Douglas Shire Council

Daintree River Ferry Traffic Assessment

Traffic Modelling Report

June 2019

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1. Introduction

1.1 Background

GHD was commissioned by Douglas Shire Council to develop a microscopic traffic model for the Daintree River Ferry crossing to assess its impact on current traffic flow for both northbound and southbound movements.

The ferry is located approximately 50 km, north of Port Douglas and is the only way to cross the river, giving access to the northern section of the Daintree. The ferry at maximum capacity can hold up to 27 vehicles and operates daily from 6 am to midnight.

GHD will undertake microscopic modelling within Aimsun version 8.2 to analyse traffic conditions based on current ferry operation. Two lanes facilitating local priority and general traffic (usually occupied by tourists) govern the current traffic operation for the northbound direction with southbound access being only a single shared lane for all users.

1.2 Purpose of this report

The main objectives of this traffic study by GHD is to:

- Provide an analysis informing council, community and road / ferry users of the level of congestions at peak times.
- Assess the existing traffic condition using microsimulation package Aimsun.
- Assess options that best dictate the future efficiency of the Daintree River Ferry crossing for future year scenario of 2036. This includes:
  - Option 1 - A do nothing scenario
  - Option 2 - Bridge crossing
  - Option 3 - Larger ferry
  - Option 4 - A second ferry service

1.3 Scope and limitations

This report has been prepared by GHD for Douglas Shire Council and may only be used and relied on by Douglas Shire Council for the purpose agreed between GHD and the Douglas Shire Council as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Douglas Shire Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report 1.3 and 1.5 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Douglas Shire Council and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report, which were caused by errors or omissions in that information.

GHD has not been involved in the preparation of the Tender for Daintree River Ferry Operations Services or any other tender document or report and has had no contribution to, or review of the Tender for Daintree River Ferry Operations Services or any other tender document or report other than in the Daintree River Ferry Traffic Assessment - Traffic Modelling Report. GHD shall not be liable to any person for any error in, omission from, or false or misleading statement in, any other part of the Tender for the Daintree River Ferry Operations Services or any other tender document or report.

1.4 Report Structure

This report is comprised of the following sections:

- Section 1: Introduction
- Section 2: Base Model Development, Calibration and Validation
- Section 3: Assessment Results of Future Year Options; and
- Section 4: Summary of Findings

1.5 Assumptions

Data limitations for which data is only available for the northbound traffic movement, results in the following assumptions for traffic movement southbound:

- Of the total northbound traffic movement, 90% will be return users for the southbound movement.
- Northbound and southbound movements represents the AM and PM peak respectively. Forming the basis that most consumers will use the ferry in the morning, whereas returners are more likely to return in the evening.
- The PM peak is likely to occur during the time when people return (southbound). Therefore, it is assumed to occur between 4:00 pm and 6:00 pm.
- Based on video footage, ferry travel time is assumed to have the following criteria:
  - 120 seconds ferry loading (for northbound movement)
  - 180 seconds ferry northbound crossing
  - 120 seconds ferry off loading
  - 120 seconds ferry loading (for southbound movement)
  - 180 seconds ferry southbound crossing
  - 120 seconds ferry off loading

Figure 1-1 shows the movement with a total travel time of 840 seconds.

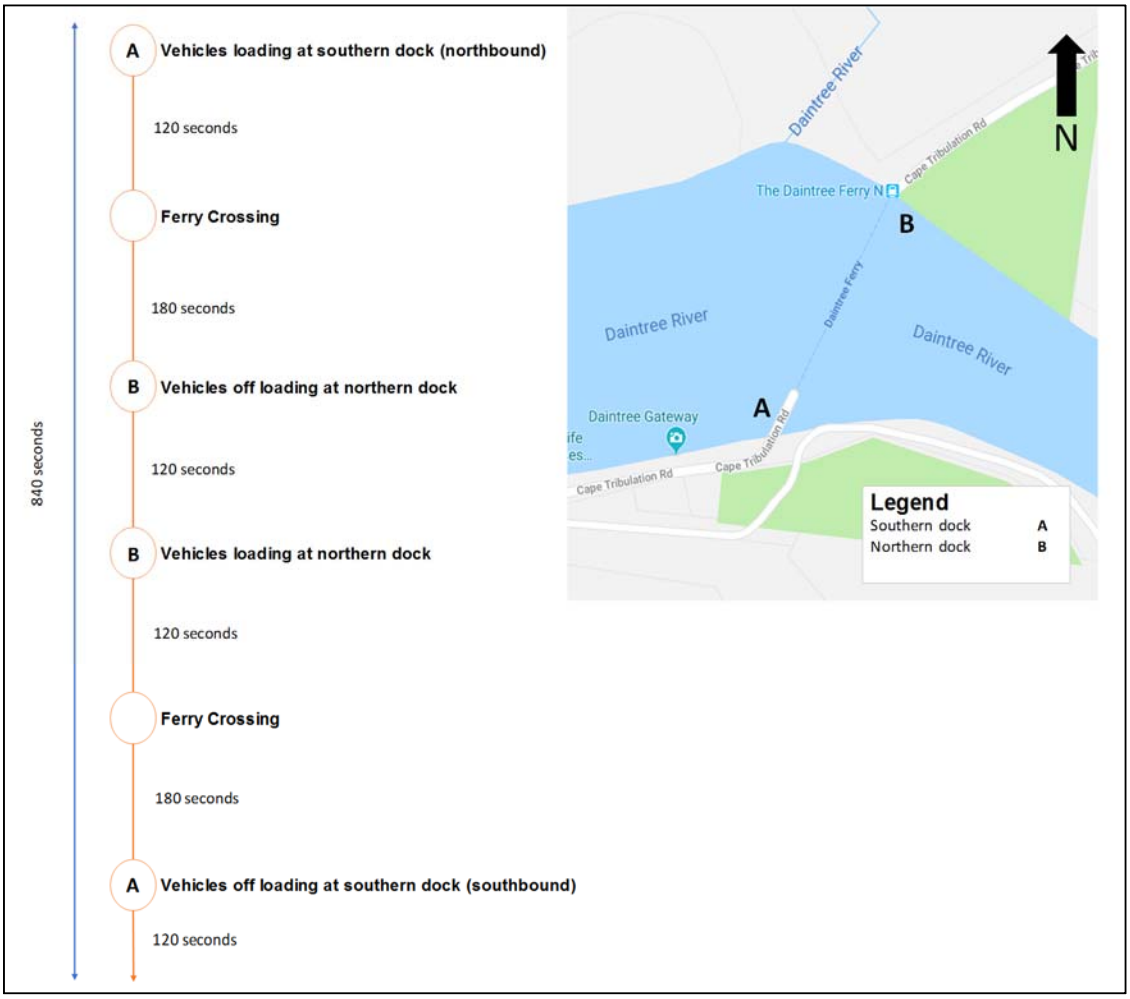

Figure 1-1 - Daintree River Ferry Movement Timeline

GHD has categorised the vehicle classes in the table below for microscopic modelling.

Table 1-1 - Vehicle Classes

Light vehicle (LV)	Heavy vehicle (HV)
Car Ute One Way	Bus 11-20 Seats One Way
Car Ute Return	Bus 11-20 Seats Return
Card No:	Bus 21+ Seats One Way
Concession Card	Bus 21+ Seats Return
Discounted One Way	Bus 6-10 Seats One Way
Discounted Return	Bus 6-10 Seats Return
Douglas Card Return	LPT Buses One Way
Machinery CPP One Way	LPT Buses Return
Machinery CPP Return	School Buses One Way
Machinery NCPP One Way	School Buses Return
Machinery NCPP Return	Trailers One Way
Motor Bikes One Way	Trailers Return
Motor Bikes Return	
Multi Day Pass Book	
Multi Day Ticket	
Visitor Ticket	

1.6 Study Area

Figure 1-2 demonstrates the study area that is located approximately 50 km from Port Douglass. The study area includes the following road section:

- Cape Tribulation Road (northbound)
- Cape Tribulation Road (southbound)

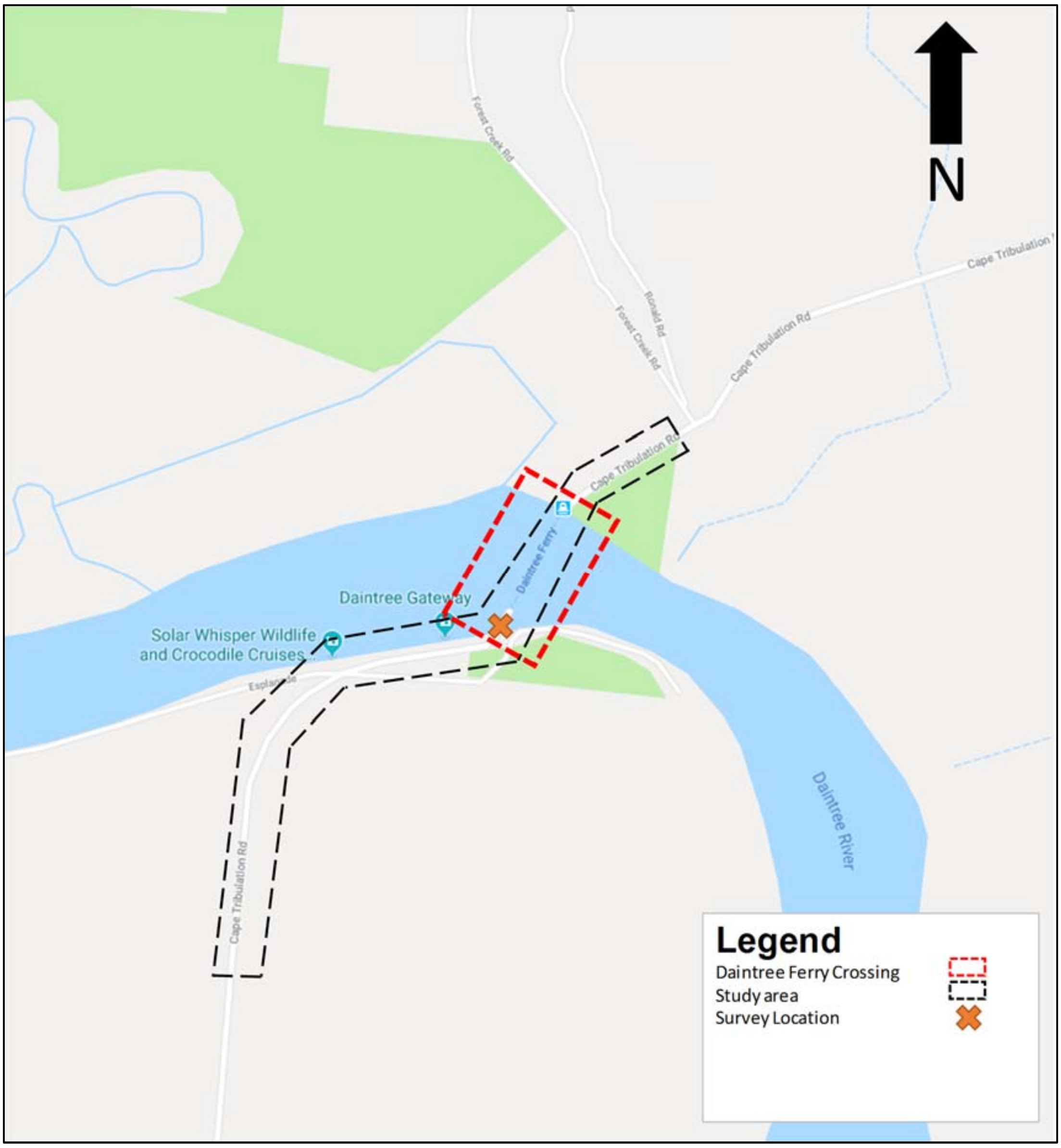

Figure 1-2 - Study Area

2. Base Model Development

This section details the existing traffic condition and the development of the corresponding base year model for both AM and PM peaks.

2.1 Traffic Data Collection and Analysis

2.1.1 Tube Counts

Ticket count, in this instance represents tube counts for the northbound traffic movement. Ticket counts data provided by Douglas Shire Council between the dates January 1st 2015 to May 23rd 2018. Data collected over a span of 24 hours based on user entry and user type. The collection of data was from the following road link:

- Cape Tribulation Road (northbound)

GHD used the traffic counts for below purposes;

- Estimation of traffic demand matrices; and
- Benchmark for the calibration of the modelled traffic flow at the ferry.

Figure 2-1 shows the month to month data analysis for all year horizons, it is noted that July contains the highest traffic movement among all three years.

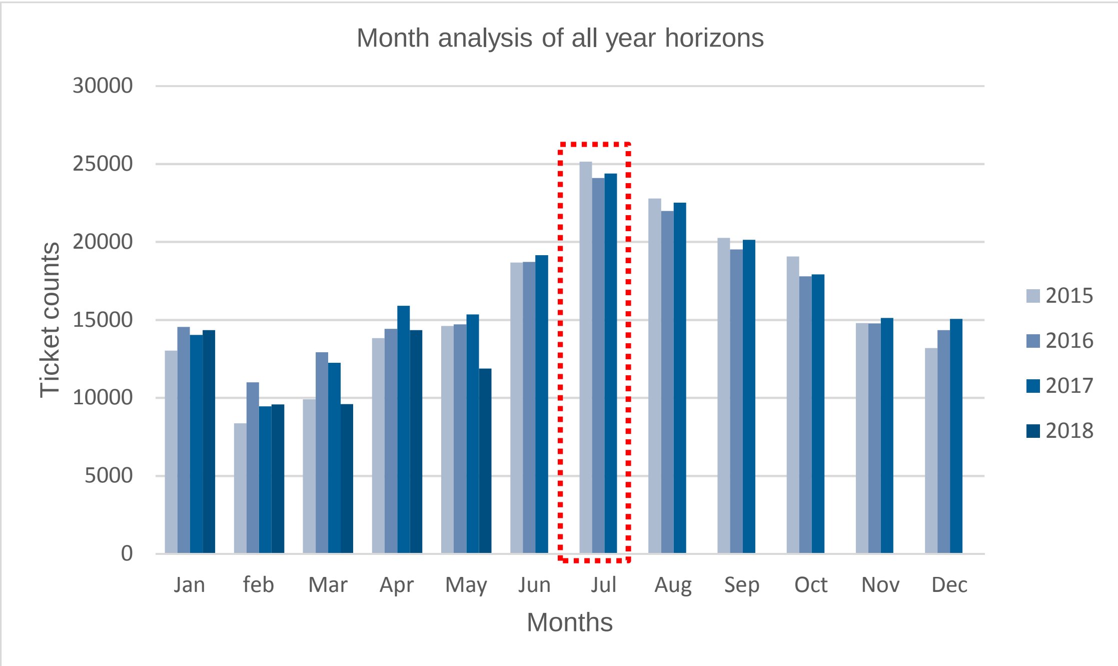

Figure 2-1 - Peak month analysis

Figure 2-2 shows the snapshot of total traffic moment in the month of July. The analysis results show that year 2015 had the highest number of traffic movements recorded in the month of July.

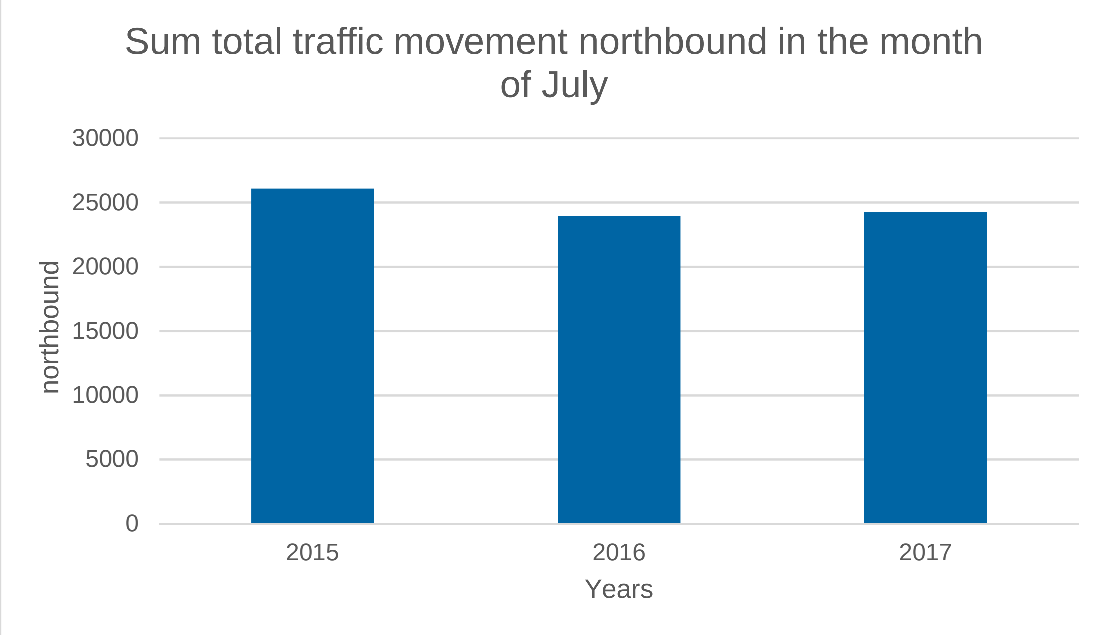

Figure 2-2 - Peak year analysis

Figure 2-3 presents the peak day traffic flow based on the peak year and month. The data analysis shows that Saturday, the 18th of July 2015 is the highest performing day within the provided survey data across all year horizons.

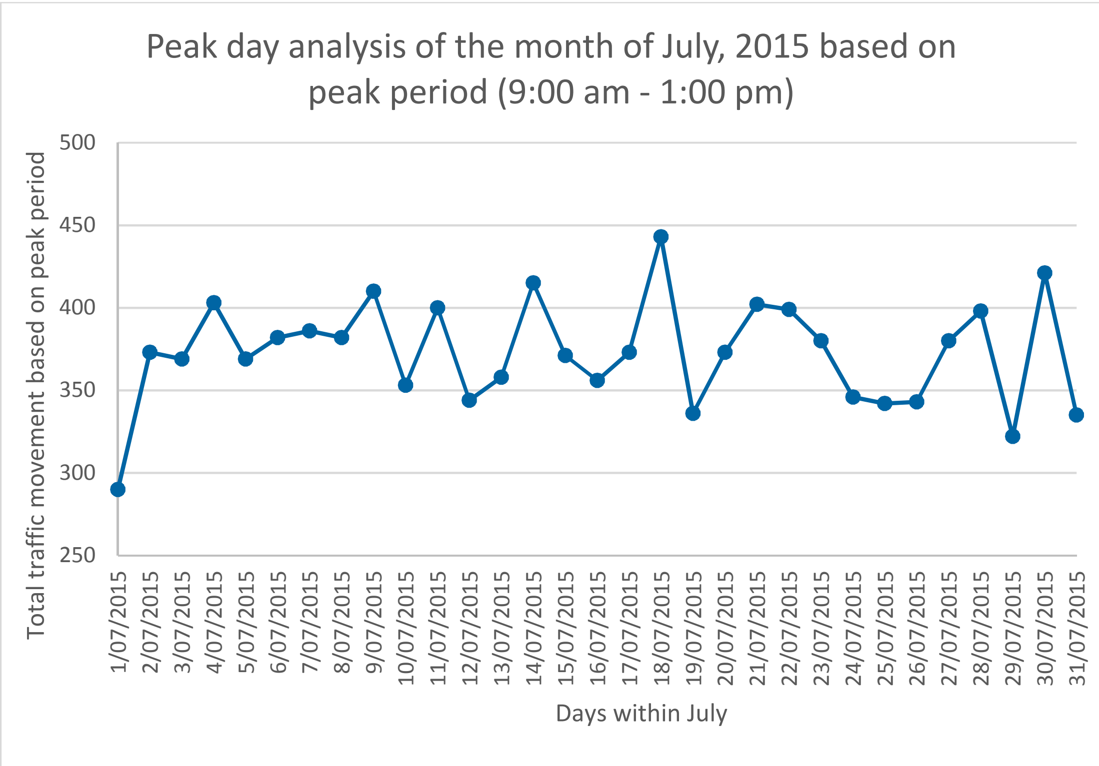

Figure 2-3 - Peak day analysis

The survey data shows that the AM peak falls between the hours of 11:00 am – 12:00 pm and 12:00 pm - 1:00 pm as shown in Figure 2-4. This is the critical AM peak, as such the data collected within this peak is used as the input traffic volume for the base case model. Appendix A provides a holistic overview of traffic movements within the month of July.

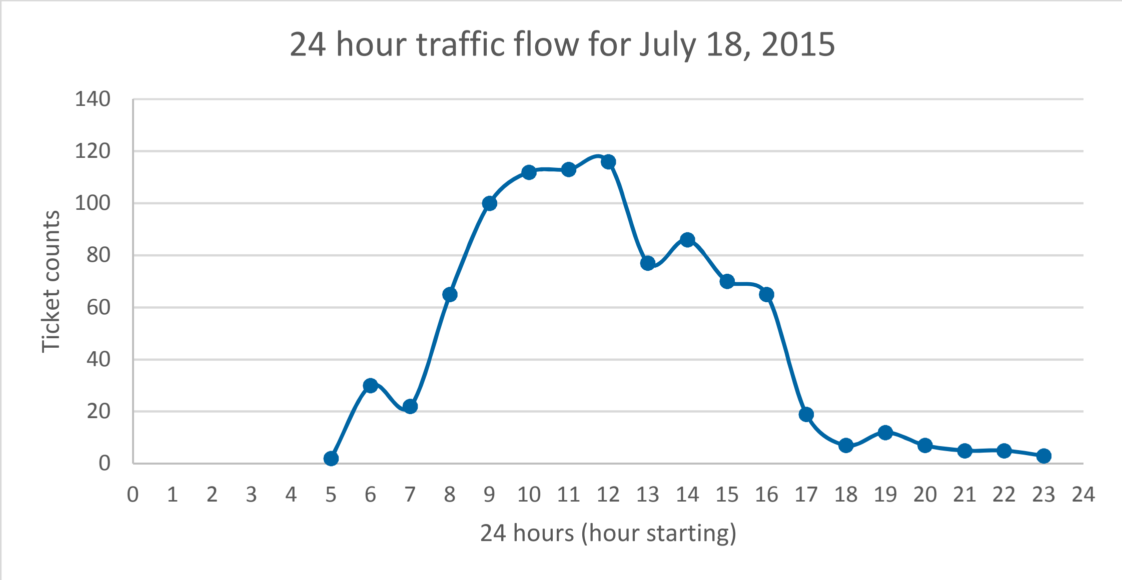

Figure 2-4 - Peak hour analysis

2.2 Development of Base Model

This section covers the development of base year model including network coding, traffic demand estimation and model calibration and validation.

2.2.1 Temporal coverage

The base model is developed for 2015 traffic conditions for the AM and PM peak hours. In order to build a model that expressively represents local traffic conditions, the peak hour falls under a two-hour period. Peak hour determination is from the survey count data as described in section 2.1. Table 2-1 details the demand for AM peak period. Appendix B presents the all-day traffic movements on July 18th.

- 1st AM Peak hour 11:00 am – 12:00 pm
- 2nd AM Peak hour 12:00 pm – 1:00 pm

Table 2-1 - AM Peak Demand

Time period (AM peak)	Total ticket entries (veh)
10:00 am -11:00 am	112
11:00 am-12:00 pm	**113**
12:00 pm-1:00 pm	**116**
1:00 pm-2:00 pm	77

Traffic data limitations results in application of the following assumptions to determine an appropriate PM peak hour:

- 90% of the northbound traffic movement is used for the return movement.
- Return peak time is not consistent with AM Peak

Therefore, from the above assumptions, the demand for PM peak is allocated between the following times:

- 1st PM Peak hour 4:00 pm – 5:00 pm
- 2nd PM Peak hour 5:00 pm – 6:00 pm

Table 2-2 shows the PM peak demand for respective peak hours including warm up and cool down periods.

Table 2-2 - PM Peak Demand

Time period (PM peak)	Total ticket entries (veh)
3:00 pm -4:00 pm	101
4:00 pm-5:00 pm	**102**
5:00 pm-6:00 pm	**104**
6:00 pm-7:00 pm	69

2.3 Vehicle Classification

Figure 2-5 illustrates the two separate lanes, which caters for general traffic and local priority traffic. An additional vehicle class is used to accommodate those considered as 'locals', formally referred to as concession card users. Table 2-3 details the 'classified' traffic demand for the northbound ferry access. Table 2-4 details the traffic demand for southbound ferry access, which is equivalent to 90% of the northbound traffic.

Figure 2-5 - General Traffic / Local Traffic Lane Configuration

Table 2-3 - Demand Classification – AM Peak

	11:00 am-12:00 pm (Vehicle Count)	12:00 pm-1:00 pm (Vehicle Count)
Light Vehicle (LV)	84	88
Concession Card	17	15
Sub Total	101	103
Heavy Vehicle	12	13
Total	113	116

Table 2-4 - Demand Classification – PM Peak

	4:00 pm-5:00 pm (Vehicle Count)	5:00 pm-6:00 pm (Vehicle Count)
Light Vehicle (LV)	76	79
Concession Card	15	13
Sub Total	91	92
Heavy Vehicle	11	12
Total	102	104

The classified local traffic (concession card) represents 15% and 13% of the total demand for the first and second AM peak hour, respectively. Additionally, heavy vehicles represent 11% of the total demand for both AM peak hours.

2.3.1 Modelling Software

The Base Year model is developed using Aimsun software package (version 8.2).

2.3.2 Aimsun Model Network

The modelled network is developed using open street maps as the foundation of the entire study area, with appropriate road types to represent the existing traffic conditions.

Model zones

Two zones were located in the base model working independently of each other due to the nature of the scenario representing northbound and southbound movements. The zone placement reflects the external points of the model and associated traffic movement through the models.

Road types

The model includes one road type and is described as follows

- Minor road – 40 and 80 kph speed limit with 800 pcu/hr capacity

Figure 2-6 illustrates the Aimsun base model network

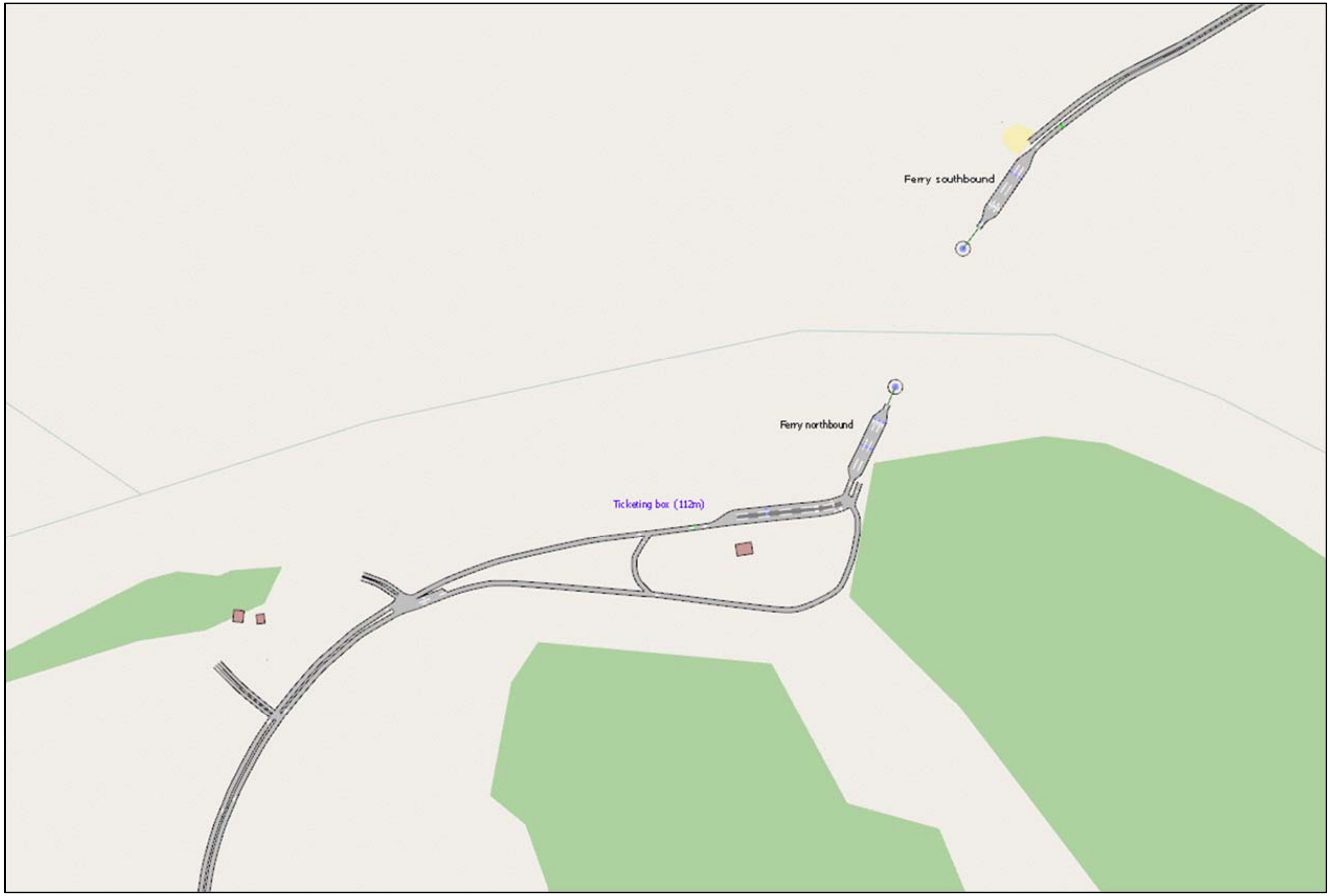

Figure 2-6 - Aimsun Base Case Model

2.3.3 Base model demand development

Vehicle types

The traffic demand matrices were developed based on the ferry user counts undertaken by Douglas Shire Council as described in Table 1-1.

2.4 Model Calibration and Validation

2.4.1 Overview

Traffic model calibration and validation can be described as:

- Calibration is the process of adjustment of model parameters in estimated or asserted models in order to replicate observed data for a base year or otherwise produce reasonable results that satisfy pre-agreed criteria.
- Validation is the process, which is conducted during model development with the ultimate goal of producing an accurate and credible model. For validation, the outputs of calibrated models are compared against observed data (which are preferably not used for model calibration) and satisfy pre-agreed criteria.

GHD followed the Roads and Maritime Traffic Modelling Guidelines, where applicable, when calibrating and validating the Aimsun models. The results of the calibration exercise were considered over five different seed values (560, 28, 2849, 7771, 86524) which is recommended in the Roads and Maritime Services Traffic Modelling Guidelines. It is considered that five seed values are sufficient for this modelling exercise due to the limited size of the network and the absence of route choice options within the road network.

Table 2-5 summarises the link and intersection turn volume calibration criteria, sourced from the Roads and Maritime Services Traffic Modelling Guidelines, used for the model calibration process.

Table 2-5 - Calibration and validation criteria (core area)

Static	Description	Target
Geoffrey E. Havers (GEH) Statistics	The GEH statistics provide a numerical comparison representing the difference between the observed traffic from the input data and modelled traffic flows. A GEH statistic of zero shows that the modelled and observed flow are identical. A GEH of less than five suggest that model is a good representation.	In order to be considered a good match, a model must have greater than 85% of turn volumes within a GEH statistic of 5, and 100% of turn volumes within a GEH statistic less than 10.
Coefficient of determination (R^2)	R^2 is a statistic that gives information about the goodness of fit of the model. An R^2 of 1 indicates that the regression line perfectly fits the data.	R^2 value to be included with plots and to be greater than 0.9.
Maximum queue length	2018 queue length data was compared against the modelled outputs. This provided an indication of how accurately the model is replicating the congestion on the approaches of the study intersection in the model.	RMS does not have mandatory guideline criteria for queue length. GHD would compare the maximum queue at key approaches.

2.4.2 Model Calibration

Ferry operation forms the foundation of the base case modelling and therefore stimulates the traffic behaviour prior to the northbound ferry access. Ferry operation time-frame assumed in the model is described as follows:

- 120 seconds ferry loading
- 180 seconds ferry northbound crossing
- 120 seconds ferry off loading
- 120 seconds ferry loading (for southbound movement)
- 180 seconds ferry southbound crossing
- 120 seconds ferry off loading

Base model calibration compares the intersection turning movements against the observed turning movements for both AM peak hours.

In reality, traffic volumes vary daily at any location. The GEH statistic copes with this type of variance in flows. Instead of comparing absolute or relative flow differences, a wide range of flows can confidently be considered as being statistically accurate using the GEH formula. The Roads and Maritime Traffic Modelling Guidelines sets calibration criteria for the traffic models where a minimum of 85% of the turn movements GEH value must be less than five. The GEH statistic compares the differences between the observed traffic flows and the modelled traffic flows through the following formula:

$$\mathrm{GEH} = \sqrt{\frac{2(\mathrm{M}-\mathrm{C})^2}{\mathrm{M}+\mathrm{C}}}$$

- M = Modelled traffic flow (veh / hr)
- C = Counted traffic flow (veh / hr)

The ‘Turns’ or vehicle movements have been defined in Aimsun in a way different from the conventional definition at intersection approaches. For this project, the through movement from the southern approach represents the total traffic movement northbound as presented in Figure 2-7. Hence, turn count ID locations represent the total through flow of traffic boarding the ferry and therefore reflect the count of ticket entries.

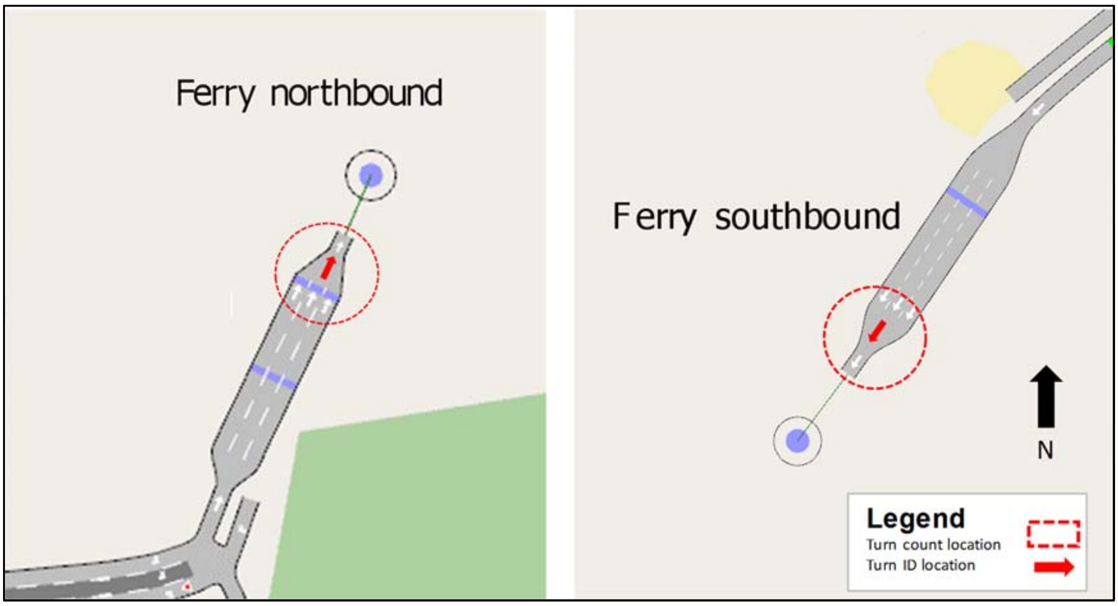

Figure 2-7 - Turn count location for GEH calculation (northbound)

AM Peak Results

Table 2-6 and Table 2-7 summarises the GEH statistics for the Base Model during AM peak period under the calibration criteria. It shows that GEH statistics are below 5 in the AM peak for all the measured movements. This represents a very good level of model calibration for the AM peak, which also satisfies the calibration criteria for core area.

Table 2-6 - GEH statistics for AM peak (11:00 am - 12:00 pm)

Turn-ID	Actual Flow	Simulated Flow	GEH
1446	113	90	2.19

Table 2-7 - GEH statistics for AM peak (12:00 pm - 1:00 pm)

Turn-ID	Actual Flow	Simulated Flow	GEH
1446	116	89	2.67

PM Peak Results

Table 2-8 and Table 2-9 summarises the GEH statistics for the Base Model during PM peak period under the calibration criteria. It shows that GEH statistics are below 5 in the PM peak for all the measured movements. This represents a very good level of model calibration for the PM peak, which also satisfies the calibration criteria for core area.

Table 2-8 - GEH statistics for PM peak (4:00 pm - 5:00 pm)

Turn-ID	Actual Flow	Simulated Flow	GEH
11006545	102	89	1

Table 2-9 - GEH statistics for PM peak (5:00 pm - 6:00 pm)

Turn-ID	Actual Flow	Simulated Flow	GEH
11006545	104	94	1

Based on the model calibration summary in Table 2-10, the Base Model for both AM and PM peaks is deemed to be calibrated, and satisfies the calibration criteria for core area set out in RMS Traffic Modelling Guidelines 2013.

Table 2-10 - GEH Summary for AM and PM Peaks

Peak Hour	GEH <3	GEH <5	GEH >5	GEH >10
11:00 am - 12:00 pm	1	-	-	-
12:00 pm - 1:00 pm	1	-	-	-
Peak Hour	**GEH <3**	**GEH <5**	**GEH >5**	**GEH >10**
4:00 pm - 5:00 pm	1	-	-	-
5:00 pm - 6:00 pm	1	-	-	-

2.4.3 Model Validation

The base model validation compares the modelled queue lengths against the anecdotal observed queue extent (provided by council and community feedback). The anecdotal observed queueing from the northbound direction is up to 1000 metres and from the southbound direction is up to 300 metres from the respective entry locations of the ferry-dock.

Vehicle queueing results are generally dependent on:

- The methodology when collecting and reporting the data, in particular, the method to calculate the moving queue verses static queue.
- Queuing in urban versus rural traffic environment, and in particular the behaviour of drivers when waiting in a queue during the peak tourist season and their response to vehicle to queue activity.
- The visibility of the extended queueing. In this case, the observers' visibility is limited when checking both the southbound and northbound queuing along Cape Tribulation Road.
- Definition of the queuing state in the Aimsun modelling software.

We have learned from experience that queuing in an urban traffic environment is comparatively different when compared to a rural traffic environment. In urban networks, the traffic tends to closely stack leaving very little gap between the vehicles, whereas in rural environments the gap between the vehicles is comparatively more than urban traffic environment. Also, queues are dependent on the difference in driver behaviour between urban and rural traffic environments.

As a result, the model simulation snapshots and the statistical results from Aimsun were used to validate the observed queue length results.

During AM peak, there was significant queueing from the northbound ferry access between 12:00 pm and 1:00 pm and is replicated in the base year model. Figure 2-8 shows the snapshot of the maximum modelled queue (590 meters) occurring for the northbound ferry crossing.

Figure 2-8 - Snapshot of indicative maximum queue length in AM peak

During PM peak, there was significant queueing from the northbound ferry access between 5:00 pm and 6:00 pm and is replicated in the base year model.

Figure 2-9 shows a snapshot of the maximum modelled queue (223 meters) occurring for the southbound ferry crossing.

Figure 2-9 - Snapshot of indicative maximum queue length in PM peak (Southbound)

Note. the Aimsun model has been well calibrated to the current traffic situation based on the robustness of the measured data, (i.e. the traffic data recorded at the ticketing booth).

2.5 Conclusion of Base Model Calibration and Validation

The outcomes of the calibration and validation of the Base Model, compared to the requirement of the Roads and Maritime Traffic Modelling Guidelines are summarised in Table 2-11. This indicates that the Base Model meets the relevant criteria. As a result, the Base Model can be utilised to assess the proposed upgrades for the future year horizons.

Table 2-11 - Summary for Calibration and Validation for the Base Year Models

Criteria	AM		PM	
	Performance	Meets Criteria	Performance	Meets Criteria
Model Calibration				
Turning Counts	100% of all turn counts below GEH of 5	Yes	100% of all turn counts below GEH of 5	Yes
Model Validation				
Queue Length	Comparable queue length	Yes	Comparable queue length	Yes

The traffic queue of up to 1000 meters reported by the community is an anecdotal observation and is different to the calibrated model queue length of 590 metres. This difference is likely due to a number of factors as outlined in section 2.4.3, not least of which is the difference in vehicles gap distances between rural and urban environments (the latter used in the modelling software) and driver behaviour in a tourist dominated location and period. The model calibration outcome suggests that the maximum queue for northbound ferry crossing would be approximately 600 meters, which is based on measured traffic volumes detected at the ticketing booth.

The model is well calibrated to reflect both the measured traffic counts at the ticketing booth and the ferry operation times (including loading and crossing times). If the model was validated to reflect the anecdotal observed queues, the model would not be calibrated to reflect the measured traffic volumes and ferry crossing times.

Whilst there is a difference between anecdotal observations and the modelled queues, the purpose of the model is to compare scenarios.

3. Future Year Options Assessment

3.1 Summary of Options Assessed

Modelling of the options include 2036 forecast demands. The proposed options for the Daintree River Ferry crossing were included as part of the modelling study scope. Sections below details the assumptions made for developing future options.

3.1.1 Option 1 - Do nothing option

Application of 2036 future year forecast demand on the current base case model.

3.1.2 Option 2 - Bridge across the river

A two-way road connecting both south and northbound approaches. GHD has modelled the bridge crossing with the following criteria:

- maximum speed limit of 40 km/h
- 4 meter lane width

3.1.3 Option 3 - Larger ferry service

The larger ferry option details properties of a similar cable ferry located in Canada, known as The Baynes Sound Collector (BSC). The purpose of using the BSC is due to its similar configuration and increase in capacity. Its travel journey is between Buckley Bay and Denman West (1880 m) applicable for the Daintree River (275 m). Figure 3-1 shows a floor plan of the BSC with voyage specifications as follows:

- Ferry capacity of 50 vehicles at 78.6 m long (note this is a significant length and may not be feasible for the Daintree River).
- 4 lane capacity
- Travel speed of 7.5 knots (3.85 m/s), reduced to 6 knots based on TMR speed limit for the Daintree river.
- 499 horsepower
- Maximum displacement of 750 tonnes

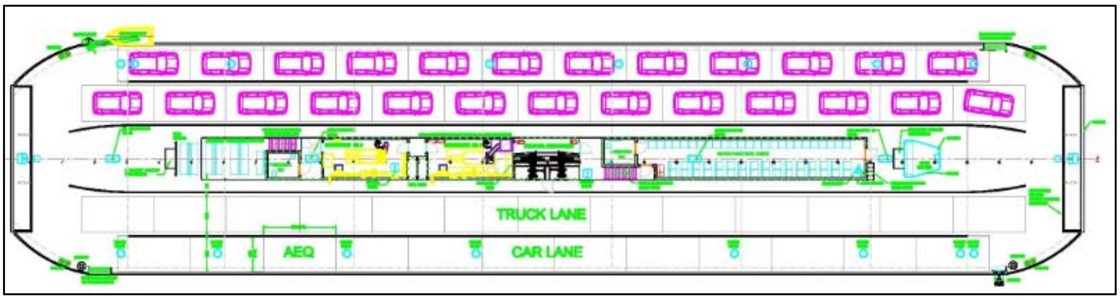

Figure 3-1 - Baynes Sound Connector floor plan

GHD proposes a loading time that is double relative to the existing ferry loading time of 120 seconds. Bringing the new loading time to 240 seconds (4 minutes). This assumption is based on the increase in capacity.

Based on voyage specifications and TMR posted river speeds, GHD assumed the travel time to cross the river as 90 seconds, with an additional 5 seconds for acceleration and deceleration. Bringing travel time to cross the river to 95 seconds (6 knots over a distance of 275 m). Figure 3-2 details the proposed travel time operation for the larger ferry option.

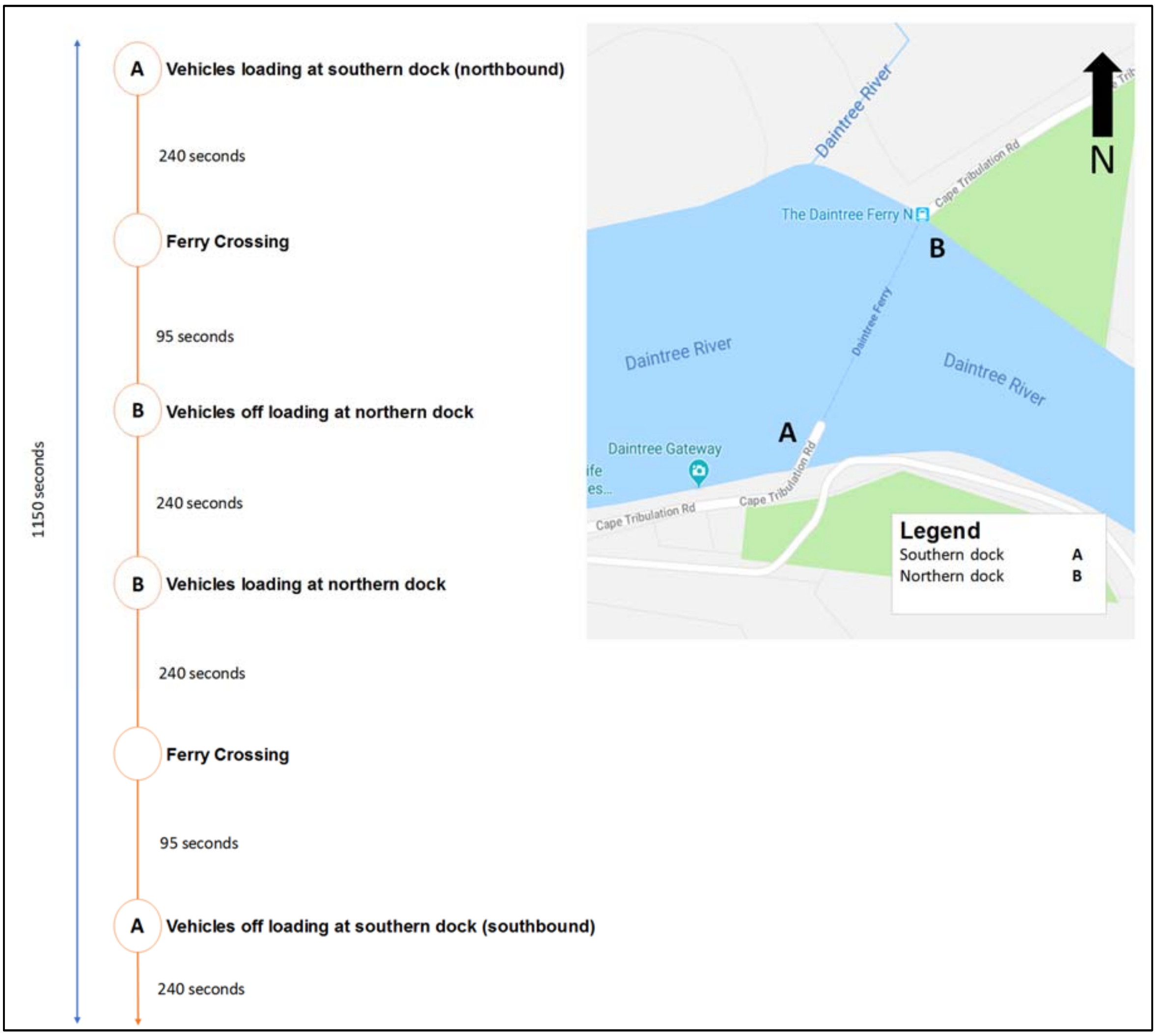

Figure 3-2 - Larger ferry movement timeline

3.1.4 Option 4 - Second ferry service

- An additional ferry service, operation being the same as the current ferry configuration with max capacity of no more than 27 vehicles.
- Model operation of this ferry service details ferry movements departing from both northbound and southbound simultaneously and crossing paths with each other in the middle of the river to approach the destination port.

Figure 3-3 is a representation of the movement paths for the second ferry operation. It is noted that for cable ferrys, both will depart and arrive at different docks to avoid conflict. This image is for illustration purposes only.

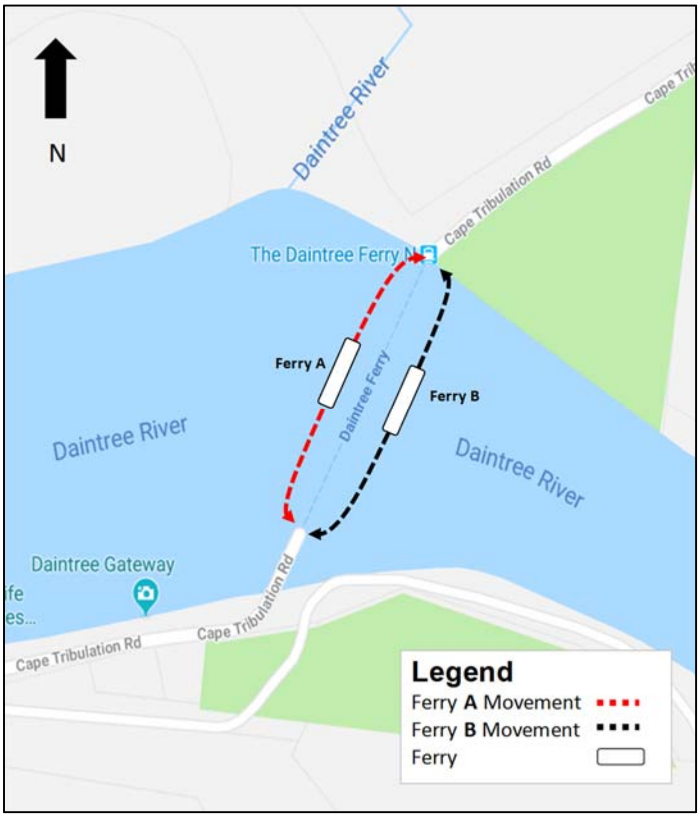

Figure 3-3 - Second Ferry Option

3.2 Growth Rate Assumptions

Evaluation of the following data source derived the proposed growth rate:

- Data provided by Douglas Shire Council

Table 3-1 shows the data analysis for growth rates between all survey year horizons. GHD will use the maximum growth rate of 1.027% for 2036 forecast traffic demand projection. This is a reasonable assumption as this falls within the peak year period and therefore is adequate in justifying future growth and is a conservative selection.

Table 3-1 - Percentage difference between years for the month of July

Year gap	%difference
2015-2016	1.027
2016-2017	1.011

Table 3-2 and Table 3-3 show the projected traffic growth for 2036 for the option analysis scenarios 1, 2, 3 and 4.

Table 3-2 - Forecast Traffic Growth (AM Peak – 11:00 am – 1:00 pm)

	Light Vehicles	Heavy Vehicles
2015	204	25
2036	253	31

Table 3-3 - Forecast Traffic Growth (PM Peak 4:00 pm – 6:00 pm)

	Light Vehicles	Heavy Vehicles
2015	183	23
2036	228	28

**Note: In the above tables, the light vehicles listed includes the concession card vehicles (refer to Table 2-3 for more information and breakdown of vehicles) and cover a 2 hour peak period.*

3.3 Temporal Coverage

Development of future year models are in accordance with the base model for weekday AM and PM peak hours as follows:

- 1st AM Peak hour 11:00 am – 12:00 pm
- 2nd AM Peak hour 12:00 pm – 1:00 pm
- 1st PM Peak hour 4:00 pm – 5:00 pm
- 2nd PM Peak hour 5:00 pm – 6:00 pm

Both AM and PM peak models also incorporate hour warm-up and hour cool-down periods to provide a more realistic representation of the peak hour traffic condition before and after the core peak periods.

3.4 Modelling Parameters

Aimsun modelling maintained default parameters.

3.5 Options Assessment Results

The queue lengths were analysed based on both northbound and southbound approach to derive the effectiveness of the options for 2036 forecast year. The following section summarise the modelling results for all options.

3.5.1 Option 1 - 'Do nothing' Modelling Results

Application of 2036 forecast demands for the existing road network (Base Model) provides a basis for comparison. Table 3-4 details the queue length comparison between both base year and 2036 do-nothing scenarios.

Table 3-4 - Queue length analysis for "do nothing" 2036 forecast

	Queue length (metres)	
Peak	**Base year**	**2036 Do Nothing**
AM (northbound)	590	938
PM (southbound)	223	706

The modelling result with 1.027% growth rate for the forecast year of 2036 indicates that the approach will operate with significant queueing for both AM and PM in comparison to the base year demands for all peak periods. Figure 3-4 and Figure 3-5 are snapshots illustrating the extent of the queue. From the results, it is noted that the base year modelled queue is 590 m.

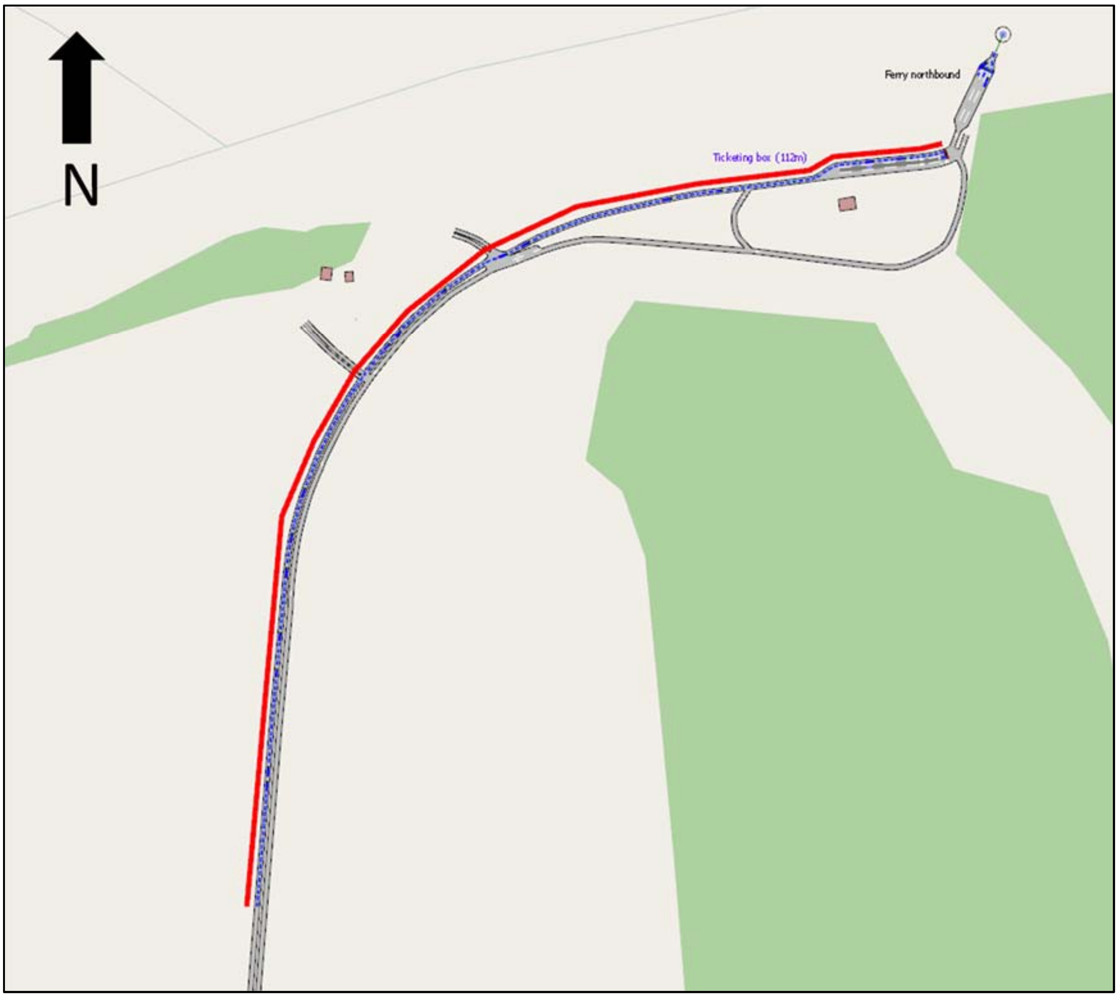

Figure 3-4 - Snapshot of 2036 Do nothing maximum queue length in AM peak

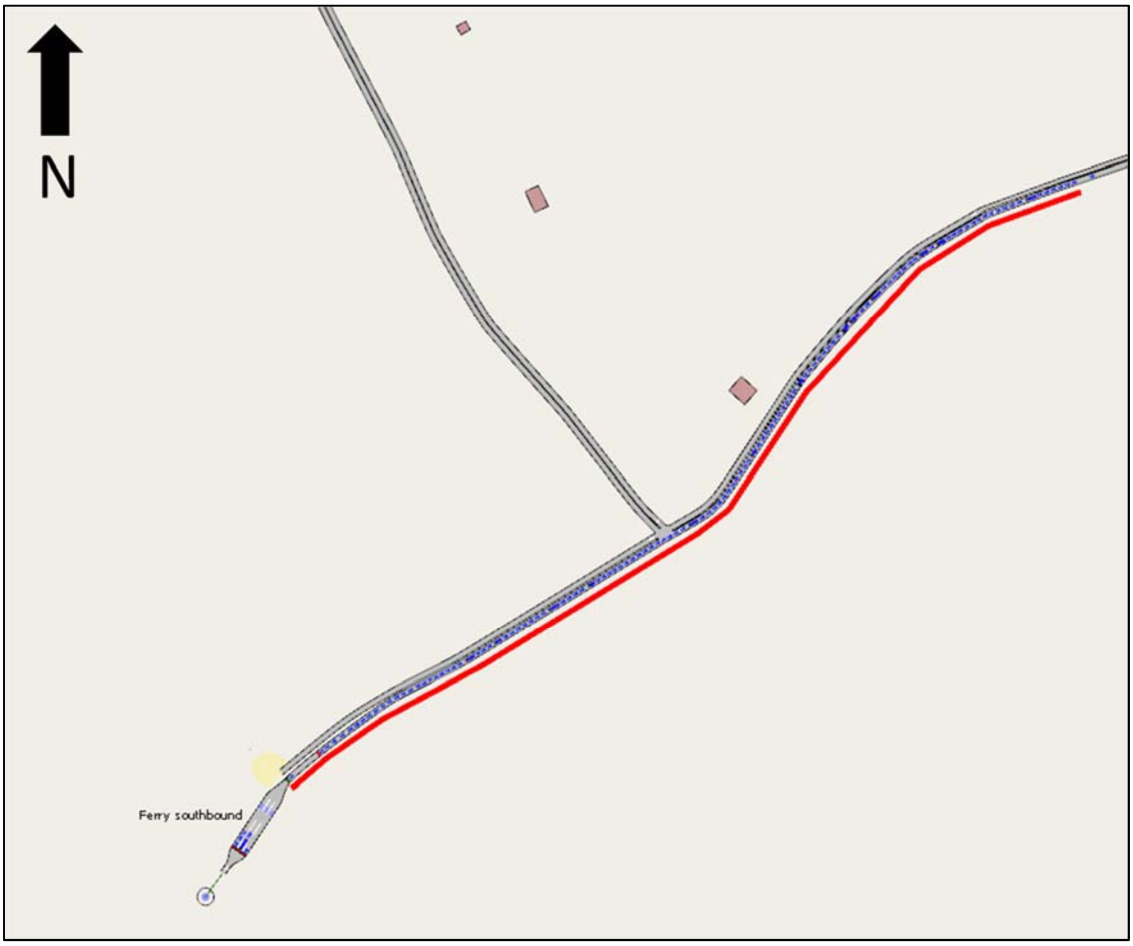

Figure 3-5 - Snapshot of 2036 Do nothing maximum queue length in PM peak

3.5.2 Option 2 - Bridge across the Daintree River

Bridge operation of the Daintree River will result in no queueing due to the free flowing nature of the bridge. The bridge governs a single lane in both directions with posted speed of 40 km/h. Figure 3-6 illustrates the bridge location at the current ferry crossing location for modelling purposes only. The bridge would be located elsewhere along the river to allow ferry operation to continue while the bridge construction is underway.

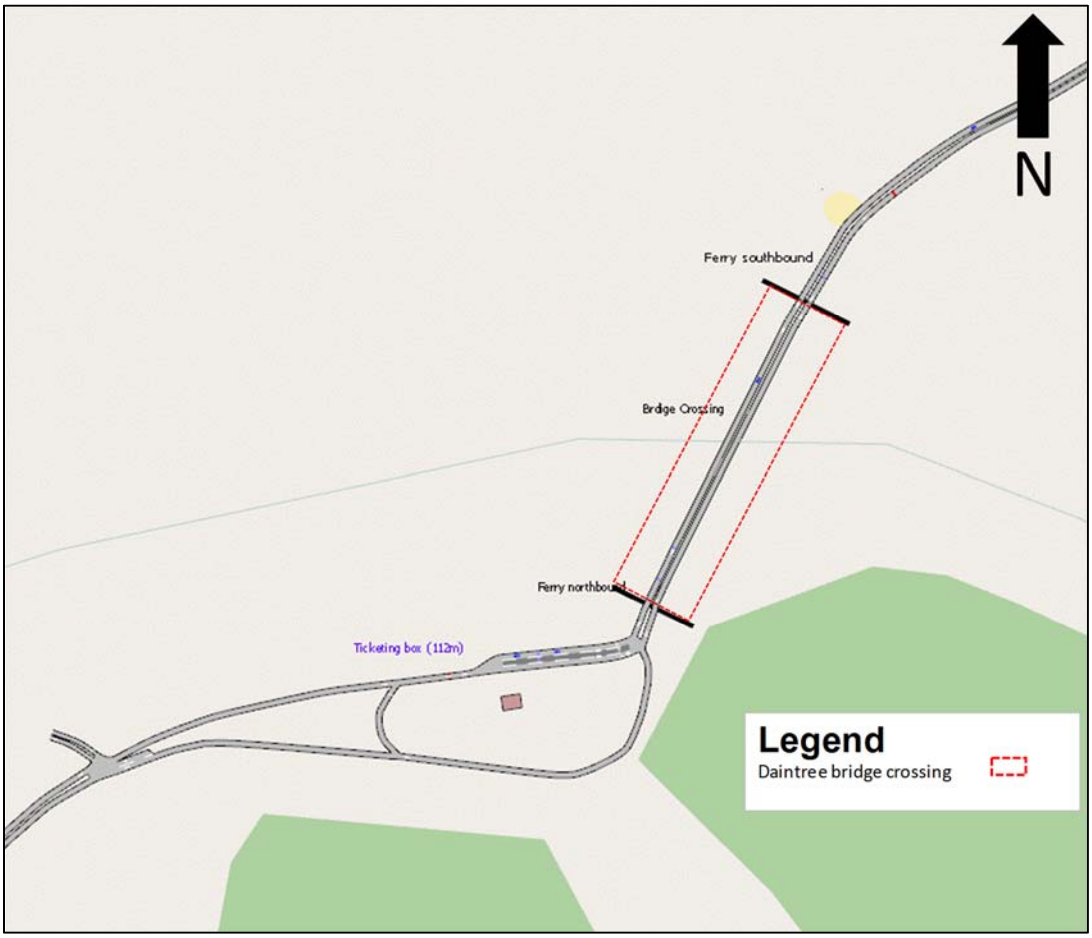

Figure 3-6 - Modelled bridge crossing

3.5.3 Option 3 – Larger ferry

Table 3-5 shows modelled queuing comparison for do nothing network configuration and the larger ferry option for both AM and PM peak. It is evident that for both AM (northbound movement) and PM (southbound movement), the larger ferry has improved performance in terms of shorter queueing.

The larger ferry option requires a longer travel time. The offset of higher capacity results in shorter wait time for ferry access, hence an expected reduction in queueing. Figure 3-7 and Figure 3-8 are snapshots of the queueing extent with the 2036-forecast demand.

Table 3-5 - Queue comparison between do nothing and larger ferry option

	Queue length (metres)	
Peak	**2036 Do Nothing**	**Larger ferry (2036)**
AM (northbound)	938	380
PM (southbound)	706	300

Figure 3-7 - 2036 Larger ferry maximum queue length in AM peak

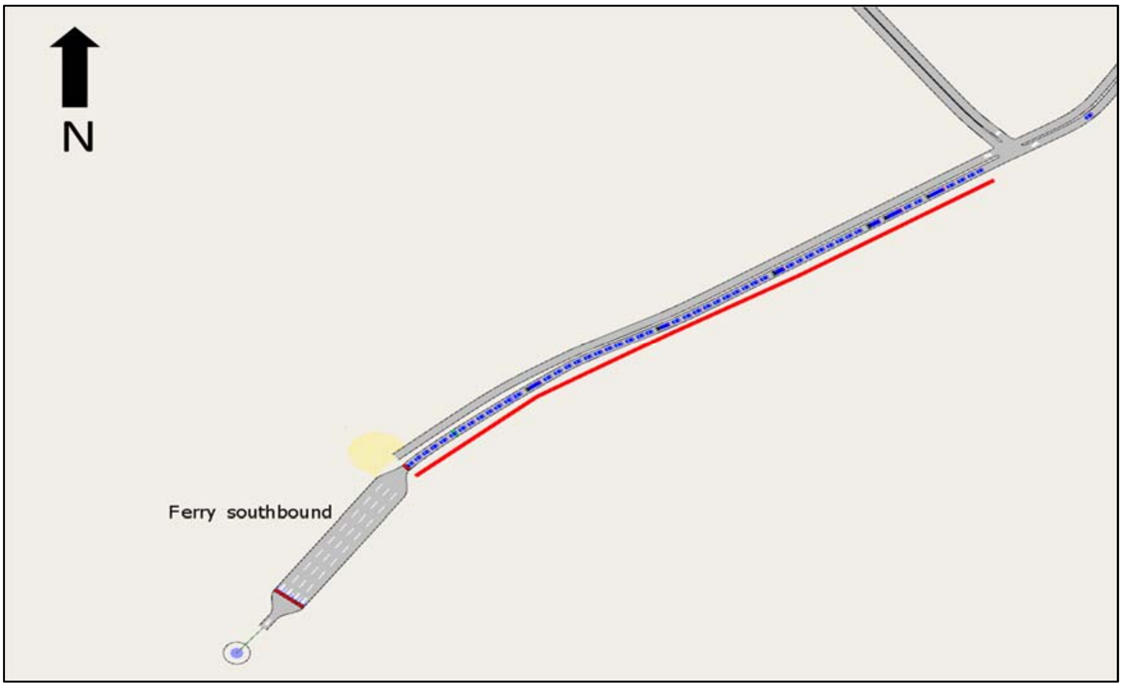

Figure 3-8 - 2036 Larger ferry maximum queue length in PM peak

3.5.4 Option 4 - Second Ferry Option

Table 3-6 shows queuing comparison for the do nothing network configuration and the second ferry option for both AM (northbound movement) and PM (southbound movement) peak periods. Performance of the second ferry compared to the do nothing shows improvement in both AM and PM peak periods in terms of reduced queuing. Figure 3-9 and Figure 3-10 shows the snapshots of the queueing extent for 2036 Option 4 AM and PM peak periods respectively.

Table 3-6 - Queue comparison between do nothing and second ferry option

	Queue length (metres)	
Peak	**2036 Do Nothing**	**Second ferry (2036)**
AM	938	562
PM	706	297

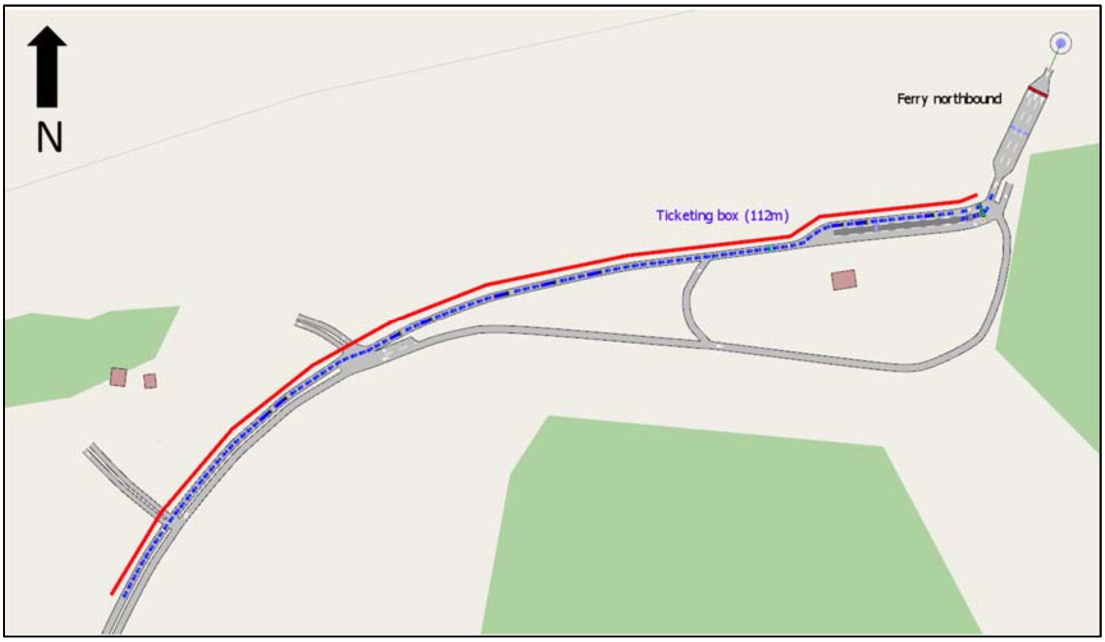

Figure 3-9 - 2036 Second ferry maximum queue length in AM peak

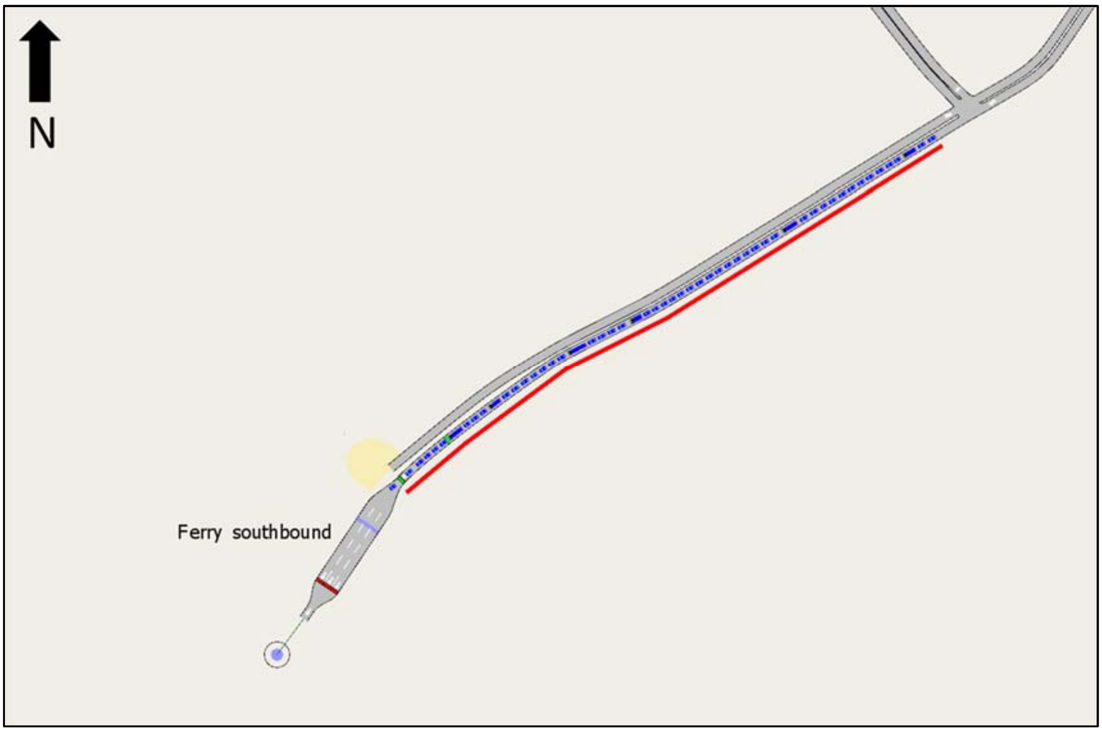

Figure 3-10 - 2036 Second ferry maximum queue length in PM peak

4. Summary of Findings

This report presented the traffic modelling outputs for base year and 2036 forecast year traffic demands for four network scenarios namely:

- Base case – Current network configuration as of 2018.
- 2036 Do nothing – Existing network configuration without any improvements
- 2036 Bridge Crossing
- 2036 Larger Ferry – Larger capacity
- Second Ferry – Dual ferry operation with same capacity.

Ferry crossing performance was modelled for the existing base case (2018) and 2036 future year demand scenarios for the AM peak hour between 11:00 am – 1:00 pm, and the PM peak hour between 4:00 pm – 6:00 pm. Table 4-1 presents the main findings for each option assessed.

Table 4-1 - Queue results summary

Queue (m)					
	Base Case	**2036 Do Nothing**	**2036 Bridge**	**2036 Larger Ferry**	**2036 Second Ferry**
AM (northbound)	590	938	-	380	562
PM (southbound)	223	706	-	300	297

4.1.1 Option 1 - 2036 Do Nothing

- Based on model simulation, cape Tribulation Road (northbound) shows an increase in queueing compared to the base case scenario. Similarly, the same outcome for Cape Tribulation Road (southbound).
- Queue length on Cape Tribulation Road going southbound shows an increase in queue compared to Cape Tribulation Road northbound movement. An expected result of not having a storage lane (Local priority) like the northbound movement.
- In the AM peak, the northbound maximum queue recorded as 938 m occurs at 12:46 pm and in PM peak, the maximum queue is recorded as 706 m at 5:58 pm for southbound.

4.1.2 Option 2 - 2036 Bridge Crossing

- Bridge crossing has no queue in both AM and PM peak due to its free flow nature. The bridge crossing modelled results are based on GHD's bridge crossing layout assumptions.

4.1.3 Option 3 - 2036 Larger Ferry

- Although travel time for this option has increased (uncontrolled by voyage specifications and river speed limits), this is offset by the reduced wait time by increasing ferry capacity, ultimately allowing more vehicles on the ferry within a single trip. An improved result in queue reduction.

- Modelled results show improvements in queuing for both AM peak (northbound) and PM peak (southbound) compared to the “Do Nothing” option.
- The maximum queue recorded in the AM peak is of 380 meters, which occurs at 12:48 pm, whereas, in the PM peak the maximum queue recorded is of 300 meters occurring at 5:48 pm.
- However, a larger ferry may not be a feasible option for the Daintree river crossing.

4.1.4 Option 4 - 2036 Second Ferry

- Travel time for each ferry assumed as similar to the current ferry operation at the Daintree River crossing. Duplication of the ferry service has added additional vehicle capacity and ultimately reducing the wait time for ferry access by half at both loading points. An improved result in queue reduction.
- Model results shows improvements in queuing for both AM peak (northbound) and PM peak (southbound) compared to the “Do Nothing” option.
- In the AM peak, maximum queue of 562 m occurs at 12:48 pm, whereas in the PM peak maximum queue of 297 m occurring at 5:48 pm.

Appendix A – Hour traffic analysis for all days of July, 2015.

	From 5:00 am to 1:00 am																			
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total based on peak period
1/07/2015	1	17	26	62	112	86	90	0	0	0	0	0	0	0	0	0	0	0	0	288
2/07/2015	6	15	13	63	112	77	101	82	60	83	69	43	32	16	9	2	5	1	0	372
3/07/2015	2	8	21	70	105	88	93	83	102	97	61	47	22	18	9	3	4	1	1	369
4/07/2015	4	9	22	65	92	96	116	97	99	82	82	68	24	12	12	5	4	3	3	401
5/07/2015	1	5	21	58	75	91	95	108	104	97	85	38	39	24	11	4	2	3	1	369
6/07/2015	2	15	24	64	104	97	94	85	85	64	69	52	22	13	5	2	2	2	1	380
7/07/2015	6	22	21	58	98	78	109	100	103	92	75	68	26	21	12	8	1	5	2	385
8/07/2015	1	28	29	49	102	81	96	102	108	73	70	46	25	11	8	5	2	0	2	381
9/07/2015	0	14	19	46	103	95	121	89	93	92	75	52	26	19	14	5	2	0	1	408
10/07/2015	0	14	26	70	100	75	98	79	94	87	74	57	38	25	9	8	4	5	3	352
11/07/2015	0	10	15	47	89	95	105	110	101	94	68	42	36	25	15	3	9	5	3	399
12/07/2015	1	9	15	32	60	83	103	98	78	69	40	46	21	16	4	2	7	6	1	344
13/07/2015	3	16	14	66	90	113	73	79	58	75	43	44	32	10	12	2	0	10	1	355
14/07/2015	2	16	35	77	106	98	111	99	97	78	40	69	43	21	10	4	2	1	0	414
15/07/2015	3	18	23	62	100	81	110	79	105	71	43	46	25	12	11	6	1	1	1	370
16/07/2015	1	17	22	70	89	79	92	96	72	71	44	49	34	8	12	10	6	9	-1	356
17/07/2015	0	19	36	80	97	98	85	91	70	78	61	55	39	19	10	9	9	7	1	371
18/07/2015	2	30	22	65	100	112	113	116	77	86	70	65	19	7	12	7	5	5	3	441
19/07/2015	0	8	18	39	61	91	95	89	106	102	44	45	20	17	9	3	4	8	2	336
20/07/2015	1	11	9	58	87	88	104	92	87	75	64	37	24	12	4	6	1	1	0	371
21/07/2015	2	15	19	72	86	99	119	97	77	80	54	28	18	13	8	7	5	2	0	401
22/07/2015	9	18	16	60	113	109	75	101	79	64	51	53	29	12	8	8	3	0	0	398

23/07/2015	2	17	19	59	111	82	103	83	73	72	63	37	23	22	4	3	1	8	0	379
24/07/2015	1	15	20	54	58	119	88	80	59	73	46	44	22	13	12	9	2	4	2	345
25/07/2015	0	7	19	31	63	111	93	72	66	55	50	47	17	19	10	4	5	3	2	339
26/07/2015	0	10	13	32	69	68	108	98	87	56	55	44	30	26	14	2	4	1	0	343
27/07/2015	3	17	16	63	93	94	103	88	88	65	54	34	13	16	9	6	0	0	0	378
28/07/2015	17	15	19	57	105	81	111	99	50	56	51	48	23	20	6	11	2	2	1	396
29/07/2015	16	12	15	96	100	58	82	81	71	72	56	45	23	11	12	10	12	3	1	321
30/07/2015	1	11	14	71	104	101	129	87	52	58	62	42	20	13	6	1	4	1	0	421
31/07/2015	0	18	19	62	79	109	88	58	71	69	60	40	24	15	8	2	0	3	1	334
Total	87	456	620	1858	2863	2833	3103	2718	2472	2286	1779	1431	789	486	285	157	108	100	32	

Appendix B – Hourly traffic analysis for July 18th, 2015

	July 18, 2015																		
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Bus 11-20 Seats One Way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus 11-20 Seats Return	0	0	1	2	6	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Bus 21+ Seats One Way	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Bus 21+ Seats Return	0	0	0	0	3	5	2	2	1	0	0	0	0	0	0	0	0	0	0
Bus 6-10 Seats One Way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bus 6-10 Seats Return	0	0	0	2	2	1	2	0	0	0	0	1	0	0	0	0	0	0	0
Car Ute One Way	0	1	1	9	5	10	17	13	16	9	20	5	3	0	4	1	0	0	0
Car Ute Return	0	4	10	41	55	59	55	63	31	44	12	32	6	1	1	1	0	0	0
Card No:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Concession Card	0	8	8	7	19	19	17	15	11	16	19	19	3	2	4	3	4	5	3
Discounted One Way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discounted Return	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Douglas Card Return	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LPT Buses One Way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LPT Buses Return	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Machinery CPP One Way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Machinery CPP Return	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Machinery NCPP One Way	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Machinery NCPP Return	1	6	0	1	0	0	0	1	3	4	0	0	0	0	0	0	0	0	0
Motor Bikes One Way	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0
Motor Bikes Return	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Multi Day Pass Book	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
Multi Day Ticket	0	2	1	1	3	6	3	2	1	0	4	4	2	0	1	0	0	0	0
School Buses One Way	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
School Buses Return	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Trailers One Way	0	0	0	1	1	2	6	2	3	1	3	2	0	0	0	0	0	0	0
Trailers Return	1	7	0	0	4	6	2	9	4	9	1	1	0	0	0	0	0	0	0
Visitor Ticket	0	2	1	1	1	3	7	9	6	2	5	1	5	4	2	2	1	0	0
Total	2	30	22	65	100	112	113	116	77	86	70	65	19	7	12	7	5	5	3

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