrade.

Based on the assessment criteria, intersections have been scored as 4.

Land Uses & Residential Access

Predominantly agricultural land with paddock accesses along with some residential driveways. There were no commercial driveways identified, however as previously stated the Marron Farm is on Harriet Road (intersects with Playford Highway) which generates tourist traffic and has been scored as 4 in the assessment criteria. Also noted is the Western Districts Sports Club that is west of Goss Ritchie Road that generates vehicle movements, predominantly on weekends and on Wednesdays (practice). Health Clinics and other community services are provided from the Sports Club.

Traffic & Safety

Playford Highway has a traffic count of 140 vpd[8] and Regionally Significant Tourist and Access Routes in the S&HLGA 2020 Transport Plan. There are no reported crashes along the assessed length of Playford Highway. The speed environment is 110km for the assessed length of Playford Highway with overtaking provisions along the assessed length.

The assessed length of Playford Highway is a school bus route. Based on the assessment criteria, an average of 3.6 has been scored.

Playford Highway A 3 - Mt Taylor Road intersection (looking west)

[8] Kangaroo Island Council Traffic Counts, Summer 2017

4.1.2 Stokes Bay Road (11.5km assessed)

Existing Road Conditions

Sealed road 6m wide between edge lines that is in very good condition. The carriageway width is just under 6m in some sections going down to 5.8, as such has been scored a 3.5 overall in the assessment criteria.

The shoulders are unsealed and range from 0.5 – 1.0 along the assessed length with clearance back at least 2m.There are several sections along the assessed length that have w-beam crash barriers installed that provides for a total width of 8m including unsealed shoulders which has resulted in a score of 4 overall in the assessment criteria.

Stokes Bay Road 1 - typical condition

The seal and pavement condition have both been scored at 5 overall in the assessment criteria.

Geometry of the assessed length has good cross fall at an average of 3 – 4% however there are sections of steep vertical grade, particularly over the bridge spanning the Cygnet River which also has a sharp transition from descent to incline. Geometry has been scored 2 overall in the assessment, predominantly due to the steep section associated with the bridge over the Cygnet River.

Drainage& Bridges

The cross drains along the assessed length of Stokes Bay Road are in good condition, 2m clear of the carriage way and suitable capacity to capture and distribute water run of. The exception to this is the 300 dia cross drain at the intersection with Playford Highway which will need to be upgraded along with the intersection should this route be adopted.

Stokes Bay Road 2 - bridge over Cygnet River

The bridge crossing the Cygnet River (at chainage 5.5 off Playford Highway) has a carriageway width of 5.9m (edge line to edge line) with unsealed shoulders of 1m and w-beam crash barriers installed to Australian Standards. The bridge has been scored at 4 in the assessment criteria however it must be noted that structural testing of this bridge is required should this route be adopted.

Roadside Native Vegetation

The Roadside vegetation is currently 2 – 3 m back from the carriageway along the majority of the assessed length of road. Pruning maintenance is required along the majority of the assessed length (approximately 9.5km) to get the vegetation back 2m behind the white marker posts. Height clearance is good (3 – 4 m clearance) with vegetation being scored at 4 overall in the assessment criteria.

Stokes Bay Road 3- roadside vegetation

Right of Way & Intersections

Along the assessed length, there are two (2) non right of way intersections being

- Stokes Bay Road & Bark Hut Road which is a right hand turn from Stokes Bay Road onto Bark Hut Road when heading towards Smith Bay.

- Stokes Bay Road & Playford Highway which is a right hand turn from Stokes Bay Road onto Playford Highway when heading away from Smith Bay.

The other intersections along the assessed length that are right of way to Stokes Bay Road are

Stokes Bay Road 4 - intersection with Weatheralls & Morgans Roads

- Weatheralls & Morgans Roads (staggered intersection) which provides adequate Safe Intersection Site Distance (SIDS).
- Pioneer Bend Road which provides adequate SIDS.

Based on the assessment criteria, right of way has been scored as 5.

Both of the intersections that are non right of way will require widening to cater for heavy vehicle swept path and some vegetation removal, particularly at the intersection of Playford Highway and Stokes Bay Road where a deceleration lane on Playford Highway to enable the vehicle to turn without encroaching on the outgoing lane. Note that there is a power pole on the western side of the intersection of Playford Highway which needs to be considered when designing an upgrade.

Stokes Bay Road 5 - intersection with Playford Highway

intersection with Bark Hut Road

Based on the assessment criteria, intersections have been scored as 4.

Land Uses & Residential Access

Predominantly agricultural land with paddock accesses along with some residential driveways. No commercial driveways were identified during the assessments however it is noted that the Stokes Bay Hall is on the intersection of Stokes Bay Road and Bark Hut Road and has been scored as 3.5 in the assessment criteria.

Traffic & Safety

Stokes Bay Road has a traffic count of 150 vpd[9], particularly in the summer peak tourist season and is a Regionally Significant Tourist Route in the Southern & Hills LGA 2020 Transport Plan. There is some crash history along the assessed length with a motorbike rider leaving the road (rider inattention) which resulted in two (2) injuries[10].

The speed environment is 100km/hr and there are overtaking provisions along the assessed length. However it should be noted that the descent and rise over the bridge at Cygnet River will require laden heavy vehicles to use low gear with no opportunity for overtaking for vehicles behind.

Currently Stokes Bay Road is a School Bus route and as previously noted is a tourist route. Based on the assessment criteria, an average of 2.2 has been scored.

[9] Kangaroo Island Council Traffic Count Summer 2017
[10] www.data.sa.gov.au/data/dataset/road-crash-data

4.1.3 Bark Hut Road (5.8km assessed)

Existing Road Conditions

Unsealed road 7m that is in very good condition. The shoulders are generally 0.5m along the assessed length with clearance back at least 2m up to 3m. There is one section along the assessed length that has w-beam crash barriers installed on a bridge that provides for a total width of 8m including shoulders which has resulted in a score of 4 overall in the assessment criteria.

Bark Hut Road 1 - typical condition

The surface and pavement condition have both been scored at 5 overall in the assessment criteria.

Geometry of the assessed length has good cross fall at 6% with gradual vertical grades however there are some sections where the batter slopes are steeper than 1 in 3 which has resulted in an overall score of 4 in the assessment criteria.

Bark Hut Road 2 - bridge crossing

Drainage& Bridges

The cross drains along the assessed length of Bark Hut Road are in good condition, 1m clear of the carriage way and suitable capacity to capture and distribute water run of. During assessments after periods of heavy rainfall, it was noted that there are a couple of sections that are holding water which could be corrected by clearing the

table drains of built up material.

Bark Hut Road has four (4) bridges with one (1) positioned on the assessed length. This bridge has an 8m width and new b-beam crash barriers. The bridge is relatively low lying (descent and rise) with a bend limiting line of sight on the eastern side of the road. The bridge has been scored 4 in the assessment criteria due to the low lying nature of the bridge which will require structural testing and hydrological capacity assessment should this route be adopted.

Roadside Native Vegetation

The Roadside vegetation is currently 2 – 3 m back from the carriageway along the majority of the assessed length of road. Some overhead clearance is required along with some tree removal near the bridge at the bend in the road on the rise leaving the bridge to improve line of sight. Vegetation has been scored at 3.5 overall in the assessment criteria.

Right of Way & Intersections

Along the assessed length, there are two (2) non right of way intersections being

Bark Hut Road 3 - intersection with McBrides

- Stokes Bay Road & Bark Hut Road which is a right hand turn from Stokes Bay Road onto Bark Hut Road when heading towards Smith Bay.
- Bark Hut Road & McBrides Road which is a right hand turn when heading away from Smith Bay.

The other intersections along the assessed length that are right of way to Bark Hut Road are

- Pioneer Bend Road which provides adequate Safe Intersection Site Distance (SIDS).

Based on the assessment criteria, right of way has been scored as 5.

Both of the intersections that are non right of way will require widening to cater for heavy vehicle swept path and some vegetation removal, particularly at the intersection of Bark Hut Road and McBrides Road.

Based on the assessment criteria, intersections have been scored as 4.

Land Uses & Residential Access

Predominantly agricultural land with paddock accesses along with timber plantations along portion of the southern side of the assessed route. No commercial driveways were identified during the assessments and has been scored as 4 in the assessment criteria.

Traffic & Safety

Bark Hut Road has a traffic count of 55 vpd in 2013[11]. As the road has recently been upgraded it is assumed that vehicle counts will increase. This road is also a local freight route that trucks use to access the north/western area of the island. There is some crash history along the assessed length however these did not result in injury and were attributed to driver inattention. One driver hit a fixed object after navigating a curve in the road with no injuries and another rolled the vehicle on a straight section of the road with no injuries. Both happened during daylight hours in dry weather[12].

The speed environment is 100km/hr with some overtaking provisions along the assessed length.

Currently that end of Bark Hut Road is not a School Bus route however as previously noted is a local freight route. Based on the assessment criteria, an average of 3 has been scored

[11] Kangaroo Island Council Traffic Counts, Winter 2013 (count was 59 vpd in Autumn 2012)
[12] [12] www.data.sa.gov.au/data/dataset/road-crash-data

4.1.4 McBrides Road (7.17km assessed)

Existing Road Conditions

An unsealed, low classification road in poor condition. It is known that McBrides Road is often closed to non local traffic during winter due to hazardous conditions as it is not an all weather road. The carriageway width varies from 5.5m down to 3.6m and as such has been scored a 1.5 overall in the assessment criteria.

McBrides Road 1 - typical condition (poor)

The shoulders are predominantly non existent along the assessed length with clearance only 0.5 – 2m resulting in a score of 1 overall in the assessment criteria.

The surface and pavement condition have both been scored at 1.5 overall in the assessment criteria.

Geometry of the assessed length has poor cross fall at an average of 1 – 2 with sections of steep vertical grade. Geometry has been scored 2 overall in the assessment, predominantly due to some steep sections.

Drainage& Bridges

The cross drains along the assessed length of McBrides Road are under capacity and in poor condition. There are multiple creek/water way crossings that would require the road to be raised/built up

McBrides Road 2 - insufficient drainage

and cross drain capacity increased. There are no bridges on McBrides Road.

Due to the multiple drainage issues, Drainage has been scored as 2 overall in the assessment criteria.

Roadside Native Vegetation

The Roadside vegetation currently abuts some of the narrow carriageway, with vegetation removal required if the road is upgraded. Based on the assessment, Vegetation has been scored as 2 in the assessment criteria.

McBrides Road 3 - roadside vegetation

Right of Way & Intersections

Along the assessed length, there are two (2) non right of way intersections being

- McBrides and North Coast Road which is a right hand turn from McBrides Road onto North Coast Road when heading towards Smith Bay.
- McBrides & Bark Hut Road which is a right hand turn from McBrides Road onto Bark Hut Road when heading away from Smith Bay.

There are no other intersections along the length of McBrides Road

Based on the assessment criteria, right of way has been scored as 5.

Both of the intersections that are non right of way will require widening to cater for heavy vehicle swept path and some vegetation removal, particularly at the intersection of Bark Hut Road and McBrides Road,a 55 degree turn, which will require widening of Bark Hut Road to allow for heavy vehicle swept path.

Based on the assessment criteria, intersections have been scored as 3.5.

Land Uses & Residential Access

McBrides Road 4 - timber plantation

All agricultural land with paddock accesses only, no residential driveways. There is also a timber plantation approximately 1.6km from Bark Hut Road with a score of 5 in in the assessment criteria.

Traffic & Safety

McBrides road has a traffic count of less than 10 vpd with no crash history reported. The speed environment is 100km/hr however it is noted that due to the current condition of the road that speed at which vehicles actually travel is around 80km/hr. Due to the narrow carriageway and encroaching roadside vegetation, currently it is considered that there are no safe overtaking provisions.

McBrides Road is not a School Bus route and as previously noted has only paddock/farmland access (no residences). Based on the assessment criteria, an average of 4 has been scored

4.1.5 North Coast Road (15.9km assessed)

Existing Road Conditions

An unsealed road 8m wide that is in good condition with minor maintenance required along some sections and has been scored 5 overall in the assessment criteria.

The shoulders around 0.5 along the assessed length with clearance back 1 - 2m. Vegetation pruning/maintenance will improve the clearance to achieve 2m behind the white posts. As such a score of 4 has been assigned in the assessment criteria.

North Coast Road 1 - typical condition

The surface and pavement condition have both been scored at a combined average of 4.5, reflecting minor maintenance requirements to some sections of the wearing surface.

Geometry of the assessed length has good cross fall at an average of –4% with some sections of steep vertical grade past Rose Cottage Road heading towards Smith Bay. The assessed length of North Coast Road has several winding sections where vegetation would need to be cut back/removed to improve line of site. Geometry has been scored 3.5 overall in the assessment, predominantly due to the steep section associated with the bridge heading towards Smith Bay and some of the winding sections.

Drainage& Bridges

The cross drains along the assessed length of North Coast Road are in good condition, 1 - 2m clear of the carriage way and suitable capacity to capture and distribute water run of.

North Coast Road 2 – approaching bridge

There is a bridge crossing (at chainage 14.8 off McBrides Road, east of the intersection with Rose Cottage Road) has a carriageway width of 7.1m which is considered narrow and w-beam crash barriers installed to Australian Standards. Due to the narrow carriageway, the bridge has been scored at 3 in the assessment criteria and it must be noted that structural testing of this bridge is required should this route be adopted. Options for widening to allow for heavy vehicle to safely pass each other on the bridge should also be investigated.

Roadside Native Vegetation

The Roadside vegetation is currently 1 – 2 m back from the carriageway along the majority of the assessed length of road. Pruning maintenance is required along approximately 65% of the assessed length to get the vegetation back 2m behind the white marker posts. Height clearance is good (3 – 4 m clearance) with vegetation being scored at 3.5 overall in the assessment criteria due to the potential requirement for cutting back/removal around corners and removal at the intersection with Smith Bay access road to facilitate upgrade of that intersection.

Right of Way & Intersections

Along the assessed length, there are two (2) non right of way intersections being

- McBrides Road and North Coast Road which is a right hand turn from McBrides Road onto North Coast Road when heading towards Smith Bay.
- Smith Bay access road & North Coast Road which is a right hand turn when heading away from Smith Bay.

The other intersections along the assessed length that are right of way to North Coast Road are

- Springs Road which is just under adequate Safe Intersection Site Distance (SIDS) due to the rise in the road heading towards Smith Bay. Advance warning signage is installed.
- Hummoky Road which provides adequate SIDS.
- Cassini Road which provides adequate SIDS.
- Rose Cottage Road which provides adequate SIDS.

Based on the assessment criteria, right of way has been scored as 4.5.

Both of the intersections that are non right of way will require widening to cater for heavy vehicle swept path and some vegetation removal, particularly at the intersection of North Coast Road and Smith Bay access road where a deceleration lane on North Coast Road to enable the vehicle to turn without encroaching on the outgoing lane will be required. .

North Coast Road 3 - approach to Smith Bay access (vegetation removal required for intersection upgrade)

Based on the assessment criteria, intersections have been scored as 3.5.

Land Uses & Residential Access

Predominantly agricultural land with paddock accesses along with multiple residential driveways along the length of the assessed length. No commercial driveways were identified during the assessments and has been scored as 3 in the assessment criteria.

Traffic & Safety

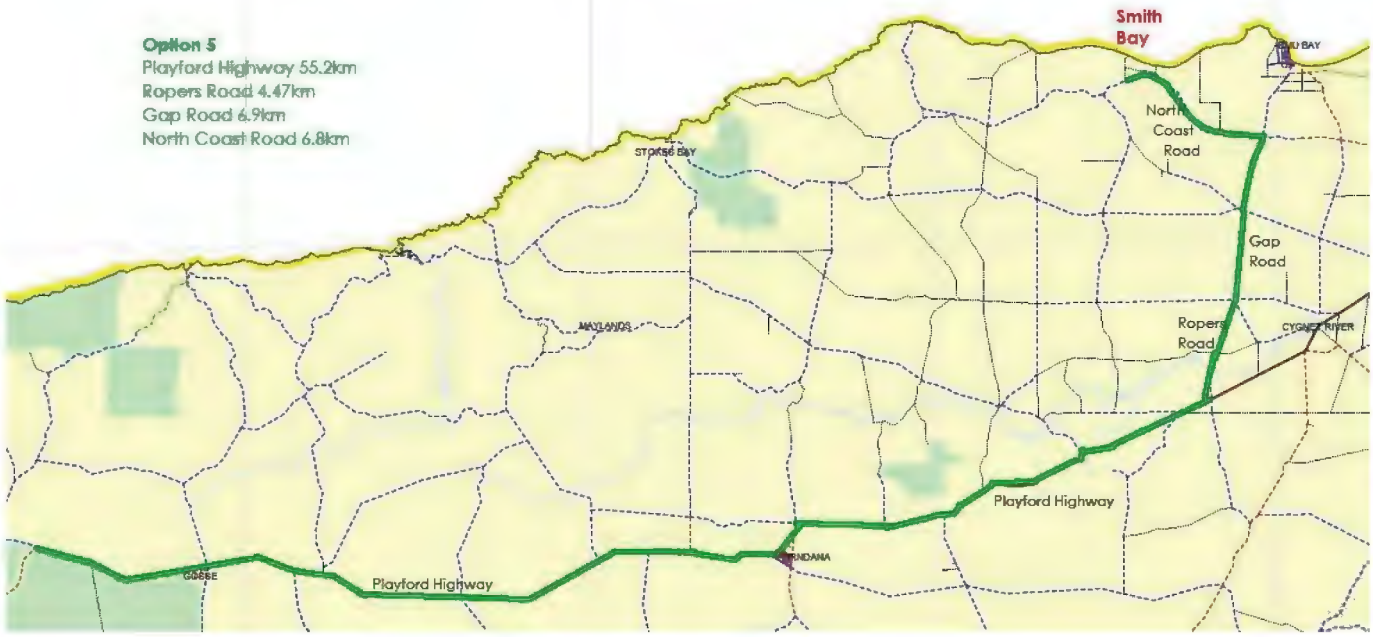
North Coast Road has a traffic count of 160 vpd[13], particularly in the summer peak tourist season and is a Regionally Significant Tourist Route in the Southern & Hills LGA 2020 Transport Plan. There is some crash history along the assessed length however these did not result in injury and were attributed to wildlife and driver inattention.

The speed environment is 100km/hr and there are some overtaking provisions along the assessed length. However it should be noted that due to the winding nature of some sections of the assessed road length, that overtaking cannot be undertaken safely along these sections.

Currently the assessed section of North Coast Road is not a School Bus route however as previously noted is a tourist route. Based on the assessment criteria, an average of 3.3 has been scored.

[13] Kangaroo Island Council Traffic Counts, Summer 2017

4.2 **Option 5** – Playford Highway, Ropers Road, Gap Road and North Coast Road



4.2.1 Playford Highway (25.2km assessed)

Playford Highway is under Department of Planning, Transport & Infrastructure (DPTI) from the intersection with Birchmore Road through to Parndana and under Kangaroo Island Council's care and control west of Parndana.

Existing Road Conditions

Playford Highway 2 – Council controlled section (west of Parndana)

Sealed road 6m wide from Stokes Bay Road intersection through to Parndana and 6.5m wide from Parndana through to Ropers Road and is in good condition. The carriageway does have some variation from the descent towards Bark Hut Road (travelling east) through to Ropers Road, going down to 6m east of the intersection with Bark Hut Road and as such has been scored a 4 overall in the assessment criteria.

The shoulders are unsealed and range from 1.0 – 2.0m along the assessed length with clearance back at least 2m. East of Parndana the shoulders are sealed 0.5 for the first 10km east of Parndana which then reduces to no edge lines with edge breaks evident along sections of the assessed length which has resulted in a score of 4 in the assessment criteria.

Playford Highway 3 – DPTI controlled section (east of Parndana)

The seal and pavement condition have both been scored at 4 overall in the assessment criteria. There is some evidence of sections of the pavement beginning to fail where developing wheel ruts on the sealed road are holding water, delamination and edgebreaks.

Geometry of the assessed length has good cross fall at an average of 3 – 4% however there is a steep descent (Kohinoor Hill) with a bend in the road that intersects with Bark Hut Road. Geometry has been scored 3 overall in the assessment, predominantly due to the steep section known as Kohinoor Hill.

Playford Highway 4 - evidence of seal delaminating

Drainage& Bridges

The cross drains along the assessed length of Playford Highway are in good condition, 2m clear of the carriage way and suitable capacity to capture and distribute water run of. The only area of concern is the length of road east of Bark Hut Road that can become inundated in very heavy, prolonged rain events. Based on that scenario, Drainage has been scored 4 overall in the assessment.

Playford Highway 5 – section east of Bark Hut Road intersection subject to inundation during prolonged, heavy rain events.

Roadside Native Vegetation

The Roadside vegetation is currently 2 – 3 m back from the carriageway along the majority of the assessed length of road. Pruning maintenance is required along the majority of the assessed length to get the vegetation back 2m behind the white marker posts. Height clearance is good (3 – 4 m clearance) with vegetation being scored at 4 overall in the assessment criteria.

Right of Way & Intersections

Along the assessed length, there is one (1) non right of way intersection being

- Ropers Road & Playford Highway which is a right hand turn from Ropers Road onto Playford Highway when heading away from Smith Bay.

The other intersections along the assessed length that are right of way to Playford Highway are

- Rowland Hill Highway (110km speed zone) which provides adequate Safe Intersection Site Distance (SIDS).
- Smith & Jones Streets, Parndana (80km speed zone) which provides adequate SIDS.
- Wedgewood Road (80km speed zone) which provides adequate SIDS.
- Timber Creek Road provides adequate SIDS.
- Bark Hut Road does not provide adequate SIDS when travelling east due to steep descent and intersection being of the edge of a bend in the road. Advance warning signs have been installed as an additional measure.
- Branch Creek Road does not provide adequate SIDS when travelling east due to the vegetation and intersection alignment (65 degree turn off Playford when travelling east). Advance warning signs have been installed as an additional measure.
- Margaries Road provides adequate SIDS.

Based on the assessment criteria, right of way has been scored as 4.

The intersection that is non right of way will require widening to cater for heavy vehicle swept path and some vegetation removal, to enable the vehicle to turn without encroaching on the outgoing lane. It should be noted that SA Water main runs along the southern side of Playford Highway which will need to be considered when designing the intersection upgrade.

Based on the assessment criteria, intersections have been scored as 4.

Playford Highway 6 - typical condition

Land Uses & Residential Access

Predominantly agricultural land with paddock accesses along with some residential driveways. There was one commercial driveway identified and has been scored as 3.5 in the assessment criteria.

The length of road assessed abuts the township of Parndana (speed limit reduced to 80km for that section). There are SA Ambulance and CFS despatches from that location servicing the central and western end of Kangaroo Island.

The commercial driveway identified services the Parndana Wildlife Park which is a popular attraction generating tourist and local traffic.

The balance of the assessed length contains a mix of agricultural land with paddock access and residential driveways. Due to the Highway abutting the township of Parndana, the commercial driveway and number of residential driveways (20 counted with rural road numbers along assessed length) Land Uses and Residential Access has been scored 2 overall.

Traffic & Safety

Playford Highway has a traffic count of over 200 vpd and is a Gazetted B-Double Route (23m) from east of Parndana (DPTI Major Freight Road), Regionally Significant Tourist and Access Routes in the S&HLGA 2020 Transport Plan . There is some crash history along the assessed length with one reported crash resulting in a casualty and serious injury. That accident occurred near Ropers Road intersection where a vehicle failed to keep left resulting in a head on crash. Another crash occurred at the Parndana township where a vehicle leaving Smith Street failed to give way (no injuries). Another occurred at a T-Junction (Mellvelle Track) where two vehicles were following too closely when one hit an animal which resulted in five (5) casualties[14].

The speed environment is 100km down to 80km through Parndana then up to 110km west of Parndana with overtaking provisions along the assessed length.

Currently Playford Highway has two (2) School Bus routes and as previously noted is DPTI Major Freight Road and Regionally Significant Tourist and Access Routes. Based on the assessment criteria, an average of 2.3 has been scored.

[14] [14] www.data.sa.gov.au/data/dataset/road-crash-data

4.2.2 Ropers Road (4.47km assessed)

Existing Road Conditions

An unsealed road in fair to poor condition. The carriageway width varies from 5.5m down to 3.3m and as such has been scored a 2 overall in the assessment criteria.

Ropers Road 1 – typical standard (200m off Playford Highway)

The shoulders are 0.5 along the majority of the road with the exception of the 600m through the Cygnet River floodway up to the single lane bridge that is narrow, low lying (floods) with no shoulders resulting in a score of 2.5 overall in the assessment criteria.

The surface and pavement condition have both been scored at 2.5 overall in the assessment criteria.

Geometry of the assessed length has cross fall at an average of 2 – 3 with sections of moderate vertical grade. Geometry has been scored 3 overall in the assessment, predominantly due to the section through the Cygnet River floodway.

Ropers Road 2 - approaching floodway section that would require to be built up with substantial tree removal

Drainage& Bridges

The cross drains along the assessed length of Ropers Road are under capacity and in fair to poor condition. The major issue identified is the length of road abutting the Cygnet River that is prone to annual flooding along that would need to be built up some 1.5 – 2m,

batters would be 2 – 3 m for a 9m wide carriageway resulting in a 15m + working envelope vegetation clearance. This is deemed a significant Water Affecting Activity that will require NRM Board approval. There are other sections crossing minor creek/water ways that would require the road to be raised/built up and cross drain capacity increased. There are also several roadside dams identified that cause potential flooding issues.

Ropers Road 3 - single lane bridge spanning Cygnet River

There is a single lane bridge (3.2m wide) with the original crash barriers that are not to current Australian Standards. There are old timber bridge pylons situated to the east of the current bridge. The existing bridge would either have to be widened, or a new double lane bridge constructed.

Due to the multiple drainage issues and single lane bridge constraint, Drainage & Bridges has been scored as 1 overall in the assessment criteria.

Roadside Native Vegetation

The Roadside vegetation currently abuts some of the narrow carriageway, with vegetation removal (large gum trees) required if the road is upgraded. Based on the assessment, Vegetation has been scored as 1.5 in the assessment criteria.

Ropers Road 4 - narrow section that would require significant tree removal

Right of Way & Intersections

Along the assessed length, there are two (2) non right of way intersections being

- Ropers Road intersection with Gum Creek Road, Duck Lagoon Road and Gap Road (5 way intersection).
- Ropers Road intersection with Playford Highway which is a right hand turn from Ropers Road onto Playford Highway when heading away from Smith Bay.

Based on the assessment criteria, right of way has been scored as 5.

Both of the intersections that are non right of way will require upgrade works. The 5 way intersection with Gum Creek Road will require re-alignment as Duck Lagoon Road is blind to vehicles travelling along Ropers Road. The intersection with Playford Highway is likely to require a deceleration lane to enable the vehicle to turn without encroaching on the outgoing lane.

Ropers Road 5 - 5 way intersection that would require reconfiguration and upgrade

Based on the assessment criteria, intersections have been scored as 2.5.

Land Uses & Residential Access

Predominantly agricultural land with paddock accesses along with several residential driveways along the length of the assessed length. No commercial driveways were identified during the assessments and has been scored as 3 in the assessment criteria.

Traffic & Safety

Ropers Road has a traffic count of 33 vpd[15] with no crash history reported. The speed environment is 100km/hr however it is noted that through the narrow section of the road vehicles actually travel at around 80km/hr. Through the narrow section there are no safe overtaking provisions, however there along the strait, flat sections at either end.

Ropers Road is not a School Bus route and there are no reported crashes. Based on the assessment criteria, an average of 4 has been scored.

[15] Kangaroo Island Council Traffic Count, Spring 2012

4.2.3 Gap Road (6.9km assessed)

Existing Road Conditions

An unsealed, low class road in fair condition. The carriageway width varies from 6.5m down to 4.8m and as such has been scored a 3 overall in the assessment criteria.

The shoulders are 0.0 – 0.5 along the assessed length with clearance only 1 – 2m resulting in a score of 3.5 overall in the assessment criteria.

The surface and pavement condition have both been scored at 2 and 2.5 respectively in the assessment criteria. It is noted that Council have recent patched sections between Gum Creek and Springs Roads and that re-sheeting of that same section is programmed for 2017/18 Financial Year.

Geometry of the assessed length has poor cross fall at an average of 1 – 2 % with several sections that dip where waterways/creeks cross (see Drainage for further details). Generally the rises and falls of the grades are gradual resulting in an overall score of 3.

Gap Road 1 - typical condition

Drainage& Bridges

The cross drains along the assessed length of Gap Road are generally under capacity and require maintenance, including extension. There are several creek/water way crossings that would require the road to be raised/built up and cross drain capacity increased. These drains range from 1200mm with several 600mm demonstrating the catchments and drainage requirements in the area. There is a 4 x 600dia creek crossing that is just under the classification of a bridge (7m or greater span) that would require upgrade subject to hydrological assessment.

Due to the multiple drainage issues, Drainage has been scored as 2 overall in the assessment criteria.

Roadside Native Vegetation

The Roadside vegetation currently abuts some of the narrow carriageway, with vegetation removal required if the road is upgraded. Councils current Roadside Vegetation Management Plan has Gap Road identified with Category A vegetation (to be confirmed) and as such Vegetation has been scored as 2 in the assessment criteria.

Right of Way & Intersections

Along the assessed length, there are two (2) non right of way intersections being

- Gap Road and Springs Road which is Give Way to Springs Road for travel in both directions (towards and away from Smith Bay).
- Gap Road & North Coast Road which is a right hand turn from North Coast Road onto Gap Road when heading away from Smith Bay.

The intersection with Gum Creek, Ropers and Duck Lagoon Road was noted and scored accordingly against Ropers Road assessment.

Based on the assessment criteria, right of way has been scored as 4.

The intersection of Gap with North Coast Road will require widening to cater for heavy vehicle swept path and some vegetation removal. The intersection with Springs Road will require to be built up (Gap Road dips at the intersection) along with vegetation removal. The line of

sight on Gap Road looking east on Springs Road heading towards Smith Bay is obscured by a bend in the road and vertical grade with vegetation requiring removal.

Based on the assessment criteria, intersections have been scored as 3.

Land Uses & Residential Access

Predominantly agricultural land with paddock accesses along with several, residential driveways along the length of the assessed length. No commercial driveways were identified during the assessments and has been scored as 3 in the assessment criteria.

Gap Road 2 - typical standard between Springs Road and North Coast Road

Traffic & Safety

Ropers Road has a traffic count of 46 vpd[16] with no crash history reported. The speed environment is 100km/hr however it is noted that through the narrow section of the road vehicles actually travel at around 80km/hr. Through the narrow section there are no safe overtaking provisions, however there along the strait, flat sections at either end.

Ropers Road is not a School Bus route however there is a reported crash (no injuries, driver inattention). Based on the assessment criteria, an average of 3.6 has been scored

[16] Kangaroo Island Council Traffic Count Spring 2015

4.2.4 North Coast Road (6.8km assessed)

Existing Road Conditions

An unsealed road 7m wide that is in good condition and has been scored 5 overall in the assessment criteria.

The shoulders around 0.5 along the assessed length with clearance back 2 - 3m. Vegetation pruning/maintenance will improve the line of sight for curves and bends in the road. As such a score of 5 has been assigned in the assessment criteria.

North Coast Road 4 - typical condition

The surface and pavement condition have both been scored at a combined average of 4.5, reflecting minor maintenance requirements to some sections of the wearing surface.

Geometry of the assessed length has good cross fall at an average of 5% with gradual vertical. The assessed length of North Coast Road has several winding sections where vegetation would need to be cut back/removed to improve line of site. Geometry has been scored 4 overall in the assessment, predominantly due to the winding sections.

Drainage& Bridges

The cross drains along the assessed length of North Coast Road are in good condition, 1 - 2m clear of the carriage way and suitable capacity to capture and distribute water run of.

There are no bridges along this section of North Coast Road, FORDS or roadside dams and as such Drainage & Bridges has been scored 5.

Roadside Native Vegetation

The Roadside vegetation is currently 1 – 2 m back from the carriageway along the majority of the assessed length of road. Pruning maintenance is required for corners and bends to improve line of sight.

Height clearance is good (3 – 4 m clearance) with vegetation being scored at 4 overall in the assessment criteria.

Right of Way & Intersections

Along the assessed length, there are two (2) non right of way intersections being

- North Coast Road and Smith Bay access road which is a right hand turn from North Coast Road onto the Smith Bay access road when heading towards Smith Bay.
- North Coast Road & Gap Road which is a right hand turn when heading away from Smith Bay.

The no other intersections along the assessed length of North Coast Road. Based on the assessment criteria, intersections have been scored as 4.

North Coast Road 5 - intersection with Gap Road

Land Uses & Residential Access

Predominantly agricultural land with paddock accesses along with multiple residential driveways along the length of the assessed length. Two (2) commercial driveways were identified during the assessments (Willsons Quarry and Abalone Farm) and has been scored as 3 in the assessment criteria.

Traffic & Safety

North Coast Road has a traffic count of 160 vpd[17], particularly in the summer peak tourist season and is a Regionally Significant Tourist Route in the Southern & Hills LGA 2020 Transport Plan. There is some crash

[17] Kangaroo Island Council Traffic Count Summer 2017

history along the assessed length however these did not result in injury and were attributed to driver inattention.

The speed environment is 100km/hr and there are some overtaking provisions along the assessed length. However it should be noted that due to the winding nature of some sections of the assessed road length, that overtaking cannot be undertaken safely along these sections.

Part of the assessed section of North Coast Road is a School Bus route and as previously noted is a Regionally Significant Tourist route. Based on the assessment criteria, an average of 2 has been scored.

4.3 **Option 6** – Playford Highway A, Stokes Bay Road, Bark Hut Road, McBrides Road, North Coast Road, Springs Road, North Coast Road & North Coast Road.

As Option 6 is a variation of Option 2 with the inclusion of Springs Road and Rose Cottage Road as a 'bypass' to North Coast Road, the following assessment is for Springs and Rose Cottage Roads only with the summary reflecting the entire route (based on the assessment of Option 2).

4.3.1 Springs Road (9.5km assessed)

Existing Road Conditions

Unsealed road 7m that is in very good condition. The shoulders are generally 0.5m along the assessed length with clearance back at least 2m up to 3m which has resulted in a score of 5 overall in the assessment criteria.

Springs Road 1 – at Woodlana looking east

The surface and pavement condition have both been scored at 5 overall in the assessment criteria.

Geometry of the assessed length has good cross fall at 6% with gradual vertical

grades however there is one section near the Millers Road intersection which is steep and winding which has resulted in an overall score of 3.5 in the assessment criteria.

Drainage& Bridges

The cross drains along the assessed length of Springs Road are in good condition, 1m clear of the carriage way and suitable capacity to capture and distribute water run-off. There are no bridges along Springs Road which has resulted in a score of 5 in the assessment criteria.

Roadside Native Vegetation

The Roadside vegetation is currently 2 – 3 m back from the carriageway along the majority of the assessed length of road. Some overhead clearance is required along with some tree removal around some corners to improve line of sight. Vegetation has been scored at 3.5 overall in the assessment criteria.

Springs Road 2 – vegetation that needs to be cut back

Right of Way & Intersections

Along the assessed length, there are two (2) non right of way intersections being:-

- North Coast Road and Springs Road which is a right hand turn from North Coast Road onto Springs Road when heading towards Smith Bay.
- Rose Cottage Road and Springs Road which is a right hand turn when heading away from Smith Bay.

The other intersections along the assessed length that are right of way to Springs Road are:-

- Millers Road which is marginally short of adequate Safe Intersection Site Distance (SIDS). When heading towards Smith Bay, the approach to the Millers Road intersection is a relatively steep descent that has a couple of curves, limiting line of sight and the ability to pull up a heavy vehicle impacted.

Springs Road 4 – intersection with Rose Cottage Road

Based on the assessment criteria, right of way has been scored as 4.

Both of the intersections that are non right of way will require widening to cater for heavy vehicle swept path and some vegetation removal, particularly at the intersection of Springs and Rose Cottage Road.

Based on the assessment criteria, intersections have been scored as 4.

Land Uses & Residential Access

Predominantly agricultural land with paddock accesses along with multiple residential accesses. No commercial driveways were identified during the assessments however it should be noted that Springs Road dissects Woodlana Station where livestock is often moved along and across the road. Land Uses has been scored as 3 in the assessment criteria.

Traffic & Safety

Springs Road has a traffic count of 129[18] vpd. As the road has recently been upgraded it is assumed that vehicle counts have increased. There is no crash history along the assessed length however is a School Bus route.

The speed environment is 100km/hr with some overtaking provisions along the assessed length. Based on the assessment criteria, an average of 3.6 has been scored

[18] Kangaroo Island Council Traffic Count Spring 2016

4.3.2 Rose Cottage Road (5.5 km assessed)

Existing Road Conditions

An unsealed, class road in fair to poor condition. The carriageway width varies from 6m down to 4.2m and as such has been scored a 2 overall in the assessment criteria.

The shoulders are predominantly non existent along the assessed length with clearance only 0.5 – 1m resulting in a score of 1 overall in the assessment criteria.

Rose Cottage Road 1 – typical condition

The surface and pavement condition have both been scored at 2 overall in the assessment criteria.

Geometry of the assessed length has poor cross fall at an average of 1 – 2 with sections of steep vertical grade towards the North Coast Road end. Geometry has been scored 3 overall in the assessment, predominantly the terrain at the North Coast Road end.

Drainage& Bridges

The cross drains along the assessed length of Rose Cottage Road are under capacity and in relatively poor condition. There are multiple creek/water way crossings that would require the road to be raised/built up and cross drain capacity increased. There are no bridges on Rose Cottage Road.

Rose Cottage Road 2 – existing FORD that would need to be upgraded

Due to the multiple drainage issues, Drainage has been scored as 2 overall in the assessment criteria.

Roadside Native Vegetation

The Roadside vegetation currently abuts some of the narrow carriageway, with vegetation removal required if the road is upgraded.

The intersection with North Coast Road is a Glossy Black habitat (endangered species) as identified by DEWNR. Vegetation removal for road and intersection upgrades is not recommended.

Based on the assessment, Vegetation has been scored as 1 in the assessment criteria.

Right of Way & Intersections

Along the assessed length, there are two (2) non right of way intersections being

- Rose Cottage and North Coast Road which is a right hand turn from Rose Cottage Road onto North Coast Road when heading towards Smith Bay.
- Rose Cottage Road and Springs Road which is a right hand turn from Rose Cottage Road onto Springs Road when heading away from Smith Bay.

Rose Cottage Road 3 – approach to intersection with North Coast Road

There are no other intersections along the length of Rose Cottage Road

Based on the assessment criteria, right of way has been scored as 5.

Both of the intersections that are non-right of way will require widening to cater for heavy vehicle swept path and some vegetation removal. The intersection with North Coast Road is steep on the approach and

meets with North Coast Road on a dip of a bend with insufficient line of sight. The intersection would need to be raised considerably but would still have limited line of sight onto North Coast Road. There is a creek crossing (FORD) 80 back from the intersection that would have to be raised and upgraded to enable laden heavy vehicles to pull up and stop safely at the intersection. The extent of works required for an intersection upgrade would impact on Glossy Black habitat and is not recommended.

Based on the assessment criteria, intersections have been scored as 1.

Land Uses & Residential Access

All agricultural land with paddock access with several residential driveways. No commercial activity was identified during the assessment and as such has a score of 4 in in the assessment criteria.

Traffic & Safety

Rose Cottage Road has a traffic count of less than 10 vpd with no crash history reported. The speed environment is 100km/hr however it is noted that due to the current condition of the road that speed at which vehicles actually travel is around 80km/hr. Due to the narrow carriageway and encroaching roadside vegetation, currently it is considered that there are no safe overtaking provisions.

Rose Cottage Road is not a School Bus route and as previously noted has several FORD crossings that reduce the speed vehicles generally travel. Based on the assessment criteria, an average of 3.6 has been scored

5.0 Summary of Assessments

5.1 Evaluation Framework (Assessment Criteria)

The assessed routes using the evaluation framework have resulted in the following outcome (in order)

Route Option	Average Weighted Score
Option 2 Playford Highway A, Stokes Bay Road, Bark Hut Road, McBrides Road and North Coast Road	75.80
Option 5 Playford Highway A & B, Ropers Road, Gap Road & North Coast Road	68.63
Option 6 Playford Highway A, Stokes Bay Road, Bark Hut Road, McBrides Road, North Coast Road, Springs Road & Rose Cottage Road	71.81

Please refer to **Appendix B** for further details on the assessment criteria results.

A summary of the advantages and disadvantages identified during the assessments is as follows:-

Route Option	Advantages	Disadvantages
Option 2	- Existing, year round / all-weather access over the Cygnet River - There are four (4) plantations on Bark Hut Road and one (1) on McBrides Road. - No residential access on McBrides Road - Least amount of upgrade requirements ($).	- High volumes of tourist traffic on Stokes Bay and North Coast Roads (Regionally Significant Tourist Routes). - Steep terrain over Cygnet River on Stokes Bay Road. - School bus route on Stokes Bay Road
Option 6	As per above, plus - Minimises travel distance on North Coast Road (Regionally Significant Tourist Route)	As above, plus - School bus route on Springs Road - Rose Cottage Road intersection with North Coast Road considered hazardous for heavy vehicles. - Rose Cottage Road at North Coast Road is a Glossy Black habitat.
Option 5	- Used DPTI's Heavy Vehicle route on Playford Highway - Shortest journey time - North Coast Road requires minimal upgrades with good geometry.	- 600m segment on Ropers Road would need to be raised 2m with 14m wide vegetation (large trees) to be removed. - Bridge over Cygnet River would need to be upgraded. - Glossy Black habitat near Cygnet River section. - Give way protocols along Ropers and Gap may need to be reviewed.

5.2 Upgrade and Annual Maintenance Preliminary Estimates

What also needs to be considered when selecting a preferred option is distance, journey time, upgrade and maintenance costs.

The cost estimates below are preliminary estimates based on square meter rates (Rawlinsons and local knowledge). **Note that these preliminary estimates are indicative only and have been compiled to aid the options assessment.**

Upgrade costs include vegetation clearance, excavation, drainage, bridge upgrades, pavement construction, resheeting and shoulder sealing. Intersection upgrades have also been included which accounts for a deceleration lane on North Coast Road at the intersection with Smith Bay access road, Playford Highway and Stokes Bay Road and Playford Highway and Ropers Road.

Maintenance costs include grading, patching, drain maintenance, crack sealing, potholes, line marking and roadside vegetation. Maintenance costs exclude operating expenses such as administration, depreciation and finance costs.

Please refer to **Appendix C** for further details on the estimated unit rates used in determining preliminary estimates.

Route Option	Distance (km)	Journey Time	Upgrade indicative preliminary estimate	Maintenance indicative preliminary estimate pa	Upgrade /km
Option 2	70.37	103 mins	$2,985,000	$ 233,000	$42,000
Option 5	73.37	107 mins	$5,135,000	$ 216,000	$70,000
Option 6	73.37	109 mins	$4,625,000	$ 246,000	$63,000

The distance for both Option 6 and 5 is the same, however the journey time for Option 6 is marginally more than Option 5 due to the additional intersections navigated. It is noted that once the roads are upgraded along the preferred route, journey time will be reduced as heavy vehicles will be able to maintain 80km/hr along the majority of the distance.

Upgrade estimates reflect the length of road requiring upgrade where Option 2 is predominantly for McBrides Road (7.17km) and shoulder sealing on Playford Highway (30km) and Stokes Bay Road (11.5km) as compared to Option 6 which requires McBrides (7.17km) and Rose Cottage (5.5km) along with shoulder sealing on Playford Highway and Stokes Bay Road or Option 5 which requires Ropers (4.47km) and Gap Road (6.9km) along with shoulder sealing along Playford Highway (52.5km). The number of intersections along

the route has also impacted the upgrade estimates where Option 2 and Option 5 both have five (5) intersections that require upgrade unlike Option 6 which has eight (8) intersections that require upgrade.

Maintenance estimates exclude administration, depreciation and finance costs. Option 5 has the longest length of sealed road (Playford Highway) which has a lower annual maintenance preliminary estimate as compared to unsealed maintenance.

5.3 Assessment Outcomes

To compare the three options against the assessment criteria outcomes, distance, journey time, upgrade estimates and annual maintenance estimates the table below reflects the combined comparisons by denoting the preferred option against each of the assessment areas:-

Route Option	Evaluation Framework Outcomes	Distance	Journey Time	Upgrade Estimates	Maintenance Estimates
Option 2	★	★	★	★	
Option 5					★
Option 6					

Based on the assessment outcomes, it is recommended that **Option 2** be considered for Road Safety Audit, engineering upgrade requirements and Native Vegetation assessments.

6.0 Funding Options

As per Council's Road Network Extension Policy[19] *"Council will not develop and construct new road nor upgrade an existing road unless the associated construction or upgrade costs are fully borne by the Applicant/s – or – the construction or upgrade is undertaken with the assistance of a significant financial co-contribution provided by the Applicant/s, they having proven the construction or upgrade is warranted within the Kangaroo Island Strategic Management Plan and subsequently, having any related costs included in the current budget."*

The policy also states *"Council's funding for applications (external and internal) to extend or upgrade the road network is dependant upon;*

2.2.1 additional funds are gained via the Roads to Recovery scheme, whether they be from State and/or Federal funding streams,

2.2.2 evidentiary need being established. That being that a case for priority development be made based upon community socio-economic need.

The Kangaroo Island Strategic Management Plan 2014 – 2018 have the following 'actions' that align with the proposed road upgrades based on the Smith Bay proposal by KIPT being:-

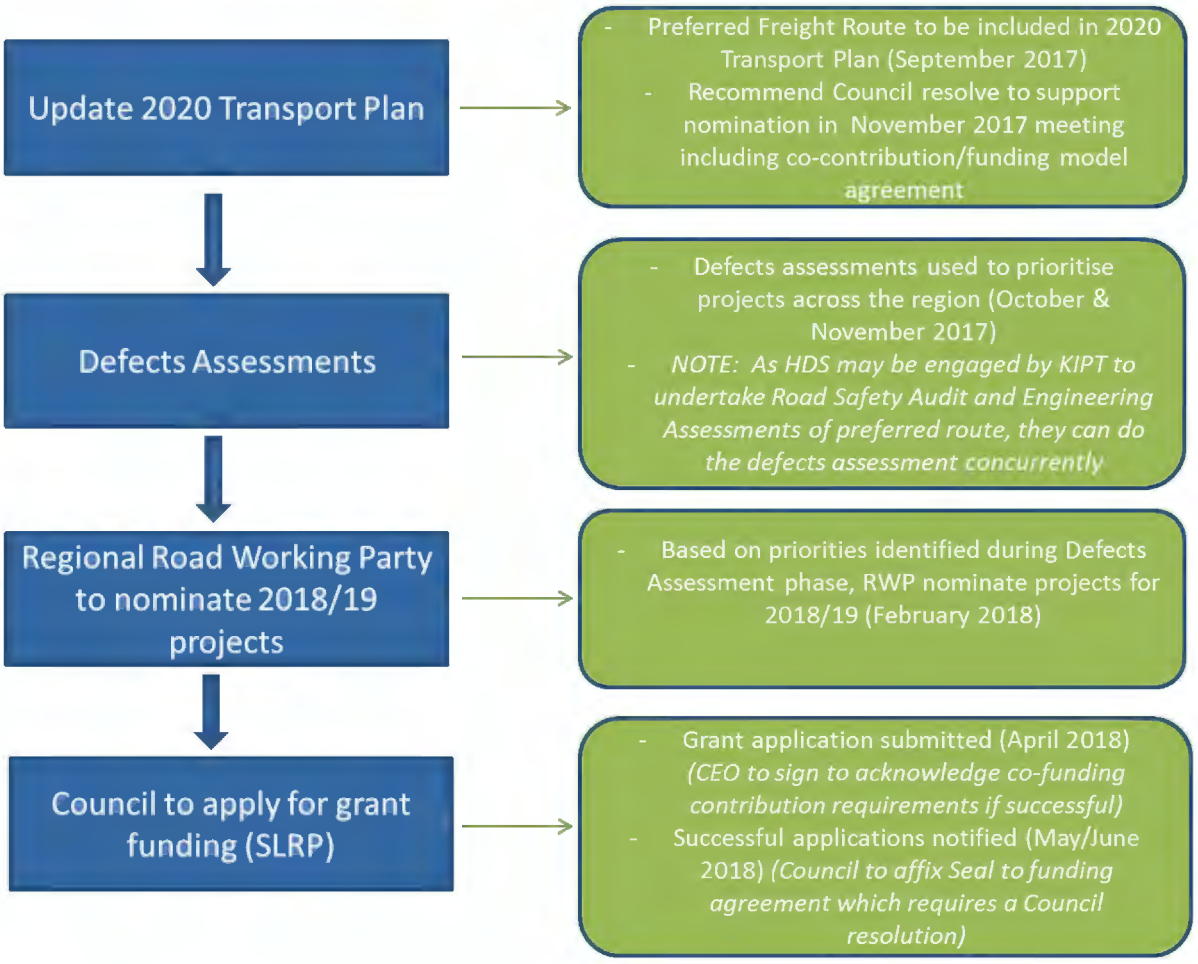
Action 7.1	Advocate for affordable access to Island by both sea and air, for freight and people.
Action 11.2	Optimise opportunities for Private Works.
Action 12.1	Review underutilised reserve/non-useable assets and explore potential to lease, sell or co-develop for commercial or community return.
Action 13.1	E tags for non-residential road users
Action 14.2	Package infrastructure service opportunities with other Community investment propositions to increase attractiveness for Public Private Partnership (PPP) potential.
Action 17.1	Encourage investment opportunities.

The Southern & Hills Local Government Association 2020 Transport Plan is the strategic transport plant document for the Southern & Hills Region that is aligned to South Australia's Strategic Plan.

[19] Kangaroo Island Council Road Network Extension Policy March 2014

It is proposed that based on the preferred freight route option be supported by Council and included in the 2020 Transport plan with a view to secure Special Local Roads Programme (SLRP) funding through the Roads Working Party.

An overview of the process is depicted below:-



Following is an overview of SLRP funding and how it is allocated along with other potential funding programmes that could be accessed.

Special Local Roads Program (SLRP)

SLRP is funded with 15% of the Local Roads Grants allocated to the State as part of the Financial Assistance Grants (FAGs) and 15% of the State allocation of Roads to Recovery.

In 2016/17 the Local Road Funding for SA was $38.7m of which $5.8m went to SLRP along with $9.8m from Road to Recovery. Southern & Hills LGA (Kangaroo Island is a member) allocation was $1.7m in 2016/17 with the successful projects being funded 1/3 Council and the balance (2/3) SLRP. It would be unlikely for the Region's full allocation to go to just one (1) Council.

Local Government Transport Advisory Panel (LGTAP) make recommendations to the LGA Board based on the submissions from the various regional and metropolitan local government associations. LGTAP give preference to those projects that have been developed through Regional Transport Plans (ie Southern & Hills LGA 2020 Transport Plan) and transparent planning processes.

The nominations for 2017/18 have been submitted. The next round of nominations will be put forward by the S&HLGA Road Working Party generally around February based on the defects assessments of the revised Regional Freight, Tourist and Community Access routes which will be done October – November 2017.

National Heavy Vehicle Safety and Productivity Program (NHVSPP)

The Australian Government has extended the Heavy Vehicle Safety and Productivity Programme and will provide $40 million per year from 2021-22 onwards, building on the current $328 million investment from 2013-14 to 2020-21. The HVSPP is an Australian Government initiative to fund infrastructure projects that improve productivity and safety outcomes of heavy vehicle operations across Australia.

Applications are assessed through a competitive, merit basis process with applicants funding ½ of the project. Round 5 successful projects were announced in September 2016. Applications for Round 6 are currently closed with no advice on when it will open.

Black Spot Funding

For individual sites such as intersections, mid-block or short road sections, there should be a history of at least three casualty crashes over a five-year period. For lengths of road, there should be an average of 0.2 casualty crashes per kilometer per annum over the length in question over five years.

The requirement of a history of crashes ensures that those sites that have a recurrent problem are targeted first for treatment.

The Black Spot Programme also recognises that there are road locations which could be considered as 'accidents waiting to happen'. Therefore, some programme funds may be used to treat sites where road traffic engineers have completed a Road Safety Audit and found that remedial work is necessary. This allows an opportunity for proactive safety works to be undertaken before casualties occur.

In line with national road safety objectives, approximately 50% of each State's allowance is allocated to rural areas, acknowledging the high rate and

consequences of crashes in rural areas (60% of fatalities are in rural areas and a significant proportion of serious injuries outside the metropolitan area).

Federal Black Spot Funding is 100% funded by the Department of Infrastructure and Regional Development. State Black Spot Funding is 50/50 funded by DPTI and Council.

Bridges Renewal Program

The Australian Government will provide $360 million from 2015-16 to 2019-20, with an on-going commitment of $60 million each year following to upgrade and repair bridges to enhance access for local communities and facilitate higher productivity vehicle access.

Round 3 closed in May 2017 with a co-funding requirement of 50%.

Regional Growth Fund

The Australian Government will provide $472.2 million over four years from 2017-18 to establish a Regional Growth Fund.

The Regional Growth Fund includes $272.2 million to provide grants of $10.0 million or more for major transformational projects which support long-term economic growth and create jobs in regions undergoing structural adjustment.

Also in the Regional Growth Fund is a further $200 million for the Building Better Regions Fund (BBRF) for four years from 2017-18. This builds on the commitment to the BBRF at the 2016 election, bringing the BBRF to nearly $500 million.

Please monitor this website for any announcements regarding funding under the Regional Growth Fund.

Building Better Regions Fund

The Building Better Regions Fund (BBRF) will create jobs, drive economic growth and support strong regional communities across Australia by funding infrastructure and community investment projects.

The BBRF invests in eligible projects in regional and remote Australia, outside the major capital cities of Sydney, Melbourne, Brisbane, Perth, Adelaide, and Canberra.

Grant funding is available through two funding streams:

The Infrastructure Projects Stream supports projects that involve construction of new infrastructure, or the upgrade or extension of existing infrastructure.

The Community Investments Stream funds community development activities including, but not limited to, new or expanded local events, strategic regional plans, leadership and capability building activities.

Nearly $500 million is available through this program, including $200 million provided from the Regional Growth Fund allocated in the 2017-18 Budget.

Infrastructure Project Grants are from a minimum $20,000 up to $10,000,000 with a 50% contribution required from the applicant (Local Gov or Not for Profit Organisation). There is an Exceptional Circumstances clause that can be applied for to waive the co-contribution (ie limited capacity for Local Government to fund the co-contribution).

Funding Options Summary Table

Program Name	Road/ intersection/ bridge	Grant Funding (per $1m)	Council Contribution (per $1m)	Commentary
Special Local Roads Program (SLRP)	Road Intersection	$700,000	$300,000	Next round 2018/19
National Heavy Vehicle Safety and Productivity Program (NHVSPP)	Road intersection Bridge	$500,000	$500,000	Next round to be advised, assumed 2018/19. Requires separate Heavy Vehicle Access Audit.
Black Spot	Road Intersection	$1,000,000		Very competitive, BCR for proactive projects difficult. Requires separate Road Safety Audit
Bridges Renewal Program	Bridge	$500,000	$500,000	Round 4 does not open until 2018, funding 2019/20
Building Better Regions Fund	Road Intersections	$500,000	$500,000	Option to apply for extraordinary circumstances to waive contribution.
Regional Growth Fund	Road Intersection	$500,000	$500,000	Funding round to be announced.

Council Contribution Funding Options

Please note that the following options are to enable discussion between Council and KIPT and are only the opinion of the author of this route assessment report. The following commentary is not intended to reflect Council's position on funding options and is provided to inform of possible options. The information provided is publically available.

DPTI $2m Funding

An option to be considered would be to direct some of the Department of Transport and Planning (DPTI) $2m Unsealed Roads Upgrade funding towards the agreed projects.

However it must be noted that this funding is not a grant and as such not recorded as income in the financial statements. Rather DPTI take over 'care and control' of the nominated road under the Highways Act for a 12 month period while the contracted upgrade works are undertaken. The asset is then re-assigned back to Council and received as an asset free of charge. Council act as Project Managers on DPTI's behalf which is claimed by Council as operational income which is then capitalised against the project in accordance with Australian Accounting Standards.

It is likely that model of funding would not suit the co-contribution requirements of the funding programmes identified earlier in this report. If clearly disclaimed during the nomination and application process for SLRP that the whole length of road is being nominated for funding however the 1/3 contribution from Council will be done separately by the DPTI contractor may be accepted, but may not be supported by the other Council's in the region (they do not get that option) or LGTAP.

Council could discuss the funding arrangement with DPTI with a view to receive a portion of the funding as income (cash) equivalent to the level of grant funding co-contribution levels. However as this grant funding is essential to Council's asset sustainability position, any changes to the funding arrangement may not be supported.

Borrowing additional funds

Based on the Economic Impact Study being undertaken by EconSearch, there may be an option for Council to borrow additional funds. This would be additional to the current level of capital expenditure which is $1.5m (net) as per the adopted Long Term Financial Plan.

Repayment of the borrowings could be funded by way of operational income received under a Freight Road Toll or Road Management Agreement between KIPT and Council. The toll would need to include a proportion of interest and principle payments along with increased depreciation.

Any agreement would also need to address costs and responsibility for increased maintenance requirements for timber freight roads including grading, patching and likely pavement stabilisation needs (dust, stormwater and corrugation mitigation).

Primary beneficiary of the upgrades and the portion of costs based on benefit would need to be considered in detail, including the impacts of other commodity being shipped off island via the Smith Bay Wharf in the future (ie KI Pure Grain) who would gain benefit from using the upgraded freight network.

Upfront Capital Contribution

KIPT may consider an upfront capital contribution to Council. As this will have an impact on Financial Statements and therefore FAGs grant allocation, may not be supported by Council. However a payment to part fund co-contribution requirements for grant funding options supplemented by a Road Management Agreement would warrant further assessment and discussion.

As per the Road Maintenance Agreement, should other commodities enjoy the benefit of the upgraded freight roads and/or new port facility the contribution and ongoing costs would need to be reapportioned. It is considered that the current level of general freight that will enjoy the benefit of the upgraded roads is accounted for by way of the grant contribution and they should not be required to contribute unless freight movements for any one commodity increase to Regional levels (ie 20 Semi movements per day/10 B-Double movements per day/50,000 tonne of freight per annum).

Summary of Council Funding Options

	Benefits/Positives	Constraints/Negatives
DPTI $2m roads funding	• Funding already provided	• Not received as Income, rather Asset Received Free of Charge.
Road Management Agreement (off set additional Council borrowing)	• Additional income stream to reduce maintenance costs for Council (Strategic Plan & Road Network Extension Policy) • Enables Levels of Service to be negotiated and agreed to (KIPT has some control over road condition = managing fleet operational costs)	• Apportioning costs between Council and KIPT allowing for any future beneficiaries
Upfront Capital Contribution (off set additional Council borrowing)	• Additional income stream to reduce maintenance costs for Council (Strategic Plan & Road Network Extension Policy) • Reduces Council's need for additional borrowing with minimal impacts on FAGs	• Impacts on financial statements and FAGs allocation • Ongoing maintenance controlled by Council which could increase KIPT fleet operational costs (roads not maintained to appropriate standard).
Road Management Agreement & Capital Contribution combination	• Reduces Council's level of additional borrowing with minimal impacts on FAGs • Additional income stream to reduce maintenance costs for Council (Strategic Plan & Road Network Extension Policy) • Enables Levels of Service to be negotiated and agreed to (KIPT has some control over road condition = managing fleet operational costs)	• Apportioning costs between Council and KIPT allowing for any future beneficiaries

Appendix A
Evaluation Framework

	Excellent	Good	Fair	Poor	Very poor	Weighting
	5	4	3	2	1	
Road Surface Material						
Road Surface width (carriageway)	>7m	6 - 7m	5 - 6m	4 - 5m	<4m	30%
Shoulders/carriageway clearances	>2	1 - 2m	1 - 0.5m	0.5 - 0.25m	<0.25m	
Road Surface Condition	As per Councils IAMP					
Road Pavement Condition	As per Councils IAMP					
Geometry	Good cross fall good vertical grades (predominantly flat)	Gradual vertical grades	Multiple corners with poor elevation	Steep vertical grades	Cross fall <6% Steep batter slopes (<1in5)	
Bridges	No bridges	>7m wide crash barriers as per Aust Standards	1 low-lying bridge (flood prone) cash barriers not to Aust Standards	<2 low lying bridges (flood prone) bridge(s)<7m wide	Single lane bridge	20%
Drainage	Good cross drainage (0.5m+ clear from road edge) No roadside dams No FORDS or	Cross drains to be extended no roadside dams	Cross drains to be extended/widened 1 - 2 roadside dams	Multiple FORDS/floodways (Water Affecting Activity) little to no cross drains	Abuts major waterway (Significant Water Affecting Activity)	
Roadside Native Vegetation	Vegetation clear 2m behind white	Vegetation clear 1m behind white	Overhead vegetation	Single Chain Road	Category A Vegetation	15%
Right of Way	1 - 2 non right of way intersections	3 - 4 non right of way intersections	5 - 6 non right of way intersections	6 - 7 non right of way intersections	7 - 8 non right of way intersections	10%
Intersections	Adequate swept path Excellent line of sight Good vertical	Intersection to be widened Veg pruning for line of sight	Intersection to be raised Veg/tree removal required for line of sight	Intersection to be re-aligned	Intersection turn greater than 45deg Poor vertical alignment	
Land Uses/residential access	No rural residential access no non complying land use	<2 rural residential access within 2km length	Commercial (<10vpd) business access 2 - 4 rural residential access within 2km length	<2 Commercial business access within 2km length 5 - 7 rural residential access within 2km length	<8 rural residential access within 2km length	15%
Other						10%
- traffic count	>10 vpd	20 - 50 vpd	50 - 100 vpd	100 - 200 vpd	<200 vpd	
- school bus route	No				Yes	
- traffic composition (2020 Transport Plan & MetroCount traffic data)	Gazetted DPTI Freight Road			Locally significant Tourist or Community Access Route	Regionally Significant Tourist or Access Route	
- crash history	No				Yes	
- overtaking	Good provision/ opportunity		Some provision/opportunity		no Provision/ opportunity	
- speed environment	<100km/hr				80km/hr	

Appendix B
Assessment Criteria Results

	Weighting	Option 2										Option 5										Option 6					
		Playford Highway A		Stokes Bay Road		Bark Hut Road		McBrides Road		North Coast Road A		Playford Highway A		Playford Highway B		Ropers Road		Gap Road		North Coast Road B		Springs Road		Rose Cottage Road		North Coast Road	
Road Surface Material		Sealed		Sealed		Limestone		Ironstone		Limestone		Sealed		Sealed		Ironstone		Ironstone		Limestone		Limestone		Ironstone		Limestone	
Road Surface width (carriageway)	30%	4		3.5		5		1.5		5		4		4		2		3		5		5		1.5		5	
Shoulders/carriageway clearances		5		4		3		1		4		5		4		2.5		3.5		5		4		1		5	
Road Surface Condition		3	27.30	5	27.95	5	28.60	2	9.75	4.5	28.60	3	27.30	4	24.70	2.5	16.25	2	18.20	4.5	30.55	5	29.25	2	11.7	4.5	27.95
Road Pavement Condition		4		5		5		1		5		4		4		2.5		2.5		5		5		2		5	
Geometry		5		4		4		2		3.5		5		3		3		3		4		3.5		2.5		2	
Bridges	20%	5	11.40	4	10.80	4	10.20	5	8.40	3	8.40	5	11.40	5	10.80	1	2.40	2.5	5.40	5	12.00	5	9.60	3	6.00	3	9.60
Drainage		5		5		4.5		2		4		5		4		1		2		5		3		2		5	
Roadside Native Vegetation	15%	5	5.75	4	4.60	3.5	4.03	2	2.30	3.5	4.03	5	5.75	4	4.60	1.5	1.73	1	1.15	4	4.60	3	3.45	1	1.15	3.5	4.03
Right of Way	10%	5	9.90	5	9.90	5	9.90	5	9.35	4.5	8.80	5	9.90	5	9.90	4	7.15	4	7.70	5	9.90	4	8.80	5	6.6	4.5	8.80
Intersections		4		4		4		3.5		3.5		4		4		2.5		3		4		4		1		3.5	
Land Uses/residential access	15%	4	4.60	3.5	4.03	4	4.60	5	5.75	3	3.45	4	4.60	2	2.30	3	3.45	3	3.45	3	3.45	3	3.45	4	4.6	4	4.60
Other												0															
- traffic count	10%	2		4		3		5		1		2		1		4		4		1		3		5		1	
- school bus route		1		1		5		5		5		1		1		5		5		1		1		5		5	
- traffic composition (2020 Transport Plan & MetroCount traffic data)		4	24.20	1	17.60	2	26.40	5	27.50	1	20.90	4	24.20	3	15.40	4	26.40	4	24.20	1	14.30	4	19.80	4	23.1	1	15.40
- crash history		5		2		4		5		2		5		1		5		2		2		2		5		2	
- overtaking		5		3		5		1		5		5		5		3		3		3		3		1		3	
- speed environment		5		5		5		4		5		5		3		3		4		5		5		1		2	
		71	83	63	74.88	71	83.73	55	63.05	62.5	74.18	70.50	83.15	57	67.70	49.5	57.38	51.5	60.10	62.5	74.80	62.5	74.35	46	53.15	59	70.38
	Total					64.40										58.20								61.00			
	Weighted					75.80										68.63								71.811			

Appendix C
Upgrade & Maintenance Preliminary Estimates

Forestry Freight Roads - Preliminary Maintenance and Operations Estimates

Road Name	Surface Type	Length	Maintenance Activity: Grading	Patching	Cross Drains	Crack sealing + edge breaks	White Marker Posts & Signs	Vegetation Management	Total	Per KM			
Option 2													
Playford Highway A	Sealed	30			$ 18,750	$ 32,250	$ 6,000	$ 15,000	$ 72,000	$ 2,400			
Stokes Bay Road	Sealed	11.5			$ 7,188	$ 12,363	$ 2,300	$ 5,750	$ 27,600	$ 2,400			
Bark Hutt Road	Unsealed	5.8	$ 9,744	$ 9,280	$ 3,625		$ 1,160	$ 2,900	$ 26,709	$ 4,605			
McBrides Road	Unsealed	7.17	$ 12,046	$ 11,472	$ 4,481		$ 1,434	$ 3,585	$ 33,018	$ 4,605			
North Coast Road	Unsealed	15.9	$ 26,712	$ 25,440	$ 9,938		$ 3,180	$ 7,950	$ 73,220	$ 4,605			
		70.37	$ 48,502	$ 46,192	$ 43,981	$ 44,613	$ 14,074	$ 35,185	**$ 232,546**		**$ 232,546 Total**	607,500 Average annual tonne	**$ 0.38 per tonne**
Option 5													
Playford Highway A	Sealed	30			$ 18,750	$ 32,250	$ 6,000	$ 15,000	$ 72,000	$ 2,400			
Playford Highway B	Sealed	25.2			$ 15,750	$ 27,090	$ 5,040	$ 12,600	$ 60,480	$ 2,400			
Ropers Road	Unsealed	4.47	$ 7,510	$ 7,152	$ 2,794		$ 894	$ 2,235	$ 20,584	$ 4,605			
Gap Road	Unsealed	6.9	$ 11,592	$ 11,040	$ 4,313		$ 1,380	$ 3,450	$ 31,775	$ 4,605			
North Coast Road	Unsealed	6.8	$ 11,424	$ 10,880	$ 4,250		$ 1,360	$ 3,400	$ 31,314	$ 4,605			
		73.37	$ 30,526	$ 29,072	$ 45,856	$ 59,340	$ 14,674	$ 36,685	**$ 216,153**		**$ 216,153 Total**	607,500 Average annual tonne	**$ 0.36 per tonne**
Option 6													
Playford Highway A	Sealed	30			$ 18,750	$ 32,250	$ 6,000	$ 15,000	$ 72,000	$ 2,400			
Stokes Bay Road	Sealed	11.5			$ 7,188	$ 12,363	$ 2,300	$ 5,750	$ 27,600	$ 2,400			
Bark Hutt Road	Unsealed	5.8	$ 9,744	$ 9,280	$ 3,625		$ 1,160	$ 2,900	$ 26,709	$ 4,605			
McBrides Road	Unsealed	7.17	$ 12,046	$ 11,472	$ 4,481		$ 1,434	$ 3,585	$ 33,018	$ 4,605			
North Coast Road	Unsealed	2.7	$ 4,536	$ 4,320	$ 1,688		$ 540	$ 1,350	$ 12,434	$ 4,605			
Springs Road	Unsealed	9.5	$ 15,960	$ 15,200	$ 5,938		$ 1,900	$ 4,750	$ 43,748	$ 4,605			
Rose Cottage Road	Unsealed	5.5	$ 9,240	$ 8,800	$ 3,438		$ 1,100	$ 2,750	$ 25,328	$ 4,605			
North Coast Road	Unsealed	1.2	$ 2,016	$ 1,920	$ 750		$ 240	$ 600	$ 5,526	$ 4,605			
		73.37	$ 53,542	$ 50,992	$ 45,856	$ 44,613	$ 14,674	$ 36,685	**$ 246,361**		**$ 246,361 Total**	607,500 Average annual tonne	**$ 0.41 per tonne**

Grading	Assumed at 6 grades pa, 2 hours per km @ $140/hr (plant + operator)
Patching	Assumed that 500m per 10km will require patching (particularly intersections and rises) @ $16,000/500m
Cross Drains	Assumed at 1 per 400m @ $250 each to flush and excavate inlets/outlets
Crask Sealing + edge breaks	Assumed at $1,075/km
White marker posts	Assumed at $200/km
Veg Management	Assumed at annual grooming (tracktor and groomer) + overhead lopping (chainsaw & mulcher) $500/km (both sides)

NOTE: *the maintenance costs exclude administration, depreciation and any finance costs*

Indicative Road Upgrade Costs

					Roadway								Intersections							
		Surface Type	Total KM	Road Reserve Width	Vegetation Clearance	Excavation Earthworks	Drainage	Bridge Upgrade	Pavement Construction	Resheeting	Seal Shoulders	Sub Total	Vegetation Clearance	Excavation Earthworks	Drainage	Pavement Construction	Resheeting	Seal	Sub Total	TOTAL
Option 2	Playford Highway A	Sealed	30	60	$ 45,000						$ 600,000	$ 645,000	$ 5,000	$ 32,000	$ 9,000	$ 38,000	$ 45,000	$ 25,000	$ 154,000	$ 799,000
	Stokes Bay Road	Sealed	11.5	20	$ 14,250						$ 230,000	$ 244,250	$ 2,500	$ 32,000	$ 13,500	$ 38,000	$ 45,000	$ 20,000	$ 151,000	$ 395,250
	Bark Hut Road	Unsealed	5.8	60	$ 2,200							$ 2,200	$ 2,500	$ 16,000	$ 9,000	$ 19,000	$ 22,500	$ 10,000	$ 79,000	$ 81,200
	McBrides Road	Unsealed	7.17	25	$ 13,000	$ 229,440	$ 54,000		$ 544,920	$ 645,300		$ 1,486,660	$ 1,500	$ 16,000	$ 9,000	$ 19,000	$ 22,500	$ 10,000	$ 78,000	$ 1,564,660
	North Coast Road	Unsealed	15.9	25	$ 21,100							$ 21,100	$ 5,000	$ 16,000	$ 9,000	$ 38,000	$ 45,000	$ 10,000	$ 123,000	$ 144,100
			70.37									$ 2,399,210							$ 585,000	**$ 2,984,210**
Option 5	Playford Highway A	Sealed	30	60	$ 45,000						$ 600,000	$ 645,000	$ 5,000	$ 32,000	$ 9,000	$ 38,000	$ 45,000	$ 25,000	$ 154,000	$ 799,000
	Playford Highway B	Sealed	25.2	60	$ 37,800						$ 504,000	$ 541,800	$ 5,000	$ 32,000	$ 9,000	$ 38,000	$ 45,000	$ 10,000	$ 139,000	$ 680,800
	Ropers Road	Unsealed	4.47	25	$ 35,000	$ 143,040		$ 350,000	$ 679,440	$ 603,450		$ 1,810,930	$ 2,500	$ 16,000	$ 22,500	$ 19,000	$ 22,500	$ 30,000	$ 112,500	$ 1,923,430
	Gap Road	Unsealed	6.9	25	$ 19,500	$ 220,800	$ 49,500		$ 524,400	$ 621,000		$ 1,435,200	$ 5,000	$ 32,000	$ 13,500	$ 38,000	$ 45,000	$ 20,000	$ 153,500	$ 1,588,700
	North Coast Road	Unsealed	6.8	25	$ 4,200							$ 4,200	$ 5,000	$ 32,000	$ 9,000	$ 38,000	$ 45,000	$ 10,000	$ 139,000	$ 143,200
			73.37									$ 4,437,130							$ 698,000	**$ 5,135,130**
Option 6	Playford Highway A	Sealed	30	60	$ 45,000						$ 600,000	$ 645,000	$ 5,000	$ 32,000	$ 9,000	$ 38,000	$ 45,000	$ 25,000	$ 154,000	$ 799,000
	Stokes Bay Road	Sealed	11.5	20	$ 14,250						$ 230,000	$ 244,250	$ 2,500	$ 32,000	$ 13,500	$ 38,000	$ 45,000	$ 20,000	$ 151,000	$ 395,250
	Bark Hut Road	Unsealed	5.8	60	$ 2,200							$ 2,200	$ 2,500	$ 16,000	$ 9,000	$ 19,000	$ 22,500	$ 10,000	$ 79,000	$ 81,200
	McBrides Road	Unsealed	7.17	25	$ 13,000	$ 229,440	$ 54,000		$ 544,920	$ 645,300		$ 1,486,660	$ 1,500	$ 16,000	$ 9,000	$ 19,000	$ 22,500	$ 10,000	$ 78,000	$ 1,564,660
	North Coast Road	Unsealed	2.7	25	$ 3,000							$ 3,000	$ 1,500	$ 1,600	$ 9,000	$ 19,000	$ 22,500	$ 10,000	$ 63,600	$ 66,600
	Springs Road	Unsealed	9.5	25	$ 7,300		$ 13,500					$ 20,800	$ 2,500	$ 16,000	$ 9,000	$ 19,000	$ 22,500	$ 10,000	$ 79,000	$ 99,800
	Rose Cottage Road	Unsealed	5.5	25	$ 27,500	$ 352,000	$ 40,500		$ 418,000	$ 495,000		$ 1,333,000	$ 5,000	$ 16,000	$ 29,000	$ 76,000	$ 22,500	$ 10,000	$ 158,500	$ 1,491,500
	North Coast Road	Unsealed	1.2	25	$ 3,500							$ 3,500	$ 5,000	$ 16,000	$ 9,000	$ 38,000	$ 45,000	$ 10,000	$ 123,000	$ 126,500
			73.37									$ 3,738,410							$ 886,100	**$ 4,624,510**

Roadway

Vegetation Clearance	Assumed at $2,500/km for 2m wide clearance and $1,500/km for pruning
Excavation Earthworks	Assumed at $32,000/km for excavation (inc dumping of spoils)
Drainage	Assumed at $4,500 per 450 dia cross drain (adjusted incrementally where applicable)
Bridge Upgrade	Assumed at $350,000 for bridge upgrade
Pavement Construction	Assumed at $38,000 per km for 8m wide carrigeway with 1m shoulders with batters at 3:1
Resheeting	Assumed at $45,000 per km for 8m wide carridgeway at300mm deep
Seal Shoulders	Assumed at $10,000 per km for box out, preparation and seal for each side

Intersections

Vegetation Clearance	Assumed at $2,500/km for 2m wide clearance and $1,500 for pruning
Excavation Earthworks	Assumed at $32,000/km for excavation (inc dumping of spoils)
Drainage	Assumed at $4,500 per 450 dia cross drain (adjusted incrementally where applicable)
Pavement Construction	Assumed at $38,000 per km for 8m wide carrigeway with 1m shoulders with batters at 3:1
Resheeting	Assumed at $45,000 per km for 8m wide carridgeway at 300mm deep
Seal	Assumed at $10,000 per km for full width sealing back 100m and full width inc decelaration lanes where required (adjusted accordingly)