



Mooney Mooney & Peat Island Planning Proposal

Traffic & Transport Review

12 September 2016

383 Kent Street
Sydney NSW 2000
PO Box Q1678, QVB
Sydney, NSW 1230
Australia

T +61 (0)2 9098 6800
F +61 (0)2 9098 6810
mottmac.com

Level 5
4-6 Bligh St
Sydney NSW 2000

Mooney Mooney & Peat Island Planning Proposal

Traffic & Transport Review

12 September 2016

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	08.08.2016	B. Smith			Draft report
B	26.08.2016	B. Smith L. Labutis	G. Hughes	C. Avis	Final Report
C	06/09/2016	L. Labutis	G. Hughes	C. Avis	Final Report - Minor Amendments
D	12/09/2016	L. Labutis	G. Hughes	C. Avis	Final Report - Minor Amendments

Information class: Standard

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Contents

Executive summary	1
Recommendations	2
1 Introduction	3
1.1 Project Appreciation	3
1.2 Site Location	3
1.3 Proposed Rezoning	3
1.4 Purpose of the Report	3
1.5 Assumptions and Report Limitations	5
1.6 Report Structure	5
2 Background and Planning Context	6
2.1 Strategic Context	6
2.2 Alignment with NSW 2021 and NSW Long Term Transport Master Plan	7
2.3 Alignment with Ministerial Direction	7
2.4 Regional Direction - Draft Central Coast Regional Plan	8
2.5 Department of Planning and Environment Queries	8
2.6 Overview of Previous Transport Report	9
2.7 Consultation with RMS and TfNSW	10
3 Existing Conditions	11
3.1 The Site	11
3.2 Current Travel Characteristics	13
3.3 Road Network	14
3.3.1 M1 Pacific Motorway	14
3.3.2 Pacific Highway	14
3.3.3 Pacific Highway Link Road	15
3.3.4 Peats Ferry Road	15
3.4 Bus services and facilities	15
3.5 Rail services and facilities	16
3.6 Walking and Cycling	17
3.7 Existing Traffic Data	18
3.8 Crash Data Analysis	20
4 Concept Plan	21
4.1 Key Components of the Concept Plan	21

4.2	Key Traffic and Transport Features	22
5	Traffic and Transport assessment	24
5.1	Impact on Public Transport	24
5.2	Road Network Considerations	24
5.2.1	Access and Parking	24
5.2.2	Road safety, Incident Management and Wayfinding	25
5.2.3	Road Design Principles	25
5.2.4	Heavy Vehicle Access and the RMS Depot (B2) site	25
5.3	Traffic Generation and Distribution	26
5.4	Road Network Performance	27
5.4.1	Traffic modelling performance measures	27
5.4.1	Modelling Scenarios	28
5.4.2	Modelled Network	28
5.4.3	Modelling Results	29
6	Key Findings and Recommendations	31
	Appendices	34
A.	Concept Plan	35
B.	Bus Route Map	36
C.	M1 Motorway & Mooney Mooney Crash Data (RMS, 2010-2015)	37
D.	B-Double Swept Paths and RMS B-Double Access Map	38
E.	Traffic Generation & SIDRA Intersection Analyses	39

Executive summary

Government Property NSW (GPNSW) has engaged Urbis to prepare a Planning Proposal to rezone surplus Government land at Mooney Mooney and Peat Island (The Site), which will help to realise its unique development potential. This revised Planning Proposal will focus on maximising The Sites strategic position, its relationship and ability to support established areas and its surroundings, and how it can be configured and shaped to establish appropriate planning controls that align with this area of natural beauty.

Mott MacDonald has been engaged to provide transport planning and engineering services to support the Planning Proposal for the rezoning of Government Property NSW (GPNSW) land at Mooney Mooney and Peat Island. This report aims to address all key traffic and transport related matters associated with the proposed Concept Plan and specifically address comments received from DPE in regard to the original 2014 Concept Plan for The Site. These issues and the responses that are addressed in this report are listed below.

Table 1.1: Traffic and Transport – Planning Issues and Responses

Issues	Responses
Strategic suitability of The Site	The planning proposal is demonstrated to align with the intention of the Draft Central Coast Regional Plan and support future growth near centres and along established transport corridors – refer to section 2 and Figure 2.1 . The planning proposal is identified to support the goals and targets identified in NSW 2021 – refer to section 2
Consultation with RMS	Refer to the below for responses to RMS issues listed in the Department of Planning and Environment letter dated 22/9/2015 (ref 15/13626) and section 2.7 for details of issues raised as part of the consultation process.
Suitability of development intensity	The capacity appraisal of the existing road network demonstrates that there is adequate spare capacity across the existing local road network to support future increases in development. The appraisal also highlights that the traffic generation from the proposed concept would be moderate and can be managed under current arrangements – refer to section 5.1.2 , section 5.3 and section 6 and Tables 5.4 and 5.5 .
Access to island	Access to the island will be managed and limited to service vehicles and authorised vehicles only. This will ensure that the limited operating capacity and potential for conflict with pedestrians can be appropriately controlled – refer to section 4 and 5.1.1 .
Access to the network and safety	The assessment has indicated that the development proposal will have a minor impact on network operations or current historical road safety trends – refer to section 3.7 , 4 and 5.3 .
Services centre and rest area	The potential development of a service station will assist in the provision of roadside services for northbound traffic and help to manage historical road safety issues and is expected to be supported by improvements in wayfinding – refer to section 4 , 5.1.4 and 6 .
Managing potential conflict with existing recreation facilities	The development proposal has limited impact on current recreation activity and proposes an upgrade and expansion to support future needs – refer to Figure 1.1 and section 5.1 .
Public transport access	The proposed development aligns with existing service routes and stops and it is acknowledged through growth along the corridor that there would be potential for future increases in service frequency as part of Government’s progressive improvement to public transport services – refer to section 3.3 , 3.4 , 4.2 and 6 and Figures 1.1 and 3.1 .
Connectivity with local facilities and services	Established roads and services, such as the Old Pacific Highway offer efficient and safe connections to surrounding facilities and services located in Brooklyn and Berowra, and more regional based facilities in Gosford and Hornsby. These can be accessed in some cases by both active and public transport - refer to sections 2 , 3.3 , 3.4 , 4.2 and 6 .
Consultation with TfNSW	Refer to the below for responses to TfNSW issues listed in the Department of Planning and Environment letter dated 22/9/2015 (ref 15/13626) and refer to section 2.7 for details of issues raised as part of the consultation process.
Public transport demand	There is adequate capacity on current services to accommodate future increases in

Issues	Responses
and servicing	demand both by rail and bus. It would be desirable to increase bus route service frequency and consider commuter parking at the rail station to make this a more desirable method of travel - refer to section 3.3, 3.4, 4.2 and 6 and Figures 1.1 and 3.1 .
Active transport opportunities (TDM)	Active transport is currently supported by limited footpath and cycle lane provision and the development will consider significant internal improvements to encourage active transport activity and investigate future upgrades to improve connectivity to surrounding centres - refer to section 4.1, 4.2 and 6 .

Source: DPE's Gateway feedback and consultation with RMS & TfNSW

This review demonstrates the strategic importance of The Site, its ability to be rezoned and align with appropriate planning controls, and in this context its ability to support sustainable planning and integrated land use and transport principles and support Government policy targets and goals.

Evacuation in case of flooding has also been considered and is covered in the Water Cycle Management Report.

Recommendations

The following recommendations are put forward for investigation or incorporation in subsequent design stages following gateway determination, which should be undertaken after rezoning to support future development applications:

- The development of a transport management and access strategy that would facilitate and support safe and efficient access by all modes of travel to and from The Site.
- Development of a wayfinding strategy for the area and to address access needs from the strategic transport network.
- The development and implementation of a local area traffic management strategy that would support safe movement along the local network and improve connectivity to surrounding centres. This investigation could include the implementation of a 50 km/h speed zone for the Mooney Mooney area, including Peats Ferry Road, Peat Island Road, Pacific Highway Link Road, Kowan Street, Chapel Road, and Pacific Highway between the Pacific Highway Link Road and Point Road.
- To undertake a more detailed traffic and transport assessment to support future DA submissions and its potential staging and investigate possible future upgrades regional links and services.

1 Introduction

1.1 Project Appreciation

A previous planning proposal was submitted to the Department of Planning and Environment (DPE) for consideration in 2014. As part of the proposal a Traffic, Transport and Access Report was undertaken by GTA Consultants. Comments from the review by DPE indicated that further consideration of the suitability of The Site in terms of existing and future traffic and transport planning and supporting measures needed to be explored and addressed to inform the proposed rezoning of the area and the establishment of new planning controls.

1.2 Site Location

The Mooney Mooney and Peat Island site (refer to Figure 1.1) is located on the shores of the Hawkesbury River and adjacent to the M1 Motorway. It is well-connected to nearby regional, sub-regional and local centres by both road and rail.

In terms of its locality to surrounding centres it is situated approximately 50km north of Sydney CBD, 24 km north of Hornsby rail station, and 2.5km north of Brooklyn. To its north are established regional townships situated at Gosford (approximately 27km north) and Wyong (approximately 45km north by road).

The Site has the potential to offer a good level of local and sub-regional access and the area itself provides the opportunity to capture recreational and lifestyle attractions and to support continued growth in NSW tourism.

Refer to Appendix A for further details of The Site, including the Concept Plan.

1.3 Proposed Rezoning

An updated Concept Plan has been developed for The Site. The Concept Plan includes a mix of community, residential and employment generating uses, as shown in Figure 1.1.

This report will identify opportunities and address potential issues associated with supporting access, movement and the overall the appropriate integration of the proposed site with its surroundings as part of the proposed rezoning of The Site.

1.4 Purpose of the Report

The purpose of this report is to assess the potential traffic and transport impacts of the revised Concept Plan, and to address relevant traffic and transport issues identified in previous DPE's responses to previous planning submissions. The analysis will be carried out at an appropriate level that helps to inform rezoning of the land and the establishment of planning controls. This report also aims to formulate a number of recommendations that would be carried out as part of the next stage of the planning process once the planning controls are established.

Figure 1.1: Mooney Mooney and Peat Island Location Plan



Source: Google Maps (2016)

1.5 Assumptions and Report Limitations

Our assessment is based on and is limited to the following assumptions and limitations:

- The assessment was based on traffic generation rates as stated in the RMS Guide to Traffic Generating Developments (2002) and the more recent *RMS's Technical Direction 2013/04a: Guide to Traffic Generating Developments – Updated Traffic Surveys* (RMS, 2013) and are generally conservative given the characteristics of planned uses.
- Traffic distribution was based on information extracted from BTS Journey to Work data for the Mooney Mooney area.
- The network assessment was limited to Weekday AM and PM peak period site survey information obtained for local intersections across The Site and RMS permanent count station traffic data provided by RMS for the M1 Pacific Motorway.
- The road safety assessment was limited to the RMS crash statistics (2010-2015) provided by RMS for the project.
- The concept plan land use was limited to the detail provided in the preferred concept plan for the rezoning of The Site.
- The assessment is based on an existing situation and full development preferred concept plan scenario only and is limited by the data obtained and identified in this report.
- The assessment of The Site and concept does not consider development staging or horizon years as these are unlikely to impact on the local road network, which is the focus of this assessment.
- The assessment was carried out at a high level using SIDRA modelling software and does not consider detailed operational aspects related to specific uses beyond the operation of local intersections during weekday AM and PM peak periods.

1.6 Report Structure

The remainder of this report is structured as follows:

- ***This section*** – introduces the project and the aims and limitations of the report.
- ***Section 2*** – covers the background of the project, previous studies and findings, relevant guidance obtained from consultation with other Government agencies and the project alignment with strategic planning objectives.
- ***Section 3*** – provides an understanding of the existing situation including area and network characteristics and the service and facility conditions.
- ***Section 4*** – Provides a broad overview of the preferred concept plan, proposed uses and the key changes from the original 2014 Concept Plan.
- ***Section 5*** – provides an assessment of the concept plan and aims to respond to the queries raised in the DPE 2015 response to the original 2014 Concept Plan and comments raised on RMS and TfNSW during subsequent discussions.
- ***Section 6*** – summarises the findings and provides recommendations for future stages in the planning process.

2 Background and Planning Context

This section provides an overview of the strategic context, project proposal and previous studies, and the project's alignment with Government planning and policy goals.

2.1 Strategic Context

The strategic context of The Site in relation to nearby centres and transport routes is presented in Figure 2.1.

Figure 2.1: Strategic Context



Source: Google Earth (2016)

Figure 2.1 demonstrates that The Site is well connected to nearby centres via the M1 Motorway, Pacific Highway and T1 North Shore train line. The 592 bus route also connects The Site to the south including Brooklyn (with the Hawkesbury River train station) and Hornsby.

2.2 Alignment with NSW 2021 and NSW Long Term Transport Master Plan

The key guiding documents that are developed by Government for the rezoning of The Site are NSW 2021 – a Plan to Make NSW Number One (2011) and the NSW Long Term Transport Master Plan (2012).

NSW 2021 is identified to be NSW 10–year plan for guiding policy direction and budget decision making, and delivering on community priorities. It sets long–term goals and measurable targets, and outlines immediate actions that will help whole of state growth, and to improve opportunities and quality of life for people situated in both regional and metropolitan areas of NSW.

The NSW Long Term Transport Master Plan is an integrated transport strategy for NSW that brings together land use and transport planning, and aims to improve the integration of all modes of transport. It proposes to develop action plans that set a clear direction for all transport modes and establish a path that offers an enhanced transport system that can meet current and future customer needs, and support projected growth.

The key targets and goals that are set within Government’s planning directions that are relevant to this assessment are as follows:

ALIGNMENT WITH NSW 2021

The Master Plan framework incorporates the NSW 2021 goals and targets. Transport for NSW is the lead agency for the following NSW 2021 goals:

- Goal 7 – Reduce travel times (private and public transport)
- Goal 8 – Grow patronage on public transport by making it a more attractive choice
- Goal 9 – Improve customer experience with public transport services
- Goal 10 – Improve road safety

Transport for NSW will also contribute to the NSW 2021 goals of:

- Goal 19 – Invest in critical infrastructure
- Goal 20 – Build liveable cities

Source: NSW Long Term Transport Master Plan (2012).

These target goals can be supported by the proposed rezoning of The Site, which is demonstrated in the subsequent sections of this report. The travel demand management plan identified in the previous submission together with the recommendations made as part of this report will help to formulate an appropriate package of measures that help to maintain network reliability, maximise the potential of existing infrastructure and services, and support and promote travel by public transport, walking and cycling, and improving safety.

2.3 Alignment with Ministerial Direction

The applicable Ministerial Directions under section 117 of the Environmental Planning and Assessment Act indicate the following:

- **Ministerial Direction and Best Practice 3.1 – Residential Zones**

The Ministerial Direction indicates that development proposals should make efficient use of existing infrastructure through locating near to established infrastructure, such as city centres, neighbourhood centres, transport hubs, schools, employment precincts, recreational facilities and regional services.

This proposal is identified to align with these principles and provides good connectivity to established and planned employment, education, retail and recreation facilities. This is achieved through existing services and network infrastructure opportunities, which offers access travel mode choices for both local and regional travel. Its proximity to the above can help to maximise the potential of existing infrastructure and support access by public transport, walking and cycling. Refer to sections 2.1 and 4.2 for further details.

- **Ministerial Direction and Best Practice 3.4 – Integrating Land Use and Transport**

The Ministerial Direction indicates that the development proposals should have a positive contribution to managing travel demand.

The Site provides an integrated land use and transport solution that aligns with the direction, and the planning principles set in NSW 2021, Draft Central Coast Regional Plan and the NSW Long Term Transport Master Plan. Its position in the Hawkesbury River catchment can help to support travel by walking, cycling and an existing public transport system. The inclusion of residential density at this site, which is situated within walking distance of a new local centre and established bus service route stops, and cycling distance of an established township with a railway station provides an opportunity supporting growth and at the same time reducing car dependency in the Hawkesbury River catchment.

2.4 Regional Direction - Draft Central Coast Regional Plan

The Draft Central Coast Regional Plan (NSW Department of Planning, November 2015) provides a regional planning vision for the Central Coast. Due to the early planning status of this rezoning application, The Site itself is not specifically mentioned, however in general terms it is covered through strategic directions that aim to increase residential development through infill and the availability of existing infrastructure and services. This aims and aligns with the planning concept through encouraging increases in housing supply and choice in established areas, which will make best use of existing services and infrastructure such as public transport.

2.5 Department of Planning and Environment Queries

Traffic and transport issues raised by the DPE are presented in Table 2.1 together with how these elements are addressed as part of this report.

Table 2.1: Traffic and Transport – Planning Issues and Responses

Issues	Responses
Strategic suitability of The Site	The planning proposal is demonstrated to align with the intention of the Draft Central Coast Regional Plan and support future growth near centres and along established transport corridors – refer to section 2 and Figure 2.1 . The planning proposal is identified to support the goals and targets identified in NSW 2021 – refer to section 2
Consultation with RMS	Refer to the below for responses to RMS issues listed in the Department of Planning and Environment letter dated 22/9/2015 (ref 15/13626) and section 2.7 for details of issues raised as part of the consultation process.
Suitability of development intensity	The capacity appraisal of the existing road network demonstrates that there is adequate spare capacity across the existing local road network to support future increases in development. The appraisal also highlights that the traffic generation from the proposed concept would be moderate and can be managed under current arrangements – refer to section 5.1.2 , section 5.3 and section 6 and Tables 5.4 and 5.5 .
Access to island	Access to the island will be managed and limited to service vehicles and authorised vehicles only. This will ensure that the limited operating capacity and potential for conflict with pedestrians can be appropriately controlled – refer to section 4 and 5.1.1 .
Access to the network and safety	The assessment has indicated that the development proposal will have a minor impact on network operations or current historical road safety trends – refer to section 3.7 , 4 and 5.3 .
Services centre and rest area	The potential development of a service station will assist in the provision of roadside services for northbound traffic and help to manage historical road safety issues and is expected to be supported by improvements in wayfinding – refer to section 4 , 5.1.4 and 6 .
Managing potential conflict with existing recreation facilities	The development proposal has limited impact on current recreation activity and proposes an upgrade and expansion to support future needs – refer to Figure 1.1 and section 5.1 .
Public transport access	The proposed development aligns with existing service routes and stops and it is acknowledged through growth along the corridor that there would be potential for future increases in service frequency as part of Government’s progressive improvement to public transport services – refer to section 3.3 , 3.4 , 4.2 and 6 and Figures 1.1 and 3.1 .
Connectivity with local facilities and services	Established roads and services, such as the Old Pacific Highway offer efficient and safe connections to surrounding facilities and services located in Brooklyn and Berowra, and more regional based facilities in Gosford and Hornsby. These can be accessed in some cases by both active and public transport - refer to sections 2 , 3.3 , 3.4 , 4.2 and 6 .
Consultation with TfNSW	Refer to the below for responses to TfNSW issues listed in the Department of Planning and Environment letter dated 22/9/2015 (ref 15/13626) and refer to section 2.7 for details of issues raised as part of the consultation process.
Public transport demand and servicing	There is adequate capacity on current services to accommodate future increases in demand both by rail and bus. It would be desirable to increase bus route service frequency and consider commuter parking at the rail station to make this a more desirable method of travel - refer to section 3.3 , 3.4 , 4.2 and 6 and Figures 1.1 and 3.1 .
Active transport opportunities (TDM)	Active transport is currently supported by limited footpath and cycle lane provision and the development will consider significant internal improvements to encourage active transport activity and investigate future upgrades to improve connectivity to surrounding centres - refer to section 4.1 , 4.2 and 6 .

Source: DPE’s Gateway feedback and consultation with RMS & TfNSW

2.6 Overview of Previous Transport Report

A previous planning proposal was submitted to the DPE for consideration in 2014 and was supported by a transport assessment prepared by GTA Consultants (Traffic, Parking & Access Report - July 2015). The study included a Travel Demand Management Plan that identified general opportunities to improve:

- **Walking and cycling** – through a proposed public foreshore walkway around Peat Island and the western foreshore.
- **Public transport** – through increasing the frequency of the existing 592 bus service during peak and off-peak periods to help to improve connectivity between The Site and Brooklyn (Hawkesbury River station), Berowra, Cowan and Hornsby.

The broad assessment completed as part of the appraisal process also highlighted that traffic on the road network would increase by approximately 670 vehicle movements during peak periods and that this would be modelled as part of a future development application once the area is rezoned.

2.7 Consultation with RMS and TfNSW

Extensive consultation has been undertaken with different sections of RMS and Transport for NSW (TfNSW) and the key issues raised as part of this process are presented in Table 2.2.

Table 2.2: Key Issues Raised During Consultation

Agency	Contact Name, Role/Title	Issues Raised/ Discussed	Resolution/ Action
RMS Hunter Region	Adam Thomas Leader – Network Optimisation	Need to consider safety and crash trends, wayfinding needs and avoid modifying motorway ramps.	Crash data provided by RMS and appraised as part of the study - refer to section 3.8. Consider impact on motorway ramps and wayfinding – refer to section 5.
RMS Hunter Region	Ken Saxby Network & Safety Manager – Network Optimisation	Consider B-double permissible routes, proposed RMS works in the vicinity of The Site and road names.	Link provided to online maps indicating vehicle/ load approved routes. B-double swept paths analysed as part of the study – refer to section 5.2.4 and Appendix D. No proposed RMS works proposed and road names adjusted to align with RMS feedback.
RMS Hunter Region	Paula Goodwin Senior Property Officer	Raised safety issues related to the M1, boat ramp and public toilets area.	Road safety issues considered as part of the appraisal process and the proposal is considered not to impact on these existing features - refer to sections 3.8 and 5.
RMS TMC Sydney	David Wainwright Principal Manager – Traffic Operations	Indicated that SIDRA Intersection analysis may not be sufficient to capture the impact of future development on M1 traffic operations.	The concept does not have a significant impact on current operations or propose change existing operations. SIDRA analysis is deemed appropriate on this basis - refer to section 5. To be further discussed as part of the next stage in the planning process.
TfNSW Active Transport	Duncan Tjin Senior Transport Planner – Active Transport	TfNSW satisfied with concept provision of walking and cycling connections to bus stops. Suggested to explore cycle link to Hawkesbury River rail station.	Cycle link to Hawkesbury River rail station to be discussed with RMS as part of future planning proposals. TfNSW indicated walking and cycling connectivity should be delivered by developers, which is acknowledged and addressed in section 6.
TfNSW Bus Planning	Gordon Hunt Service Planner – Service Planning and Development, Infrastructure and Services	Transdev bus route 592 serves the Mooney Mooney area Services are limited and the development should support the potential for more frequent and weekend services.	Possible development funding to support improved service provision is supported and will be investigated as part of subsequent studies. The possibility of diverting the 592 services to Peat Island Road and deemed not to be required - refer to section 5.1.

3 Existing Conditions

3.1 The Site

The Site is separated by the M1 Pacific Motorway (M1) corridor, which is a high speed interstate corridor with high daily traffic volumes. Access to and from the M1 is via on/off ramps that offer access in both northbound and southbound directions. An established rest area that is positioned on the eastern side (northbound direction) of the corridor is currently used by passing traffic and regularly used by heavy vehicle drivers. This corridor restricts access between the western and eastern sections of The Site, which are limited to a two lane road corridor running under the M1 and a pedestrian underpass further north. Refer to Figure 3.1 for further details.

The Mooney Mooney and Peat Island local catchment is characterised with the following uses:

- Small pockets of low density residential housing;
- Disused or infrequently-used facilities (Peat Island, RMS depot, RFS depot, and a Chapel);
- A public boat ramp at the southern end of the peninsula;
- A limited number of commercial activities on the eastern foreshore;
- The Mooney Mooney Club (off Kowan Street);
- Deerubban Reserve to the southern edge of the area; and
- Brisbane Water Nation Park to the north.

Large parts of The Site are currently zoned SP2 (Special infrastructure) for either road, hospital or educational purposes. In the majority of cases these uses are now surplus to requirements and Government (the land owner) is currently seeking to rezone the land for more appropriate uses that could support regional strategies and growth of the economy.

Figure 3.1: Snapshot of the Existing Situation – The Site

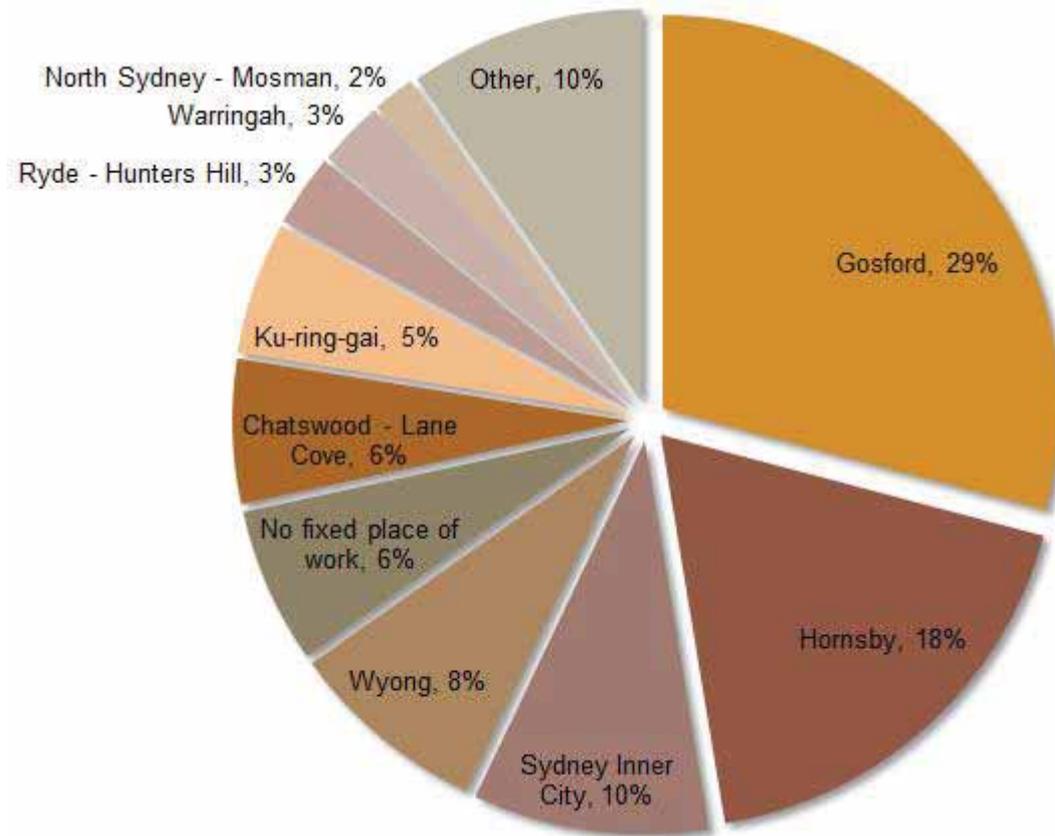


Source: Google Maps (2016) combined with Mott MacDonald edits (2016)

3.2 Current Travel Characteristics

An analysis has been undertaken of current Bureau of Transport Statistics (BTS) Journey to Work (JTW) trends for people currently residing in Mooney Mooney (part of BTS Travel Zone 5316). Figure 3.2 shows the normal place of work for people living in Mooney Mooney.

Figure 3.2: JTW Destinations - Place of Work

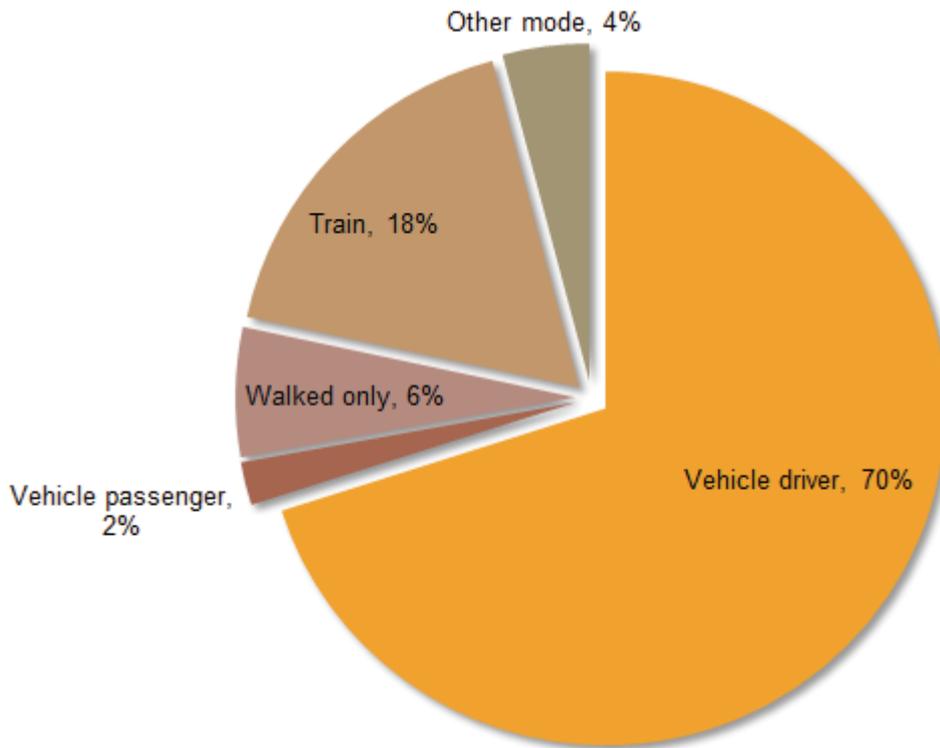


Source: BTS Journey to Work (2011)

The data indicates that people currently residing in the study area work in a variety of commercial centres and employment areas, with Gosford and Hornsby being key destinations. The data also highlights that some residents have no fixed place of work (6%) and indicates that this area is attractive to retirees. Based on this data it is expected that there would be a relatively similar north and south travel demand profile for future users of the sit and the attraction of retirees and lifestyle residents indicates that traditional peak demand levels during commuter peaks may not occur.

Figure 3.3 shows the normal JTW travel mode for people living in Mooney Mooney.

Figure 3.3: JTW Travel Mode



Source: BTS Journey to Work (2011)

The data indicates that travel by private car is the dominant travel mode for journeys in Mooney Mooney. Over 70% of residents travelled by car as either a driver (70%) or a passenger (2%) and this reflects the quality of access The Site offers to the strategic road network. Train also attracts a significant number of commuters with a 18% travel mode share. Refer to section 3.2 for further detail, which highlights that Hawkesbury River station offers attractive service connections to the major centres of Gosford and Hornsby (the key journey to work destinations). It is noted that the BTS data shows that less than 1% of the people surveyed stated that they travelled to work by bus and that road and rail will be the main modes of access for commuting purposes.

3.3 Road Network

The catchment is supported by the following road characteristics and the road network details highlighted in Figure 3.1:

3.3.1 M1 Pacific Motorway

The M1 (previously the F3 Freeway) is a major state road that connects key urban centres and conurbations, including Sydney, the Central Coast and Newcastle. This important arterial road link contains three lanes in each direction and includes entry and exit ramps at Mooney Mooney in both directions. The posted speed limit along this section of the motorway is 110km/h.

3.3.2 Pacific Highway

The Pacific Highway is a historical strategic road link that was replaced in this section by the M1 and functions as a regional road providing access to surrounding suburbs and recreation areas. This section of the Pacific Highway provides access to Brooklyn to the south (including Hawkesbury River train station) and Cheero Point to the north and contains one lane in each

direction and generally does not allow for kerbside parking. The posted speed limit through Mooney Mooney is 60km/h, which increases to 80km/h over the Hawkesbury River.

3.3.3 Pacific Highway Link Road

The Pacific Highway Link Road functions as a collector road connecting the Pacific Highway and M1 Motorway northbound off and on ramps. It allows access to and from Mooney Mooney for northbound traffic on the motorway and also feeds into local and private roads on the western section of The Site. The Pacific Highway Link Road contains one lane in each direction and has a posted speed limit of 60km/h.

3.3.4 Peats Ferry Road

Peats Ferry Road is a local access road that services parklands, an existing boat ramp and a car park. It contains one lane in each direction and does not have a posted speed limit.

3.4 Bus services and facilities

The Site catchment is served by one bus service route (592) that travels along the Pacific Highway and is operated by Transdev. The Route 592 provides an important public transport link to this part of the Hawkesbury River catchment and serves:

- The townships of Cheero Point (residential) and Mooney Mooney (residential/ recreational/ tourist village) to the north of the Hawkesbury River; and
- Brooklyn (Hawkesbury River rail station and recreational/tourist village), Cowan (rail station), Berowra (rail station and village centre), and Hornsby to the south.

The access offered by this service was identified to be very important for this catchment through its ability to offer direct access from The Site to other public transport and regional rail connections. This includes the nearby rail stations at Brooklyn that offers fast and reliable connections to regional centres at Gosford and Hornsby, and the metropolitan centres of Sydney and Newcastle. Each of these centres offer employment, health, education, retail and recreation opportunities for existing and proposed residents of Mooney Mooney area.

Refer to Appendix B for an understanding of the bus service route and its connectivity to rail stations and other surrounding local centres.

The review of 592 service operations indicated that it offers an infrequent weekday and Saturday service that is focused around peak commuter periods. This service in general offers limited access opportunities and based on the current timetable does not appear to service weekday and Saturday off peaks, Sundays or public holiday periods. Stopping patterns of the service also appears to be inconsistent with some stops, such as the Peat Island Road bus stop only receiving one service a day.

Route #	Route Description	Frequency	
		Peak Periods (7-9AM, 4-6PM)	Off-Peak Periods
592	To Brooklyn Hawkesbury River Station	One every 25-50 minutes	-
592	From Brooklyn Hawkesbury River Station	One every 25-60 minutes	

Source: *GTA, 2014*

Bus stop facilities were identified to be sub-standard with stops not supported by an established footpath network, shelters, bus timetable and passenger information (except for the bus stop on Point Road) or Disability Discrimination Act (DDA) facilities.

3.5 Rail services and facilities

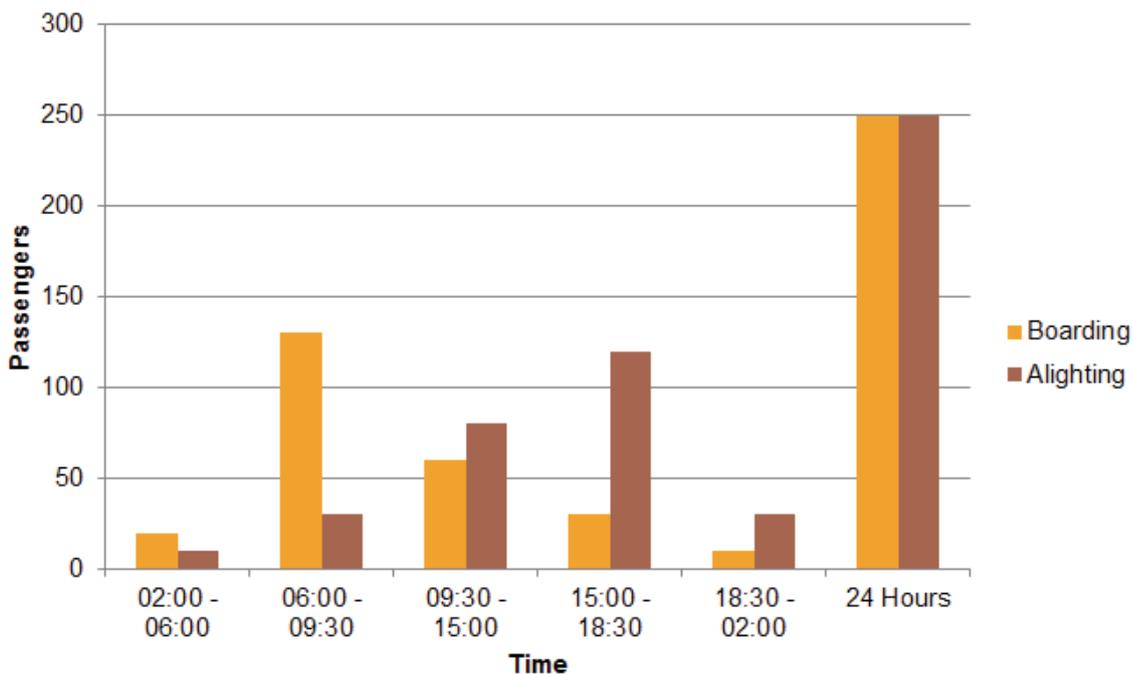
The nearest rail station to The Site is the Hawkesbury River station in Brooklyn, which offers Sydney-Newcastle train services. This is situated approximately 5.5 kilometres to the south of The Site by road and offers relatively frequent services to employment and education facilities situated at Sydney, Hornsby, Chatswood, Macquarie Park and Newcastle. The current frequency of rail services is summarised below.

Route Description	Frequency	
	Peak Periods (7-9AM, 4-6PM)	Off-Peak Periods
To Newcastle	One every 60 minutes (for AM) and 30 minutes (for PM)	One every hour
From Newcastle	One every 30 minutes (for AM) and 60 minutes (for PM)	One every hour

Access to the Hawkesbury River station is possible by private vehicle, bicycle and bus services. However, it is noted that both bus service frequency and parking provision at the station and township are limited. Cycling to the station is influenced by the quality of supporting infrastructure and is also noted to be limited.

In order to obtain an understanding of the function of the station and capacity of existing services a review of the daily patronage profile was undertaken. Figure 3.4 provides a breakdown of typical weekday passenger movements at Hawkesbury River station.

Figure 3.4: Weekday Passenger Flow Profile at Hawkesbury River Station (2012)



Source: RailCorp Barrier Counts of Rail Passengers (2012)

The passenger profile indicates that Hawkesbury River station acts as a minor commuter station for passengers situated along the Newcastle and Central Coast line and offers spare capacity to support future growth. Refer to section 5.1 for an understanding of available spare service capacity.

A review of the station's compliance with current DDA standards was also considered as part of the assessment, which highlighted (based on information contained on the TfNSW website) that the station is not DDA compliant. The nearest station that offers access for people with DDA needs is Cowan and can be accessed via the 592 bus service route.

3.6 Walking and Cycling

There are currently a limited number of footpaths and bicycle facilities within The Site area and as a result current opportunities for cycling beyond commuter or recreational uses are limited. A review of Central Coast Council's "*Gosford Bike Strategy 2014*" and subsequent discussions with Gosford City Council confirmed that there are no commitments to improve cycle routes or other facilities in the Mooney Mooney area. However it is noted that the *Gosford Bike Strategy 2014* states a goal of *increasing the cycling mode share, which is consistent with the NSW State Plan and a commitment to improving road safety, facilities and cycling tourism.*

The existing active transport network is presented in Figure 3.5.

Figure 3.5: Existing Active Transport Network



Source: <http://www.rms.nsw.gov.au/roads/bicycles/cyclewayfinder/>

3.7 Existing Traffic Data

Traffic intersection counts were undertaken in May 2016 for both a weekday AM and PM peak period, which consisted of a Thursday from 6-9am and 4-7pm. The intersections appraised are shown in Figure 3.6 and described below:

1. B83 Pacific Highway/ Point Road – operates as a give-way controlled T-intersection.
2. Pacific Highway Link Road/ B83 Pacific Highway - operates as a give-way controlled T-intersection.
3. M1 Northbound ramps/ Peats Ferry Road/ B2 Site Road/ Pacific Highway Link Road – operates as a four-way roundabout.
4. M1 Southbound ramps/ B83 Pacific Highway – operates all way stopped controlled intersection under normal operations with the ability to operate under traffic signal control (temporary operations)

Figure 3.6: Modelled Intersections



These intersections represent the key access points to the Mooney Mooney area from the M1, Pacific Highway and the local network.

The analysis of data indicated that 6:45-7:45 am and 3:00-4:00 pm represent the weekday AM and PM peak hours for the Mooney Mooney area. Surveys were also undertaken on a Saturday to determine the impact from weekend traffic however a major incident on the M1 impacted on the results and as a result the data was compromised and removed from the appraisal.

A review of traffic data on the M1 was also undertaken, which was extracted from a permanent count station at Cowan to the south of The Site. The review of this data clarified that the peak operating periods on this section of the network is a weekday AM and PM peak period.

Existing traffic data was used to develop a SIDRA model to assess existing intersection performance. Refer to section 5.4 for the results of the assessment and comparison with the results under a scenario including the rezoning proposal and full development of The Site.

3.8 Crash Data Analysis

Crash data was obtained for a five year period from 2010 to 2015 and is presented in Appendix C. This data indicates that there is a historical crash trend that is concentrated along the M1 with the majority of crashes recorded as non-casualty crashes occurring near to the northbound and southbound exit ramps at Mooney Mooney. This section of the M1 Pacific Highway is signposted at 110km/h and the crash trend is unrelated to existing or proposed uses and should be addressed as part of an operational solution for the M1 corridor.

Further investigation into the cause of crashes and planned improvements by Government in traffic flow, monitoring and warning management systems are expected to help to address this current road safety issue.

The proposal could be configured to help to support a design solution for this existing issue through the visual appearance of development, separation, and improvements in wayfinding systems and access routes between the western and eastern sides of the corridor. It is also noted that the proposal has the potential to exacerbate the issue if not addressed as part of the above, which is expected to be a focus of Government under the NSW 2021 targets and goals.

Refer to Appendix C for further details of the crash analysis.

4 Concept Plan

Refer to Appendix A for the proposed Concept Plan. The following sections detail the key components and traffic and transport features of the Concept Plan.

4.1 Key Components of the Concept Plan

Key components of the proposed Concept Plan are described below:

Proposed Component	Description	Changes from Original Concept Plan
Adaptive reuse of the existing Peat Island institutional buildings	<p>Intended for hotel/accommodation purposes</p> <p>Constrained by Peat Island causeway and is intended that vehicular access is restricted to service vehicles and 'guest only' vehicles</p> <p>Public parking provided on the western Mooney Mooney shoreline to service this area</p>	Consistent with original Concept Plan
New marina development with dry-stack boat storage	<p>Located to the south of the Peat Island causeway</p> <p>Includes parking provision and the potential to accommodate associated commercial uses</p>	Reduction in intensity to that previously proposed under the original Concept Plan
New medium and low density residential areas	<p>Will accommodate residential developments for pre-retirement/ semi-retired/ fully-retired housing markets with a focus on attracting people seeking recreational riverside lifestyle</p> <p>Offers an opportunity for contained travel during peak periods and encourages public transport use due to the proximity and access to nearby centres and rail services</p>	Reduced scale from that proposed under the original Concept Plan
Neighbourhood/Service centre	<p>On the western side of the M1, proposed to offer direct access from the existing M1 northbound on/off ramps</p> <p>Includes spatial provision for a service station and convenience store</p> <p>Will be developed to better manage conflict, improve access to service facilities and allow for B-double access</p>	Consistent with the original Concept Plan
Recreational paths and active transport connectivity	<p>Improvement of the river foreshore to a shared path from the northern residential area to the existing boat ramp at the southern peninsula</p> <p>Will also connect to the new residential areas, marina and community facilities</p> <p>Includes a potential east-west connection via the M1 underpass or Pacific Highway Link Road, and a potential extension to Brooklyn and Hawkesbury River train station</p>	Includes potential connections from east-west and to Hawkesbury River train station
Upgraded boat ramp parking area	Upgraded facilities and expansion of the existing car park	Consistent with the original Concept Plan
Public parklands and public car parking	Provided throughout the western section of The Site and supports proposed land uses	Consistent with original Concept Plan, with minor reconfiguration

4.2 Key Traffic and Transport Features

The Concept Plan includes the following relevant traffic, transport, and access aspects:

- **New local centre** – the existing RMS depot site has the potential to become a commercial centre that would support planned urban intensification, recreation and commercial uses and the service facility needs of M1 users. The Site can be easily accessed from existing on and off ramps situated at the Mooney Mooney interchange on the M1, the local road network and is within a 5-10 minute walk from existing and proposed developments identified within the Concept Plan.
- **Peat Island causeway** – consists of a narrow causeway that limits access to one way traffic movement and is considered under the concept as a walkway for future users of Peak Island with limited access for service vehicles. The causeway will be enhanced to support this role and function and its concept supports and appropriately manages environmental and heritage related matters.
- **Existing Peat Island access road** – the existing access road will be formalised to align with the requirements set under Gosford City Council guidelines for local access roads and should be designed to facilitate access for vehicles, pedestrian and cyclists to recreation, commercial and residential areas.
- **M1 northbound and southbound on and off ramps** – wayfinding and enhancements to intersection arrangements on the local road network will be adopted to support the safe and efficient movement of traffic, pedestrians and cyclists. The current arrangements are noted to support direct vehicular access to the Mooney Mooney area and can support tourist and service facilities and functions.
- **Marina and boat storage** – this facility will generally generate traffic outside of peak periods and associated parking should be designed to accommodate users of the Marina, commercial premises and boat storage facilities.
- **Walking and cycling paths** – all new roadways will include footpaths on both sides to encourage walking as a travel mode. Continuous accessible paths will be provided from the residential developments to the nearest bus stops and local centre. Planned improvement along the Hawkesbury River foreshore will also enhance the recreational and local access and amenity of the redevelopment areas.
- **East-west connections** – The concept proposes enhancements to road and pedestrian underpasses that run under the M1 to improve road, pedestrian and cycling connectivity.
- **Access to public transport** - All new and existing residential areas are planned within an 800m radius of the existing bus stops and align with TfNSW's goals for public transport access specified in the Integrated Public Transport Service Planning Guidelines – Outer Metropolitan Area (TfNSW, June 2016).
- **Supporting public transport enhancements** - The concept design allows for improvements to public transport services which includes:
 - Urban density to support the viability for increasing bus service frequency.
 - An accessible road network that allows for modifications to bus routes.
 - Enhancements to bus stop facilities and access.
 - Improvements to east-west connections across the M1.
 - Investigating options for better connecting The Site to the Hawkesbury River train station in Brooklyn.
- **DDA Compliance** – All new footpaths and enhanced routes will meet DDA requirements where feasible.

Refer to section 6 for further details and recommendations for future improvement of the traffic and transport network.

5 Traffic and Transport assessment

This Section provides the evidence that helps to respond to the issues raised by the DPE as part of the original 2014 Concept Plan.

5.1 Impact on Public Transport

Refer to Figure 3.3 for an understanding of the travel mode profile generated under the proposed Concept Plan. The data indicates that public transport trips comprise of approximately 20% of all commuter trips and that travel by rail is the preferred method of travel. A review of available capacity of rail services was undertaken to understand the potential impact on current peak hour commuter services by the proposal and is presented as an average peak hour load percentage against the total seating capacity of current services¹:

- AM Peak: 75% (measured at Woy Woy)
- PM Peak: 75% (measured at Hornsby)

The review indicated that existing rail services operating via Hawkesbury River station operate with some spare capacity that should easily accommodate any additional demand generated by the proposal.

Bus services are infrequent in nature due to the existing low demand. Less than 1% of trips are expected to use the bus as a travel mode, and The Site will therefore have no negative impact on bus services. It is also noted that Mooney Mooney is likely to attract retirees due to the rural, recreational nature of The Site, and these residents are likely to be attracted to public transport for travel and to travel outside the commuter peak. Increases in bus routes and frequency will improve the public transport amenity of The Site and could be supported by developer contribution and this together with the planned increases in population are likely to attract a larger mode share in the future.

5.2 Road Network Considerations

This section addresses the road network issues raised as part of the 2015 DPE comments to the original 2014 concept plan.

5.2.1 Access and Parking

Access to Peat Island is limited to a narrow road that runs along the causeway from the western side of the Mooney Mooney peninsula to Peat Island. The causeway itself is approximately 200m in length and 5m wide (3.0-3.5m wide road carriageway and approximately 1.5m wide footpath = 5m road reserve) between fences, which limits the capacity of the link and access to Peat Island.

Under Gosford City Council's *Civil Works Specification Volume 1 – Design* the causeway is potentially permissible as a laneway with the verge acting as a footpath. Under this specification the development potential of the Island would be limited if general traffic flow was permitted. Due to this constraint and investigations indicating that widening is not feasible from

¹ Data taken from the Compendium of Sydney Rail Travel Statistics (8E v1.1, November 2012)

an economic, environmental or heritage perspective, vehicular traffic operating across the causeway is limited to service vehicles only and other authorised vehicles.

Parking for Peat Island will be accommodated on the Mooney Mooney Peninsula and shared with Marina and other associated commercial operations. The design will allow for adequate parking to accommodate demand for all of the above users.

Parking in other areas of The Site will also be enhanced to facilitate further intensification of uses and this includes the south eastern public car park. Adequate parking for all land uses identified in the Concept Plan will be provided in accordance with the DCP as part of future DAs. Further consideration will be undertaken as part of the next stage of planning for the service station / local centre and will include concepts of how access and parking can be managed. This will be undertaken once the development yields and spatial layouts are refined. A key consideration as part of this process will be to manage parking and queuing overspill that may occur and associated with passing trade and existing recreation uses.

5.2.2 Road safety, Incident Management and Wayfinding

Future developers will work with Government agencies to enhance access to The Site via the Mooney Mooney interchange. The improvement of access is expected to be further supported by current Government programmes that aim to optimise network operations, better inform road users and manage incidents. Part of this initiative would be to improve wayfinding for traffic on the motorway on/off ramps, which should be enhanced to target the historical crash history identified in section 3.7. This is expected to include advance direction signs for both the northbound and southbound exit ramp approaches as identified and recommended by RMS.

5.2.3 Road Design Principles

The current posted speed limit on the B83 Pacific Highway and the Pacific Highway Link Road is 60 km/h and it is assumed that all other local roads in The Site area are 50 km/h, given their residential or low-density nature. The concept plan aims to reduce all local road posted traffic speeds limits within The Site to 50 km/h, which would support the proposed future uses of this area and the characteristics of its residents. This 50km/h urban speed environment would cover the following roads:

- Peats Ferry Road.
- Peat Island Road.
- Pacific Highway Link Road.
- Kowan Street.
- Chapel Road.
- The Pacific Highway between the Pacific Highway Link Road and Point Road.

Along with setting the speed environment the local road network will be planned so that safe and efficient movement is promoted. This will be achieved through aligning intersections and access points to help to minimise conflict and promote safe and efficient movement. These aims and objectives will be reviewed in further detail as part of the next stage of planning process and will include the proposed new T-intersection on the B83 Pacific Highway that is located approximately 60m north of Kowan Street and the existing roundabout north of the M1 northbound off ramp.

5.2.4 Heavy Vehicle Access and the RMS Depot (B2) site

Development of the B2 site as a petrol filling station and convenience store will be designed to facilitate access by B-double and other types of heavy vehicles. Investigations has indicated

that access can be provided via both carriageways of the M1 with southbound traffic exiting the motorway at Mooney Mooney and accessing The Site via the Pacific Highway Link Road, which runs under the M1 motorway. The vertical clearance on this route is 4.6m, which is at the maximum design vehicle height for a B-Double. Initial investigations highlight that the M1 northbound off ramp provide direct access to the proposed service centre site and can facilitate access by heavy vehicles. This is demonstrated by the B-Double swept path analysis undertaken on the existing road layout, which is presented in Appendix D.

Minor kerbside adjustments may be required to three local roads and intersections along the route, which includes:

- The Pacific Highway/Southbound M1 Ramps
- The Pacific Highway/Highway Link Road
- The Highway Link Road/Peats Ferry Road

Further consultation with RMS as part of future planning submission and the detailed design stages will be used to determine an appropriate design solution for The Site.

5.3 Traffic Generation and Distribution

Trip generation resulting from the potential rezoning and development of The Site was determined using the RMS Guide to Traffic Generating Developments (2002) and the RMS Technical Direction 2013/04a: Updated Traffic Surveys (2013). A summary of the trip generation based on the Urbis concept plans is presented in Table 5.1.

Table 5.1: Trip Generation

Land Use	AM		PM	
	IN	OUT	IN	OUT
Townhouses	1	13	11	3
Apartments	11	96	85	21
Residential lots	6	52	51	13
Marina	27	3	23	23
Hotel	2	17	30	7
Local Centre	183	183	183	183
Chapel, RFS, Community Centres	36	4	16	24
Total	266	368	399	274

The analysis indicates that The Site could generate between 600-700 vehicle trips in the peak hour and the key land use generator would be the proposed local centre. Further review of these findings indicates that the proposed local centre, which includes a service centre, would generate approximately 60% of all site trips. The majority of these trips are likely to be attracted from passing trade or from local uses, and as a result they already travel along the M1 or along the local Mooney Mooney road network.

It should be noted that the trip generation produced above is conservative and will be refined as part of future planning submissions when the development types and yields are better understood.

The conservative estimates of generated trips were distributed across the study area road network and understand the likely impacts on critical points of the road network. The distribution was based on the locality of sites shown on the concept plans and the following assumptions:

- 50% of generated trips will arrive from the north and 50% from the south

- 70% of generated trips will use the M1 Motorway to access The Site
- 30% of generated trips will use the Pacific Highway to access The Site.
- No assumptions were made for trip containment based on proposed local facilities.

Refer to Appendix E for further details of the trip generation.

5.4 Road Network Performance

This section of the report provides an understanding of the existing traffic conditions and potential traffic impact resulting from future rezoning and development of the area. Modelling of key intersections was undertaken using SIDRA Intersection 6.1 and used to assess the operational performance of the existing road network and to identify potential traffic impacts. The methodology and results are provided in the following sections.

5.4.1 Traffic modelling performance measures

SIDRA Intersection 6.1 is a micro-analytical traffic modelling software tool that has been used to appraise the future conditions on the road network.

The 'Level of Service' (LoS) is the standard measure used to understand the operational performance of the network and intersections. This is defined as the qualitative assessment of the quantitative effect of factors such as speed, traffic volume, geometric features, delays and freedom of movement.

The LoS concept is applied to intersections through measures of effectiveness, as summarised in Table 5.2.

Table 5.2: Intersection Measures of Effectiveness

Intersection Control	Measure of Effectiveness
Priority controlled	Degree of Saturation
	Delay to critical movements (sec/vehicle)
	Queue length for critical movements
Traffic Signals	Average Delay (sec/vehicle)
	Delay to critical movements
	Degree of Saturation
	Cycle Length
	Queue length for critical movements
Roundabout	Average Delay (sec/vehicle)
	Delay to critical movements
	Degree of Saturation
	Queue length for critical movements

Source: RTA Guide to Traffic Generating Developments (2002)

The assessment of intersection operation is based on criteria outlined in Table 5.3, as defined by the NSW Roads and Maritime Services in the 'Guide to Traffic Generating Developments' (RMS 2002), and will be used to evaluate network conditions.

Table 5.3: Level of Service (LOS) Criteria for Intersections

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required

Level of Service	Average Delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control modes	At capacity, requires other control mode
F	> 70	Over capacity, unstable operation	Over capacity, unstable operation

Note:

1. The average delay assessed for signalised intersections is over all movements.
2. For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule), the critical criterion for assessment is the movement with the highest average delay.
3. Average delay is expressed in seconds per vehicle.

5.4.1 Modelling Scenarios

The following scenarios have been modelled in SIDRA:

- **Existing** – existing conditions only based on the traffic counts obtained for the project.
- **With Development** – potential future conditions resulting from the rezoning proposal and development of the area in line with the Urbis concept plans presented in Appendix A.

5.4.2 Modelled Network

The following intersections were modelled as part of the road network appraisal:

1. Pacific Highway / Point Road
2. Pacific Highway / Highway Link Road
3. Highway Link Road / Peats Ferry Road
4. Pacific Highway / M1 Motorway Southbound Ramps

The modelled network is presented in Figure 5.1 together with the proposed land uses that will generate new traffic movement across The Site.

Figure 5.1: Modelled Intersections and Traffic Generating Land Uses



5.4.3 Modelling Results

The results of the SIDRA intersection modelling for both existing and future development scenarios are presented in Table 5.4 and Table 5.5, respectively and include weekday AM and PM peak period assessments.

Table 5.4: Intersection Operational Performance - Existing Conditions

Ref	Intersection	AM			PM		
		LOS	DoS	Max. Delay (s)	LOS	DoS	Max. Delay (s)
1	Pacific Highway / Point Road	A	0.027	5.9	A	0.025	6.3
2	Pacific Highway / Highway Link Road	A	0.034	6.1	A	0.049	6.3
3	Highway Link Road / Peats Ferry Road	A	0.04	10.9	A	0.075	10.7
4	Pacific Highway / M1 SB Ramps	A	0.187	14.8	A	0.164	12.3

The results indicate that the existing network operates at the highest level of service with very low degrees of saturation at all intersections. This demonstrates that the existing road network contains a large amount of spare capacity.

Table 5.5: Intersection Operational Performance - With Development

Ref	Intersection	AM			PM		
		LOS	DoS	Max. Delay (s)	LOS	DoS	Max. Delay (s)
1	Pacific Highway / Point Road	A	0.038	5.6	A	0.049	5.7
2	Pacific Highway / Highway Link Road	A	0.205	7.4	A	0.213	7.9
3	Highway Link Road / Peats Ferry Road	A	0.179	6.9	A	0.22	8.3
4	Pacific Highway / M1 SB Ramps	B	0.374	17.5	B	0.481	19.8

The results indicate that the potential rezoning and development of The Site does not have a negative impact on the operation of the local road network. All intersections continue to operate at satisfactory levels of service with spare capacity available.

6 Key Findings and Recommendations

The key findings of the assessment include the following:

- The existing road network contains spare capacity to accommodate the proposed rezoning of the area.
- The expected development resulting from the rezoning proposal is not expected to have a negative impact on the operational performance of the local road network. The modelling results indicate that the road network still contains spare capacity after full development of The Site and all key intersections operate at satisfactory levels of service.
- The causeway to Peat Island is narrow and only considered suitable for pedestrian, cyclist and one-way vehicular access.
- The Site presents opportunities for improved road network connectivity and active transport links, including consolidation of intersections, and shared path links for east/west connectivity and links south to Brooklyn to connect to the train station and local centre.

The recommendations resulting from the assessment include the following:

Public and Active Transport Recommendations:

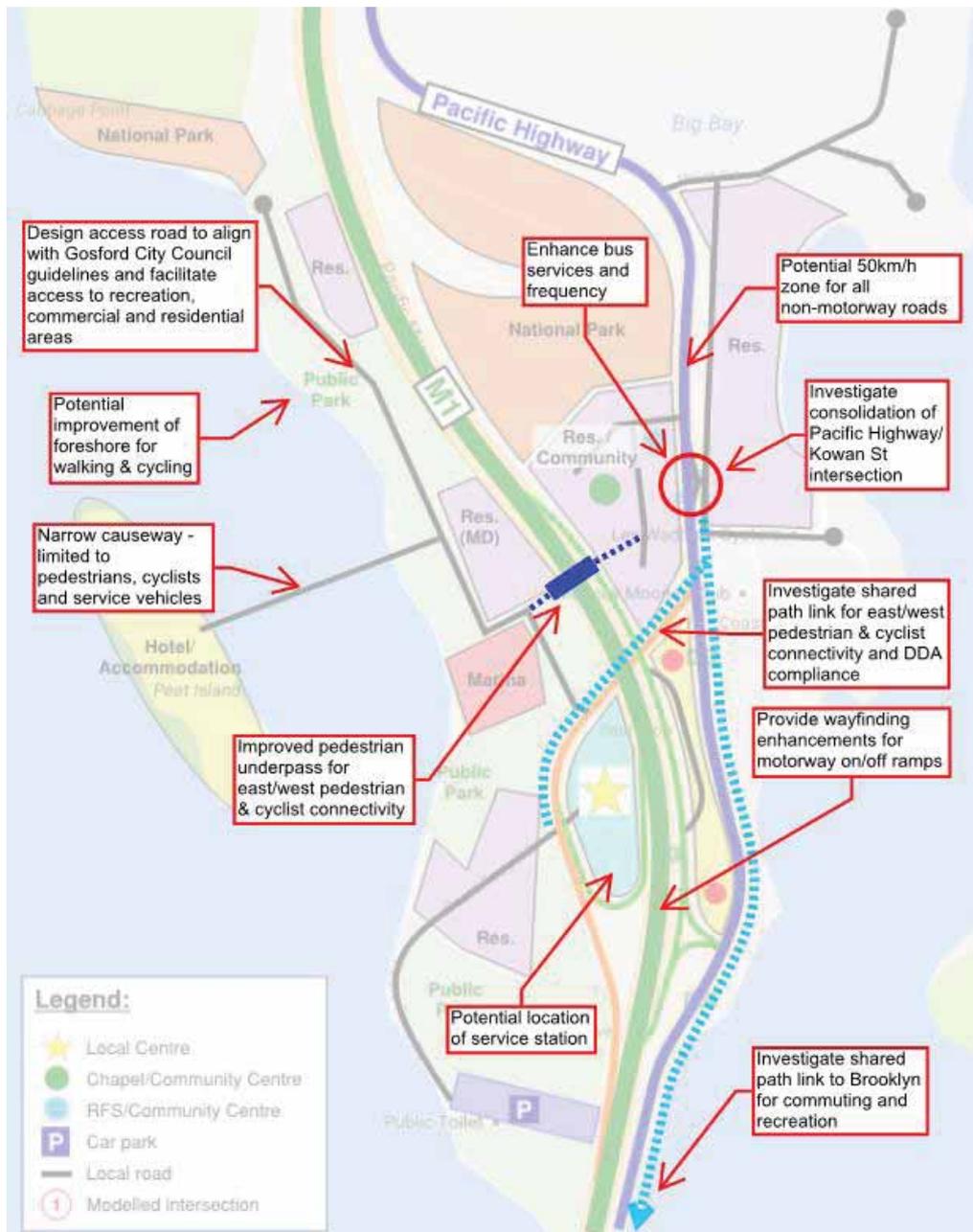
- A shared path link on the Pacific Highway Link Road between Peats Ferry Road and the Pacific Highway should be investigated to improve east/west access for pedestrians and cyclists and align with DDA compliance requirements.
- A shared path link over the bridge towards Brooklyn should be investigated for commuting and recreation purposes and may be partly funded as part of developer contributions.
- The pedestrian underpass under the M1 should be improved to enhance east/west connectivity for pedestrians and cyclists.
- The potential for improvement of the foreshore for walking and cycling access should be investigated.
- Bus services and frequency should be further investigated and if feasible enhanced to promote public transport access.

Road Network Recommendations

- The access road to Peat Island and residential and recreation areas north of the marina should be designed in accordance with Gosford City Council guidelines and facilitate access to these areas.
- The potential consolidation of the Pacific Highway/Kowan Street intersection should be investigated to enhance the intersection arrangement and operational function.
- Wayfinding for the motorway on/off ramps should be enhanced and include advance direction signs for both the northbound and southbound exit ramp approaches as recommended by RMS.
- The causeway to Peat Island is recommended to be limited to pedestrians, cyclists and service vehicle access due to the narrow roadway.

A summary of the key findings and recommendations is presented in Figure 6.1.

Figure 6.1: Key Findings and Recommendations



Studies for Subsequent Design Stages:

The following investigations should be carried to support future stages in the planning process:

- A transport management and access strategy should be developed that would facilitate and support safe and efficient access by all modes of travel to and from The Site.
- A wayfinding strategy for the area should be developed to address access needs from the strategic transport network.
- A local area traffic management strategy should be developed and implemented that would support safe movement along the local network and improve connectivity to surrounding centres. This investigation could include the implementation of a 50 km/h zone for the Mooney Mooney area, including Peats Ferry Road, Peat Island Road, Pacific Highway Link

Road, Kowan Street, Chapel Road, and Pacific Highway between the Pacific Highway Link Road and Point Road.

- A more detailed traffic and transport assessment should be undertaken to support future DA submissions and its potential staging and investigate possible future upgrades regional links and services.
- Undertake a Crime Prevention through Environmental Design (CPTED) assessment of proposed improvements to M1 underpasses and proposed foreshore paths.

Appendices

A.	Concept Plan	35
B.	Bus Route Map	36
C.	M1 Motorway & Mooney Mooney Crash Data (RMS, 2010-2015)	37
D.	B-Double Swept Paths and RMS B-Double Access Map	38
E.	Traffic Generation & SIDRA Intersection Analyses	39

A. Concept Plan



Residential

National Park

Public Park

RFS / Community Centre

Residential

Residential

Chapel / Community Centre

Residential

Townhouses

Public Car Park

Medium Density Residential 1-2 storeys

Medium Density Residential 1-3 storeys

Marina Car Park

Boat Stacker

Public Car Park

Relocated Ambulance Services

Building accommodation

Marina

Refurbished Existing Buildings
Hotel / Accommodation

Public Park

Medium Density Residential 1-3 storeys

Local Neighbourhood Centre

Relocated RMS Highway Services

Residential

Townhouses

Public Park

boundary

Expanded Public Carpark
with new and upgraded facilities

B. Bus Route Map

Sunday & Public Holidays

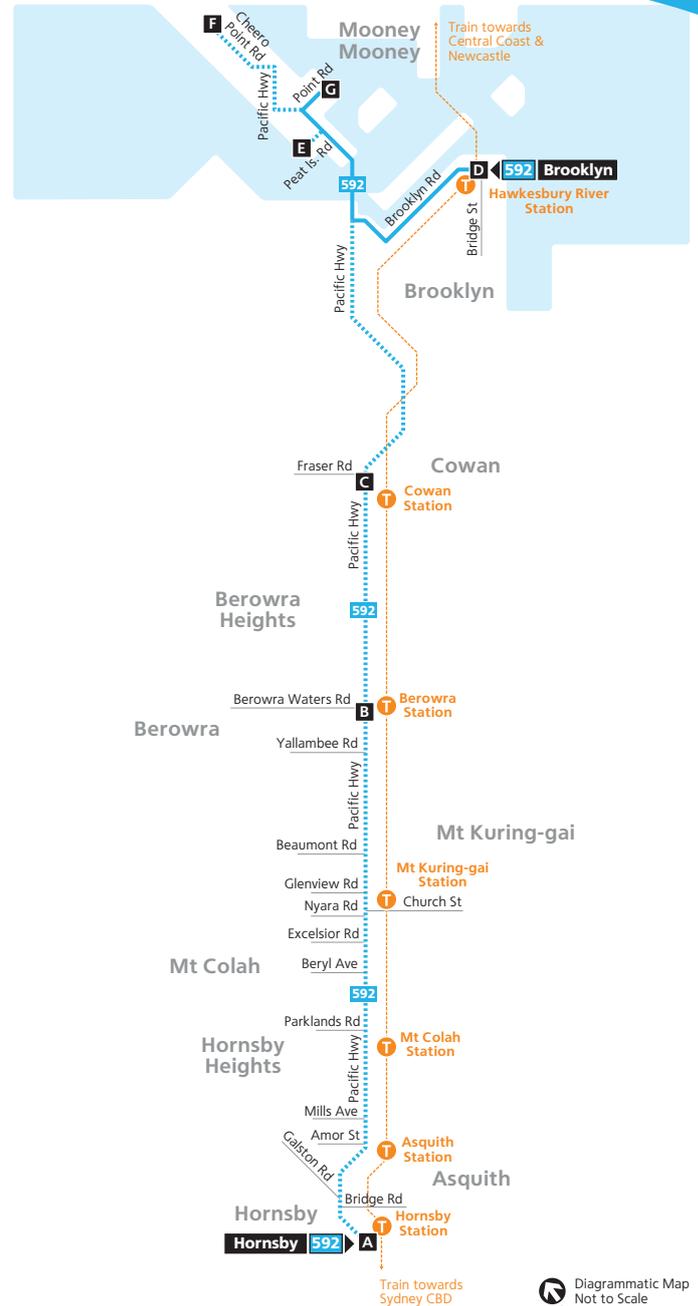
No service on Sunday, Public Holidays or Christmas Day.

Timing Points

- A** Hornsby Station Interchange
- B** Berowra Station
- C** Cowan Station
- D** Brooklyn Hawkesbury River Station
- E** Peat Island
- F** Cheero Point
- G** Mooney Mooney Point Road

Bus route map

592



Legend

- Bus route
- Bus route number
- Timing point
- Train line/station

Diagrammatic Map
Not to Scale

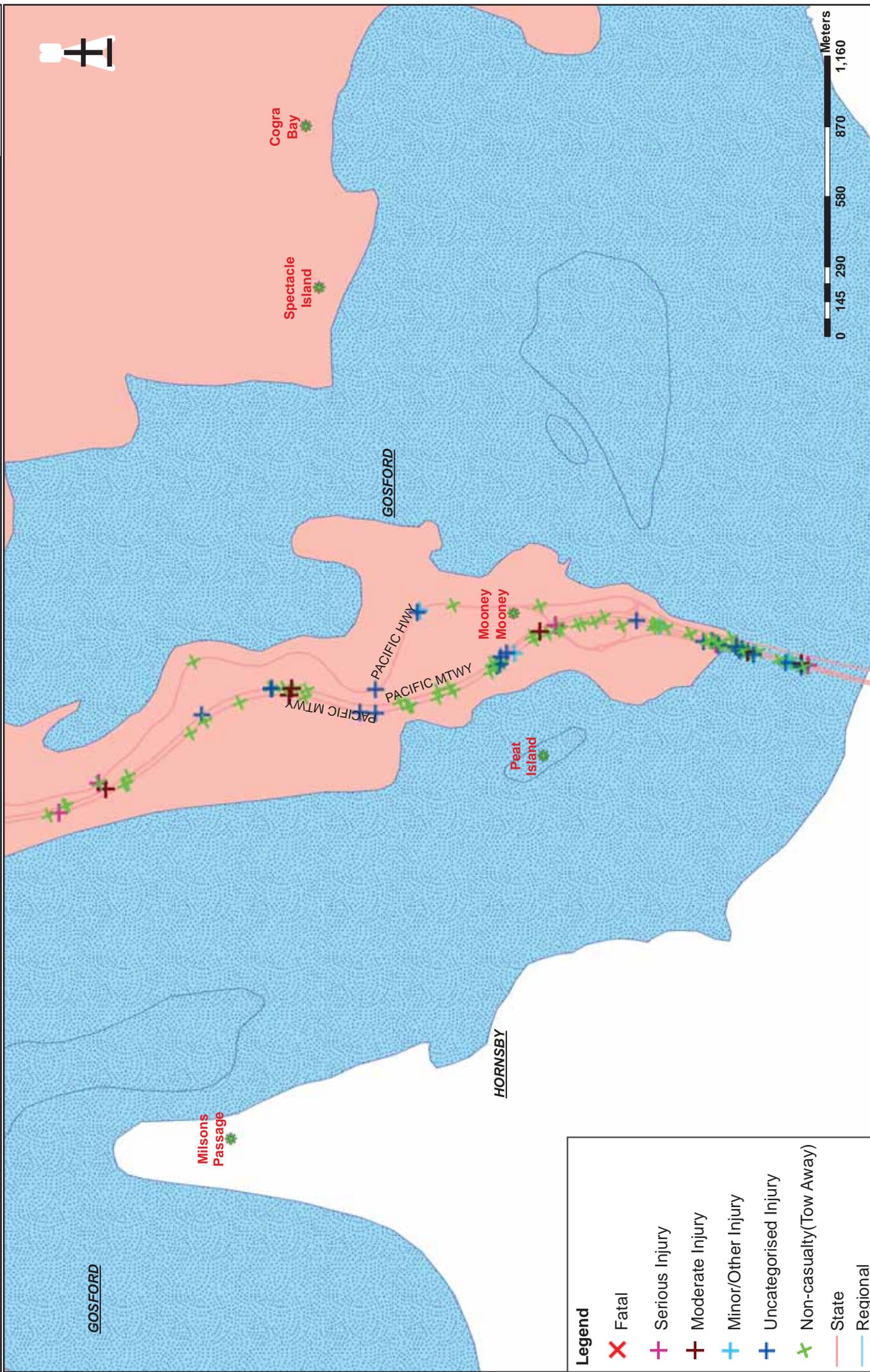


C. M1 Motorway & Mooney Mooney Crash Data (RMS, 2010-2015)

Mooney Mooney

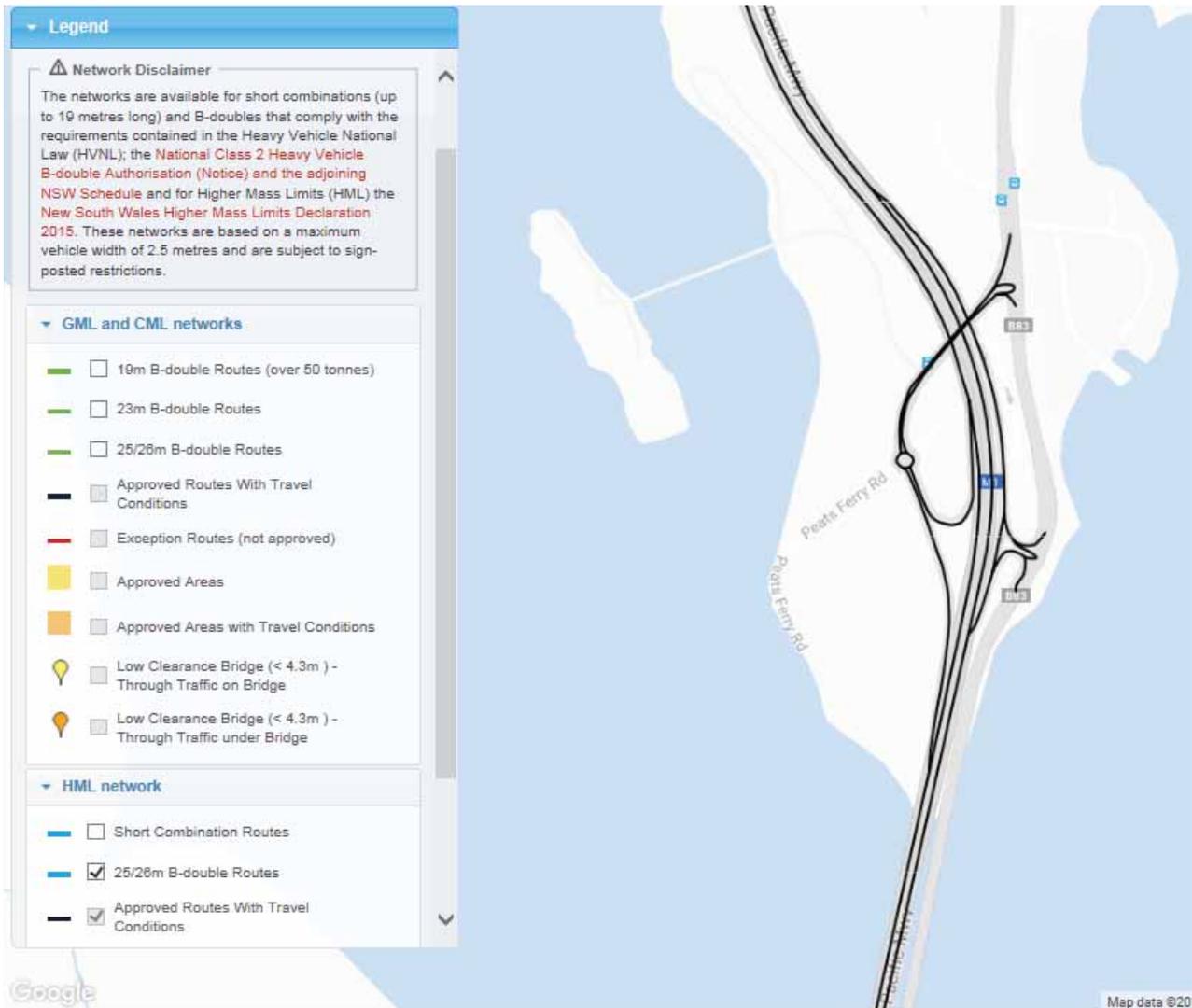
Crash Period: 1st July 2010 to 30th June 2015 (Finalised Data)

Plus provisional data (which is incomplete & subject to change) to date



Legend	
	Fatal
	Serious Injury
	Moderate Injury
	Minor/Other Injury
	Uncategorised Injury
	Non-casualty(Tow Away)
	State
	Regional

D. B-Double Swept Paths and RMS B-Double Access Map



Source: <http://www.rms.nsw.gov.au/business-industry/heavy-vehicles/maps/restricted-access-vehicles-map/map/index.html>



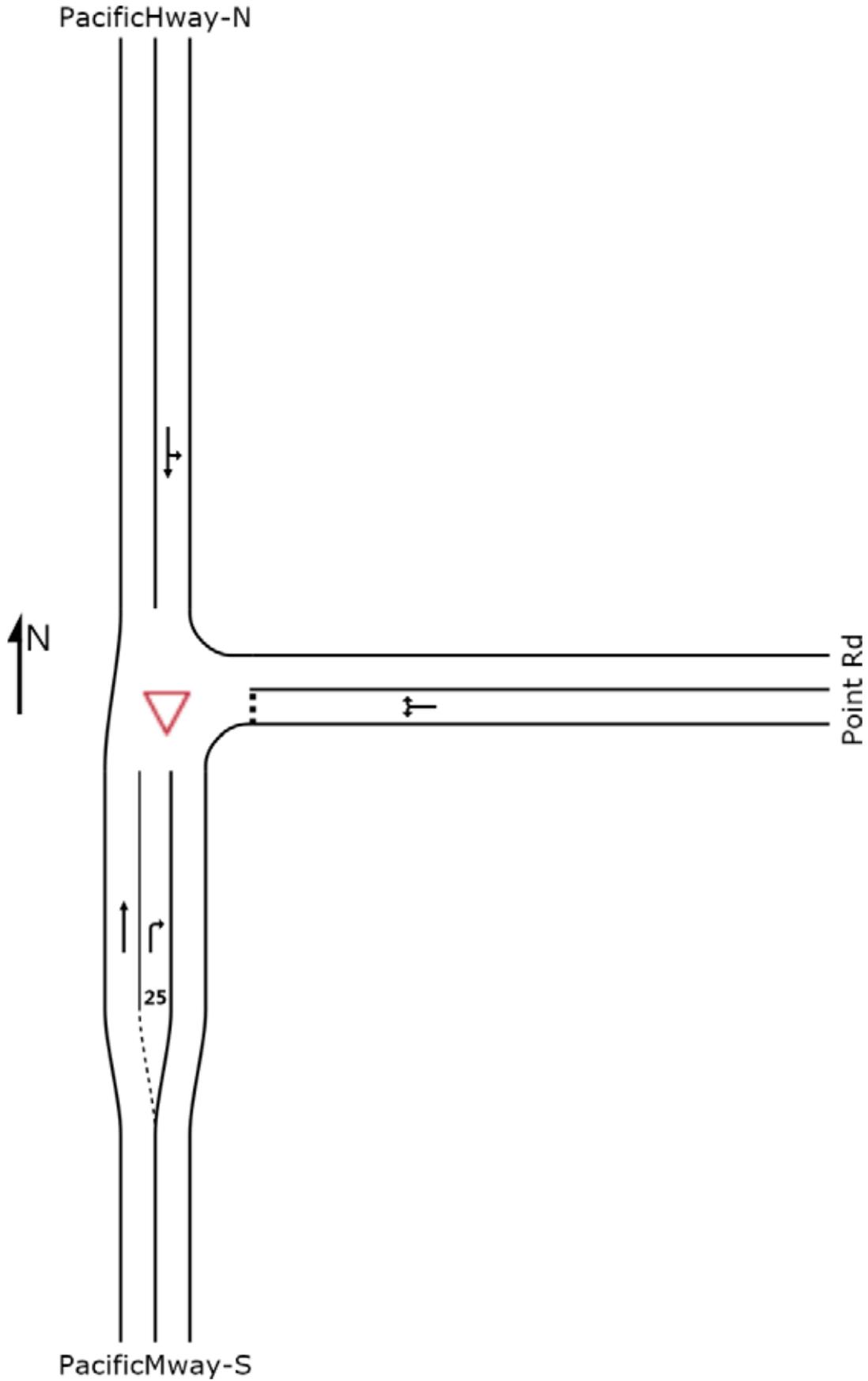
E. Traffic Generation & SIDRA Intersection Analyses

SIDRA Results - Existing

SITE LAYOUT

▽ Site: AM-Pacific Highway/Point Rd

2016 Background traffic
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: AM-Pacific Highway/Point Rd

2016 Background traffic
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: PacificMway-S											
2	T1	15	21.4	0.009	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R2	17	18.8	0.011	5.8	LOS A	0.0	0.4	0.11	0.56	47.3
Approach		32	20.0	0.011	3.1	NA	0.0	0.4	0.06	0.30	52.5
East: Point Rd											
4	L2	34	6.3	0.027	4.7	LOS A	0.1	0.8	0.10	0.50	47.8
6	R2	4	50.0	0.027	5.5	LOS A	0.1	0.8	0.10	0.50	47.2
Approach		38	11.1	0.027	4.8	LOS A	0.1	0.8	0.10	0.50	47.7
North: PacificHway-N											
7	L2	3	33.3	0.018	5.9	LOS A	0.0	0.0	0.00	0.05	56.4
8	T1	31	0.0	0.018	0.0	LOS A	0.0	0.0	0.00	0.05	59.6
Approach		34	3.1	0.018	0.6	NA	0.0	0.0	0.00	0.05	59.2
All Vehicles		103	11.2	0.027	2.9	NA	0.1	0.8	0.05	0.29	52.5

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

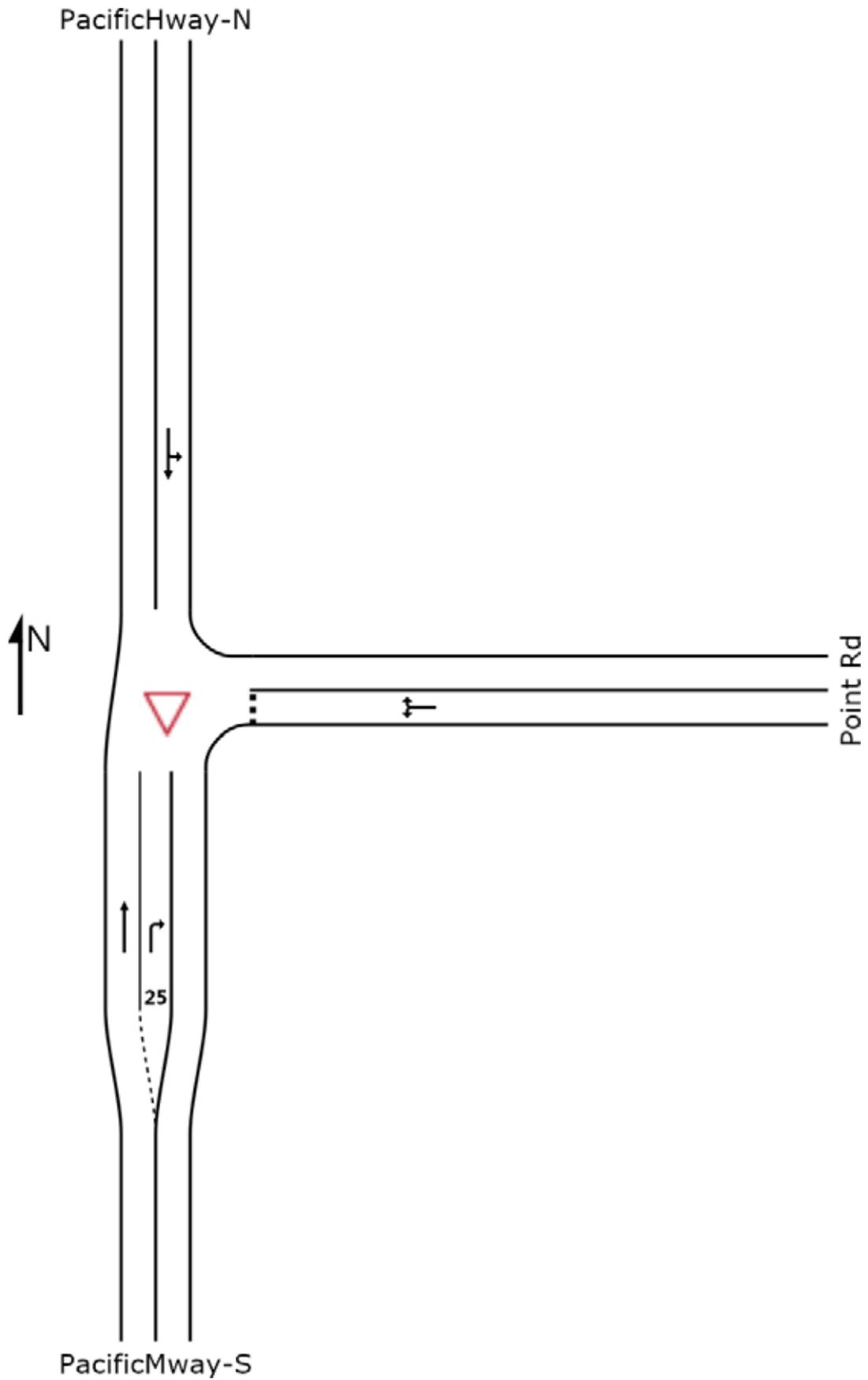
Organisation: MOTT MACDONALD HUGHES TRUEMAN | Processed: 26 August 2016 11:17:08

Project: \\mottmac\project\Sydney\Projects\37xxxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

SITE LAYOUT

▽ Site: PM-Pacific Highway/Point Rd

2016 Background traffic
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: PM-Pacific Highway/Point Rd

2016 Background traffic
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %								
South: PacificMway-S											
2	T1	33	6.5	0.017	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R2	16	0.0	0.009	5.6	LOS A	0.0	0.3	0.13	0.56	47.6
Approach		48	4.3	0.017	1.8	NA	0.0	0.3	0.04	0.18	55.3
East: Point Rd											
4	L2	18	17.6	0.013	4.8	LOS A	0.1	0.4	0.12	0.50	47.3
6	R2	1	0.0	0.013	5.0	LOS A	0.1	0.4	0.12	0.50	49.0
Approach		19	16.7	0.013	4.9	LOS A	0.1	0.4	0.12	0.50	47.4
North: PacificHway-N											
7	L2	3	66.7	0.025	6.3	LOS A	0.0	0.0	0.00	0.04	55.0
8	T1	39	16.2	0.025	0.0	LOS A	0.0	0.0	0.00	0.04	59.8
Approach		42	20.0	0.025	0.5	NA	0.0	0.0	0.00	0.04	59.3
All Vehicles		109	12.5	0.025	1.8	NA	0.1	0.4	0.04	0.18	55.1

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

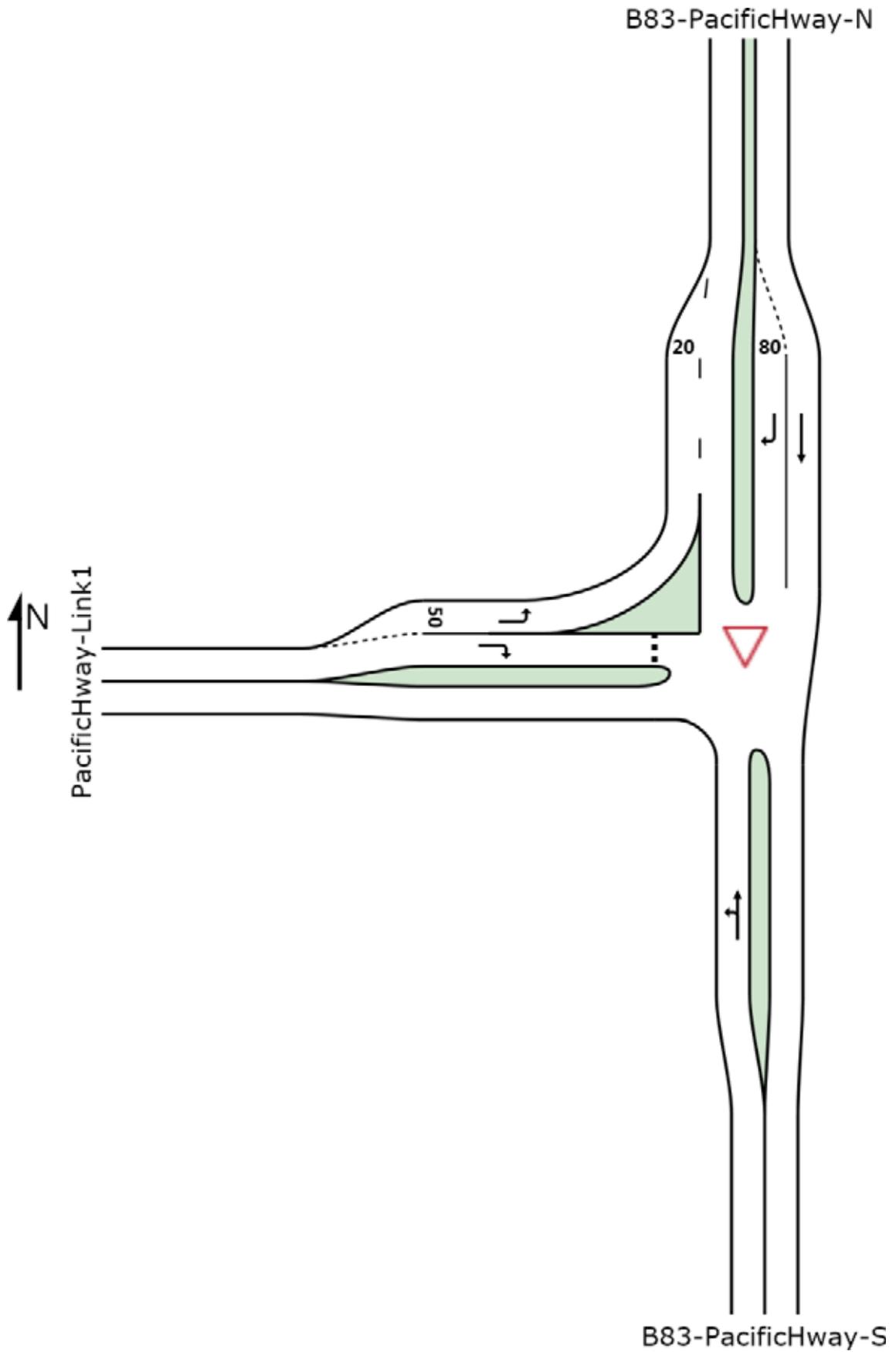
Organisation: MOTT MACDONALD HUGHES TRUEMAN | Processed: 26 August 2016 11:17:09

Project: \\mottmac\project\Sydney\Projects\37xxxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

SITE LAYOUT

▽ Site: AM-Highway Link Road/Pacific Highway

2016 Background
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: AM-Highway Link Road/Pacific Highway

2016 Background
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %								
South: B83-PacificHwy-S											
1	L2	32	10.0	0.030	5.7	LOS A	0.0	0.0	0.00	0.35	50.3
2	T1	21	20.0	0.030	0.0	LOS A	0.0	0.0	0.00	0.35	53.6
Approach		53	14.0	0.030	3.4	NA	0.0	0.0	0.00	0.35	51.5
North: B83-PacificHwy-N											
8	T1	64	3.3	0.034	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R2	8	0.0	0.005	5.7	LOS A	0.0	0.2	0.14	0.53	42.0
Approach		73	2.9	0.034	0.7	NA	0.0	0.2	0.02	0.06	58.1
West: PacificHwy-Link1											
10	L2	13	16.7	0.008	5.8	LOS A	0.0	0.0	0.00	0.52	44.8
12	R2	32	6.7	0.031	6.1	LOS A	0.1	0.9	0.24	0.57	46.7
Approach		44	9.5	0.031	6.0	LOS A	0.1	0.9	0.17	0.55	46.3
All Vehicles		169	8.1	0.034	2.9	NA	0.1	0.9	0.05	0.28	52.5

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

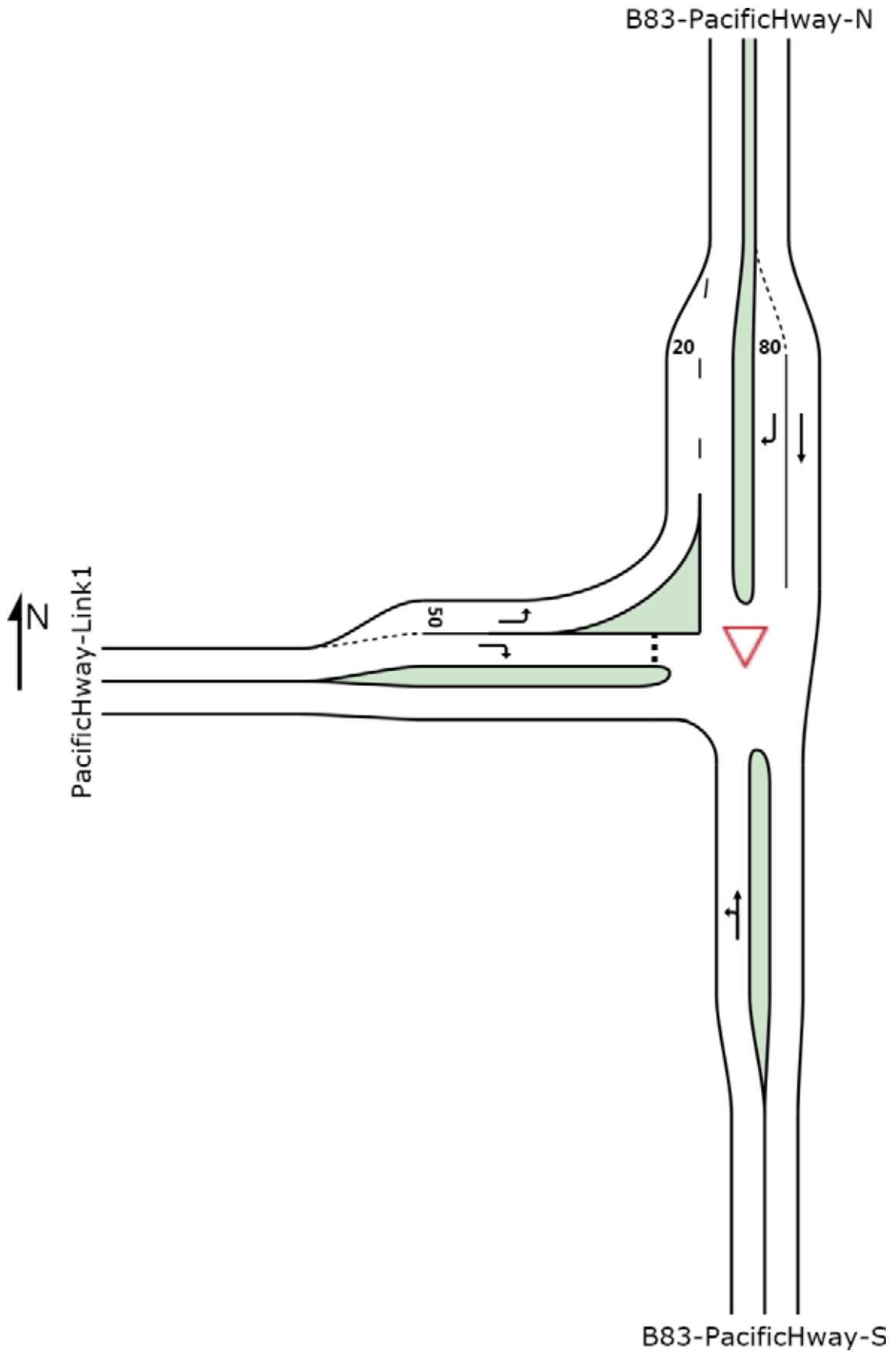
Organisation: MOTT MACDONALD HUGHES TRUEMAN | Processed: 26 August 2016 11:17:09

Project: \\mottmac\project\Sydney\Projects\37xxxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

SITE LAYOUT

▽ Site: PM-Highway Link Road/Pacific Highway

2016 Background
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: PM-Highway Link Road/Pacific Highway

2016 Background
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total veh/h	HV %								
South: B83-PacificHwy-S											
1	L2	57	3.7	0.048	5.6	LOS A	0.0	0.0	0.00	0.38	51.0
2	T1	32	6.7	0.048	0.0	LOS A	0.0	0.0	0.00	0.38	53.4
Approach		88	4.8	0.048	3.6	NA	0.0	0.0	0.00	0.38	51.8
North: B83-PacificHwy-N											
8	T1	60	8.8	0.033	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
9	R2	29	21.4	0.020	6.1	LOS A	0.1	0.7	0.20	0.53	38.6
Approach		89	12.9	0.033	2.0	NA	0.1	0.7	0.07	0.17	53.0
West: PacificHwy-Link1											
10	L2	34	3.1	0.019	5.6	LOS A	0.0	0.0	0.00	0.53	46.0
12	R2	49	0.0	0.049	6.3	LOS A	0.2	1.3	0.28	0.58	47.0
Approach		83	1.3	0.049	6.0	LOS A	0.2	1.3	0.17	0.56	46.7
All Vehicles		261	6.5	0.049	3.8	NA	0.2	1.3	0.08	0.37	50.5

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

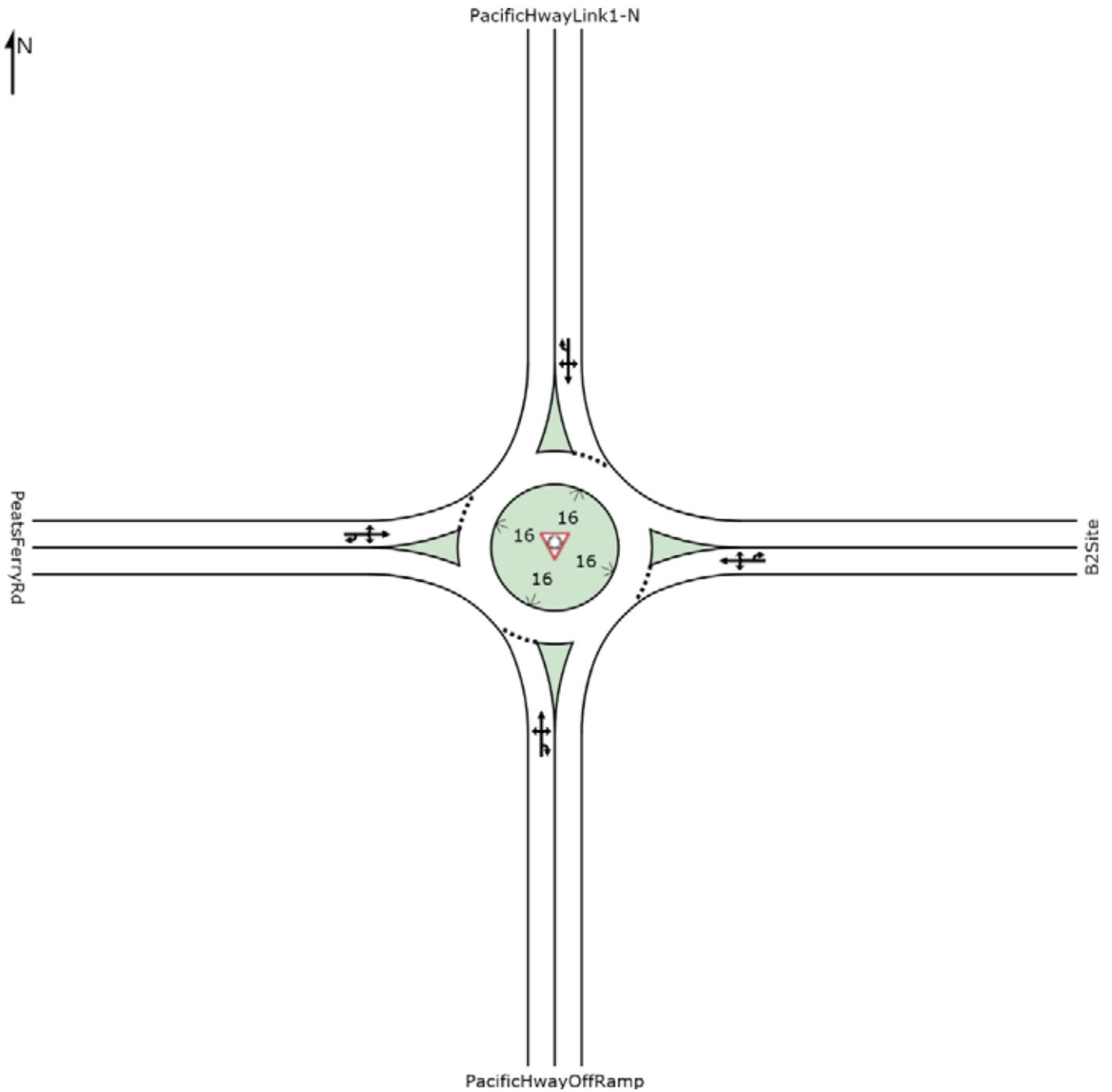
Organisation: MOTT MACDONALD HUGHES TRUEMAN | Processed: 26 August 2016 11:17:10

Project: \\mottmac\project\Sydney\Projects\37xxxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

SITE LAYOUT

 Site: AM-Highway Link Road/Peats Ferry Rd

2016 Background
Roundabout



SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: MOTT MACDONALD HUGHES TRUEMAN | Created: 26 August 2016 11:17:30

Project: \\mottmac\project\Sydney\Projects\37xxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

MOVEMENT SUMMARY

 Site: AM-Highway Link Road/Peats Ferry Rd

2016 Background
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: PacificHwyOffRamp											
1	L2	18	0.0	0.040	4.2	LOS A	0.2	1.3	0.09	0.45	53.6
2	T1	35	6.1	0.040	4.5	LOS A	0.2	1.3	0.09	0.45	52.6
3	R2	1	0.0	0.040	8.5	LOS A	0.2	1.3	0.09	0.45	32.9
3u	U	1	0.0	0.040	10.4	LOS A	0.2	1.3	0.09	0.45	56.1
Approach		55	3.8	0.040	4.6	LOS A	0.2	1.3	0.09	0.45	52.6
East: B2Site											
4	L2	1	0.0	0.003	2.0	LOS A	0.0	0.1	0.16	0.55	50.2
5	T1	1	0.0	0.003	2.5	LOS A	0.0	0.1	0.16	0.55	51.3
6	R2	1	0.0	0.003	6.0	LOS A	0.0	0.1	0.16	0.55	15.8
6u	U	1	0.0	0.003	7.9	LOS A	0.0	0.1	0.16	0.55	9.4
Approach		4	0.0	0.003	4.6	LOS A	0.0	0.1	0.16	0.55	31.3
North: PacificHwyLink1-N											
7	L2	1	0.0	0.033	4.1	LOS A	0.2	1.2	0.07	0.51	22.5
8	T1	28	3.7	0.033	4.4	LOS A	0.2	1.2	0.07	0.51	51.7
9	R2	11	10.0	0.033	8.6	LOS A	0.2	1.2	0.07	0.51	50.0
9u	U	3	66.7	0.033	10.9	LOS A	0.2	1.2	0.07	0.51	25.5
Approach		43	9.8	0.033	5.9	LOS A	0.2	1.2	0.07	0.51	49.1
West: PeatsFerryRd											
10	L2	7	0.0	0.011	4.2	LOS A	0.0	0.4	0.14	0.54	48.2
11	T1	1	0.0	0.011	4.5	LOS A	0.0	0.4	0.14	0.54	38.2
12	R2	5	20.0	0.011	8.9	LOS A	0.0	0.4	0.14	0.54	52.4
12u	U	1	0.0	0.011	10.5	LOS A	0.0	0.4	0.14	0.54	53.9
Approach		15	7.1	0.011	6.4	LOS A	0.0	0.4	0.14	0.54	49.9
All Vehicles		117	6.3	0.040	5.3	LOS A	0.2	1.3	0.09	0.49	50.5

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

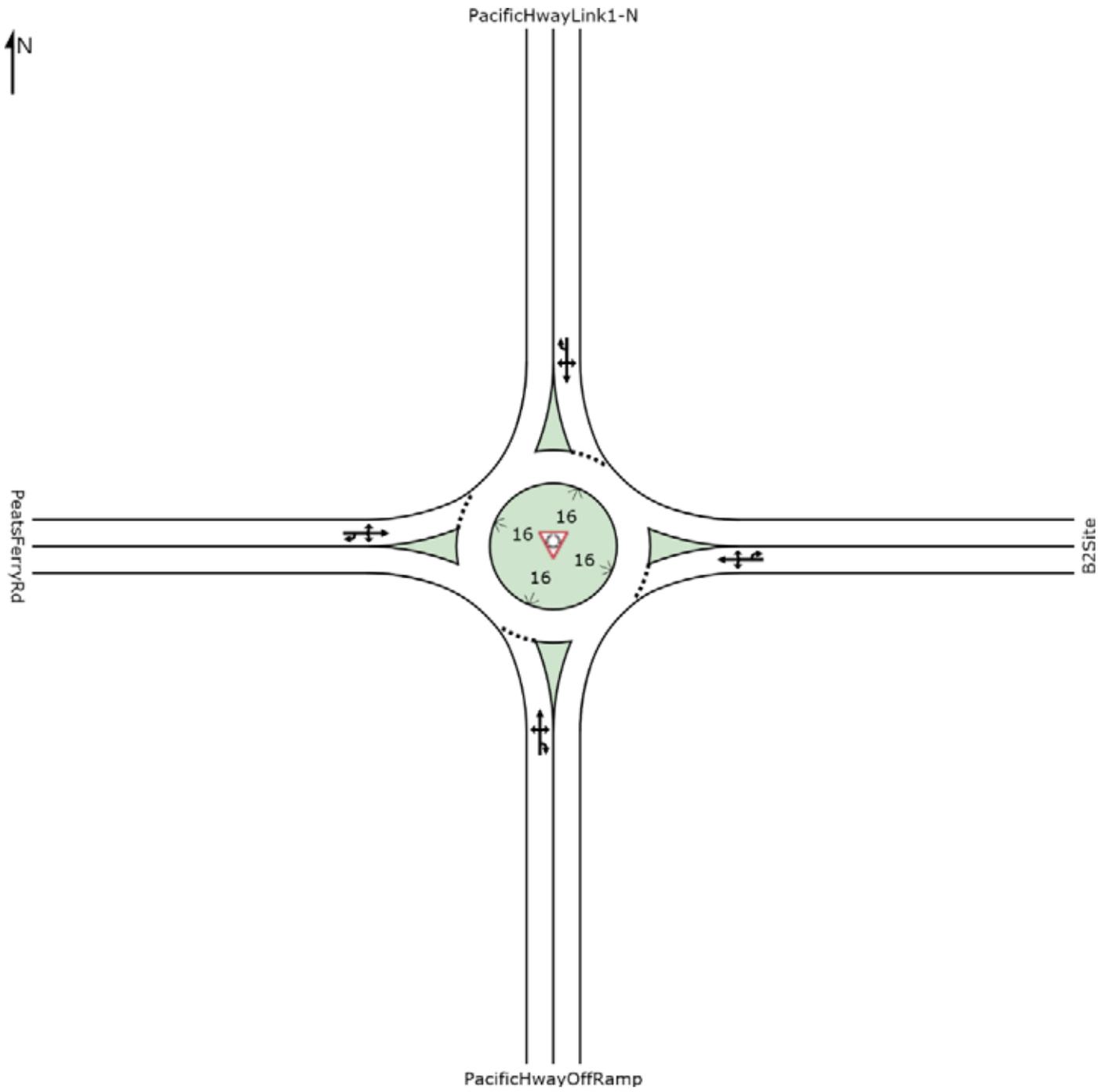
Organisation: MOTT MACDONALD HUGHES TRUEMAN | Processed: 26 August 2016 11:17:10

Project: \\mottmac\project\Sydney\Projects\37xxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

SITE LAYOUT

 Site: PM-Highway Link Road/Peats Ferry Rd

2016 Background
Roundabout



SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: MOTT MACDONALD HUGHES TRUEMAN | Created: 26 August 2016 11:17:30

Project: \\mottmac\project\Sydney\Projects\37xxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

MOVEMENT SUMMARY

 Site: PM-Highway Link Road/Peats Ferry Rd

2016 Background
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: PacificHwyOffRamp											
1	L2	36	0.0	0.075	4.1	LOS A	0.4	2.6	0.07	0.47	53.5
2	T1	67	0.0	0.075	4.4	LOS A	0.4	2.6	0.07	0.47	52.7
3	R2	2	0.0	0.075	8.5	LOS A	0.4	2.6	0.07	0.47	32.8
3u	U	7	0.0	0.075	10.4	LOS A	0.4	2.6	0.07	0.47	55.9
Approach		113	0.0	0.075	4.8	LOS A	0.4	2.6	0.07	0.47	52.8
East: B2Site											
4	L2	1	0.0	0.003	2.3	LOS A	0.0	0.1	0.27	0.54	49.8
5	T1	1	0.0	0.003	2.8	LOS A	0.0	0.1	0.27	0.54	50.9
6	R2	1	0.0	0.003	6.3	LOS A	0.0	0.1	0.27	0.54	15.7
6u	U	1	0.0	0.003	8.3	LOS A	0.0	0.1	0.27	0.54	9.3
Approach		4	0.0	0.003	4.9	LOS A	0.0	0.1	0.27	0.54	31.1
North: PacificHwyLink1-N											
7	L2	1	0.0	0.070	4.3	LOS A	0.3	2.6	0.18	0.45	22.4
8	T1	73	10.1	0.070	4.7	LOS A	0.3	2.6	0.18	0.45	51.4
9	R2	6	16.7	0.070	8.9	LOS A	0.3	2.6	0.18	0.45	49.6
9u	U	2	0.0	0.070	10.6	LOS A	0.3	2.6	0.18	0.45	27.3
Approach		82	10.3	0.070	5.1	LOS A	0.3	2.6	0.18	0.45	50.6
West: PeatsFerryRd											
10	L2	15	7.1	0.040	4.5	LOS A	0.2	1.3	0.20	0.58	46.2
11	T1	1	0.0	0.040	4.6	LOS A	0.2	1.3	0.20	0.58	37.1
12	R2	38	2.8	0.040	8.8	LOS A	0.2	1.3	0.20	0.58	51.9
12u	U	1	0.0	0.040	10.7	LOS A	0.2	1.3	0.20	0.58	52.4
Approach		55	3.8	0.040	7.6	LOS A	0.2	1.3	0.20	0.58	50.5
All Vehicles		254	4.1	0.075	5.5	LOS A	0.4	2.6	0.14	0.49	51.3

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

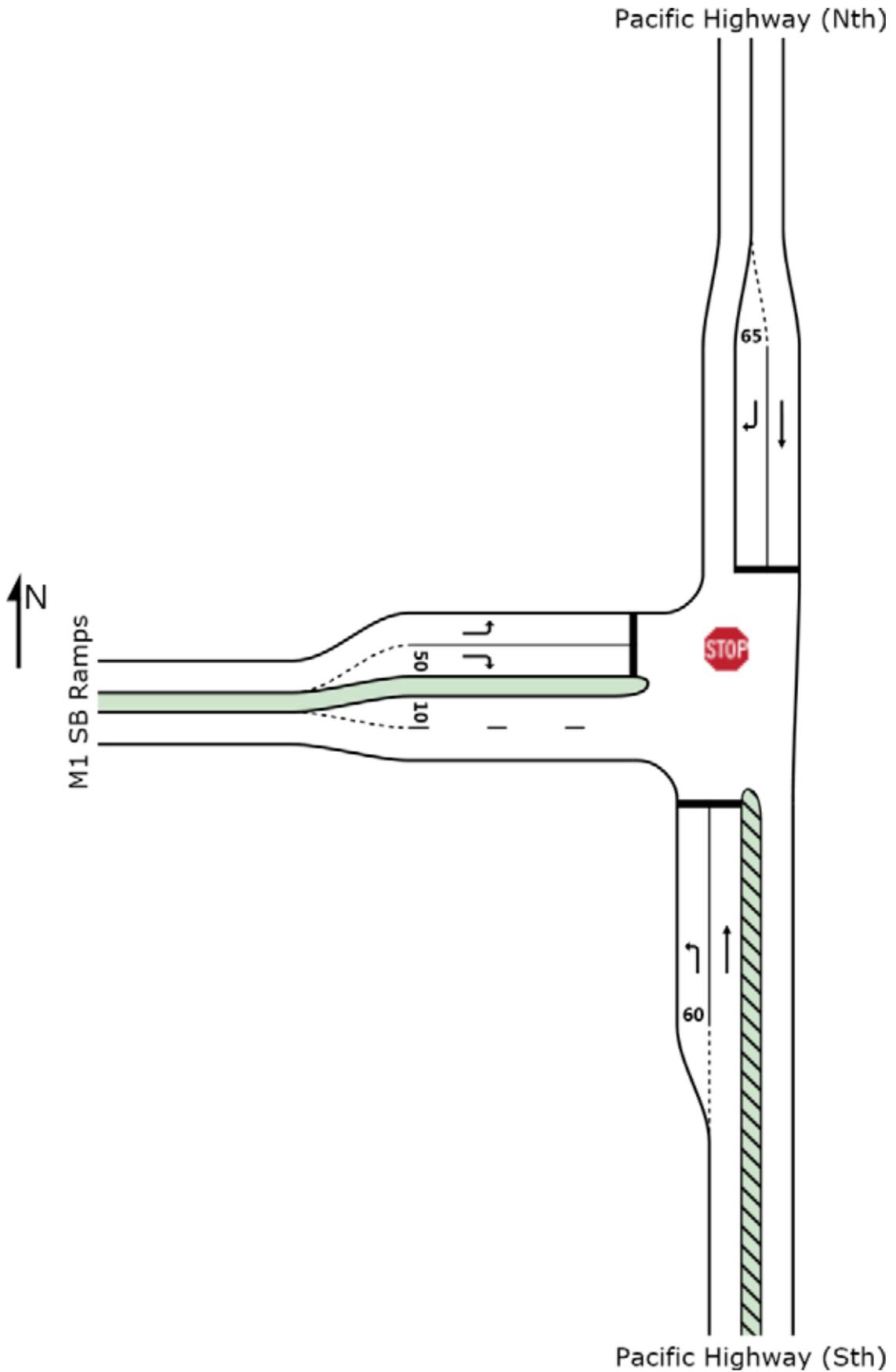
Organisation: MOTT MACDONALD HUGHES TRUEMAN | Processed: 26 August 2016 11:17:11

Project: \\mottmac\project\Sydney\Projects\37xxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

SITE LAYOUT

 Site: AM-M1 SB Ramps/Pacific Highway - All-way Stop

New Site
Stop (All-Way)



MOVEMENT SUMMARY

 Site: AM-M1 SB Ramps/Pacific Highway - All-way Stop

New Site
Stop (All-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: Pacific Highway (Sth)											
1	L2	58	0.0	0.187	14.8	LOS B	0.7	4.7	0.94	1.28	41.5
2	T1	28	11.1	0.101	14.1	LOS A	0.3	2.7	0.94	1.26	47.4
Approach		86	3.7	0.187	14.6	LOS B	0.7	4.7	0.94	1.27	43.9
North: Pacific Highway (Nth)											
8	T1	49	6.4	0.109	11.5	LOS A	0.4	2.6	0.84	1.26	49.3
9	R2	45	0.0	0.109	11.0	LOS A	0.4	2.5	0.87	1.25	41.2
Approach		95	3.3	0.109	11.2	LOS A	0.4	2.6	0.86	1.26	46.5
West: M1 SB Ramps											
10	L2	22	19.0	0.072	11.3	LOS A	0.2	1.9	0.92	1.26	41.5
12	R2	41	2.6	0.118	11.4	LOS A	0.4	2.9	0.91	1.26	45.1
Approach		63	8.3	0.118	11.4	LOS A	0.4	2.9	0.91	1.26	44.0
All Vehicles		244	4.7	0.187	12.4	LOS A	0.7	4.7	0.90	1.26	44.9

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

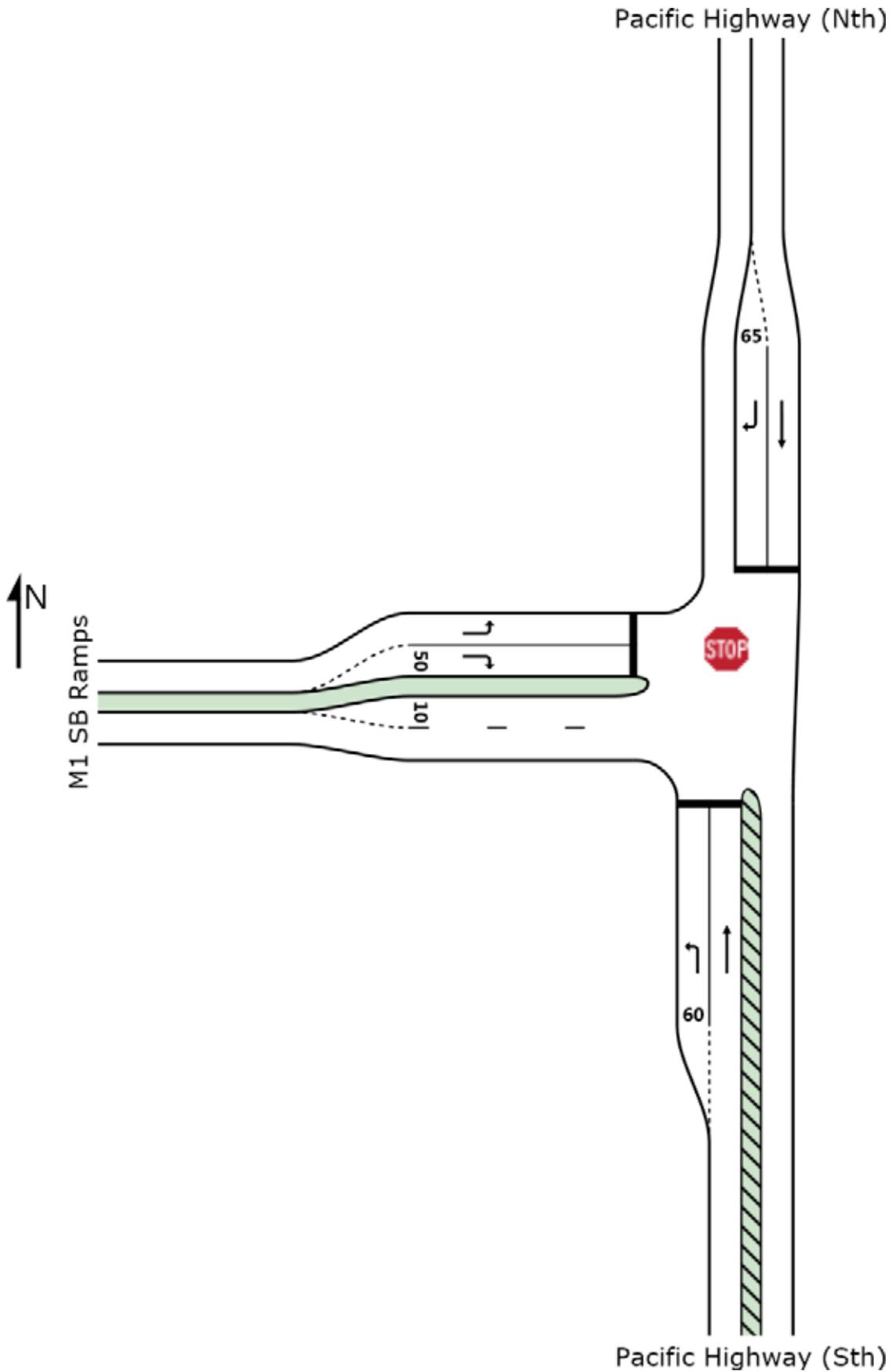
Organisation: MOTT MACDONALD HUGHES TRUEMAN | Processed: 26 August 2016 11:17:12

Project: \\mottmac\project\Sydney\Projects\37xxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

SITE LAYOUT

 Site: PM-M1 SB Ramps/Pacific Highway - All-way Stop

New Site
Stop (All-Way)



MOVEMENT SUMMARY

 Site: PM-M1 SB Ramps/Pacific Highway - All-way Stop

New Site
Stop (All-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total veh/h	HV %	v/c	sec		Vehicles veh	Distance m	per veh	km/h	
South: Pacific Highway (Sth)											
1	L2	51	0.0	0.128	11.7	LOS A	0.4	3.0	0.88	1.26	44.1
2	T1	71	4.5	0.164	12.3	LOS A	0.6	4.1	0.87	1.28	48.7
Approach		121	2.6	0.164	12.1	LOS A	0.6	4.1	0.88	1.27	47.2
North: Pacific Highway (Nth)											
8	T1	81	3.9	0.159	11.3	LOS A	0.5	3.9	0.83	1.27	49.4
9	R2	33	6.5	0.070	10.3	LOS A	0.2	1.7	0.83	1.25	42.0
Approach		114	4.6	0.159	11.0	LOS A	0.5	3.9	0.83	1.27	48.0
West: M1 SB Ramps											
10	L2	16	6.7	0.063	12.2	LOS A	0.2	1.6	0.95	1.25	41.0
12	R2	19	0.0	0.065	12.0	LOS A	0.2	1.5	0.93	1.24	44.7
Approach		35	3.0	0.065	12.1	LOS A	0.2	1.6	0.94	1.25	43.1
All Vehicles		269	3.5	0.164	11.6	LOS A	0.6	4.1	0.86	1.27	47.1

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com

Organisation: MOTT MACDONALD HUGHES TRUEMAN | Processed: 26 August 2016 11:17:12

Project: \\mottmac\project\Sydney\Projects\37xxx\370106\04 Working\03 Calculations\Transport\SIDRA\2016Existing-160825_LL.sip6

SIDRA Results - With Development

SITE LAYOUT

▽ Site: AM-Pacific Highway/Point Rd

2016 Background traffic
Giveway / Yield (Two-Way)

