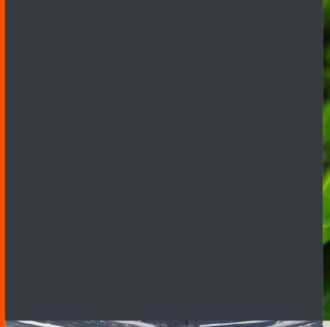
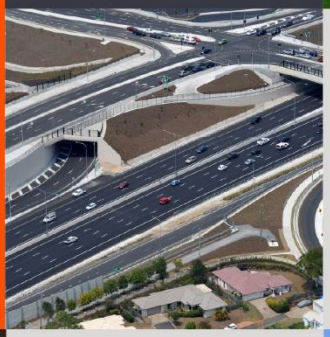


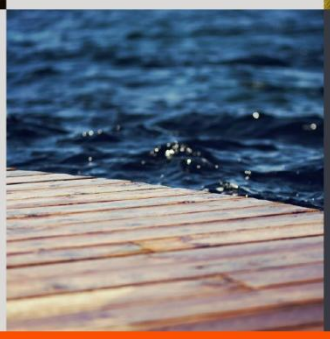

Civil Engineering
TRAFFIC IMPACT STUDY

156-158 Jonson Street Mixed Use Development
156- 158 Jonson Street, Byron Bay, NSW,2481 | Lot 51 DP844054 and Lot 9 DP818197

By Planit Consulting Pty Ltd

September 2020
J6799 | TIS01



This report has been written by

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Disclaimer

Content

Executive Summary

This Traffic Impact Study has been prepared on behalf of 156 Jonson Street Pty Ltd in support of the proposed mixed-use development located at 156-158 Jonson street on Lots 9 (DP818197) and Lot 51(DP844054) in Byron Bay, NSW,2481. It presents an assessment of the potential traffic impact associated with the proposed development on the surrounding road network.

The subject site currently consists of three (3) existing lots with one lot containing a portal frame warehouse, the second lot consisting of vacant vegetated land and the remaining lot forming part of a rail corridor. The proposed site layout consists of retail and mixed commercial space with an approximate GFA of 4000m^2. A 2-storey carpark accessed from Jonson Street is proposed to service the development as well as provide parking credits for potential future developments in the area. The purpose of this report is to outline opportunities and constraints regarding the proposed development including:

- Existing traffic conditions;
- Access and parking for cars, service vehicles, mobility impaired, bicycles $ pedestrians;
- Safety associated with the exiting, entering and internal manoeuvring; and
- Impact on the surrounding road network.

The assessment in accordance with Section B4 of Byron Shire Council's (BSC) DCP and therein referenced documents including the RMS Guide to Traffic Generating Developments.

It is proposed to provide a 2-storey carpark to service the development. The access to the site will be via Jonson Street. It is proposed to extend Jonson street to cater for two-way traffic and the simultaneous entering and exiting of cars within the development. The access point to the site has been designed to be suitable for MRV and HRV access. Carparking provisions are summarised in the table below;

Item	Minimum Required
Total car parking spaces	200
Accessible parking spaces	4
Bicycle spaces	23
Motorbike spaces	16
HRV loading bay	1 (combined)
MRV loading bays	2 (combined)

Based on Table B4.2 of Chapter B4 of the 2014 DCP, one (1) HRV and two (2) MRV loading bays are required for the proposed development. A configuration is proposed where either two MRVs or one HRV can service the site simultaneously. An operational management plan should be prepared prior to occupation.

Trip generation rates have been derived from multiple sources including RMS's 'Guide to Generating Traffic Development' *and* ITE'S Trip 'Generation Manual'. This report adopts a merit-based assessment for trip generation to ensure that an accurate representation of the proposed site is adopted. It is anticipated that the development will generate 309 AM/ PM peak hour trips, and 2942 vehicle trips/ day.

Internal manoeuvring has been assessed for the design vehicles for the site, using Autodesk Vehicle Tracking software and was deemed suitable the relevant design vehicles.

The future Byron Bay Bypass (currently under construction) will begin at the corner of Jonson Street and Browning Street and connect into the end of Butler Street and continue to the existing roundabout adjacent to the Shirley St/Lawson St intersection to the north of the CBD. A new roundabout will be located at the corner of Jonson Street and Browning Street. This roundabout has been assumed as part of the 'pre-development' scenario.

SIDRA intersection modelling shows a suitable level of service at the nearest intersection.

1 Introduction

1.1 Project Background

This Traffic Impact Study (TIS) has been prepared to provide an assessment on the potential impact the proposed development has on the surrounding road network. The proposed development is located at 156-158 Jonson street on Lots 9 (DP818197) and Lot 51(DP844054). Planit was engaged by 156 Jonson Street Pty Ltd to prepare a Traffic Impact Study to support the development application (DA) for the proposed development.

The subject site currently consists of three (3) existing lots with one lot containing a portal frame warehouse, the second lot consisting of vacant vegetated land and the remaining lot forming part of a rail corridor. The proposed site layout consists of retail and mixed commercial space with an approximate GFA of 4000m^2. A 2-storey carpark accessed from Jonson Street is proposed to service the development as well as provide parking credits for potential future developments in the area.

1.2 Project Scope

The purpose of this report is to outline opportunities and constraints regarding the proposed development including:

- Existing traffic conditions;
- Access and parking for cars, service vehicles, mobility impaired, bicycles $ pedestrians;
- Safety associated with the exiting, entering and internal manoeuvring; and
- Impact on the surrounding road network.

1.3 Standards, Policies and Guidelines

This assessment is based on requirements from the following standards, policies and guidelines:

- Byron Shire Development Control Plan 2014-Chapter B4- Traffic Planning, Vehicle;
- 2002 RTA Guide to Traffic generating Developments;
- Australian/New Zealand Standard 2890.1 to 2890.6;
- Austroads Guide to Road Design;
- Austroads Guide to Traffic Management;
- ITE Trip Generation Manual; and
- National Construction Code- Building Code of Australia-Class 2 to Class 9 Buildings.

1.4 Strategic Environment

Byron Shire Council published a Strategic Transport Statement (Transport Policy) that aims to integrate a shire-wide transport network and network approach that improves mobility, accessibility, and choice for all road users. The Shire aims to mitigate the use of non-renewable energy and improve sustainability, amenity, and opportunities for environmental health. Council have many mechanisms to implement these actions and they can be identified as either supply or demand.

Council's supply techniques that are currently in place are;

- Council adopted bike plan: This identifies the needs for off-road paths, on-road bicycle lanes, bicycle parking and end of trip facilities.
- Proposed Pedestrian Access and Mobility Plan (PAMP) and car parking studies: This will be influenced by development of a transport strategy to ensure an integrated and coordinated approach is adopted for future road network. The first step of this process is assessing the existing infrastructure and transport supply.
- Disability and Inclusion Action Plan: This was developed for people with a disability through a stakeholder engagement process and a whole-of-council process. This action plan was Council's commitment to reducing the barrier for people with disabilities by improving the access for disabled people. The plan facilitated an inclusion and participation process across the Byron Shire.

The Byron Shire Bike Strategy and Action Plan 2008 provides an assessment of existing conditions in each town within the Byron Shire by reviewing the pedestrian and cyclists needs of the different user groups. Byron Shire Council currently accommodates for bicycle users and pedestrians by providing cycle ways

and pedestrian footpaths combined with the road system. This offers opportunity for locals, workers, and visitors to utilise these facilities for recreation access. The plan facilitates the expansion of the existing network of bicycles facilities within the Byron Shire. The plan analyses the current bike needs and demands within the Shire and aims to predict the future demand on the bicycle network.

Provision of pedestrian and bicycle facilities such as signage, bicycle storage racks and special kerb crossings will be undertaken as part of the road network improvements. The purpose of these proposed pedestrian and cycle facilities will be for commuter access as well as for recreational purposes.

1.5 Byron Bay Bypass

The subject site is located on the southern end of Jonson Street. As part of the construction of the Byron Bay Bypass, this intersection shall be upgraded and a roundabout shall be provided. Planit understands that works for the Bypass commenced in July 2019 and be completed by December 2020.

1.6 Definitions

- Annual Average Daily Traffic (AADT) is the total volume of vehicle traffic for a year divided by 365 days. Sometimes also referred to as "Average Annual Daily Traffic" it provides a rudimentary traffic volume;
- Carriage is the portion of the road assigned to the use of vehicles, inclusive of shoulder and auxiliary lanes;
- SRV, Small rigid vehicle as defined in AS 2890.2-2004;
- MRV, Medium rigid vehicle as defined in AS 2890.2-2004;
- Custom Waste HRV, Custom Waste Heavy Rigid Vehicle as received by Solo Richmond Waste.
- AV, Articulated vehicle as defined in AS 2890.2-2004;
- Design year, standard practise in traffic engineering is to determine the impact of a development 10 years after the date of the assessment. For a 2019 assessment, the design year is 2029;
- Classification of buildings, the classification of a building or part of a building is determined designed, constructed, or adapted to be used; and
- Level of Service, (in accordance with the Austroads definition), is a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. A level of service definition generally describes these conditions in terms of factors such as speed and travel time, delay, density, freedom to manoeuvre, traffic interruptions, comfort and convenience, and delay. Levels of service can be described for interrupted and uninterrupted flow facilities. Descriptions are provided in Table 1.

Table 1 - Level of Service Definitions

Level of Service	Uninterrupted flow facility definition (*HCM 2010)	Interrupted flow facility definition (**AGTTM3)
A	A condition of free-flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.	Describes primarily free-flow operation. Vehicles are completely unimpeded in their ability to manoeuvre within the traffic stream. Control delay at the boundary intersections is minimal. The travel speed exceeds 85% of the base free-flow speed.
B	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is a little less than with level of service A.	Describes reasonably unimpeded operation. The ability to manoeuvre within the traffic stream is only slightly restricted and control delay at the boundary intersections is not significant. The travel speed is between 67% and 85% of the base free-flow speed.
C	Also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.	Describes stable operation. The ability to manoeuvre and change lanes at mid segment locations may be more restricted than at LOS B. Longer queues at the boundary intersections may contribute to lower travel speeds. The travel speed is between 50% and 67% of the base free-flow speed.
D	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.	Indicates a less stable condition in which small increases in flow may cause substantial increases in delay and decreases in travel speed. This operation may be due to adverse signal progression, high volume, or inappropriate signal timing at the boundary intersections. The travel speed is between 40% and 50% of the base free-flow speed.
E	Traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause breakdown.	Characterised by unstable operation and significant delay. Such operations may be due to some combination of adverse progression, high volume, and inappropriate signal timing at the boundary intersections. The travel speed is between 30% and 40% of the base free-flow speed.
F	In the zone of forced flow, where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.	Characterised by a flow at extremely low speed. Congestion is likely occurring at the boundary intersections, as indicated by high delay and extensive queueing. The travel speed is 30% or less of the base free-flow speed. LOS F is assigned to the subject direction of travel if the through movement at one or more boundary intersections has a volume-to-capacity ratio greater than 1.0.

* HCM – Highway Capacity Manual 2010
**AGTTM3 – Austroads Guide to Traffic Management Part 3

2 Site Assessment

2.1 Site Description

The proposed development site (Figure 2) is located in an area zoned for local centres and infrastructure which forms part of the Byron Shire Council (BSC) Local Government Area (LGA). The subject site is approximatly 8,850m^2 in plan and is located on Lot 9 on DP818197 (local Centre), Lot 51 on DP844054 (infrastructure), and a Portion Lot 4729 on DP1228104 (infrastructure. The site currently contains:

- Lot 9 on DP818197 (3,165m^2):
  - Large shed covering the majority of the site.
  - Site access at the north to a carpark.
  - Battle axe access to the south of the lot.
  - Small landscaped area.
- Lot 51 on DP844054 (3,850m^2)and portion of Lot 4729 on DP1228104 (1,835m^2):
  - Complete grass cover with scattered trees.
  - Wetland in the south area of the site.
  - Lot 4729 on DP1228104 is currently part of a rail corridor.

Figure 1-Subject Site (Source: NearMaps, 2020)

It is proposed to construct a two-storey car park with sufficient capacity to service the number of car parks required by Byron Shire Council for a retail classified development. The ground floor and 1st floor of the 2-storey car park access shall be via the public road. The access to the site will be via Jonson Street. Jonson street is primarily accessed from the Jonson/Browning Street intersection.

Two Medium Rigid Vehicle (MRV) loading bays, doubling as a single Heavy Rigid Vehicle (HRV) loading bay, are proposed on the site via Johnson Street. directly north of the vehicle access point to the 2-storey carpark. The proposed carpark is sized accordingly to accommodate for workers, employees, and visitors of the subject site. It is proposed to extend the existing access via Jonson Street to the south by approximately 10.5m to cater for two-way traffic.

3 Existing Infrastructure

3.1 Parking Provisions

Byron Shire Council introduced a paid parking scheme in December 2015 that extends throughout the Byron Bay CBD, including the majority of the local streets (Figure 2). There is available free and paid parking along Jonson street directly north of the subject site. Free parking exists south of Jonson street, adjacent to Mitre 10, directly north of the subject site.

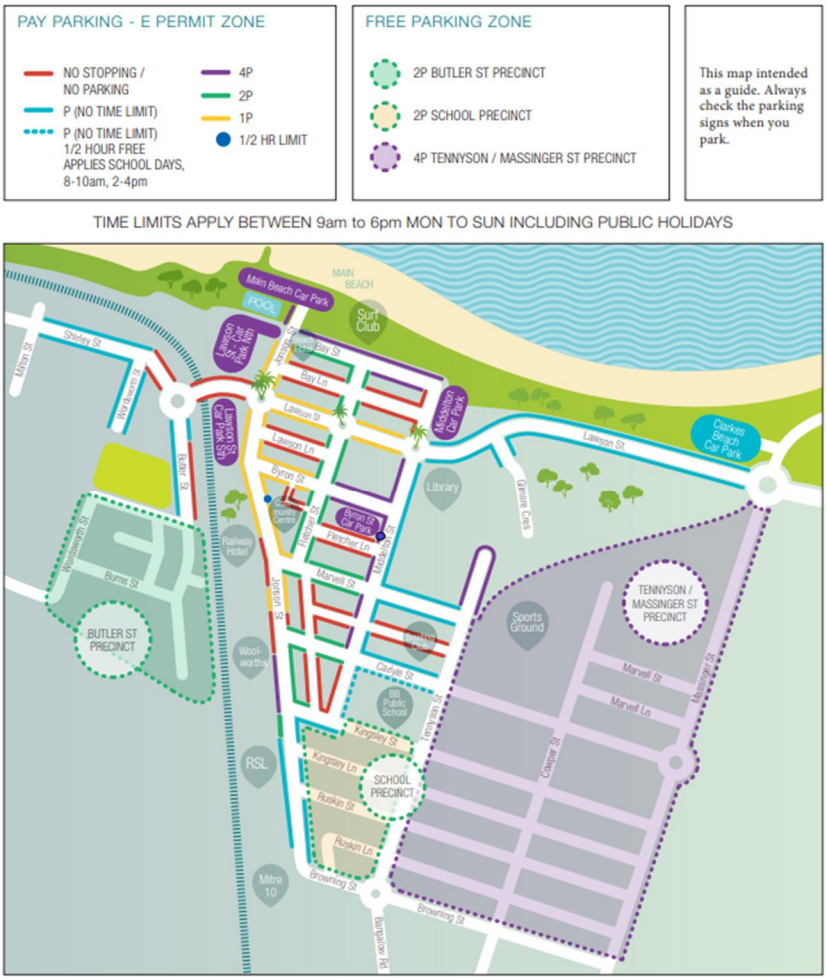

Figure 2 | BSC Paid Parking Scheme

3.2 Public Transport

Bus services are the only form of public transport (PT) facility available in close proximity to the site. Approximately several bus routes pass near the proposed development. Northern Rivers Bus lines group (Routes 610 and 635), Blanch's Bus Company (Routes 637, 640 and 641) and Greyhound (Routes Red and Green) are the main providers of bus services in the Byron Shire. The scheduled routes to and from Byron Bay operate 7 days a week. Byron Bay bus origin/destinations include but are not limited to, Bangalow, Ballina, Mullumbimby, Lismore, Gold Coast and Brisbane.

Although no official bus stops are displayed on the official routes along Jonson or Browning street, Blanch's Bus Company operates these routes on a 'hail and ride' policy. The closest bus stop is approximately 450m north of the subject site. Blanch's timetables show that bus routes are passing the subject site on weekdays and weekends. This gives future users the opportunities to utilise PT to the proposed development.

3.3 Road Network

The main roads surrounding the subject site are Jonson Street and Browning Street, both are RMS controlled roads. The total road carriageway is approximately 16m wide, this include two 5m wide traffic lanes and two 3-metre-wide kerbside parking shoulders. The intersection where Jonson Street and Browning Street meet is the primary route to access the subject site. It should be noted that this connection point is where the new bypass roundabout is currently under construction. Therefore, the existing intersection will be upgraded and resealed to accommodate for an increase in traffic demand and to divert significant traffic flows away from Byron Bay CBD.

Table D.1.5 of the Northern Rivers Local Government (NRLG) Development Design Specification- 'Geometric Road Design' specifies that the maximum traffic volume for distributor roads is 3000+ (vpd). This value has no explicit vehicle limit and does not give valuable representation of the maximum allowable vehicles on the road network directly north of the subject site.

The SIDRA modelling of Jonson Street and Browning Street intersection provides a simulated model representation of the performance of the road network. Modelling results are provided in Section 7 of this report. Additionally, site inspections during peak hour periods provide a good representation of the current operation of the road network.

3.4 Peak Hour Traffic Survey

3.4.1 Turning Movement Survey

Planit has previously performed an onsite AM peak turning movement survey between 8am and 8:30am on Thursday 4th of May 2017. This turning movement survey was conducted at the intersection at Ruskin Lane and Browning Street. The survey results are provided in the below:

Table 2| Turning Movement Survey

Approach	Turning movement	Vehicles survey in 30 minutes	*Adopted AM peak hour volume
Browning Street (Eastbound)	Left	2	4
	Straight	172	344
	Right	0	0
Browning Street (Westbound)	Left	0	0
	Straight	269	538
	Right	0	0

*Refer to section 3.4.3 of this report for the adopted volumes for 2020

The total volume for the AM peak hour would be 886 vehicles per hour on Browning Street. Due to the close proximity of the surveyed location and the subject site, these results are considered representative for the purpose of this Traffic Impact Study.

3.4.2 Traffic Survey

Currently, the road network adjacent to the site is subject to significant roadworks (Byron Bay Bypass construction. Therefore, Planit believes any traffic counts conducted at present time would not be representative of 'normal, operations. Accordingly, Historic traffic survey data was accessed by Planit. Accordingly, the traffic volumes in accordance with Table 3 have been assumed.

Table 3| Jonson and Browning Street Peak Hour Volumes

Approach	AM Peak Hour Volume	PM Peak Hour Volume
Browning Street (Westbound)	624	517
Browning Street (Eastbound)	411	556
Jonson Street	453	588

3.4.3 Adopted Peak Hour Traffic Volumes

Adopted data based has been presented in Table 4. The results obtained from the turning movements survey and traffic data is multiplied by a seasonality factor of 1.05 (+5%) to give a growth estimate of the average peak hour volumes across the entire year. The values obtained from multiplying the results by the seasonality factor will utilise 2017 as the base data traffic volumes. The 2020 and 2030 design year will be modelled in SIDRA to give a simulated visual representation of the intersection will operate in

existing and future conditions. Based on experience with other developments in the Byron shire region, an annual compound growth rate of 2.5% is adopted for 2020 and 2030 design year. The volumes used for modelling inputs can be seen in table 4.

Table 4 | Turning Movements

Approach	Turning Movements	2017 AM Peak	2017 PM Peak	2020 AM Peak	2020 PM Peak	2030 AM Peak	2030 PM Peak
Browning Street (Eastbound)	Left	4	0	4	0	6	0
	Straight	412	583	444	628	568	804
Browning Street (Westbound)	Right	0	0	0	0	0	0
	Straight	655	490	705	528	903	675

3.5 Daily Traffic Survey

The AADT is a more accurate parameter discussed more commonly than ADT in traffic engineering. The AADT gives a better representation of the average traffic on a road network because it accounts for the high and low volume times of the year. Based on this information, the adopted data was converted to AADT using a seasonality factor to account for the variations in daily traffic throughout the year. A factor of 1.05 (Derived from Austroads) will be used to determine the 2017 AADT. An annual Compound traffic growth factor of 2.5% will be adopted to calculate growth traffic volumes for the design year of 2030. Table 5 shows the AADT calculations.

Table 5| AADT Calculations

	Jonson Street	Browning Street
7-day ADT	11890	11609
Seasonal adjustment factor	1.05	1.05
2017 AADT	12484.5	12189.45
Annual Compound traffic Growth factor (2.5%)	0.025	0.025
2020 AADT	13444	13127
2030 AADT	17210	16803
% HV	6.1%	4.9%

Table 6 shows the adopted traffic speeds.

Table 6|Speed Data

	Jonson Street	Browning Street
Mean (Km/h)	40.3	39.4
85% percentile (Km/h)	46.1	44.3
95% percentile (Km/h)	49.7	47.5
Median (Km/h)	40.3	39.6

3.6 Peak Period Traffic Characteristics

Two traffic site inspections have been carried out on (7/09/2020), in the surrounding vicinity of the subject site, observations of which are presented in this section of the assessment.

3.6.1 8:00 to 9:00 AM Observations

- Tennyson/Browning Street Roundabout:
  - Minor congestion and queues are observed in all circulating and turning movements for the intersection;
  - Tennyson/Browning street roundabout is the primary access point for road users travelling from the south to get into Byron CBD; and
  - Cars travelling north on Tennyson Street can enter the 'Bay Grocer' grocery without any significant queuing.
- Jonson Street/Browning Street Intersection:
  - Trucks are observed to be able to safely accelerate coming out of the Mitre-10 parking area and entering Jonson Street northbound in a safe manner;
  - Cars and Trucks can enter the 'Mitre-10' area through Jonson Street (through lane), no significant queuing was observed;

  - The 'Mitre-10' Liberty petrol station provides sufficient turning movements for vehicles to safely re-enter the main road; and
  - It was observed that two road users carried out illegal U-turn manoeuvres to alter their direction of travelling while transiting northbound on Browning street. This will no longer be an issue once the new roundabout is constructed.
- Ruskin Lane/Browning Street Intersection:
  - Only one road user is observed coming out of Ruskin Lane onto Browning Street. The user had to wait for approximately 15 seconds before being able to turn right.
  - On-Street Parking:
  - Cars can park on both sides of Jonson Street and Browning Street. The carpark strips were both at approximately 40% capacity.
- Public Transport:
  - Blanch's school Bus stopped by at 08:01 students gathered nearby 'Spell and the Gypsy' on the northern side of the Browning Street/Tennyson Street roundabout.
- Pedestrians:
  - Pedestrians can generally walk safely and efficiently within the vicinity of the subject site. They share the footpaths with cyclists; and
  - Pedestrians walking from Bangalow Road to Tennyson Street face difficulties crossing the roundabout due to vehicles having the right of way onto the roundabout.
- Cyclists:
  - Cyclist can generally ride safely and efficiently within the vicinity of the subject site;
  - It was observed that cyclists travelling in the surround area tend to ride on the traffic lane and neglect the designated cyclist path; and
  - Cyclist travelling on the footpaths from Bangalow Road to Tennyson Street face difficulties during roundabout crossing, just like pedestrians.

3.6.2 15:10 to 16:10 PM Peak Observations

- Tennyson/Browning Street Roundabout:
  - It was observed that there was more congestion and queuing observed in all circulating and turning movements for the intersection because of peak hour school traffic; and
  - Cars travelling north on Tennyson Street can enter the 'Bay Grocer' grocery with minor queuing.
- Jonson Street/Browning Street Intersection:
  - Trucks and cars entering from Jonson Street can safely queue on existing turning lane; and
  - Cars and medium articulated vehicles can use the intersection in all directions. Stable flow and no significant queuing was observed.
- Ruskin Lane/Browning Street Intersection:
  - No vehicles were observed using the intersection.
- On-Street Parking:
  - Cars are parked on both sides of Browning and Jonson street; and
  - Both car parks were at 80% capacity
- Public Transport:
  - Blanch's School Bus stopped by at 16:03 to drop off students on the northern side of Browning street; and
  - Blanch's School Bus stopped by at 16:10 to drop off students on the southern side of Browning street.
- Pedestrians:
  - Similar observations to AM
- Cyclists:
  - Similar observations to AM

4 Car Parking

4.1 Carparking Number

To ensure sufficient onsite car, bicycle, and motorcycle parking spaces, it is proposed to include a new 2-storey carpark to service the development. Car parking requirements are outlined in with BSC'S DCP 2014 Chapter B4 'Traffic Planning, Vehicle Parking, Circulation and Access' and the 2002 RTA 'Guide to Traffic generating Developments'.

4.1.1 Overall Car Parking

Overall car parking as part of the DCP requirements calculations are detailed in table 7. A minimum of 240 car spaces are required for the proposed development. However, Planit believes that to adequately service the site, a reduction in these spaces is warranted for the following reasons:

- Proximity to the town centre, residential areas and available infrastructure allows for adequate walkability and cyclability;
- Because of the mixed-use nature of the development (retail, restaurant and office space), different peak times for different components are likely to occur, hence flattening parking requirements;
- It is considered likely that a significant number of patrons will be tourists who will be able to walk from short-stay accommodation in town. Based on previous studies by Planit, it is believed that a significant number of tourists within the town centre are do not bring a vehicle; and
- The proponent is proposing upgrades to Jonson Street which may improve on-street parking.

Therefore, it is proposed to reduce the number of required spaces to 200.

Table 7 | Overall Car Parking Calculation Table

Relevant DCP Land use Definition	Calculation Rate	Total Footprint (m^2)	Number of Parking Spaces (DCP)	Number of Parking Spaces (Proposed)
Retail/Shopping centres	6.1 per 100m^2	3411	208	175
Commercial/Offices	1 space per 20m^2 GFA	627	32	25
Total Number of Carparks Required			240	200

It should be noted that the proposed carparking layout proposed 284 parking spaces. Planit understands that the proponent is requesting to use surplus spaces as parking credits for future development directly adjacent to the subject site (Lot 1 DP 1267388). Considering that this lot is directly bordering the carpark, Planit believes that this is appropriate from a serviceability point of view.

4.1.2 Accessible Car Parking

Accessible car parking requirements are specified in AS2890.6 and Volume 1 of the 2015 National Construction Code and Building Code of Australia. These codes provide rates for various building classes. The overall accessible car parking is presented in the Table 8.

Table 8 | Accessible Parking Requirements

Item	Class	Calculation Rate	Number of parking spaces	Number of Accessible spaces
Retail/Shopping centres	6	1 space for every 50 car parking spaces or part thereof	174	3.5
Commercial/Offices	5	1 space for every 100 carparking spaces or part thereof	25	0.25
Total				3.75 = 4

It should be noted that proposed car parking allocated to future development has not been included in accessible car parking calculations. From a serviceability point of view, it is considered more appropriate if these are provided on-site in the future.

4.1.3 Bicycle Parking

Bicycle spaces are calculated in accordance with the requirements of Chapter B4 of the 2014 Byron Shire DCP. It is calculated that a minimum of 23 bicycle spaces are to be provided onsite. A calculation summary is provided in Table 9 below.

Table 9|Bicycle Space Calculations

Item	Relevant DCP land use definition	Calculation Rate	Total Footprint (m^2)	Number of Bicycle spaces
Retail/Shopping centres/ Commercial & Offices	Business premises	2 per 100m^2 (or part thereof) up a floor area of 200m^2 and 1 per 200m^2 Thereafter	4038	23.19
Total				23

Dimensions for bicycle spaces shall be in accordance with section 4.2 of this report.

4.1.4 Motorbike Parking

As stated in the BSC DCP, large commercial developments with a GFA exceeding 1000m^2 shall make provision for a minimum of two percent of car parking spaces will be converted to motorbike spaces (at a rate of 4 motor cycle spaces for every space converted).

The proposed development exceeds the GFA 1000m^2 threshold, therefore the above requirement applies. We recommend that four of the 200 spaces be converted to a total of 16 motor-cycle spaces. Dimensions for motorcycle spaces shall be in accordance with section 4.2 of this document.

4.1.5 Loading Bays

Loading bay calculations are carried out in accordance with Chapter B4 of the 2014 Byron Shire DCP and the GTTG, based on development types. The calculations are provided in table 10.

Table 10|Loading Bay Calculations

Relevant DCP land use definition	GFA (m^2)	Number of loading bays required by vehicle class
Retail premises, tourist and visitor accommodation	4038	2 x SRV (Small Rigid Vehicle) 2x MRV (Medium Rigid Vehicle) 1x HRV (Medium Rigid Vehicle)

Based on table B4.2 of Chapter B4 of the 2014 DCP, a total of 2 SRV loading bays, two (2) MRV loading bays and 1 HRV loading bay would be required. However, to accommodate for spatial constraints and to be able to utilise the existing loading dock, it is proposed to utilise the following configuration:

- Single loading dock near the carpark entry that can accommodate a MRV, HRV and, if managed adequately, an AV;
- Provide a queuing space suitable to either accommodate a single HRV or two MRVs.
- This configuration will allow for:
  - Two MRV's or SRV's waiting in a safe spot, away from the general public whilst an MRV or HRV is loading/ unloading; or
  - 1 HRV waiting in a safe spot , away from the general public whilst an MRV or HRV is loading/ unloading.

It should be noted that the main tenant of the development, Harris Farm does have extensive experience with operating spatially constraint sites in the Sydney metro area and has indicated that this arrangement is fit-for-purpose. It is recommended that a commercial vehicle management plan is prepared and implemented prior to occupation of the site.

4.2 Geometric Requirements

Geometric requirements for the parking spaces and loading bays are determined in accordance with AS2890.1 and AS2890.6. An overview of the geometric requirement is provided in table 12. The proposed design complies with the parking requirements and geometric design requirements outlined in this chapter of the report. The design has been modified to ensure that the require carparking, motorcycle, accessible and bicycle spaces are provided. Safety measure including pedestrian zones and pedestrian crossings have been provided to enhance safe pedestrian movement within the subject site.

Table 11| Geometric requirements

Item	Minimum Required	Relevant user classes	Dimensions
Regular parking spaces	200	1A,2,3	5.4 x 2.6m spaces with 5.8m aisle width.
Accessible parking spaces	5	4	5.4 x 2.5m spaces with 2.4m shared between 2 spaces
Bicycle spaces	23	-	-
Motorbike spaces	16	-	2.5 x 1.2m
Staff parking spaces	0	-	-
SRV loading bay	N/A	-	3.5 X 6.4m bay with 3.5m vertical clearance
MRV loading bays	2	-	3.5 x 8.8m bay with 4.5m vertical clearance

5 Trip Generation

5.1 Trip Generation Rates

This section of the report focuses on the traffic generated by the proposed development. Trip generation rates have been obtained from multiple sources including the RMS's 'Guide to Traffic Generating Development' (GTTGD) and ITE's 'Trip Generation Manual'. Planit has adopted a merit-based assessment for trip generation to ensure that an accurate representation of the proposed site is shown. Based on Planit's experience with development within the Byron Shire area, the rates that best represent the proposed development will be adopted for this assessment. Table 13 shows a summary of relevant rates provided in the GTTGD and the ITE Trip Generation Manual. The rates provided in this table have been analysed to establish the most appropriate trip generation rates for the proposed development. The rates are summarised in the tables 13-16 below.

Table 12 | Trip Generation, data sources

Item	Trip generation Parameter	Source	Daily trip generation rate	Peak hour trip generation rate
Shopping centre	m² GFA	RTA Guide to generating traffic developments	Daily generation rate 121 per 100m² GFA (0-10,000m² GFA)	12.5 per 100m² GFA
Commercial Office	m² GFA	RTA Guide to generating traffic developments	10 per 100m² GFA	2 per 100m² GFA
Shopping centre	m² GFA	ITE Trip Generation manual	42.7 per 100m² GFA	0.96 PER 100m² GFA (AM) 3.71 per 100 m² GFA (PM)

The proposed refurbished portal frame warehouse development has a significant GFA footprint and will constitute a large percentage of trip generation to the development. The GTTGD and ITE Trip Generation Manual both provides daily trip and peak hour rate for shopping centres. Both trip generation guides and manuals have been sourced to provide a better understanding of the trip generation at the development.

Clause 3.6.1 of the GTTGD suggests that a 25% discount rate can be applied to the shopping centre rates that are less than 10,000m² GFA. This reduces the daily trip generation to 91 trips per 100m² GFA, and the peak hour trip generation to 9.3 trips per 100m² GFA. The ITE Trip Generation Manual predicts significantly lower trip generation for the proposed shopping centre. For modelling purposes, the discounted GTTGD rates will be utilised as they are conservative trip generation rates for the estimated development use.

Additionally, the Byron Bay Town Centre Master Plan supports the promotion of a pedestrian and cycle friendly CBD to reduce the amount of traffic within the CBD. This is also consistent with the 2019 Pedestrian Access and Mobility Plan (PAMP) which aims to improve pedestrian and cycle access throughout the CBD and encourages visitors to arrive via alternative modes of transport rather than private vehicles.

The adopted peak hour trip generation rates are summarised in Table 14.

Table 13 | Trip Generation (peak hour rates)

Item	Trip generation Parameter	Source	AM Peak Hour Trip Generation Rate	Total Footprint	AM peak hour trip generation	PM peak hour trip generation
Shopping centre	m² GFA	RTA Guide to generating traffic developments	9.3 per 100m² GFA	3134	291	291
Commercial/ Offices	m² GFA	RTA Guide to generating traffic developments	2 per 100m² GFA	904	18	18
Total				4038	309	309

The existing site conditions comprises of a Singhs (tyre shop), Repco, Liberty, and Mitre-10. The existing peak hour trip generation conditions are estimated based of RTA Guide to generating traffic

developments. The existing condition trip generation rates for daily and peak hour are presented in Table 15.

Table 14 | Peak Hour Trip Generation, adopted rates for existing conditions

Item	Trip generation Parameter	Source	Total Footprint	Daily Trip Generation Rate	AM peak hour trip generation	PM peak hour trip generation
Car Tyre Retail Outlets	m² GFA	RTA Guide to generating traffic developments	250	25	2.5	2.5
RTA Building Supplies	m² GFA	RTA Guide to generating traffic developments	500	165	21	25
RTA Service Station	m² GFA	RTA Guide to generating traffic developments	40	114	18	18
Automotive parts	m² GFA	RTA Guide to generating traffic developments	350	217	16	23
Total			1140	320	57.5	68.5

5.2 Daily Trip Calculations

Based off the above table, the existing daily trip generate rate is approximately 58 AM peak hour trips, 69 PM peak hour trips and 320 daily trips per day. The daily trip generation for the proposed development are provided in table 16.

Table 15 | Daily Trip Generation, adopted rates

Item	Trip generation Parameter	Source	Daily Trip Generation Rate	Total Footprint	Trip Generation
Shopping centre	m² GFA	RTA Guide to generating traffic developments	91 per 100m² GFA	3134	2852
Commercial/Offices	m² GFA	RTA Guide to generating traffic developments	10 per 100m² GFA	904	90.4
Total				4038	2942

Based on the parameter above provide by RTA Guide to generating traffic developments with a net daily trip generation of 2942 vehicle trips per day.

Trip calculation results presented in this section of the report formed the input for traffic modelling. The modelling results are presented in Section 8 of this report.

6 Development Access Assessment

6.1 Jonson Street Access

The propose development proposes a primary access point through the main road on Jonson Street. The access point is located in the north-eastern quadrant of Lot 51 (DP844054). Refer to Figure 3 below for the location of the access point.

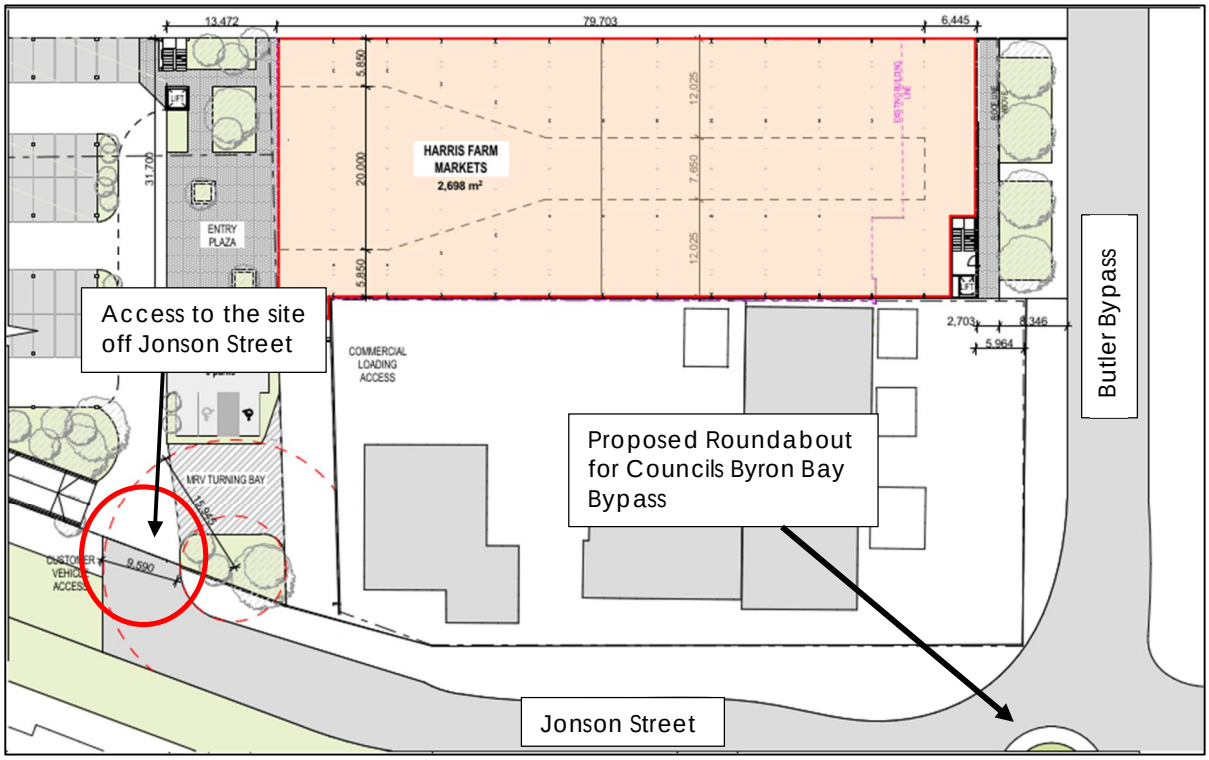

Figure 3 | Site access to the subject site

7 Internal Manoeuvring

Internal manoeuvring has been assessed for the design vehicles for the site, using Autodesk Vehicle Tracking software. The following design vehicles have been adopted:

- Standard MRV as per AS2890.2;
- Standard HRV as per AS2890.2;

The results of swept path analysis has been presented in Figures 4 and 5.

Figure 4| 2 x MRV turning movements into Loading Bay

Figure 4 demonstrates that an MRV can safely access the site via the main entrance and enter the queuing area, line up in the loading back and reverse towards the loading dock. The figure also demonstrates that this can occur safely whilst a second MRV is positioned within the queuing area.

Figure 5 demonstrates that an HRV can safely access the site via the main entrance and enter the queuing area, line up in the loading back and reverse towards the loading dock. Sufficient space would be available for queuing when the loading bay is in use.

Figure 5 | MRV turning movements entering and exiting subject site

8 Impact on Surrounding Road Network

8.1 Impact on Road Capacity

The sections of Jonson street and Browning street adjacent to the subject site is currently used to enter and exit the Byron Bay CBD from and to the Suffolk park direction. The design of the proposed development also takes into account the proposed Byron Bay Bypass design and all road changes have been allowed for in this report.

The Byron Bay Bypass will begin at the corner of Jonson Street and Browning Street and connect into the end of Butler street and continue to the existing road adjacent to the police station. The proposed overall layout is presented in Figure 6. The bypass includes a new roundabout at the intersection of Johnson Street and Browning street, changing the dynamics of the existing traffic movement around the subject site. Construction of the bypass has commenced in July 2019 and is planned for completion in late 2020.

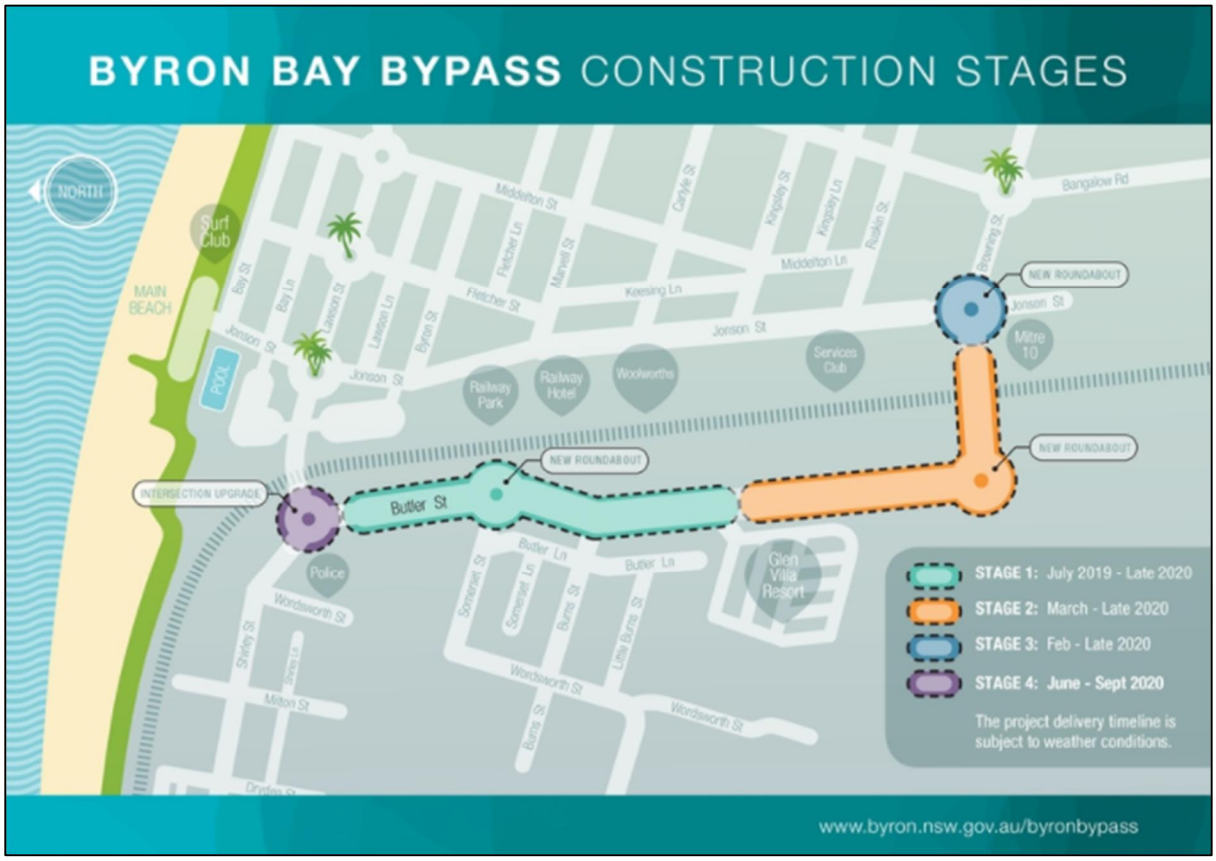

Figure 6 | Byron Bay Bypass Overall Layout Plan (Source: BSC)

The Byron Bay Bypass will aim to improve the traffic flow along Jonson Street by diverting through traffic around the Byron Bay CBD. It is anticipated that the traffic volumes along Jonson Street will decrease, and the traffic volumes along Browning Street will remain the same after commissioning of the bypass. Although the configuration of Browning Street will remain the same, the dynamic of the road will change as the flow of traffic will no longer be constant due to the provision of a roundabout at the Jonson Street and Browning Street intersection. Additionally, the vehicle speed coming off the roundabout travelling eastbound on Browning Street is expected to be reduced compared to the existing scenario, therefore making access/egress to/from the development site safer.

The average peak hour traffic volumes for Jonson Street and Browning Street are presented in table 17. These values are inclusive of the 1.05 seasonality factor. It is evident that the peak hour vehicle trips on the surrounding network in table 17 are within the 900vehicles/h limit (Table 5.1 of the *Guide to Traffic Management Part 3: Traffic studies and Analysis)*. Based on the calculations presented in table 14 (Section 5.1 of this report), the proposed development will have a peak AM and PM rate of 309 vehicles an hour. It is assumed that the distribution of trips will be 50% into and 50% out of the development.

Table 16|Peak Hour Vehicle Trips on Surrounding Road Network

Scenario	Time	Jonson Street (Southbound)	Browning Street (Eastbound)
2020 pre-development	AM Peak (vehicles/h)	488	444
	PM Peak (vehicles/h)	633	628
2030 pre-development	AM Peak (vehicles/h)	624	596
	PM Peak (vehicles/h)	811	804
2030 post-development	AM Peak (vehicles/h)	765	737
	PM Peak (vehicles/h)	952	945
Percentage increase (between 2030 and 2030 pre and post development)	AM Peak (vehicles/h)	22.6%	23.6%
	PM Peak (vehicles/h)	17.3%	17.5%

8.2 SIDRA Modelling

8.2.1 Modelling Scenarios

The relevant modelling scenarios are based on the following questions and assumptions:

- How does the intersection perform with existing conditions and in the 2030 design year, adopting an assumed 2.5% annual compound traffic growth rate?
- How does the intersection perform in 2030 with post development traffic added? and
- Are there any additional intersection upgrades required?

Two distinctive intersection modelling scenarios have been setup to address the above questions. The pre-development modelling scenario was based on the existing conditions at Jonson Street and Browning Street. For the post-development scenarios, the new roundabout proposed at Jonson Street and Browning street has been modelled. The modelled scenarios are as follows:

- Pre-development 2020 AM Peak ; and
- Post-development 2030 PM Peak

8.2.2 General Modelling Information

SIDRA Intersection 8.0 PLUS was used to carry out intersection modelling. Although general site-specific modelling input is described in the corresponding sections, detailed SIDRA modelling data can be provided upon request.

For traffic on Jonson Street, Browning Street and the Butler bypass, an approach speed limit of 50km/h is assumed.

The following generic key performance indicators were adopted when deciding whether a modelling scenario is a pass or fail;

- Worst Level of Service on an intersection or roundabout: and
- Worst Level of Service on a through road.

The pre-development turning movements have been assumed based on observations by Planit. The movements have been used as the inputs for the turning movements along Jonson and Browning Street. The following assumptions were made for determining the traffic volumes;

- 2.5% per annum compound traffic growth on background traffic;
- Equal distribution of trips into and out of the proposed development (e.g. 50% in and 50% out);
- 50% of traffic to use the bypass and 50% to continue to use Jonson Street;
- Turning movements will be conservatively distributed through the new bypass roundabout; and
- The most critical peak hour volumes between the AM and PM are modelled in SIDRA.

Table 17| SIDRA Modelling Inputs

Approach	Turning Movement	2020 PM Peak Hour Volume (Pre-development)	2030 PM Peak Hour Volume (Post-development)
Jonson Street (Southbound)	Left	616	350
	Straight	17	141
	Right	0	0
Jonson Street (Northbound)	Left	12	59
	Straight	12	59
	Right	12	59
Butler Bypass (westbound)	Left	0	0
	Straight	0	350
	Right	0	141
Browning Street (Eastbound)	Left	17	141
	Straight	0	366
	Right	611	366

8.2.3 Modelling Results

Modelling results for level of service are provided figures 7 and 8. The SIDRA modelling demonstrates that the new intersection is operating at a level of service A for every movement. The modelling results show sufficient performance of both intersections for pre- and post-development scenarios. It is unlikely that there is any queuing of traffic leaving the subject site which in turn ensures that traffic flow from development can travel into and out of the proposed development unimpeded.

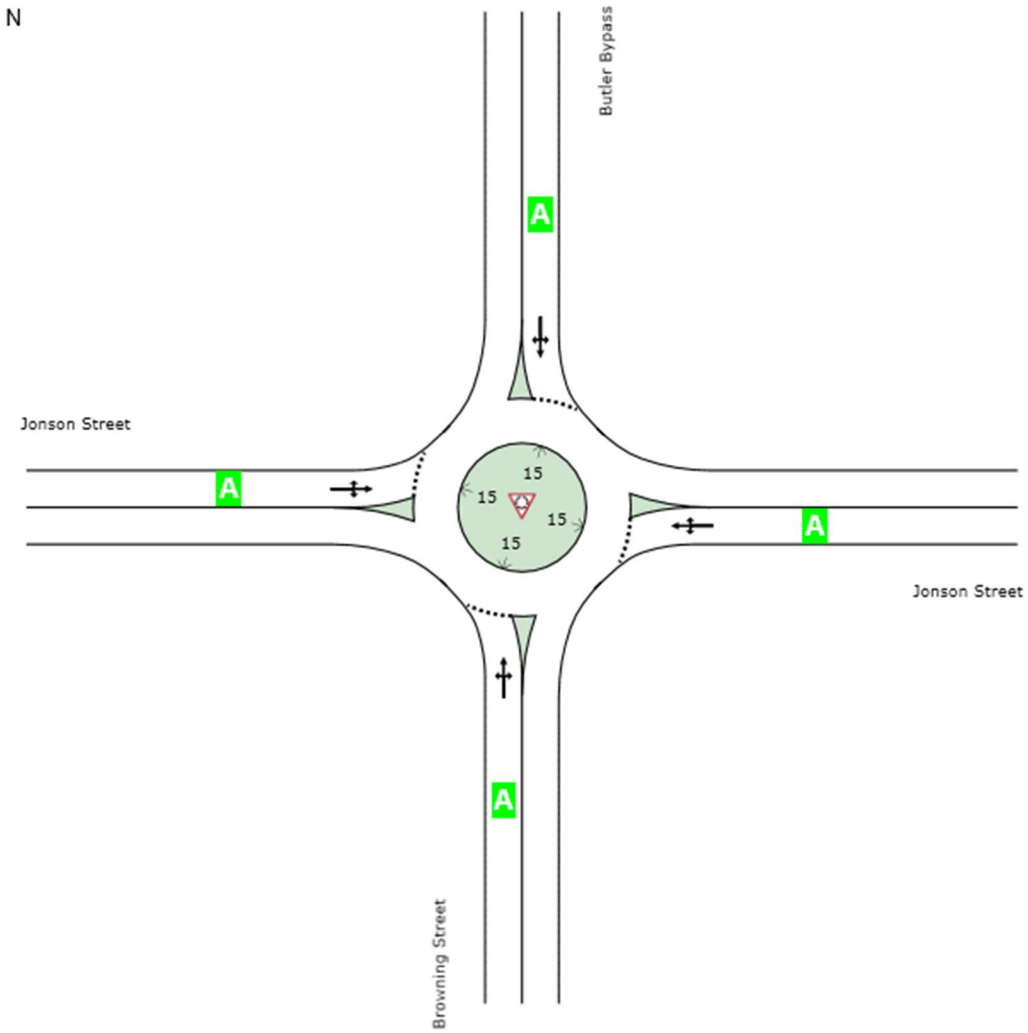

Figure 7| SIDRA output Level of Service for Pre-Development Scenario

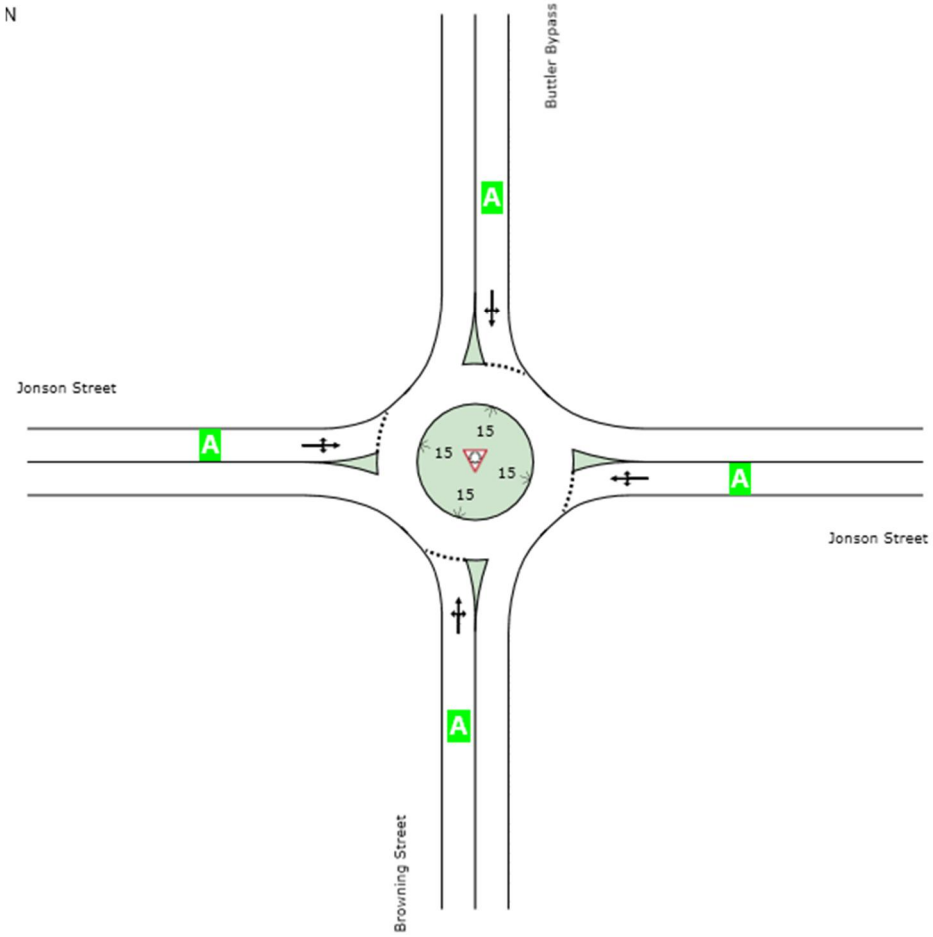

Figure 8 | SIDRA output Level of Service for Post-development scenario

The modelling results for the pre and pos development scenarios show:

- Level of service A for the most critical peak hour volumes for pre and post development scenarios; and
- The increased in peak trips has not resulted in a negative impact with regards the level of service.

9 Safety Considerations

9.1 Site Access

There is currently one proposed access point to 156-158 Jonson Street via the Jonson street frontage. It is proposed that all vehicle entry and exits to the subject site will be via Jonson Street. The site access will also allow for commercial vehicles servicing the site. The access point complies with the minimum width requirements outline in Table 3.1 of AS2890.2. It is believed that required sight lines on Jonson street and the proposed site access point on Jonson street are achievable.

9.2 Road Safety

A current pedestrian safety issue was identified along Jonson Street and Browning Street intersection where vehicles have right of way. It was noticed that pedestrians face difficulties whilst crossing the street from Browning street to 'Mitre 10'. The proposed development form, in combination with the bypass works currently under construction intent to improve the vision and facilities for pedestrian crossings. It was determined that Pedestrians walking to and from the proposed development through the new bypass intersection will have access at either end of Butler Street or Browning Street. Both pedestrian access points will have safe pedestrian refuge spacing. The provisions of signs and safety measurements will be put in place to ensure pedestrian safety.

The trip generation calculations show that the proposed development would not result in a significant change in road conditions, and that the capacity of the surrounding road network is not exceeded.

10 Cycling Provisions

There currently is a cycle way that exists throughout the Byron Bay CBD that promotes the use of bicycles in the area. In accordance with the the Byron Bay Town Centre Bypass design documentation, there will be a 2m wide shoulder/bicycle lane in each direction along the bypass. Butler Street currently has a designated cycle way and it is anticipated that the bypass will tie into cycle way. Refer Figure 9 for the existing path network in Byron Bay.

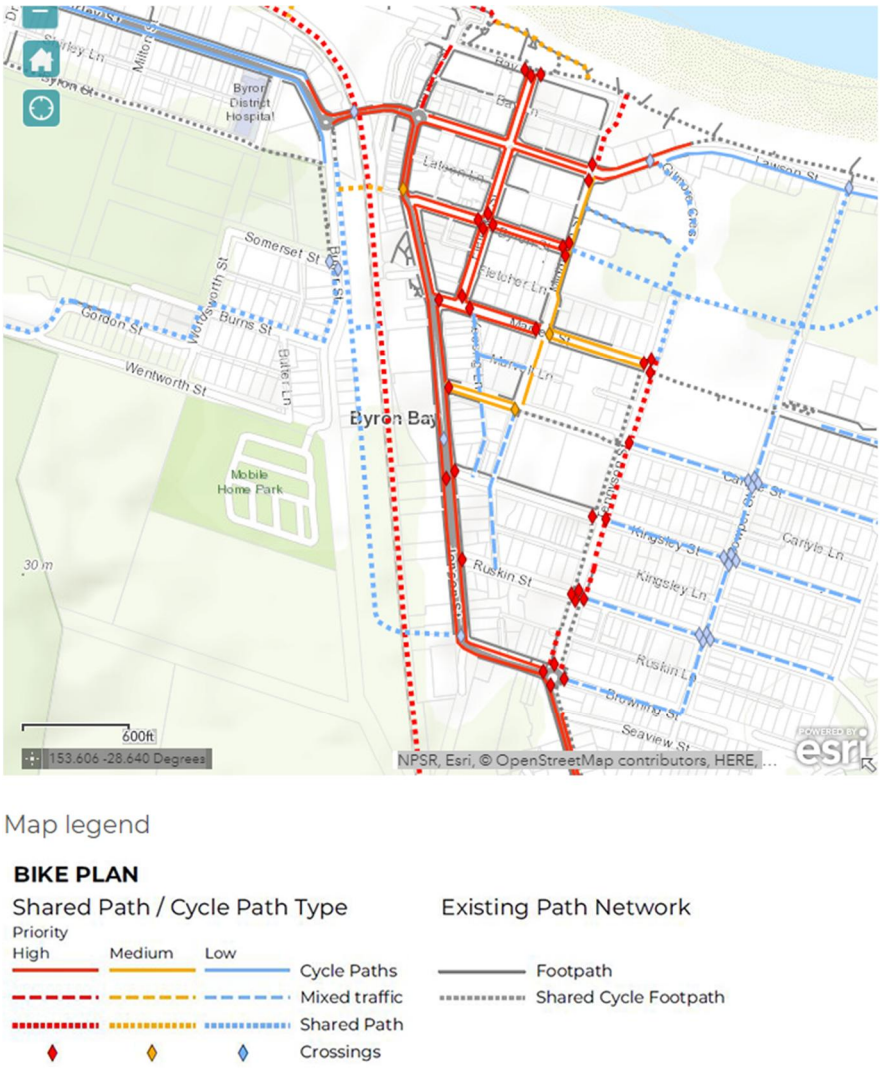

Figure 9 | Existing Byron Bay Path Network (source: BSC)

The Byron Shire Bike Plan and the 2019 Draft PAMP promotes the transitioning of the Byron Shire into a cycle friendly road space. It is proposed a minimum of 23 bicycle parks are provided at the development to promote sustainable means of transport to and from the site. The bicycle storage will be provided on the ground level of the 2-storey carpark. Therefore, the development adequately addresses the requirements of the Byron Shire Bike Plan and Action Plan and the 2019 Draft PAMP.

11 Conclusions and Recommendations

Based on the findings in this report, it was determined that;

- The proposed development will increase traffic volumes on the surrounding road network by up to 23%, however this does not result in exceedance of roadway capacity. SIDRA modelling shows suiable intersection performance with a level of service 'A' for each movement for the new intersection;
- The proposed development can be serviced by two MRV in the proposed loading bay and zones;
- The development adequately incorporates the recommendations of the Byron Shire Bike Strategy and Action Plan and 2019 Draft PAMP as well as Byron Shire Councils Masterplan principles;
- The proposed development as outlined in this report is unlikely to create safety hazards to road users and pedestrians.

Based on this assessment, an appropriate traffic and parking strategy can be achieved for the proposed development in compliance with Byron Shire Councils 2014 DCP.