# Planning Proposal

## Amendment to Shoalhaven LEP 2014 to permit a Highway Service Centre

Lot 2 DP 1154597
Woncor Avenue, Nowra Hill

16 August 2017
Reference: L103289

# SET Consultants Pty Ltd

NOWRA
51 Graham Street
Nowra 2541
Tel: (02) 4421 4500

KIAMA
44 Manning Street
Kiama 2533
Tel: (02) 4233 2006

Email: *mail@setconsultants.com.au*

Document Control Table:

| Prepared By | Reviewed By | Revision Number | Date |
|---|---|---|---|
| Karen Mion (B.TP(Hons))<br>Senior Town Planner | Rachel Harrison (BTP(Hons))<br>Senior Town Planner | Ver 0.1 - Draft | 16 Augsut 2017 |
| Karen Mion (B.TP(Hons))<br>Senior Town Planner | | Ver 1.0 Final Issue | 5 May 2017 |
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# 1 Statement of Objectives or intended outcomes

The objective of this planning proposal is to improve road safety by amending the Shoalhaven Local Environmental Plan (LEP) 2014 to permit a Highway Service Centre in Nowra Hill which would cater for the needs of heavy vehicle drivers travelling along the Princess Highway.

# 2 Explanation of Provisions

The proposed outcome will be achieved by amending Schedule 1 of the Shoalhaven LEP 2014 to list a *'Highway Service Centre'* as permitted with development consent on Lot 2 DP 1154597. It is also proposed that the Clauses Map be amended to show this Schedule as applying to the subject land.

Potential wording for the amended Schedule 1 (subject to potential redrafting by Parliamentary Council post-exhibition) is detailed below:-

19 Use of Certain land at Woncor Avenue, Nowra Hill

(1) This Clause applies to land identified as "Sch 1.19" on the Clauses Map, being Lot 2 DP 1154597, Woncor Avenue, Nowra Hill.

(2) Development for the purpose of a Highway Service Centre is permitted with development consent.

# 3 Justification

## *3.1 Need for a Planning Proposal*

### 3.1.1 Is the Planning proposal the result of any strategic study or report?

In 2010 the RTA Strategy for major heavy vehicle rest areas on key rural freight routes in NSW identified gaps in rest areas between Nowra and Batemans Bay southbound and Bateman's Bay to Wollongong northbound. A number of new rest areas or upgrades were proposed to fill the gaps identified. One of the new rest areas suggested by this report for the northbound gap was at Meroo Meadow as part of the Gerringong-Bomaderry Princes Highway Proposal.[1] The Roads and Maritime Services (RMS) later investigated this option and found that an upgrade to the existing light vehicle rest area at Rotary Park at South

[1] RTA, *RTA Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in NSW,* January 2010 - p44

Nowra was preferable.[2] However, recent upgrades to this rest area has not accommodated heavy vehicles.

Heavy Vehicle National Law (HVNL) and regulations commenced in NSW in 2014 and amended in 2016. The Heavy Vehicle (Fatigue Management) National Regulations (NSW) stipulates maximum work requirements and minimum rest requirements for heavy vehicle drivers. The Princes Highway remains one of the most critical freight networks in NSW.[3] The Traffic Impact Assessment (TIS) prepared by *Bitzios Consulting*, undertaken for this Planning Proposal states that '*future upgrades proposed along the Princes Highway will increase freight movements through Nowra and past the proposed site*.'[4]

The provision of a Highway Service Centre on the subject site was discussed with RMS in 2016. RMS advised that such a facility would provide a direct road safety benefit for truck drivers using the Princes Highway and an indirect road safety benefit for all other road users. In 2017 the RMS again advised that notwithstanding the provision of rest areas at Bewong and Mount Ousley, they would generally support the provision of heavy vehicle facilities at a new highway service centre.

### 3.1.2 Is the Planning Proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

Management of driver fatigue is a significant part of road safety, and adequate provision of rest stops has been a major focus of federal and state road authorities for lowering the road toll.[5] An Economic Report prepared by *Foresight Partners*, was undertaken which investigated other service stations provided along the Princes Highway within vicinity of the site and further south. The report surmises that *"There are currently no 24hour highway service centres directly accessible from the Princes Highway offering a range services as proposed for the subject site. Nowra's existing 24 hour service stations on the Princes Highway are not designed or equipped to cater to heavy vehicles, and none provide amenities such as dedicated parking, separate dining area, lounge or rest areas designated for heavy vehicle drivers."*[6]

Permitting a Highway Service Station on the site would allow for the establishment of private infrastructure which would provide rest facilities for road users in accordance with RMS requirements.

[2] http://www.rms.nsw.gov.au/projects/south-coast/south-nowra-proposed-heavy-vehicle-rest-area/index.html - accessed on 7 February 2017.
[3] http://www.rms.nsw.gov.au/projects/freight-regional/index.html access on 7 February 2017.
[4] Bitzios Consulting, *South Nowra Service Centre Traffic Impact Centre*, 14 August 2017, p1.
[5] Foresight Partners, *Economic Impact Assessment South Nowra Highway Service Centre,* February 2017, p3.
[6] Foresight Partners, *Economic Impact Assessment South Nowra Highway Service Centre,* February 2017, p13.

Highway Service Centres are prohibited in all zones under the Shoalhaven LEP 2014. Therefore, there is no zone to which the land could be rezoned which would achieve the outcome of permitting a Highway Service Centre on the subject site. An additional permitted use is therefore the only means of achieving the intended outcome.

The following two options remain available to achieve the intended outcome:-

1. Rezoning the land and amending Schedule 1 of the LEP to include the additional permitted use.

   The land is zoned RU2 Rural Landscape. A Business Zone would provide zoning objectives more consistent with a Highway Service Centre. Such a rezoning would result in a range of other land uses becoming permitted on the site. These other land uses are generally best located within the context of a larger commercial or industrial area where they adjoin compatible uses. These other land uses are generally capable of being accommodated within existing industrial and business zones within the LGA and specifically in South Nowra which is located to the north of the subject site. Discussions were held with Council on the 18 September 2015 regarding rezoning the site and Council staff recommended that any Planning Proposal prepared be for an additional permitted use only and not seek to rezone the land.

2. Retaining the existing zone and amending Schedule 1 of the LEP to include the additional permitted use.

   This limits the change to the range of land uses permitted on the site to the development of a Highway Service Centre only. As shown in this Planning Proposal the site is suitable for this land use and there is limited opportunity for this need to be met in the business or industrial zones to the north of the site. This approach will result the land having a permitted use which is not directly reflective of the zone objectives.

The benefit of limiting the changes to the land uses permitted on the site outweigh the benefit of having zone objectives which are directly reflective of the additional permitted use. The second option is therefore considered the best means of achieving the intended outcome of the Planning Proposal.

## 3.2 Relationship to Strategic Planning Framework

### 3.2.1 Is the planning proposal consistent with objectives and actions of the applicable regional, sub-regional or district plan or strategy (including any exhibited draft plans or strategies)?

The site is located within the Shoalhaven LGA and falls under the Illawarra-Shoalhaven Regional Plan (ISRP). The ISRP outlines five goals and aims to ensure that the Region is economically resilient and that a balanced approach to growth is achieved while protecting areas of environmental importance. While the ISRP does seek to ensure that transport infrastructure (including freight) is improved and identifies freight and logistics as one of the priority growth sectors,[7] the specifics of this priority focus primarily on port-related activities and discusses a freight rail connection between Port Kembla and Sydney.

The ISRP does not contain any specific objectives or actions directly related to the subject site or the proposed additional use. Notwithstanding this, the site is cleared land with frontage to the Princes Highway. The site is not identified in the ISRP as resource land and is mapped by the Department of Agriculture (now Department of Primary Industries) as Agriculture Class 4 Land being land suited to grazing but not cultivation and with a comparatively low level of production.[8]

The Princes Highway connects regional centres identified in the ISRP to the north with regional centres to the south and is the main north-south coastal transport corridor for the region. Providing a facility which will service the needs of heavy-vehicle drivers travelling along this corridor is not inconsistent with the goals of the ISRP.

### 3.2.2 Is the planning proposal consistent with a Council's local strategy or other local strategic plan?

Shoalhaven Community Strategic Plan (SCSP) - Shoalhaven 2023 was adopted by Council in May 2013. This Plan sits at the top of Council's planning hierarchy and identifies the community's main priorities and expectations for the future. The Planning Proposal is consistent with this Strategic Plan. Specifically the Planning Proposal satisfies Objective 3.2 and corresponding strategy 3.2.4 as detailed below:-

> Objective 3.2 – An economy that supports and is supported by growing, diverse and changing communities.

[7] NSW Department of Planning and Environment, *Illawarra-Shoalhaven Regional Plan*, 2015, p15
[8] NSW Agriculture, *Agricultural Land Classification Agfact AC.25*, 2002

Strategy 3.2.4 – Plan and advocate for infrastructure improvements to support economic activity and investment

The objectives and strategies were developed in consultation with the community and further to the objective and strategy detailed above, the Strategy reports that the community identified the need to continue to advocate for improvements to the Princes Highway.[9]

Heavy vehicles play a vital role in the economy through the transportation of goods. Where there is a lack of freight rail corridors this role is further amplified. The Planning Proposal allows for the establishment of private infrastructure which will improve road safety though the provision of rest areas and facilities for heavy vehicle drivers.

The Planning Proposal is considered to be consistent with the SCSP.

### 3.2.3 Is the planning proposal consistent with applicable State Environmental Planning Policies?

The Planning Proposal is consistent with applicable State Environmental Planning Policies (SEPPs) as detailed below.

State Environmental Planning Policy No.55 – Remediation of Land

State Environmental Planning Policy No. 55 – Remediation of Land aims to provide a planning approach to the remediation of contaminated land for the purposes of reducing risk of harm to human health or any other aspect of the environment. Specifically relevant is that SEPP 55 specifies certain matters to be considered when rezoning land.

The Planning Proposal relates to vacant land currently zoned for rural purposes. A search of Council's file does not show any record of development approvals granted on the subject land and a site inspection does not reveal any evidence of the site being used for actives listed in Table 1 of *'Managing Land Contamination Planning Guidelines SEPP 55 – Remediation of Land*'. The site gives the appearance that any previous use would most likely be animal grazing. Given the low risk of site contamination it is considered that the Stage 1 Preliminary Investigation Report required under Clause 6 of SEPP 55 and detailed in '*Managing Land Contamination Planning Guidelines SEPP 55 – Remediation of Land*' should not be required until after and in accordance with any Gateway determination.

[9] Shoalhaven City Council, *Shoalhaven Community Strategic Plan - Shoalhaven 2023*, p22

State Environmental Planning Policy (Infrastructure) 2007

Clause 99 of the State Environmental Planning Policy (Infrastructure) 2007 permits Highway Service Centres in a road corridor for a freeway, tollway or national highway with consent. The subject site is privately owned adjacent to but not within the road corridor.

A Highway Service Centre would become permissible on the site as a result of this Planning Proposal. A Highway Service Centre on this site would be classed as traffic generating development. Any subsequent Development Application for a Highway Service Centre on the subject site would require referral to the RMS. Initial discussions have been held with the RMS regarding this proposal. See Appendix 3. As recommended by the RMS in 2016 a Traffic Impact Study (TIS) has been prepared by *Bitzios Consultants* and is provided in Appendix 2. The TIS finds that with appropriate intersection treatments, a Highway Service Centre site could be provided on the site with the intersection of Princes Highway / BTU Road operating within acceptable limits. The RMS should be consulted post-gateway as required.

State Environmental Planning Policy No. 33 Hazardous and Offensive Development

This SEPP is likely to apply to any future Development Application for a Highway Service Station. Given the site area of the subject site it is considered that a site layout and design could be established which would accommodate suitable safeguards.

State Environmental Planning Policy No. 44 – Koala Habitat Protection

There are limited trees on the site. A row of trees are located along a portion of the eastern boundary. These trees do not form part of a larger cluster. An assessment of significance could be carried out if deemed necessary in the Gateway determination.

State Environmental Planning Policy No. 64 Advertising and Signage

Any future Development Application is likely to involve signage and will be required to address this SEPP.

State Environmental Planning Policy (Rural Lands) 2008

This SEPP applies to the subject site. The Planning Proposal would not result in the subject site being subdivided or for a dwelling to be erected and as such Part 3 of the SEPP does not apply. Notwithstanding this Part 2 of the SEPP contains Rural Planning Principles which apply to the site.

The Planning Proposal does not seek to rezone the land and as such the Rural Landscape objectives of the RU2 zone would remain applicable to the site. In this regard, any

proposed Development Application for a highway service centre would need to (as far as is practical) provide landscape screening to the surrounding RU2 land.

The land is predominately grassed. The land is not zoned for Primary Production and not classed as high agricultural land (see Section 3.2.1 above). The site is currently zoned RU2 Rural Landscape and is bound by the Princes Highway to the east and Woncor Avenue to the west. The site is 7.238ha and has limited potential to be consolidated. For these reasons it is considered that the loss of this land for a rural use would not have a significant impact on the rural economy or community.

### 3.2.4 Is the planning proposal consistent with applicable Ministerial Directions (s117 directions)?

The following table identifies the proposal's consistency with the relevant Ministerial Directions.

| Table 1 - Applicable s117 Directions | |
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| s.117 Direction | Consistency of Planning Proposal |
| *1.1 Business and Industrial Zones*<br>*A planning proposal must:*<br>*a) give effect to the objectives of this direction,*<br>*b) retain the areas and locations of existing business and industrial zones,*<br>*c) not reduce the total potential floor space area for employment uses and related public services in business zones,*<br>*d) not reduce the total potential floor space area for industrial uses in industrial zones, and*<br>e) *ensure that proposed new employment areas are in accordance with a strategy that is approved by the Director-General of the Department of Planning.* | The Planning Proposal does not reduce any business or industrial zone. An Economic Impact Assessment prepared by *Foresight Partners*, has been undertaken which found that a Highway Service Centre in the proposed location is '*unlikely to impact the viability and level of service offered by existing service station and food outlets in or near the Nowra township' (Appendix 1 p30)*.<br><br>The Planning Proposal will permit an additional use on the site which will create employment opportunities.<br><br>The Planning Proposal is consistent with Direction 1.1 – Business and Industrial Zones. |
| *1.2 Rural Zones*<br>*A planning proposal must:*<br>*a) not rezone land from a rural zone to a residential, business, industrial, village or tourist zone.* | The site is zoned RU2 Rural Landscape. The Planning Proposal does not seek to rezone the land. The Planning proposal seeks to permit an additional use on the land. |

| Table 1 - Applicable s117 Directions | |
|---|---|
| s.117 Direction | Consistency of Planning Proposal |
| | The objective of Direction 1.2 is to protect the agricultural production value of rural land. Use of the site for a Highway Service Centre would not protect the agricultural production value of this rural land. However, for the reasons outlined under the SEPP (Rural Lands) in Section 3.2.3 this loss is considered to be of minor significance.<br><br>This Planning Proposal is not inconsistent with Clause 4(a) of Direction 1.2. The inconsistency with the objective is of Direction 1.2 - Rural Zones is of minor significance. |
| *1.5 Rural Lands*<br>*This direction applies when:*<br>*a) a relevant planning authority prepares a planning proposal that will affect land within an existing or proposed rural or environment protection zone (including the alteration of any existing rural or environment protection zone boundary) or*<br>*b) a relevant planning authority prepares a planning proposal that changes the existing minimum lot size on land within a rural or environment protection zone.*<br><br>*Where a) applies:-*<br>*A planning proposal must:-*<br>*be consistent with the Rural Planning Principles listed in State Environmental Planning Policy (Rural Lands) 2008.* | The Planning Proposal affects land within an existing rural zone. The Planning Proposal does not change the minimum lot size.<br><br>The Planning Proposal is consistent with the Rural Planning Principles contained within SEPP (Rural Lands) as discussed in Section 3.2.3 as such the proposal.<br><br>The objective of Direction 1.5 is to protect the agricultural production value of rural land and facilitate the orderly and economic development of rural lands for rural and related purposes. Use of the site for a Highway Service Centre would not protect the agricultural production value of this rural land and is not a rural related purpose. However, for the reasons outlined in Section 3.2.3 this loss is considered to be of minor significance.<br><br>This Planning Proposal is not inconsistent with Clause 4 of Direction 1.5 – Rural Lands. The inconsistency with the objective is of Direction 1.5 is of minor significance. |
| *2.3 Heritage Conservation* | |

| Table 1 - Applicable s117 Directions | |
|---|---|
| s.117 Direction | Consistency of Planning Proposal |
| *A planning proposal must contain provisions that facilitate the conservation of:*<br>*a) items, places, buildings, works, relics, moveable objects or precincts of environmental heritage significance to an area, in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item, area, object or place, identified in a study of the environmental heritage of the area,*<br>*b) Aboriginal objects or Aboriginal places that are protected under the National Parks and Wildlife Act 1974, and*<br>*c) Aboriginal areas, Aboriginal objects, Aboriginal places or landscapes identified by an Aboriginal heritage survey prepared by or on behalf of an Aboriginal Land Council, Aboriginal body or public authority and provided to the relevant planning authority, which identifies the area, object, place or landscape as being of heritage significance to Aboriginal culture and people.* | The land to which the Planning Proposal applies does not contain any known items of heritage significance.<br><br>Clause 5.10 of SLEP2014 contains provisions relating to heritage conservation including Aboriginal heritage. The Planning Proposal does not seek to alter provisions of Clause 5.10.<br><br>The Planning Proposal is consistent with Direction 2.3 – Heritage Conservation. |
| *3.3 Home Occupations*<br>*Planning proposals must permit home occupations to be carried out in dwelling houses without the need for development consent.* | The Planning Proposal applies to land zoned RU2 – Rural Landscape. Home Occupations are permitted without consent within this zone. The Planning Proposal will not alter this permissibility.<br><br>The Planning Proposal is consistent with Direction 3.3 – Home Occupations. |
| *3.4 Integrated Land Use and Transport*<br>*A planning proposal must locate zones for urban purposes and include provisions that give effect to and are consistent with the aims, objectives and principles of:* | The Planning Proposal permits the development of a Highway Service Centre. The Planning Proposal does not involve urban land. |

| Table 1 - Applicable s117 Directions | |
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| s.117 Direction | Consistency of Planning Proposal |
| a) *Improving Transport Choice – Guidelines for planning and development (DUAP 2001), and*<br>b) *The Right Place for Business and Services – Planning Policy (DUAP 2001).* | The site has frontage to the Princes Highway and the Planning Proposal seeks to meet the needs of vehicles travelling along this popular north-south coastal route.<br><br>The Planning Proposal is consistent with Direction 3.4 – Integrated Land Use Transport. |
| *3.5 Development Near Licensed Aerodromes*<br>*(4) In the preparation of a planning proposal that sets controls for the development of land in the vicinity of a licensed aerodrome, the relevant planning authority must:*<br>*(a) consult with the Department of the Commonwealth responsible for aerodromes and the lessee of the aerodrome,*<br>*(b) take into consideration the Obstacle Limitation Surface (OLS) as defined by that Department of the Commonwealth,*<br>*(c) for land affected by the OLS:*<br>*(i) prepare appropriate development standards, such as height, and*<br>*(ii) allow as permissible with consent development types that are compatible with the operation of an aerodrome*<br>*(d) obtain permission from that Department of the Commonwealth, or their delegate, where a*<br>*planning proposal proposes to allow, as permissible with consent, development that encroaches above the OLS. This permission must be obtained prior to undertaking community consultation in satisfaction of section 57 of the Act.*<br>*(5) A planning proposal must not rezone land:*<br>*(a) for residential purposes, nor increase residential densities in areas where the ANEF, as from*<br>*time to time advised by that Department of the Commonwealth, exceeds 25, or* | This Planning Proposal is to permit an additional use. The Planning Proposal does not set out controls for the subject site. As such the Planning Proposal does not require referral to the Department of the Commonwealth responsible for the airfield.<br><br>The subject site is approximately 4.6km to the east of the HMAS Albatross Navy Base airfield and has a land level (ADH) lower than the airfield.<br><br>The site is outside the areas mapped on the ANEF map as having ANEF levels of between 20-35 (see Appendix 4).<br><br>The Planning Proposal is consistent with Direction 3.5 – Development Near Licensed Aerodromes. |

| Table 1 - Applicable s117 Directions | |
|---|---|
| s.117 Direction | Consistency of Planning Proposal |
| *(b) for schools, hospitals, churches and theatres where the ANEF exceeds 20, or*<br>*(c) for hotels, motels, offices or public buildings where the ANEF exceeds 30.*<br>*(6) A planning proposal that rezones land:*<br>*(a) for residential purposes or to increase residential densities in areas where the ANEF is between 20 and 25, or*<br>*(b) for hotels, motels, offices or public buildings where the ANEF is between 25 and 30, or*<br>*(c) for commercial or industrial purposes where the ANEF is above 30,*<br>*must include a provision to ensure that development meets AS 2021 regarding interior noise levels.* | |
| *4.1 Acid Sulfate Soils*<br>*The relevant planning authority must consider the Acid Sulfate Soils Planning Guidelines adopted by the Director-General of the Department of Planning when preparing a planning proposal that applies to any land identified on the Acid Sulfate Soils Planning Maps as having a probability of acid sulfate soils being present.*<br>*When a relevant planning authority is preparing a planning proposal to introduce provisions to regulate works in acid sulfate soils, those provisions must be consistent with:*<br>• *the Acid Sulfate Soils Model LEP in the Acid Sulfate Soils Planning Guidelines adopted by the Director-General, or*<br>• *such other provisions provided by the Director-General of the Department of Planning that are consistent with the Acid Sulfate Soils Planning Guidelines.*<br>*A relevant planning authority must not prepare a planning proposal that proposes an intensification of land uses on land identified as* | The site is mapped as Class 5 on the Acid Sulfate Soils Map. The site is not located within close proximity to any land mapped as Class 1 – 4.<br><br>Clause 6.1 of the SLEP2014 contains provisions relating to acid sulphate soils. The Planning Proposal does not seek to alter the provisions of Clause 7.1.<br><br>The Planning Proposal is consistent with Direction 4.1 – Acid Sulfate Soils. |

| Table 1 - Applicable s117 Directions | |
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| s.117 Direction | Consistency of Planning Proposal |
| *having a probability of containing acid sulfate soils on the Acid Sulfate Soils Planning Maps unless the relevant planning authority has considered an acid sulfate soils study assessing the appropriateness of the change of land use given the presence of acid sulfate soils. The relevant planning authority must provide a copy of any such study to the Director-General prior to undertaking community consultation in satisfaction of section 57 of the Act.*<br>*Where provisions referred to under paragraph (5) of this direction have not been introduced and the relevant planning authority is preparing a planning proposal that proposes an intensification of land uses on land identified as having a probability of acid sulfate soils on the Acid Sulfate Soils Planning Maps, the planning proposal must contain provisions consistent with paragraph (5).* | |
| <u>*4.3 Flood Prone Land*</u><br>*A planning proposal must include provisions that give effect to and are consistent with the NSW Flood Prone Land Policy and the principles of the Floodplain Development Manual 2005 (including the Guideline on Development Controls on Low Flood Risk Areas).*<br>*A planning proposal must not rezone land within the flood planning areas from Special Use, Special Purpose, Recreation, Rural or Environmental Protection Zones to a Residential, Business, Industrial, Special Use or Special Purpose Zone.*<br>*A planning proposal must not contain provisions that apply to the flood planning areas which:*<br>*a) permit development in floodway areas,*<br>*b) permit development that will result in significant flood impacts to other properties,* | The subject site is not mapped as being within Council's Flood Planning Area. Category two watercourses are located on land to the east, west and north of the subject site. The proposal does not seek to rezone land that is zoned Special Use, Special Purpose, Recreation, Rural or Environmental Protection.<br><br>Clause 7.3 of the SLEP2014 contains provisions relating to flood planning. The Planning Proposal does not seek to alter the provisions of Clause 7.3 and does not seek to add any additional flood planning controls. Future development of the site would require development consent and be assessed in accordance with Clause 7.3. |

| Table 1 - Applicable s117 Directions | |
|---|---|
| s.117 Direction | Consistency of Planning Proposal |
| c) *permit a significant increase in the development of that land,*<br>d) *are likely to result in a substantially increased requirement for government spending on flood mitigation measures, infrastructure or services, or*<br>e) *permit development to be carried out without development consent except for the purposes of agriculture (not including dams, drainage canals, levees, buildings or structures in floodways or high hazard areas), roads or exempt development.*<br>*A planning proposal must not impose flood related development controls above the residential flood planning level for residential development on land, unless a relevant planning authority provides adequate justification for those controls to the satisfaction of the Director-General (or an officer of the Department nominated by the Director-General).*<br>*For the purposes of a planning proposal, a relevant planning authority must not determine a flood planning level that is inconsistent with the Floodplain Development Manual 2005 (including the*<br>*Guideline on Development Controls on Low Flood Risk Areas) unless a relevant planning authority provides adequate justification for the proposed departure from that Manual to the satisfaction of the Director-General (or an officer of the Department nominated by the Director-General).* | Direction 4.3 does not apply to the Planning Proposal. Notwithstanding this, the Planning Proposal is consistent with Direction 4.3 – Flood Prone Land. |
| *4.4 Planning for Bushfire Protection*<br>*In the preparation of a planning proposal the relevant planning authority must consult with the Commissioner of the NSW Rural Fire Service following receipt of a gateway determination under section 56 of the Act, and prior to* | While a portion (eastern strip) of the site is mapped as Buffer, the majority of the site is not mapped as Bushfire Prone. Consultation with the NSW Rural Fire Service will occur following an in accordance with any gateway |

| Table 1 - Applicable s117 Directions | |
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| s.117 Direction | Consistency of Planning Proposal |
| *undertaking community consultation in satisfaction of section 57 of the Act, and take into account any comments so made,*<br>*A planning proposal must:*<br>*a) have regard to Planning for Bushfire Protection 2006,*<br>*b) introduce controls that avoid placing inappropriate developments in hazardous areas, and*<br>*c) ensure that bushfire hazard reduction is not prohibited within the APZ.*<br>*A planning proposal must, where development is proposed, comply with the following provisions, as appropriate:*<br>*a) provide an Asset Protection Zone (APZ) incorporating at a minimum:*<br>*(i) an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and*<br>*(ii) an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road,*<br>*b) for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section* | determination. This shall occur prior to community consultation.<br><br>The proposal does not rezone the site but would result in a Highway Service Centre being permissible on the site. A highway service centre poses a bushfire risk as it has the potential to be a hazard to adjacent areas or fire fighters if it is impacted upon by bush fires. Service stations are classified as a controlling development type under *Planning for Bushfire Protection 2006*.<br><br>The bushfire threat comes from vegetation on the eastern side of the Princes Highway. The highway itself therefore provides a significant buffer between the vegetation and the site. In addition, internal roads likely to be required to provide access to the site from the Princes Highway which would further add to this buffer.<br><br>Fuel bowsers and LPG storage tank are the vulnerable points of the development. The site has sufficient area to enable a design which could place the buildings, fuel bowsers and LPG storage tank at maximum radiant heat of 12.5 kw/m2, with 29kw/m2 identified by *Planning for Bushfire Protection (2006)* as defendable space. In the event of bush fire, firefighters will have direct access to the bushland via multiple roads that support parallel and direct firefighting efforts. Multiple exits will be available to the site, which provide exists located away from the bushland threats.<br><br>Any future development application for a Highway Service Centre would be accompanied by a Bushfire Report which |

| Table 1 - Applicable s117 Directions | |
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| s.117 Direction | Consistency of Planning Proposal |
| *100B of the Rural Fires Act 1997), the APZ provisions must be complied with,*<br>*c) contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,*<br>*d) contain provisions for adequate water supply for firefighting purposes,*<br>*e) minimise the perimeter of the area of land interfacing the hazard which may be developed,*<br>*f) introduce controls on the placement of combustible materials in the Inner Protection Area.* | addressed *Planning for Bushfire Protection 2006*.<br><br>The Planning Proposal is consistent with Direction 4.4 – Planning for Bushfire Protection. |
| *5.1 Implementation of Regional Strategies*<br>*Planning proposals must be consistent with a regional strategy released by the Minister for Planning.* | The Planning Proposal is consistent with the Illawarra - Shoalhaven Regional Strategy (see Section 3.2.1 of this report).<br><br>The Planning Proposal is therefore consistent with Direction 5.1 – Implementation of Regional Strategies. |
| *6.1 Approval and Referral Requirements*<br>*A planning proposal must:*<br>*a) minimise the inclusion of provisions that require the concurrence, consultation or referral of development applications to a Minister or public authority, and*<br>*b) not contain provisions requiring concurrence, consultation or referral of a Minister or public authority unless the relevant planning authority has obtained the approval of:*<br>*(i) the appropriate Minister or public authority, and*<br>*(ii) the Director-General of the Department of Planning (or an officer of the* | The Planning Proposal does not include any additional provisions to the LEP which would require the concurrence, consultation or referral of future development applications to a Minister or public authority.<br><br>The Planning Proposal is consistent with Direction 6.1 – Approval and Referral Requirements. |

| Table 1 - Applicable s117 Directions | |
|---|---|
| s.117 Direction | Consistency of Planning Proposal |
| *Department nominated by the Director-General),*<br>*prior to undertaking community consultation in satisfaction of section 57 of the Act, and*<br>*c) not identify development as designated development unless the relevant planning authority:*<br>*(i) can satisfy the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) that the class of development is likely to have a significant impact on the environment, and*<br>*(ii) has obtained the approval of the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) prior to undertaking community consultation in satisfaction of section 57 of the Act.* | |
| <u>*6.2 Reserving Land for Public Purposes*</u><br>*A planning proposal must not create, alter or reduce existing zonings or reservations of land for public purposes without the approval of the relevant public authority and the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General).*<br>*When a Minister or public authority requests a relevant planning authority to reserve land for a public purpose in a planning proposal and the land would be required to be acquired under Division 3 of Part 2 of the Land Acquisition (Just* | The subject site is not zoned or reserved for any public purposes. This Planning Proposal does not seek to rezone and reclassify public land currently reserved for public purposes.<br><br>Any future Highway Service Centre would contain a 'no obligation' rest facility for users who choose not to utilise the food outlets. This rest area would include an outdoor picnic and eating area as per RMS requirements. It is expected that the continued provision of this rest facility would form a condition of any future consent issued for a Highway Service |

| Table 1 - Applicable s117 Directions | |
|---|---|
| s.117 Direction | Consistency of Planning Proposal |
| *Terms Compensation) Act 1991, the relevant planning authority must:*<br>*a) reserve the land in accordance with the request, and*<br>*b) include the land in a zone appropriate to its intended future use or a zone advised by the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General), and*<br>*c) identify the relevant acquiring authority for the land.*<br>*When a Minister or public authority requests a relevant planning authority to include provisions in a planning proposal relating to the use of any land reserved for a public purpose before that land is acquired, the relevant planning authority must:*<br>*a) include the requested provisions, or*<br>*b) take such other action as advised by the Director-General of the Department of Planning (or an officer of the Department nominated by the Director-General) with respect to the use of the land before it is acquired.*<br>*When a Minister or public authority requests a relevant planning authority to include provisions in a planning proposal to rezone and/or remove a reservation of any land that is reserved for public purposes because the land is no longer designated by that public authority for acquisition, the relevant planning authority must rezone and/or remove the relevant reservation in accordance with the request.* | Centre on the site. However, this land would remain private land and this Planning Proposal does not propose any land to be rezoned or formally reserved for public purposes.<br><br>The Planning Proposal is consistent with Direction 6.2 – Reserving Land for Public Purposes. |
| *6.3 Site Specific Provisions*<br>*A planning proposal that will amend another environmental planning instrument in order to allow a particular development proposal to be carried out must either:* | The Planning Proposal seeks to allow a Highway Service Centre on the subject site without imposing any development standards or requirements in addition to those already contained in the Shoalhaven LEP 2014. As |

| Table 1 - Applicable s117 Directions | |
|---|---|
| s.117 Direction | Consistency of Planning Proposal |
| a) *allow that land use to be carried out in the zone the land is situated on, or*<br>b) *rezone the site to an existing zone already applying in the environmental planning instrument that allows that land use without imposing any development standards or requirements in addition to those already contained in that zone, or*<br>c) *allow that land use on the relevant land without imposing any development standards or requirements in addition to those already contained in the principal environmental planning instrument being amended.*<br>*A planning proposal must not contain or refer to drawings that show details of the development proposal.* | discussed in Section 3.12 no existing zones in the Shoalhaven LEP currently permit Highway Service Stations.<br><br>While a concept site layout for the site has been prepared, this is not formally part of the Planning Proposal. This concept and has been prepared to enable the traffic assessment (see Appendix 2) to be carried out and to illustrate that the site has sufficient area and access opportunities to satisfies the general requirements for a Highway Service Centre as required by the RMS (see Schedule 1 of RMS letter dated 18 February 2016 in Appendix 3).<br><br>The Planning Proposal is prepared under Part 3 of the EP&A Act and seeks only to amend the Shoalhaven LEP 2014. Any development thereafter would be subject to the Development Assessment process under Part 4 of the EP&A Act.<br><br>The Planning Proposal is consistent with Direction 6.3 – Site Specific Provisions. |

## *3.3 Environmental, Social and Economic Impact*

### 3.3.1 Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

The Shoalhaven LEP 2014 contains Biodiversity and Riparian Lands & Watercourses maps which link with Clause 7.5 Terrestrial Biodiversity and Clause 7.6 Riparian Land and Watercourses containing controls for development occurring on or within close proximity of identified land. Clause 5.9 provides controls for the preservation of trees and vegetation also. The Planning Proposal does not seek to change the Biodiversity and Riparian maps nor Clause 5.9, 7.5 or 7.6 of the Shoalhaven LEP 2014. These clauses would apply to any future development of the land.

The site is not mapped as containing biodiverse land or riparian land. Two Category 2 watercourses are mapped within close proximity to the site. A site inspection reveals that the site it predominately grassland with a row of trees located along a portion of the western boundary. No watercourses, wetlands or dams were identified on the site.

Land to the east of the site is heavily vegetated. The Princes Highway provides a large buffer between the subject site and this vegetation. Land to the west and south has been cleared and is predominantly used for rural purposes. Land to the north is residue land from the BTU Road relocation and is in a state of regeneration. Land to the North-West is used for Boral Timbers.

Upgrades to the Princes Highway including relocation of the BTU Road intersection began in 2011. During this construction Green and Golden Bell Frogs were found in the locality[10]. It is therefore recommended that any Gateway determination require that an Assessment of Significance be carried out in accordance with Section 5A of the *Environmental Planning and Assessment Act 1979* and the 'Threatened Species Assessment Guidelines.'

### 3.3.2 Are there any other likely environmental effects as a result of the Planning Proposal and how are they proposed to be managed?

Traffic

The site has a large frontage to both Princes Highway and Woncor Avenue. A Traffic Impact Assessment (TIA) prepared by *Bitzios Consultants*, concludes that a Highway Service Centre could be located on the site such that the operation of the associated intersections would be within acceptable limits subject to upgrade works being provided (see Appendix 2). While details of the upgrade works would form part of any Development Application, the TIA finds that the likely works to enable the Princes Highway / BTU Road intersection to operate within acceptable limits would be the provision of a 200m left-turn slip lane and a 230m acceleration land for the Princes Highway/BTU Toad intersection and the works for the BTU Road / Woncor Avenue would be a Basic Augmented Left treatment for the BTU Road westbound approach, and a Short Channelised Right treatment for the BTU Road eastbound approach in accordance with Austroads Guidelines.

Notwithstanding this, it is likely that any future Development Application would also include the provision of an off-ramp to the site from the Princes Highway. In this regard, the TIA acknowledges that:-

[10] http://www.rms.nsw.gov.au/projects/south-coast/south-nowra/index.html accessed on 7 March 2017

*"While it has been demonstrated that the Princes Highway / BTU Road intersection can operate within acceptable limits (DOS < 0.8) for both the 2019 and 2029 design scenarios with the inclusion of the left turn slip lane upgrade only, the provision the off-ramp has considerable benefits to the average delay of the right turn movement from BTU Road in the 2029 design scenario."*[11]

However, as the RMS require levels of details more suited to Development Application stage in order to confirm their support for an off ramp, and also potential negotiations with the developers of the Shalolin Tourist development or illustration of compatibility with consent conditions for this Tourist development, the TIA has demonstrated that should such off ramp not be supported by the RMS then the development of the site for a Highway Service Centre would still be achievable with regards to traffic implications.

Note: The proponents of the Highway Service Centre are willing to liaise with the developers of the Shalolin Tourist Development to investigate a mutually beneficial outcome however, early attempts to contact the appropriate people proved unsuccessful and it was indicated construction of a grade separated interchange may not proceed.

Bushfire

While a portion (eastern strip) of the site is mapped as Buffer, the majority of the site is not mapped as Bushfire Prone. Consultation with the NSW Rural Fire Service will occur following and in accordance with any gateway determination. This shall occur prior to community consultation.

The proposal does not rezone the site but would result in a Highway Service Centre being permissible on the site. A highway service centre poses a bushfire risk as it has the potential to be a hazard to adjacent areas or fire fighters if it is impacted upon by bush fires. Service stations are classified as a controlling development type under *Planning for Bushfire Protection 2006*.

The bushfire threat comes from vegetation on the eastern side of the Princes Highway. The highway itself therefore provides a significant buffer between the vegetation and the site. In addition, internal roads likely to be required to provide access to the site from the Princes Highway which would further add to this buffer.

Fuel bowsers and LPG storage tank are the vulnerable points of the development. The site has sufficient area to enable a design which could place the buildings, fuel bowsers and LPG storage tank at maximum radiant heat of 12.5 kw/m2, with 29kw/m2 identified by

[11] Bitzios Consulting, *South Nowra Service Centre Traffic Impact Centre*, 14 August 2017, p13.

*Planning for Bushfire Protection 2006* as defendable space. In the event of bush fire, firefighters will have direct access to the bushland via multiple roads that support parallel and direct firefighting efforts. Multiple exits will be available to the site, which provide exists located away from the bushland threats.

Any future development application for a Highway Service Centre would be accompanied by a Bushfire Report which addressed *Planning for Bushfire Protection 2006*.

### 3.3.3 Has the Planning Proposal adequately addressed any social and economic effects?

Economic Impact

Council requested a market assessment be prepared and submitted with any Planning Proposal lodged which would enable the development of a Highway Service Centre on the site (see Email dated 1 April in Appendix 3). An Economic Impact Assessment, prepared by *Foresight Partners*, has been carried out and is provided in Appendix 1. This Economic Impact Assessment assesses the demand for a Highway Service Centre in this location and the impacts of such a development on existing Service Stations and food outlets closer to the Nowra township. The Economic Impact Assessment also investigates if there are alternative sites located within South Nowra which could reasonably accommodate such a development.

To satisfy the RMS requirements for a Highway Service Centre any development for such a centre would need to satisfy an array of criteria (see Schedule 1 of RMS letter dated 18 February 2016 in Appendix 3). The Assessment finds that *"the proposed highway service centre will provide a mix of fuel, convenience retail, meals, heavy vehicle parking, rest area and driver amenities on a single site, which is presently not available in the Nowra or Shoalhaven City area."*[12](See Potential concept site plan provided in Appendix 5) *"There are no similar highway service centres meeting RMS guidelines along the Princes Highway south of Sydney to eastern Melbourne"*[13] and Highway Service Centres are not currently permitted within any zone under the Shoalhaven LEP 2014.

As a result of the reduced choice for heavy vehicles, the Assessment acknowledges that the turn-in rate is likely to be higher for heavy vehicles than for light vehicles. Furthermore, the Assessment finds that *"the forecast levels of sales at 2018 are, in our opinion, unlikely to impact the viability and level of service offered by existing service station and food outlets in or near the Nowra township. Growth in traffic volumes along the Princes*

[12] Foresight Partners, *Economic Impact Assessment South Nowra Highway Service Centre,* February 2017, p2
[13] Foresight Partners, *Economic Impact Assessment South Nowra Highway Service Centre,* February 2017, p3

*Highway in the vicinity of the subject site, together with projected increases in resident spending for meals/out takeaway food in Shoalhaven, are sufficient to ameliorate economic impacts on affected businesses over time."* A Highway Service Centre "*will contribute to meeting the current and future demand of residents, visitors, heavy vehicle drivers and other road users passing through the Nowra area."*[14]

Further to the above, "*a key benefit of the highway service centre is its potential contribution to road safety… The provision of rest areas for heavy vehicles on the Australian road network is integral to ensuring drivers have appropriate locations where they can stop during their journey for effective rest and meet their fatigue management obligations. Heavy vehicle rest areas provided by state road authorities, together with commercial truck stop facilities and company depots, form part of Australia's road freight logistics infrastructure."*[15]

The report also estimates that *"once operational, the highway service centre is likely to employ 30 to 50 people in full-time, part-time and casual positions, depending on the hours of operation of the food outlets."*[16]

Notwithstanding the need for and benefits of a Highway Service Centre, the proposed location has also been considered in order to address any concerns that such a centre should be located closer to Nowra. In this regard, the suitability of a site for a highway service station is dependent on a number of factors. These factors include size, accessibility and visibility. A preliminary concept plan prepared for the site (see Appendix 5) illustrates the land area required for such a land use. The Economic Assessment reviewed vacant or underutilised alternative sites located within the South Nowra – Nowra Hill General Industry or Business Development Zones and found none suitable. Specifically the report states *"existing vacant sites within the General Industry or Business Development zones in the Nowra Hill – South Nowra area are unsuitable, or unavailable, for a highway service centre, and nor would it represent the best economic use of such sites."*[17]

Overall, it is considered that the need for a Highway Service Centre and the suitability of the site subject to this Planning Proposal for a Highway Service Centre has been adequately addressed in the Economic Impact Assessment.

Rural Landscape Impact

The Planning Proposal does not seek to rezone the land and as such the Rural Landscape objectives of the RU2 zone would remain applicable to the site. In this regard, any

[14] Foresight Partners, *Economic Impact Assessment South Nowra Highway Service Centre,* February 2017, p34
[15] Foresight Partners, *Economic Impact Assessment South Nowra Highway Service Centre,* February 2017, p34
[16] Foresight Partners, *Economic Impact Assessment South Nowra Highway Service Centre,* February 2017, p34
[17] Foresight Partners, *Economic Impact Assessment South Nowra Highway Service Centre,* February 2017, p34

proposed Development Application for a highway service centre would need to (as far as is practical) provide landscape screening to the surrounding RU2 land. The subject site has an area of 7.238ha. This large site area will provide opportunity for any future development proposal to include landscaping and setbacks to the southern and western rural land.

Road Safety

The proposal seeks to provide an additional rest area for drivers travelling along the Princes Highway. RMS requirements for a Highway Service Centre include the provision of a no obligation rest area facility for users who choose not to utilise the food outlets, inclusive of an outdoor picnic/eating area(s) and also a separate dining area and/or restaurant for heavy vehicle drivers. This Planning Proposal seeks to permit a Highway Service Centre with such provisions on the subject site. A centre with such provisions would provide a direct road safety benefit for truck drivers using the Princes Highway and an indirect road safety benefit for all other road users (see RMS letter 18 February 2016 in Appendix 3).

## *3.4 State and Commonwealth Interests*

### 3.4.1 Is there adequate public infrastructure for the planning proposal?

The existing public infrastructure is considered adequate for the Planning Proposal.

Upgrade the BTU Road / Princes Highway intersection and the BTU Road / Woncor Avenue intersection are likely to be required as part of any development consent issued for a Highway Service Centre on the subject site. Any Development Application for a Highway Service Centre on the site is also likely to propose the construction of a northbound off-ramp from the Princes Highway.

### 3.4.2 What are the views of State and Commonwealth public authorities consulted in accordance with the Gateway determination?

The Roads and Maritime (RMS) were consulted as part of the preparation of this Planning Proposal. Their view is recorded in a letter dated 18 February 2016 (copy provided in Appendix 3). The RMS advised that a facility which included a truck rest area would provide a direct road safety benefit for truck drivers using the Princes Highway and an indirect road safety benefit for all other road users. The RMS indicated that they were willing to consider

the Planning Proposal if it could be demonstrated that appropriate access arrangements would be provided.

A concept layout plan was prepared and further consultation with the RMS was undertaken. In this regard pre-DA advice was provided from the RMS (see letter dated 1 June 2017) detailing information that would be required as part of any Development Application. The RMS have indicated that they will require that any proposed access to the site directly from the Princes Highway will need to be compatible with Conditions imposed on the Shaolin Tourist Development (Department Reference MP06_0135). The RMS have indicated that if this cannot be achieved then all access to the site will need to be from Woncor Avenue. The detail required to resolve this, will occur at DA stage. The developers are willing to work with the Shaolin Tourist developers, but to-date this has proved unsuccessful. As a result, the Traffic Impact Assessment (TIA) has addressed scenarios both with and without direct access from the Princes Highway (see Appendix 2) to demonstrate the suitability of the site.

It is requested that the Gateway determination confirm the following list of State authorities to be consulted and nominate any other State or Commonwealth authorities required for consultation.

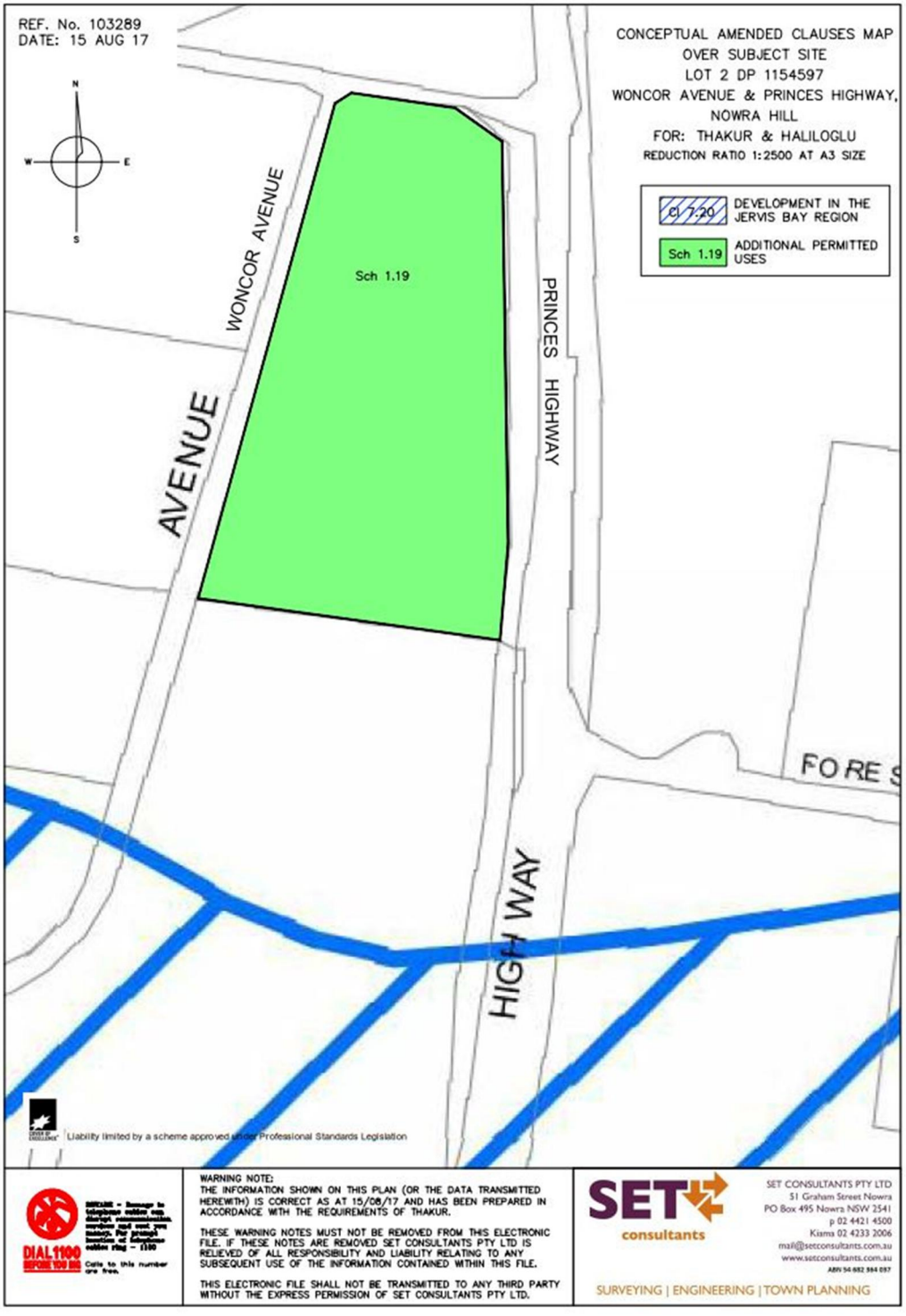
- NSW Rural Fire Service (as per s117 Direction 4.4)
- Road and Maritime Services

# 4 Mapping

The following images illustrate the subject site in context of surrounding land. No changes to the Land Zoning nor any of the principal development standards maps are proposed. A change to the Clauses Map is proposed as outlined in Section 2. This change will be mapped after the gateway determination and will result in the creation of Clauses Map – Sheet CLS_014C. A conceptual map indicating this amendment to the clauses map.

## 4.1 Land the subject of the Planning Proposal

## 4.2 Proposed Conceptual Amended Clauses Map



# 5 Community Consultation

Following the Gateway determination and approval from the Director-General (or delegate), the Planning Proposal will be exhibited for a minimum period of 28 days and include:

- Notification in local newspaper;
- Hard copies made available at the Council Administration Building;
- Link to an electronic copy on Council's website;
- Notification letters to adjoining and surrounding property owners;
- Letters to any State and Commonwealth Public Authorities identified in the gateway determination; and
- Any other consultation methods deemed appropriate for the proposal.

# 6 Project Timeline

The following table outlines the anticipated timeline for the project.

**Table 2: Project Timeline**

| Stage | Anticipated Timeframe | Possible Dates |
|---|---|---|
| Planning Proposal to the Department | Following Council meeting October 2017 | October 2017 |
| Gateway determination | 4 weeks from Council forwarding the Planning Proposal to the Minister | December 2017 |
| Completion of any technical information or studies as determined by Gateway | 4 – 6 weeks from the gateway determination | February 2018 |
| Consultation with State / Commonwealth agencies | 4 weeks after gateway determination. | February 2018 |
| Exhibition of Planning Proposal (assuming Director General's approval for community consultation was issued with the Gateway determination) | 4 weeks after gateway determination. | February 2018 |
| Review of submissions and preparation of report to Council. | 4 weeks from end of public exhibition period. | March 2018 |

| | | |
|---|---|---|
| Report to Council | First available Council meeting after review of submissions and report preparation. | March 2018 |
| Submission to the department to finalise (unless function was delegated) | 4weeks from Council meeting | April 2018 |
| Anticipated date LEP will be notified | | May 2018 |

# 7 Appendix


# APPENDIX 1

## Economic Report

# Economic Impact Assessment

## South Nowra Highway Service Centre

Prepared for
Recep Haliloglu

February 2017
16020

Foresight partners Pty Ltd

ABN 59 111 542 673

Suite 13, Level 2
50-56 Sanders Street
UPPER MT GRAVATT,
QLD, 4122

P: (07) 3422 2011
admin@foresightpartners.com.au
www.foresightpartners.com.au

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Disclaimer

The sole purpose of this report is to provide Recep Haliloglu (the Client) with information in accordance with Foresight Partners Pty Ltd's scope of services set out in its proposal to the Client.

Foresight Partners has relied upon information relevant to this report provided by government agencies, the Client and others. Except as otherwise stated in the report, Foresight Partners has not attempted to verify the accuracy or completeness of such information.

The assumptions underlying the findings, observations, forecasts and conclusions presented in this report are subject to significant uncertainties and contingencies. Therefore, actual results may differ significantly from forecast results. Foresight Partners do not make or imply any warranty or guarantee with respect to the data reported or to the findings, observations, forecasts and conclusions expressed in this report. Foresight Partners cannot confirm or guarantee achievement of any forecast growth or performance, as future events, by nature, are not amenable to independent confirmation or substantiation.

## LIST OF FIGURES



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# SUMMARY

Recep Haliloglu is seeking an amendment to the Shoalhaven Local Environmental Plan (LEP) to permit a highway service centre on the western (northbound) side of the Princes Highway near BTU Road, South Nowra. The proposed 7.328ha site is located about 7kms south of Nowra's town centre and about 2kms south of Warra Warra Road and just north of Forest Road. The land is currently zoned 'Rural Landscape' and is vacant.

The proposed highway service centre's commercial facilities are to include a 24 hour 350m² service station/convenience store with separate fuel bowsers for cars and heavy vehicles, and five food outlets totaling 500m², with a common dining area. It will provide for heavy vehicle, bus and recreational vehicle parking and rest areas generally in accordance with Roads and Maritime Services (RMS) *General Requirements for Highway Service Centres*.

RMS has indicated general support for the proposed development provided it includes a truck rest area, which it considers will provide a direct road safety benefit for truck drivers using the Princes Highway and an indirect road safety benefit for all other road users, and provided that access arrangements to the service centre preserve road safety and traffic efficiency on the Princes Highway.

Foresight Partners were commissioned by Recep Haliloglu (the Client) to prepare an economic assessment addressing issues raised by Shoalhaven City Council with respect to need and demand for the development.

## Service Centre Network

The proposed highway service centre will provide a mix of fuel, convenience retail, meals, heavy vehicle parking, rest area and driver amenities on a single site, which is presently not available in the Nowra or Shoalhaven City area.

Seven service stations are located along the Princes Highway within and near the Nowra urban area north of the site. Four are clustered along a 1.4km stretch of the Princes Highway southbound in the South Nowra Business Development area. Three others are clustered along an 800 metre stretch of the Princes Highway in Bomaderry. Only two provide (limited) refuelling access for heavy vehicles.

Three other Princes Highway service stations are located well south of Nowra at Tomerong, Bewong and Wandandian. Two can accommodate heavy vehicles but do not offer dedicated heavy vehicle parking and rest areas or food services other than their convenience stores.

Highway service centres providing facilities for heavy vehicle drivers in NSW are mostly servicing traffic along the Hume Highway and other major freeways. There are currently no 24 hour highway service centres directly accessible from the Princes Highway offering a similar range of services as proposed for the subject site. Nowra's existing 24 hour service stations on the Princes Highway are not designed or equipped to cater to heavy vehicles, and none provide amenities such as dedicated parking, separate dining area, lounge or rest areas designated for heavy vehicle drivers.

## Market Characteristics

Shoalhaven City's current population of 99,600 at 2016 is projected to increase by 10,100 people to 109,700 by 2036 under the 2016 *NSW State and Local Government Area Population and Household Projections* (Main Series) produced by NSW Planning & Environment. This will add a further 6,350 households and approximately 6,160 additional vehicles. Under Council's higher growth scenario (119,467 people), the total additional vehicles would be about 10,200.

The Annual Average Daily Traffic (AADT) past the subject site is estimated at around 19,970 vehicles in 2016, of which around 1,300 (6.5%) were heavy vehicles. This is projected to grow to 20,470 vehicles by 2018 (the highway service centre's assumed first year of trading) and to 22,500 vehicles by its tenth year of operation in 2028, and reflects a 1% average annual growth rate, similar to Shoalhaven's overall population growth rate.

## Demand Analysis and Impacts

The proposed highway service centre's service station (including is convenience store) forecast turnover at 2018 is based on vehicle turn-in rates of 1% for light vehicles and 4% for heavy vehicles. Light vehicle drivers have more choice in service station options (mainly travelling southbound), but truck and heavy vehicle drivers are more constrained, with fewer options and limited accessibility, and the proposed highway service centre is therefore likely to achieve a higher turn-in rate for heavy vehicle traffic.

Average fuel consumption rates, average transaction size, average fuel prices (for 2016) and average contribution of non-fuel sales (convenience retail sales) were applied to the light and heavy vehicle turn-in rates to produce an estimated annual turnover of $7.9m at 2018.

Estimates of the sales potential for the five fast food outlets, based on productivity levels and average store turnovers for Australian fast food services, anticipate sales at 2018 of about $4.0m.

The proposed highway service centre's *total* forecast turnover at 2018 is $11.9m. The forecast levels of sales at 2018 are, in our opinion, unlikely to impact the viability and level of service offered by existing service station and food outlets in or near the Nowra township. Growth in traffic volumes along the Princes Highway in the vicinity of the subject site, together with projected increases in resident spending for meals/out takeaway food in Shoalhaven, are sufficient to ameliorate economic impacts on affected businesses over time.

## Alternative sites

Vacant and under-utilised sites in Nowra Hill – South Nowra industrial area and the extensive B5 Business Development Zone along the eastern side of the Princes Highway were identified and assessed for suitability as an alternative highway service centre location. Four vacant sites were identified with access or proximity to the Highway. In our opinion, these sites are unsuitable, or unavailable, for a highway service centre, and nor

would they represent the best economic use of such sites. The subject site is suitable and available for development as a highway service centre.

## Need for Highway Service Centre

Continued population growth and a corresponding increase in economic activity will drive the need and demand for additional highway service facilities along the Princes Highway. Approval of the proposed development will contribute to meeting the current and future demand of residents, visitors, heavy vehicle drivers and other road users passing through the Nowra area.

A key benefit of the highway service centre is its potential contribution to road safety.

Management of driver fatigue is a significant part of road safety, and adequate provision of rest stops has been a major focus of federal and state road authorities for lowering the road toll. Given the need for such provisions, the NSW RMS has indicated a general support of the proposed highway service centre development and its role as a rest stop in South Nowra along the Princes Highway.

The provision of rest areas for heavy vehicles on the Australian road network is integral to ensuring drivers have appropriate locations where they can stop during their journey for effective rest and meet their fatigue management obligations. Heavy vehicle rest areas provided by state road authorities, together with commercial truck stop facilities and company depots, form part of Australia's road freight logistics infrastructure.

The proposed highway service centre on the subject site would be located close to town but without the need to divert off the highway into the industrial or other areas for fuel and rest and refresh opportunities. As it is specifically designed to cater to truck and heavy vehicle traffic using the Princes Highway, the proposed highway service centre will provide all drivers with more options for rest, fuel and food without deviating from the Highway.

## Conclusions

From our investigations we conclude that there is a demonstrable need for the proposed highway service centre on the proposed site:

- there are no similar highway service centres meeting RMS guidelines along the Princes Highway south of Sydney to eastern Melbourne;

- all of South Nowra's Princes Highway service stations are located on the southbound side the Highway and the proposed highway service centre will be safely accessible by northbound and southbound travelers;

- the development will generate net community benefits through its contribution to road safety for the motoring public and especially heavy vehicle drivers; and

- its potential economic impacts will not threaten the viability or level of service presently enjoyed by residents and visitors but it will enhance that level of service by providing a facility not available in the region. Any potential impacts are likely to

be short term and would be made good through the provision of a new and multi-functional facility.

# 1. INTRODUCTION

Recep Haliloglu is seeking an amendment to the Shoalhaven Local Environmental Plan (LEP) to permit a highway service centre on the western (northbound) side of the Princes Highway near BTU Road, South Nowra (Figure 1.1). The proposed 7.328ha highway service centre site is located about 7kms south of Nowra's town centre and about 2kms south of Warra Warra Road and just north of Forest Road.

The land is vacant and is zoned 'Rural Landscape under the current 2014 Shoalhaven LEP.

**Figure 1.1: Proposed South Nowra Highway Service Centre site**


Source: Google Earth Imagery, December 2016.

The service centre will have left-in (northbound) access from the Princes Highway and its southbound access will be via the BTU/Woncor Avenue intersection with the Highway. The service centre is planned to open in 2018.

Figure 1.2 shows the site concept plan and its points of entry/exit.

PRELIMINARY

## DEVELOPMENT ASSESSMENT

TOTAL SITE AREA – 7.238 Ha

## BUILDING AREAS

- T1 FUEL SALES/SHOP – 350m²
- T2 F/FOOD & D/THRU – 190m²
- T3 F/FOOD – 90m²
- T4 F/FOOD – 70m²
- T5 F/FOOD – 70m²
- T6 F/FOOD – 80m²
- PUBLIC/TRUCKERS AMENITIES – 85m²
- PUBLIC DINING – 390m²

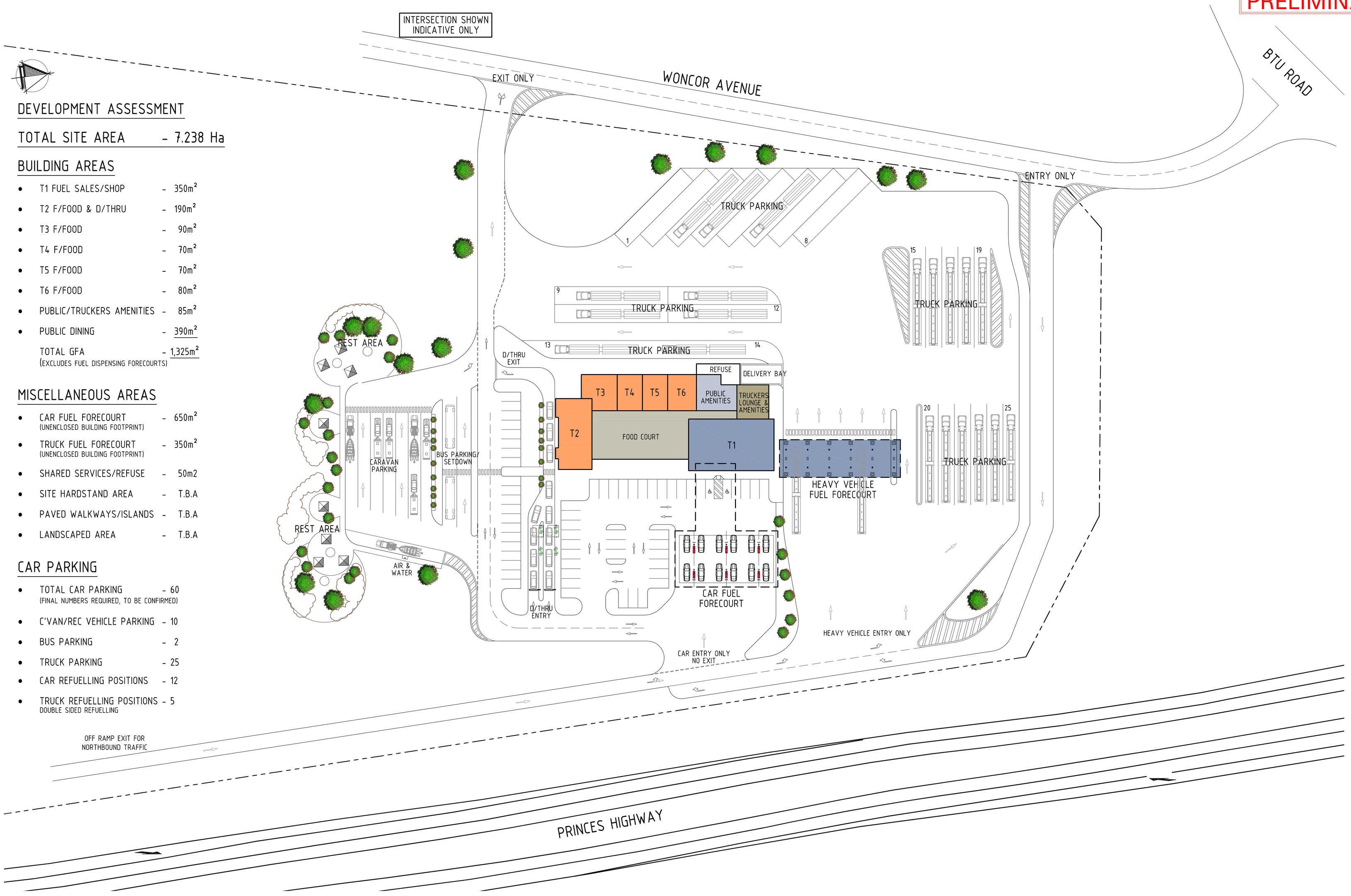
TOTAL GFA – 1,325m²
(EXCLUDES FUEL DISPENSING FORECOURTS)

## MISCELLANEOUS AREAS

- CAR FUEL FORECOURT – 650m²
  (UNENCLOSED BUILDING FOOTPRINT)
- TRUCK FUEL FORECOURT – 350m²
  (UNENCLOSED BUILDING FOOTPRINT)
- SHARED SERVICES/REFUSE – 50m2
- SITE HARDSTAND AREA – T.B.A
- PAVED WALKWAYS/ISLANDS – T.B.A
- LANDSCAPED AREA – T.B.A

## CAR PARKING

- TOTAL CAR PARKING – 60
  (FINAL NUMBERS REQUIRED, TO BE CONFIRMED)
- C'VAN/REC VEHICLE PARKING – 10
- BUS PARKING – 2
- TRUCK PARKING – 25
- CAR REFUELLING POSITIONS – 12
- TRUCK REFUELLING POSITIONS – 5
  DOUBLE SIDED REFUELLING




Consulting Engineer

VERVE BUILDING DESIGN CO.

BUILDING DESIGNERS LICENCE No. 1002212 PH. 07 3857 0942
OFFICE 1, LEVEL 1, 318 JUNCTION ROAD, CLAYFIELD QLD 4011 E: info@vervebd.com.au

imagine □ create □ deliver

□ commercial / industrial / retail
□ fast food restaurant design
□ travel centre / service stations
□ project concept to completion



Revision and approvals

| Code | Date | Drn | Description | Dwn |
|---|---|---|---|---|
| P3 | 11.04.2017 | GN | PRELIMINARY ISSUE FOR INFORMATION | |

Project Description
PROPOSED HIGHWAY SERVICE CENTRE
LOT 2 WONCOR AVENUE, SOUTH NOWRA

Drawing Title
SITE CONCEPT PLAN
OPTION 4

Scale 1:500 @ A1 / 1:1000@A3
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Drawing Number 16090-SK07
Revision P3

The proposed highway service centre will comprise:

- separate fuel forecourts for cars (six bowsers) and heavy vehicles (five bowsers);
- a 350m² service station and convenience store operating 24 hours a day;
- five food outlets totaling 500m² and a common dining area (390m²);
- separate truckers lounge and amenities (85m²); and
- heavy vehicle, bus and recreational vehicle parking and rest areas.

New South Wales Roads and Maritime Services, in a letter to SET Consultants, the Client's planners, dated 18 February 2016 has indicated general support for the proposed development provided it includes a truck rest area, which it considers will provide a direct road safety benefit for truck drivers using the Princes Highway and an indirect road safety benefit for all other road users, and provided that access arrangements to the service centre preserve road safety and traffic efficiency on the Princes Highway.

## 1.1 Purpose of Report and Methodology

SET Consultant's preliminary meetings with Shoalhaven City Council with respect to the proposed highway service centre highlighted concerns about the development falling outside the South Nowra-Nowra Hill Business and General Industry areas about 2kms north of the subject site. Council has requested a market and economic assessment which:

- demonstrates that there is a need and demand for a highway service centre on the subject site; and
- that this demand cannot reasonably be met within the South Nowra Business Development or Industry zones.

Foresight Partners have been commissioned by Recep Haliloglu, to prepare an economic assessment addressing the issues raised by Shoalhaven City Council.

The tasks undertaken in forming the basis of this assessment included:

- a reconnaissance of the South Nowra-Nowra Hill Business and General Industry areas in early November 2016 noting the general nature of its business mix, with a more detailed examination of vacant and under-utilised land fronting, or proximate to the Princes Highway which might have the size, accessibility and visibility characteristics suitable for a large highway service centre;
- an inventory of existing rest areas, service stations and associated convenience retail and food outlets to the north and south of the subject site along the Princes Highway noting their capacity (number of bowsers/pumps), accessibility, hours of

operation, facilities and amenities particularly as they relate to truck and heavy vehicle drivers;

- analysis of current and forecast traffic volumes on Princes Highway near the subject site using available traffic census information from RMS and traffic engineering assessments provided by the Client;

- analysis of projected population growth, vehicle ownership and average household expenditure on meals out/takeaway food within the Shoalhaven area;

- estimation of the market potential for the proposed service centre based on benchmark turn-in rates and expenditure profiles for existing highway service centres and service stations; and

- identification of community benefits of the highway service centre with respect to road safety for truck drivers and local workers and residents using the Princes Highway, and any implications for the South Nowra business-industry area.

Section 2 of this report provides an overview of existing service stations in Nowra and Shoalhaven City region and any other proposed or approved service centre developments in vicinity of the subject site. It then identifies rest areas along the Princes Highway with services nearby.

Section 3 examines Shoalhaven's population growth and socio-economic characteristics with population forecasts and estimation of future households and increases in household vehicles, together with forecasts of traffic volumes past the site.

Section 4 presents a demand analysis and forecasts the performance of the proposed development based on demand generated by fuel and retail sales. Its potential impacts and implications of those impacts on existing service stations in Nowra along the Princes Highway and elsewhere are also discussed.

Section 5 discusses community need and demand for a highway service centre on the subject site in South Nowra, including employment and road safety benefits.

# 2. SERVICE CENTRE NETWORK

The following section details the current supply of service stations and service centres along the Princes Highway to the north and south of the subject site, and their capacity to cater to trucks and heavy vehicles using the Princes Highway.

## 2.1 Requirements for Highway Service Centres

General requirements for highway service centres were provided to SET Consultants by RMS in a letter dated 18 February 2016 and include[1]:

- the centre operates 24 hours a day, seven days a week;
- entry and exit arrangements, and internal traffic arrangements are safe and efficient, with provisions for heavy vehicle maneuvering;
- provision of an emergency break down clearance point for highway vehicles to be inspected and towed for mechanical repair off-site;
- a minimum of 25 B-Double heavy vehicle parking spaces and additional parking spaces for ten recreational vehicles and two coaches, unless analysis can support a higher or lower number of spaces;
- a convenience store and a separate dining area for heavy vehicle drivers;
- availability of toilets and other amenities without the obligation to purchase goods or services;
- segregated undercover heavy and light vehicle fueling areas; and
- the sale of alcohol is prohibited.

Other features of highway service centres also include children's play areas and tourist information.

Although separation distances between highway service centres are not mandated, guidelines typically aim to establish service centres where driving intervals between towns exceeds two hours on major rural freeways[2].

[1] Similar general requirements are also noted in *Highway Service Centres along the Pacific Highway – Policy Review*, May 2014. RMS 14.143, Page 4.

[2] Feasibility Study – *Parking and Rest Opportunities in Areas Zoned for Industrial Purposes: Options Assessment,* May 2010. Austroads Research Report AP-R354/10, Page 36.

## 2.2 Existing Nowra Area Service Stations

A total of seven service stations are located along the Princes Highway within and near the Nowra urban area north of the subject site, as shown in Figure 2.1. Table 2.1 sets out key characteristics of these service stations as well as three others located well south of the subject site at Tomerong, Bewong and Wandandian.

Of the ten service stations identified, five operate on a 24 hour basis. Only three are accessible by B-double or truck and trailer vehicles but only the Shell station at Wandandian operates 24 hours. Four of the seven Nowra area service stations are clustered along a 1.4km stretch of the Princes Highway southbound in the South Nowra Business Development area. Three others are clustered along an 800 metre stretch of the Princes Highway in Bomaderry.

**Table 2.1: Locations and facilities of Princes Highway service stations in the Nowra area**

| Operator | Distance from Site (Kms) | Bowser (No.) | Max. vehicles (No.) | Hours of operation | Facilities | Comments |
|---|---|---|---|---|---|---|
| **North of site** | | | | | | |
| ***Northbound*** | | | | | | |
| Caltex (Narang Rd) | 10.7 | 6 | 12 | 24 hrs | Convenience store | No capacity for trucks |
| ***Southbound*** | | | | | | |
| Caltex | 11.6 | 4 (+1 for trucks) | 4 (+ 2 trucks) | 6am – 8pm | Small convenience store | Small, but offers B-Double access |
| Caltex / Woolworths | 11.3 | 5 | 8 | 6am – 10pm | Convenience store | No capacity for trucks |
| United | 4.0 | 6 | 10 | 24 hrs | Convenience store, Oporto. Located between KFC & McDonalds | Temporarily closed (no capacity for trucks) |
| Caltex | 3.8 | 8 | 12 | 24 hrs | Convenience store | No capacity for trucks |
| Coles Express | 2.7 | 4 | 8 | 24 hrs | Convenience store. Opposite Hungry Jacks | No capacity for trucks |
| BP | 2.6 | 4 (+1 for trucks) | 8 (+1 truck) | 5am – 9pm | Small convenience store, near Hungary Jacks | Separate bowser for rigid trucks only |
| **South of site** | | | | | | |
| United Tomerong | 9.3 | 5 (+3 for trucks) | 10 (+3 trucks) | 5.30am – 8pm | Convenience store. Vacant shop | Accessible to B-doubles |
| Caltex Bewong | 19.4 | 3 | 5 | 6am-6pm Mon - Wed; 9pm Thur; 10pm Fri; 8am-4pm Sat-Sun | Bewong Roadhouse & café | No truck capacity. Opposite rest area w/ toilet |
| Shell Wandandian | 22.6 | 4 (+2 for trucks) | 8 (+2 trucks) | 24 hours | Convenience store | Accessible to B-doubles |

*Source: Foresight Partners field inspections, company websites. November 2016.*

**Figure 2.1: Service Stations along Princes Highway near Subject Site**

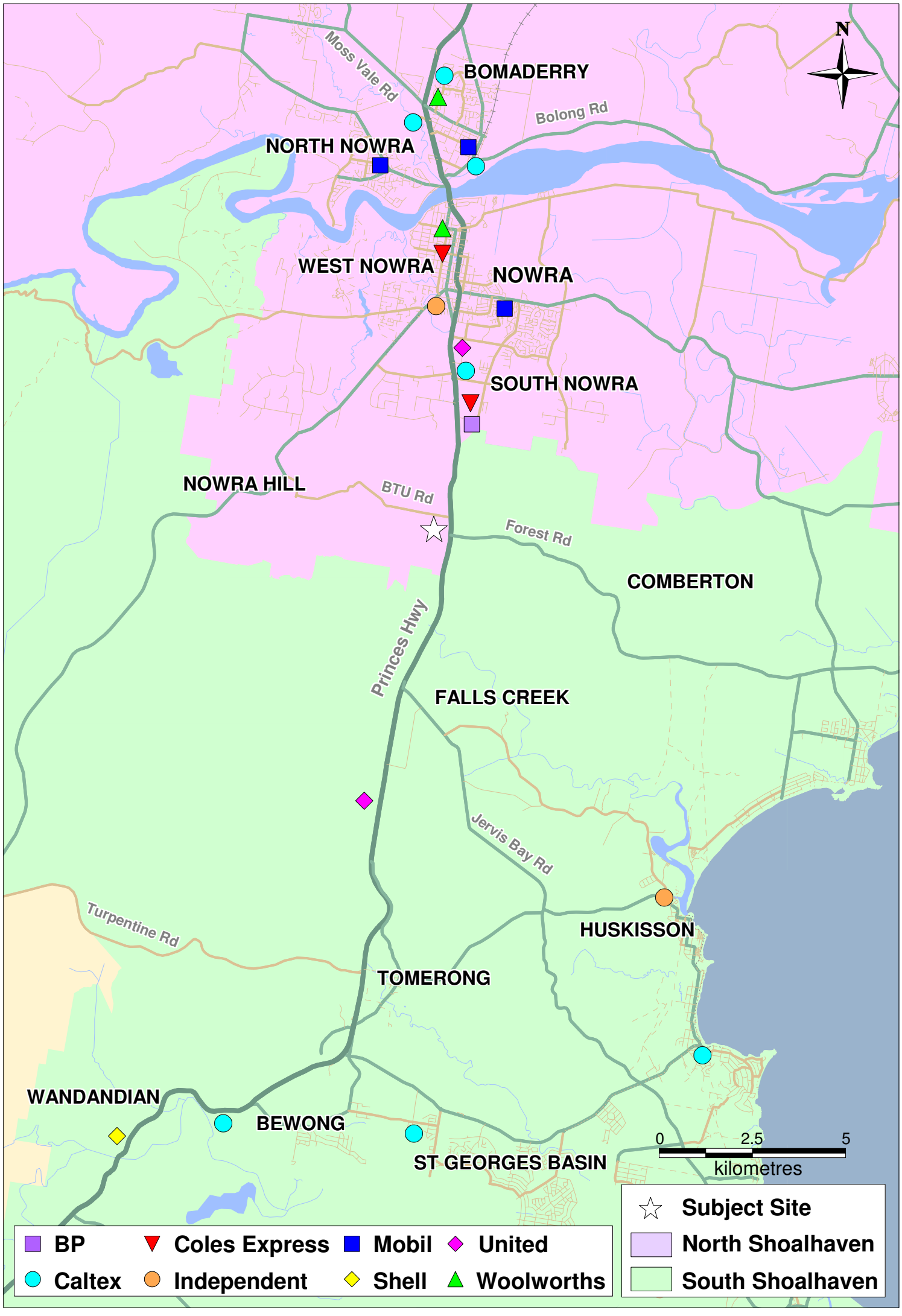


Figure 2.1 also shows several other service stations located in or near the Nowra town centre and in North Nowra and Bomaderry, which are not visible or accessible from the Princes Highway. Only partially shown are several other local service stations located in coastal communities. Other service stations are also located further south fronting the Princes Highway in the Milton-Ulladulla area. All are small and would cater mainly to local residents and none cater to heavy vehicles.

The closest 24 hour service stations are located in South Nowra within four kilometres of the subject site. Temporarily closed for maintenance on its underground fuel tanks (as at November 2016), the United service station located at 86 Princes Highway is positioned between a KFC and a 24 hour McDonalds. It features a convenience store with a modest instore café offering hot box food and an adjoining Oporto restaurant. Just to the south of the McDonalds on the south side of Browns Road is a Caltex service station with a large Star Mart convenience store.

Coles Express located at 190 Princes Highway is the closest 24 hour service station at around 2.7kms north of the subject site. Amenities include a convenience store offering hot box food and customer toilets, with a Hungry Jacks (24 hour) restaurant located adjacent to the service station.

The four lane grade separated stretch of the Princes Highway though South Nowra precludes north bound traffic from accessing existing service stations directly. Roundabouts at Browns Road and Central Avenue do allow access to the four service stations but it involves some back-tracking to resume a north bound journey.

Of the ten service stations, only the United service station at Tomerong and the Shell station at Wandandian are capable of catering to more than one heavy vehicle (including B-doubles) at a time. However, the United station has very limited facilities and is open only from 5.30am to 8pm.

Table 2.2 summarises and compares the key characteristics of the proposed highway service centre with these ten service stations.

**Table 2.2: Summary of Selected Service Station Characteristics and Proposed Highway Service Centre**

| Operator | Open 24 Hours | Accessible from Both Directions | Heavy Vehicle Parking | On-Site Food Service* | Dedicated Rest Area |
|---|---|---|---|---|---|
| Proposed Highway Service Centre | ✓ | ✓ | ✓ | ✓ | ✓ |
| Shell Wandandian | ✓ | ✓ | ✓ | – | – |
| Coles Express | ✓ | – | – | ✓ | – |
| Caltex South Nowra | ✓ | – | – | – | – |
| United South Nowra | ✓ | – | – | ✓ | – |
| Caltex Bomaderry (Narang Rd) | ✓ | ✓ | – | – | – |
| United Tomerong | – | ✓ | ✓ | – | – |
| Caltex / Woolworths Bomaderry | – | ✓ | – | – | – |
| Caltex Bomaderry | – | ✓ | – | – | – |
| Caltex Bewong | – | ✓ | – | – | – |

| Operator | Open 24 Hours | Accessible from Both Directions | Heavy Vehicle Parking | On-Site Food Service* | Dedicated Rest Area |
|---|---|---|---|---|---|
| BP | – | – | – | ✓ (nearby) | – |

*Designated food/cafe outlet on or adjacent to site.

Source: Foresight Partners field inspections November 2016; company websites.

## 2.3 Other Princes Highway Service Centres and Rest Areas with Services Nearby

Highway service centres providing a full range of facilities for heavy vehicle drivers in NSW are mostly servicing traffic along the Hume Highway and other major freeways. There are currently no 24 hour highway service centres directly accessible from the Princes Highway offering a similar range of services as proposed for the subject site. Nowra's existing 24 hour service stations on the Princes Highway are not designed or equipped to cater to heavy vehicles, and none provide amenities such as showers, lounges or rest areas designated for heavy vehicle drivers.

A perusal of RMS, NSW Centre for Road Safety and VicRoads websites[3] indicate there are no dedicated highway service centres located along the approximate 500km stretch of the Princes Highway between Sydney and the state's southern border. The next designated highway service centre south of the proposed subject site for vehicles traveling on the Princes Highway appears to be at Longwarry, east of Melbourne, approximately 780km southwest of Nowra[4]. However there are numerous other service stations, including some that can refuel heavy vehicles, located along the Princes Highway, particularly in urban areas along the route.

Table 2.2 provides an overview of designated Princes Highway rest areas where additional commercially-provided services and facilities are located roughly within 300m of the rest area.

**Table 2.3: Princes Highway Rest Areas with Selected Commercial Services within 300m**

| Rest Area | Distance from Subject Site | Coordinates | Type | Rest Area Amenities | Additional Services within 350m | Open 24 hrs* | Truck Access |
|---|---|---|---|---|---|---|---|
| ***NSW*** | | | | | | | |
| Flinders St South Nowra | 4km North | -34. 90669, 150. 60269 | Town | Toilets, Shelter, Tables, BBQ, Bins | Caltex 200m, United 300m, McDonalds 250m, Oporto 300m, KFC 350m | Yes | No |
| Bewong | 19km South | -35. 08539, 150. 53373 | Road Side | Toilets, Shelter, Tables, Bins | Caltex (Bewong Roadhouse) 50m | No | Yes |
| Burrill Lake, | 63km South | -35. 38918, 150. 44441 | Town | Toilets, Shelter, | Food outlet (Lakeside Café & Restaurant) 50m | N/A | Yes |

[3] http://www.rms.nsw.gov.au/ and http://roadsafety.transport.nsw.gov.au/index.html

[4] VicRoads Interactive Map – *Rest Areas in Victoria*, July 2016

| Rest Area | Distance from Subject Site | Coordinates | Type | Rest Area Amenities | Additional Services within 350m | Open 24 hrs* | Truck Access |
|---|---|---|---|---|---|---|---|
| Lions Park | | | | Tables, BBQ, Bins | | | |
| Termeil Info Bay | 78km South | -35. 48479, 150. 33916 | Road Side | Shelter | BP (Café/ Pizza/ Liquor Store/ Toilets) 50m, Food outlet (Blondies Takeaway) 80m | Yes | No |
| ***VIC*** | | | | | | | |
| Bellbird Hotel | 453km South | S37 39.121 E148 49.018 | Road Side | Toilets, Tables, Water, Shade, Play Area | Food outlet (Bellbird Hotel Restaurant) 50m | N/A | No |
| Nowa Nowa | 527km South | S37 43.921 E148 05.515 | Town | Toilets | Service Station (Independent), Food outlet (General Store) 50m | No | No |
| Swan Reach | 564km South | S37 49.343 E147 51.452 | Town | Toilets, Tables, Phone | Service Station (Independent/Cafe) 250m, Food outlet (General Store) 50m | No | Yes |
| Memorial Park Stratford | 631km South | S37 57.938 E147 04.798 | Town | Toilets, Tables, Water, Shade, Tourist Info, Play Area, Phone | BP 300m, Food outlets (multiple), 100-300m | N/A | No |
| Rosedale | 674km South | S38 09.083 E146 47.172 | Town | Toilets, Tables, Shade, Tourist Info, BBQ, Phone | Caltex 100m, United 350m, Food outlets (multiple), 100-300m | No | No |
| Trafalgar | 736km South | S38 12.464 E146 09.278 | Town | Toilets, Tables, Water, Shade, Tourist Info, BBQ, Phone | Caltex 100m, Coles Express 150m, United 350m, Food outlets (multiple) within 200m | No | Yes (road side only) |
| Yarragon | 743km South | S38 12.245 E146 03.940 | Town | Toilets, Tables, Water, Shade, Tourist Info, BBQ, Phone | Food outlets (multiple) within 300m | N/A | Yes (road side only) |

**Refers to Service Stations - where multiple Service Stations are listed, 'Yes' means at least one is open 24 hrs*
*Source: NSW RMS 'Rest Areas Map', May 2016 and RACV 'Victorian Rest Stops Princes Highway East', 2016*

Of the rest areas with service stations located nearby shown in the table above, most do not operate on a 24-hour basis nor do they have adequate access to allow heavy vehicle manoeuvrability. As such, there are no rest areas currently servicing the Princes Highway in either New South Wales or Victoria that provide the same level of amenities and services on a single site as will be offered by the proposed South Nowra highway service centre.

## 2.4 Approved and Proposed Developments

The Mount Ousley heavy vehicle rest area is under construction at the intersection of the Princes Highway and Clive Bissell Drive near Wollongong, about 100kms north of the

subject site. The rest area will provide parking space for ten heavy vehicles, toilets, rubbish bins and sheltered areas with picnic tables and should be completed by mid 2017. Although not a highway service centre, the project is a significant upgrade of an existing "informal" rest area to assist truck drivers manage driver fatigue[5].

Perusal of Shoalhaven City Council's Applications Online (November 2016) indicate that there are currently no applications or approvals for proposed highway service centres in Nowra and surrounding areas.

However, an application (DS16/1069) was approved in September 2016 for the Shell service station in Wandandian to modify the design of a proposed diesel pump canopy from a previously approved two re-fuelling bays to four re-fuelling bays. However, design plans suggest limited on-site truck parking and amenities. Located at 2720 Princes Highway around 23km south of the proposed subject site, the 24-hour service station has a small convenience store and toilets. Although there is a café (open 7 days) located approximately 250m away, the lack of a designated food outlet and rest area for drivers means this service station would only partially function as a highway service centre as envisaged in RMS guidelines.

[5] http://www.rms.nsw.gov.au/projects/illawarra/m1-princes-motorway/heavy-vehicle-rest-area/index.html

# 3. MARKET CHARACTERISTICS

As a major interstate coastal route for heavy and light vehicles, the Princes Highway carries a large volume of passing traffic through the Nowra township. The proposed highway service centre will serve this passing traffic, which also includes current and future Nowra residents and workers using the Princes Highway as part of their commute. This section briefly outlines the population growth prospects and selected socio-economic characteristics of the Shoalhaven area population, followed by current and projected traffic past the subject site.

## 3.1 Population Growth

Nowra and Shellharbour are the two designated Major Regional Centres under the *Illawarra Shoalhaven Regional Plan* (November 2015), secondary only to the Metro Wollongong area with respect to population, economic activity and growth potential. The key functions of these Major Regional Centres are to service a number of districts, providing a wide range of business, retail and entertainment uses, transport logistics as well as act as focal points for sub-regional road and transport networks (page 59).

The Local Government Areas (LGA) comprising the Regional Plan area (Wollongong, Shellharbour. Kiama and Shoalhaven) are envisaged to increase their populations from about 402,750 at 2016 to 463,150 by 2036 (page 5). The more recent 2016 *NSW State and Local Government Area Population and Household Projections* (Main Series) produced by NSW Planning & Environment indicate a slightly higher projected population for these LGAs at 2036 of 471,700 (about 2% greater).

The Shoalhaven LGA has experienced modest growth of around 0.7% per annum with a current (2016) population estimate of 99,600, up from 96,200 at 2011. It is projected to increase by about 10,100 over the 20 year period to 2036 to reach 109,700 people. Under the LGA High Series projections, its 2036 population would increase to 114,150 (about 4% higher). Shoalhaven City Council's population forecasts are higher still, with a projected population of 119,467 by 2036[6].

We have segmented the Shoalhaven LGA into north and south areas to reflect the distribution of population generally to the north and south of the subject site, based on Statistical Area 2 (SA2) Census boundaries. It is expected that resident usage of the proposed highway service centre will come from areas to the south of the site. Given the large (and some sparsely populated) SA2 areas, the subject site actually falls just within the north Shoalhaven area, as shown in Figure 3.1[7].

[6] Council website link http://forecast.id.com.au.

[7] Figure 3.1 outlines the western part of the LGA, which consists mainly of national park areas and its sparse population apportioned to the north and south areas.

**Figure 3.1: Shoalhaven Local Government Area, North and South of Highway Service Centre Site**

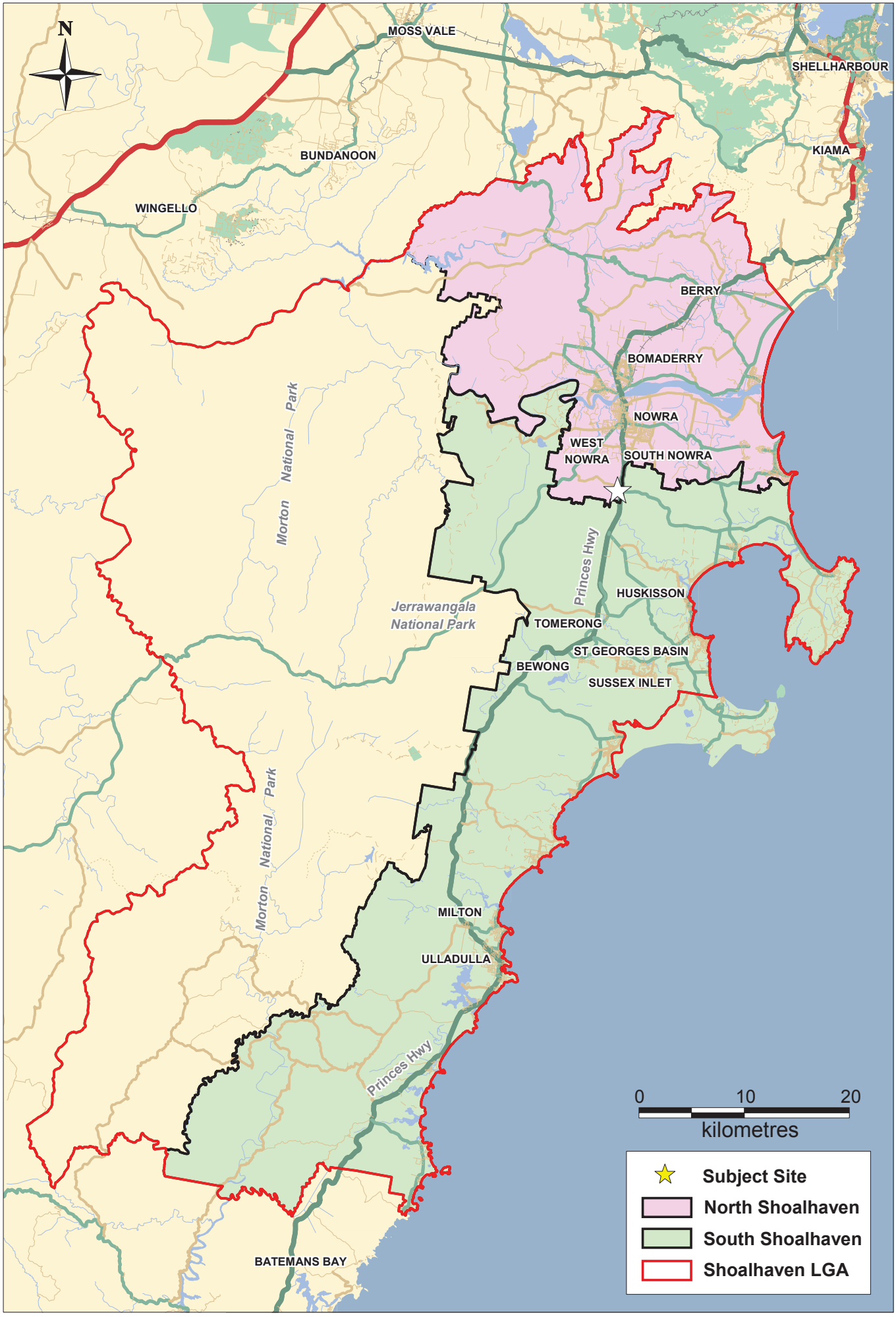


Table 3.1 sets out population and household projections for the northern and southern Shoalhaven areas at five year intervals to 2036. Inter-censual years of 2018, 2023 and 2028 are included as it is assumed as the proposed highway service centre's first year of trading, with 2028 its tenth. Population and households are almost evenly split between the northern and southern areas of Shoalhaven over the projection period.

Shoalhaven is projected to gain an additional 10,100 people and about 6,350 households by 2036, with both the northern and southern areas growing at approximately 0.5% per annum between 2016 and 2036.

**Table 3.1: Shoalhaven Local Government Area Population Growth, 2016 to 2036**

| At June | 2011 | 2016 | *2018* | 2021 | *2023* | 2026 | *2028* | 2031 | 2036 | Increase 2016 - 2036 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Northern Shoalhaven** | | | | | | | | | | |
| Population | 48,131 | 49,641 | *50,269* | 51,211 | *51,769* | 52,606 | *53,074* | 53,777 | 54,674 | 5,033 |
| Households | 20,361 | 21,182 | *21,581* | 22,179 | *22,518* | 23,026 | *23,315* | 23,749 | 24,347 | 3,165 |
| **Southern Shoalhaven** | | | | | | | | | | |
| Population | 47,838 | 49,920 | *50,551* | 51,498 | *52,060* | 52,902 | *53,372* | 54,079 | 54,982 | 5,062 |
| Households | 20,476 | 21,301 | *21,702* | 22,303 | *22,664* | 23,155 | *23,446* | 23,882 | 24,484 | 3,183 |
| **Shoalhaven LGA*** | | | | | | | | | | |
| Population | 96,006 | 99,600 | *100,860* | 102,750 | *103,870* | 105,550 | *106,490* | 107,900 | 109,700 | 10,100 |
| Households | 40,853 | 42,500 | *43,300* | 44,500 | *45,180* | 46,199 | *46,779* | 47,650 | 48,850 | 6,350 |

* Totals do not add as they include a large SA2 (mainly National Park area) with a very small number of people.
Source: 2011 Census; 2016 NSW Planning & Environment State and Local Government Area Population and Household Projections; Foresight Partners estimates.

Should Council's higher projections at 2036 be realised (119,467), the underlying growth rate would be higher (but would still average just under 1% per annum), and would add a further 9,800 people and 4,200 households by 2036.

## 3.2 Selected Socio-economic Characteristics

A summary of the key socio-economic characteristics (as at the 2011 Census[8]) for the northern and southern parts of Shoalhaven are shown in Table 3.2 below. Data for New South Wales are included as a benchmark. Key points of difference between the Shoalhaven area and NSW are:

[8] First release results of the 2016 Census (via Tablebuilder) are expected in June 2017, according to the Australian Bureau of Statistics.

**Table 3.2: Summary of Selected Socio-Economic Characteristics, Trade Area, 2011**

| | Northern Shoalhaven | Southern Shoalhaven | Shoalhaven LGA | New South Wales |
|---|---|---|---|---|
| **Age (%)** | | | | |
| 0-14 | 18.3 | 16.9 | 17.6 | 19.3 |
| 15-24 | 12.2 | 9.4 | 10.8 | 12.9 |
| 25-44 | 21.6 | 17.8 | 19.7 | 27.6 |
| 45-64 | 27.4 | 30.0 | 28.7 | 25.4 |
| 65+ | 20.5 | 25.8 | 23.2 | 14.7 |
| **Employment (%)** | | | | |
| In labour force | 54.4 | 47.8 | 51.1 | 63.3 |
| Unemployed | 7.3 | 8.1 | 7.7 | 5.9 |
| White collar occupations | 66.6 | 65.1 | 65.9 | 71.2 |
| Employed per household | 0.9 | 0.6 | 0.7 | 1.1 |
| **Household Income (%)** | | | | |
| $0-$31,000 | 32.7 | 38.1 | 35.5 | 24.2 |
| $31,000-$65,000 | 32.4 | 34.6 | 33.5 | 26.2 |
| $65,000-$130,000 | 25.1 | 21.3 | 23.2 | 28.4 |
| Over $130,000 | 9.7 | 6.0 | 7.8 | 21.1 |
| Average ($2016 values) | $69,702 | $60,536 | $65,000 | $92,023 |
| **Family Type (%)** | | | | |
| Couples with Children | 25.5 | 22.2 | 23.8 | 32.7 |
| Couples without Children | 30.7 | 35.2 | 33.0 | 26.3 |
| Single Parent Household | 12.5 | 11.9 | 12.2 | 11.7 |
| Lone Person Household | 27.5 | 27.5 | 27.5 | 24.2 |
| Group/Other Household | 3.7 | 3.1 | 3.4 | 5.0 |
| **Mobility (%)** | | | | |
| No car | 7.9 | 5.7 | 6.8 | 10.8 |
| 1 Car | 41.3 | 45.1 | 43.3 | 39.0 |
| 2 or more cars | 50.8 | 49.2 | 50.0 | 50.2 |
| Total vehicles (No.) | 16,900 | 17,816 | 34,724 | 2,392,836 |

Source: ABS 2011 Census

- Shoalhaven's age profile is considerably older and labour force participation rates are considerably lower relative to NSW, reflecting a higher level of retirees in the area;
- Average household income in southern Shoalhaven is significantly lower at $60,536 than northern Shoalhaven ($69,702) with both well below the NSW average of $92,023 (2016 $ values), reflecting its higher proportion of people of retirement age;
- Family structure differs from NSW with a lower proportion of Couples with Children and higher proportions of Couple only households; and
- Mobility is high with only 8.1% of Shoalhaven households without a motor vehicle compared to 10.8% for NSW as a whole. There were 34,724 vehicles recorded in Shoalhaven, averaging nearly one (0.97) per occupied dwelling and reflects the NSW average. When unoccupied dwellings as at the 2011 Census are included

(total dwelling stock), the average falls to about 0.7 in Shoalhaven (compared to about 0.9 vehicles for NSW).

The above characteristics suggest Shoalhaven area households are more car-dependent and, despite lower average household incomes, may spend above average levels for fuel, given the distances many households would travel for work, shopping, education and other activities, particularly those in the Southern Shoalhaven area.

The projected addition of 6,350 households between 2016 and 2036 implies an additional 6,160 vehicles, split more or less evenly between the northern and southern areas of Shoalhaven. Under Council's higher projected population and households at 2036, this would increase by 10,200 vehicles.

## 3.3 Current and Forecast Traffic Volumes

Only one published Annual Average Daily Traffic (AADT) count is available for the Princes Highway in the Nowra area. An AADT count of 24,314 (northbound only) was recorded by RMS in 2016 on the Princes Highway at a location 190 metres south of Illaroo Road. In previous years (2007 to 2011), north and southbound counts were virtually the same.

Traffic investigations undertaken as part of the proposed highway service centre development by Bitzios Consulting (on behalf of the Client) produced Annual Average Daily Traffic (AADT) estimates at 2028, including a heavy vehicle and other vehicle split. Using this data, we have estimated the AADT at 2018 as representing the proposed development's first year of trading[9].

The AADT past the subject site was estimated at around 19,970 vehicles in 2016, of which around 1,300 (6.5%) were heavy vehicles. This is projected to grow to 20,369 vehicles by 2018 and to 22,500 vehicles by its tenth year of operation in 2028, and reflects a 1% average annual growth rate (Table 3.3).

**Table 3.3: Annual Average Daily Traffic (AADT) at the Subject Site, Princes Highway**

| | 2016 | 2018 | 2023 | 2028 |
|---|---|---|---|---|
| Heavy Vehicles | 1,298 | 1,324 | 1,392 | 1,463 |
| Other Vehicles (including light commercial) | 18,670 | 19,045 | 20,016 | 21,038 |
| **Total** | **19,968** | **20,369** | **21,048** | **22,500** |

Source: Bitzios Consulting; Foresight Partners estimates.

The proposed highway service centre will serve through traffic along the Princes Highway in addition to Shoalhaven's resident populations, and mainly residents in the Southern Shoalhaven area. Residents would form a significant part of the traffic flow past the site but it is not practical (or even possible) to separate resident travel from through traffic travel on

[9] Bitzios Consulting forecast the AADT on the section of the Princes Highway near the site as between 20,000 and 25,000 at 2028, with the proportion of heavy vehicles at between 5% and 8%. We have adopted mid-points of 22,500 vehicles and 6.5% heavy vehicles as at 2028.

available information. However, it is reasonable to assume that much of heavy vehicle traffic would fall in the latter category.

# 4. DEMAND ANALYIS

This section outlines the demand for the proposed highway service centre and estimates its sales potential from fuel, convenience goods and dining and takeaway food based on assumed turn-rates, average fuel consumption and other industry benchmarks relevant to service station operations.

## 4.1 Service Station Demand and Turnover

Applying turn-in rates to the forecast AADT counts at 2018 (and subsequent years) generates an estimate of daily customers for the proposed highway service centre and is the basis for estimating its potential market performance and fuel sales.

### 4.1.1 Assumed Turn-in Rates

Given the variation in locations and traffic environments in which service stations and, to a lesser extent, highway service centres can operate, universal rule of thumb or benchmark turn-in rates are not readily applicable or even available. Although dated (March 2002) the *Road Planning and Design Manual* produced by Queensland's Department of Transport and Main Roads provides some design guidance for highway service centres[10], including turn-in rates:

> *The volume of traffic expected to use a Service Centre access may be estimated using the "turn-in rate". This rate will vary depending on the services available and the spacing of facilities along the road. Some Service Centres in NSW have achieved turn-in rates of 10-15%. Individual service stations on the Bruce Highway (SE Region) have shown rates of 4-6%. Up to 10% has been measured.*
>
> *For initial design purposes a rate of 8-10% could be assumed if better information is not available* (page 20-4).

Given the number and location of service stations in and near the Nowra area (including those not located on the Princes Highway) catering to passenger vehicles and other light vehicles, and the paucity of stations equipped to cater to heavy vehicles, we have adopted more modest turn-in rates of:

- 1% for light vehicles (passenger vehicles, motorcycles, light commercial vehicles);
- 4% for heavy vehicles (rigid trucks, articulated trucks, non-freight carrying trucks, buses); which
- averages to a 1.2% turn-in rate for all vehicles past the proposed highway service centre.

[10] Chapter 20: Roadside Amenities.

Light passenger and commercial vehicle drivers have more choice in service station options (mainly travelling southbound), but truck and heavy vehicle drivers are more constrained, with fewer options and limited accessibility, and the proposed highway service centre is therefore likely to achieve a higher turn-in rate for heavy vehicle traffic.

### 4.1.2 Other assumptions

Other assumptions underpinning forecast fuel turnover of the proposed highway service centre include:

- Fuel turnover will increase in line with projected increases in traffic volume (1% per annum) to 2028.

- Price of fuel is 117.6 cents per litre, and is held constant over time. The Australian Institute of Petroleum's *Retail Prices* for NSW show the average retail price per litre of petrol and diesel were virtually identical (117.6 and 117.8 cents, respectively). However, it is acknowledged that fuel prices will continue to fluctuate significantly over time. Over the three year period ending December 2016, NSW petrol prices averaged 134.9 cents

- Average fuel transaction of 43 litres per vehicle and an average fuel expenditure of $50.70 is assumed for light vehicles, which is sourced from the Australasian Association of Convenience Stores' (AACS) *State of the Industry Report, 2015*.

- An average fuel transaction for heavy vehicles of 140 litres is estimated based on total kilometres travelled by light and heavy vehicles in NSW in 2014 and the weighted average fuel consumption for each (10.78 litres per 100kms for light vehicles and 35.12 litres per 100kms for heavy vehicles)[11] . The resulting average fuel transaction for heavy vehicles is $165.31 based on $1.18 per litre of fuel.

#### Convenience store sales

The convenience store component of most modern service stations is a vital part of their service function and even their viability. The AACS *State of the Industry Report 2015* notes that the average merchandise transaction in 2015 was $9.80 (page 8). This represents about 16% of combined fuel and non-fuel sales per transaction.

IBISworld's *Fuel Retailing in Australia* industry report (October 2016) estimates the average annual sales per retail fuel outlet in Australia is $4.6m in 2015-16, of which 79.7% is generated by fuel sales comprising petrol (69.8%), diesel (7.1%) and LPG and other gas

[11] Australian Bureau of Statistics *Survey of Motor Vehicle Use, Australia, 12 months ended 31 October 2014* – Table 4 (Cat. No. 92080). Note that this is a weighted average transaction over a range of heavy vehicles, including buses. It does not reflect a single class of truck. Long haul vehicles, for example, have fuel capacities of 900-1,200 litres or more.

(2.8%). Convenience retail goods and services generate 17.6% of sales, with auto related goods (oils, lubricants, additives) contributing the remaining 2.7% of sales[12].

Table 4.1 sets out our estimates of potential sales for the service station component of the proposed highway service centre at 2018 and in subsequent years (at constant December 2016 dollar values). Non-fuel sales should generate between 15% and 20% of total sales and we have assumed 17.5% for this analysis.

**Table 4.1: Forecast Fuel Turnover from Princes Highway Traffic – 2018 to 2028 (2015 $ values)**

| | 2018 | 2023 | 2028 |
|---|---|---|---|
| **Light vehicles AADT** | **19,045** | **20,016** | **21,038** |
| Highway Service Centre Turn-in rate | 1% | 1% | 1% |
| Daily Patronage to Proposal (Vehicles) | 190 | 200 | 210 |
| Average fuel sale per Vehicle (Litres) | 43 | 43 | 43 |
| Fuel sales per annum (Litres) | 2,989,109 | 3,141,583 | 3,301,836 |
| **Fuel sales per annum ($m)** | **3.5** | **3.7** | **3.9** |
| | | | |
| **Heavy vehicles AADT** | **1,324** | **1,392** | **1,463** |
| Highway Service Centre Turn-in rate | 4% | 4% | 4% |
| Daily Patronage to Proposal (Vehicles) | 53 | 56 | 59 |
| Average fuel sale per Vehicle (Litres) | 140 | 140 | 140 |
| Fuel sales per annum (Litres) | 2,707,986 | 2,846,121 | 2,991,301 |
| **Fuel sales per annum ($m)** | **3.2** | **3.4** | **3.5** |
| | | | |
| **Total vehicles AADT** | **20,369** | **21,408** | **22,500** |
| Highway Service Centre Turn-in rate | 1.2% | 1.2% | 1.2% |
| Daily Patronage to Proposal (Vehicles) | 243 | 256 | 269 |
| Average fuel sale per Vehicle (Litres) | 64 | 64 | 64 |
| Fuel sales per annum (Litres) | 5,697,095 | 5,987,704 | 6,293,137 |
| **Total fuel sales per annum ($m)** | **6.7** | **7.1** | **7.4** |
| **Convenience retail sales ($m)** (17.5% of total sales) | **1.2** | **1.2** | **1.3** |
| **Total service station sales ($m)** | **7.9** | **8.3** | **8.7** |

Note: Totals may not add due to rounding in calculations. $1.18/litre fuel price.

Foresight Partners calculations.

Market demand for the proposed service station component of the highway service centre has the potential to generate sales of about $7.9m assuming 2018 as its first full year of trading. Assuming constant market growth (1% per annum), this will increase to $8.3m by 2023 and $8.7m by 2028 (constant 2016 dollar values).

[12] The average annual sales per Australian establishment can vary significantly from year to year due to the volatility of fuel prices, as well as changes in the number of establishments in a given year (currently 6,959), but the proportion of sales generated by non-fuel merchandise has shown more stability over time (IBISworld *Fuel Retailing in Australia* reports, various years).

The above forecasts of sales potential are based on a snapshot of current market conditions and industry performance characteristics as at 2016. They will invariably change over time as fuel prices and market conditions fluctuate. For example, should fuel prices return to their three year average of $1.34/litre, the service station sales at 2018 would increase to $9.1m and to $10.0m by 2028.

## 4.2 Restaurant and Takeaway Food Demand and Turnover

"On the go" food outlets are key features of modern highway service centres, and provide quick food service to travelers as well as local residents. Major national franchise chains, such as McDonalds, Hungry Jacks, KFC, Subway and others locate stores in well-positioned highway service centres, as do many regional and local food service and café operators. The proposed highway service centre is planned to offer five food outlets totaling 500m² of lettable area with a food court style dining area.

Although it is too early in the approval and development process to nominate specific potential tenants, we understand there is market interest in establishing as part of the highway service centre and that the mix is likely to comprise major chain operators.

As noted in section 2.2 (Table 2.1), a number of Nowra's fast food outlets are located along the Princes Highway adjacent to, or co-located with, service stations. Presently, all of the major chain outlets are located on the eastern (southbound) side of the Princes Highway in South Nowra and Bomaderry.

National chain outlets are also located in the town centre and in the Stockland Nowra Shopping Centre.

### 4.2.1 Sources of Demand and Turnover

Visitors and travelers will comprise a significant component of the proposed food outlets' customer base. However, the food outlets are also likely to attract resident, worker and visitor spending independently of a refueling stop if they find the location convenient and the food offer appealing, which warrants a different approach in estimating demand and turnover potential.

Shoalhaven and the South Coast region is a major tourism destination. Tourism Research Australia key metrics for Shoalhaven Local Government Area[13] indicate that:

- it attracted 2.45m visitors (including 1.29m domestic day visitors) in 2015, which compares to the four year annual average of 2.36m annual visitors (year ending September 2014);

- 4.12m visitor nights were spent in Shoalhaven in 2015, which compares to a four year annual average of 4.0m visitor nights;

[13] Tourism Research Australia. *Local Government Area Profiles-Shoalhaven City, 2015*.

- visitors spent an average of $225 per trip, with total spend of $552m in 2015, which somewhat lower than the four year average of $606m; and

- 93% of domestic visitors to Shoalhaven traveled by private or company vehicle.

Visitors clearly make a significant contribution to Shoalhaven's local economy, including the support of its restaurant and takeaway businesses as well as its service stations.

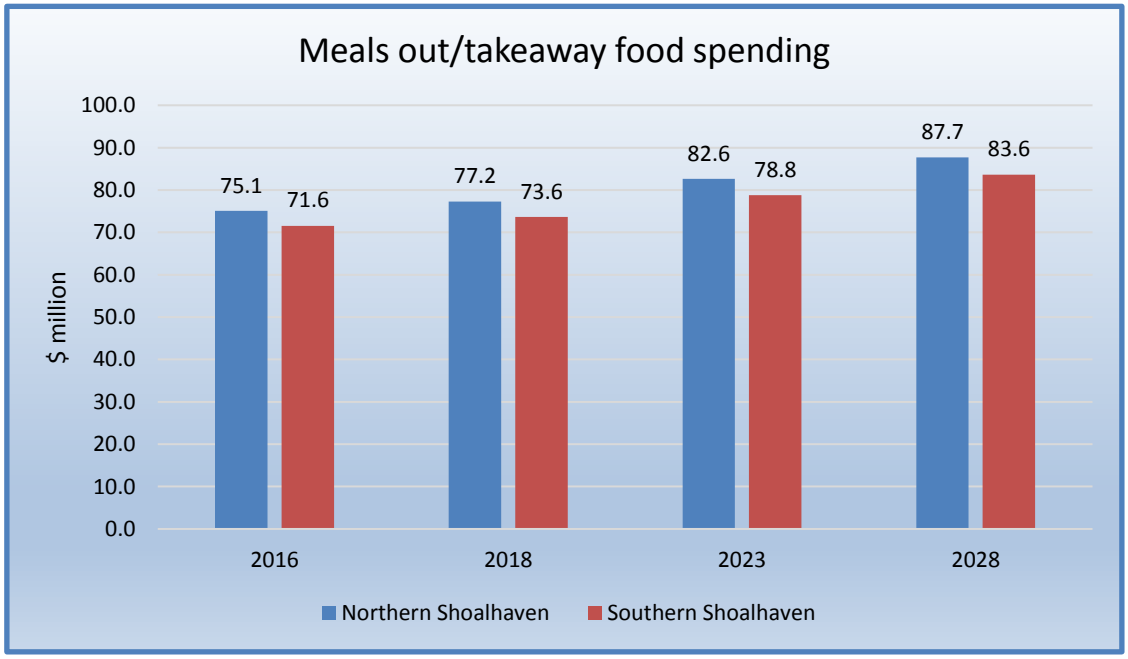
Shoalhaven household spending on meals out/takeaway can be estimated from the ABS *Household Expenditure Survey, 2009-10* (latest available) based on weekly spending patterns for non-metropolitan NSW. Adjusting for inflation, and local factors such as average household incomes and household sizes for the northern and southern Shoalhaven areas, we estimate the average annual household spending on meals out/takeaway at:

- $3,543 per northern Shoalhaven household; and

- $3,360 per southern Shoalhaven household.

Applied to the number of households at 2016 to 2028 (from Table 3.1) generates an estimate of the total annual retail spending potential available and how it is likely to increase over time.

**Figure 4.1: Total Available Household Spend, Meals Out/Takeaway Food, June 2016 to 2018 (December 2016 $ values)**




Source: Foresight Partners estimates.

As shown in Figure 4.1, total available expenditure potential on meals out/takeaway food generated by Shoalhaven households is forecast to increase by $24.7m, from $146.6m in 2016 to:

- $150.9m in 2018;

- $161.4m in 2023; and
- $171.3m by 2028.

About $20.5m of this increase is forecast to occur over the ten year period 2018 to 2028 (equivalent to $2m per annum). Just under half ($10.0m) will be generated by growth in the southern Shoalhaven area.

This $20.5m increase in spending is *theoretically* sufficient to support an additional 3,400m² assuming an average productivity level (turnover per square metre) of $6,000/m². In practice, only part of this additional spending could be captured by the proposed highway service centre's food outlets.

The nature of the five café/restaurant/takeway stores likely to occupy the 405m² in the highway service centre is still to be determined.

The average turnover per fast food store in Australia is about $600,000, although this average reflects a very wide range[14]. This would imply total sales of $3.0m for the five stores. As national café-fast food chains are anticipated, the proposed stores collectively are likely to achieve higher sales productivity levels of $7,000–8,000/m², which implies a total turnover of $3.5m to $4.0m, or an average of $0.7–$0.8m per store.

Local residents and workers are likely to generate a significant proportion of the service centre's fast food sales as residents are likely to pass the site more frequently than visitor and through traffic. Assuming 50% or $2.0m of the higher $4.0m estimate originates from Shoalhaven residents and workers and 50% originates from visitor spending, the proposed highway service centre food outlets would require only a 1.4% share of Shoalhaven's meals out/takeaway food market at 2018.

In our opinion this should be readily achievable, but actual sales realised will ultimately rest with the mix of tenants secured for the proposed highway service centre, as well as their individual hours of operation.

At a constant 1.4% market share and 50% visitor contribution, total food outlet sales would increase to about $4.3m by 2023 and $4.6m by 2028.

## 4.3 Total Highway Service Centre Turnover and Potential Impacts

The combined potential sales achievable by the service station/convenience store (from Table 4.2) and food outlets comprising the highway service centre are estimated are:

- $11.9m at 2018;

[14] IBISWorld's *Fast Food Services in Australia* report (July 2016) show revenues of $19.3bn generated by some 33,207 establishments or about $600,000 per store in Australia. However, some individual major chain stores can achieve sales of $5m+ and employ 100 or more people per store.

- $12.6m at 2023; and

- $13.3m at 2028 (constant 2016 dollar values).

The $11.9m in turnover at 2018, the proposed highway service centre's assumed first year of trading, also represents the potential impacts upon existing service stations and cafes/restaurants and takeaway food outlets, although their distribution will differ.

### 4.3.1 Potential Highway Service Centre Impacts

The proposed service station/convenience store impacts ($7.9m) are expected to be distributed over many service stations, both within the Nowra area and beyond the Shoalhaven region.

Of this amount, it is the light vehicle fuel sales (including a share of convenience retail sales) that are likely to be most relevant to most competing services stations in the Nowra area which would be about $4.1m (about 52%). If impacts were concentrated *only* on the ten service stations located on the Princes Highway (Figure 2.1), this would amount to an average of about $410,000 per station at 2018. If all stations were trading at the average for Australian service stations ($4.6m) the equivalent average impact would be just under 9%. However, impacts are likely to be spread over a larger number of service stations than just these ten, and stations trade profitably at levels well above and below the national average.

Only two of the seven stations fronting the Princes Highway in the Nowra urban area have limited heavy vehicle accessibility, with the nearest stations with greater accessibility (but limited facilities) located well to the south at Tomerong and Wandandian. The $3.8m generated by heavy vehicles (including a share of retail sales) would be diverted from these and other service stations along the Princes Highway (including well beyond the Shoalhaven region) as well as from off-Highway stations and unmanned fuel depots.

Several factors will help mitigate the level of impacts on any single service station at 2018:

- The highway service centre function of the development is aimed at providing 24 hour easy access refueling facilities for all motorists, with dedicated truck and other large vehicle parking and service centre amenities for heavy vehicles which are presently unavailable in Nowra, and only partially available at sites well to the south of Nowra. It is expected to serve inter-and intra-state heavy vehicle users of the Princes Highway that might otherwise forego Nowra by providing easy to access purpose-built facilities (incorporating RMS guideline standards). These same features also appeal to light vehicle drivers, whether passing through/visitors to Nowra, as well as residents and workers regularly commuting past the site (e.g. Albatross Aviation Technology Park, HMAS Albatross west of the subject site).

- The cluster of service stations along the Princes Highway in the South Nowra area are all located on the southbound side, either attached or adjacent to, major fast food outlets. These service stations are more cumbersome for northbound

articulated vehicles and other large trucks to access as it would involve negotiating roundabouts and back-tracking (and there is no roadside parking).

- As these South Nowra service stations and fast food outlets are located on the "going home" side of the Highway, they are unlikely to be significantly affected by the proposed highway service centre. They are also located amongst a range of retail, service trades and light industrial activities catering directly to customers as well as business-to-business, which also generates traffic past these service stations and restaurants throughout the day.

- Although the future operator of the proposed highway service centre will be subject to the outcome of commercial negotiations, brand loyalty is also likely to mitigate potential impacts on some stations. Fuel discount dockets offered by Coles and Woolworths provide strong incentives for many motorists to bypass the nearest service station in favour of their brand. Fuel cards offered by other operators also encourage brand loyalty.

- Shoalhaven population growth and concomitant growth in Princes Highway traffic will help ameliorate potential impacts over time. Traffic along the Highway is projected to increase by about 1% per annum to 2028, and growth in population is also expected to grow at a similar rate. As noted in section 3.2, household growth between 2016 and 2036 is likely to add a further 6,160 vehicles (10,200 under Shoalhaven's higher population growth scenario). At an average annual fuel consumption of about 1,414 litres for passenger cars in NSW, these additional vehicles would generate demand for an additional 8.7m litres of fuel (14.4m litres under Shoalhaven's higher growth scenario) by 2036, which will also underpin need for additional service stations as well as support existing ones[15].

Impacts upon any one service station will also be determined by the ultimate operator. Should the operator be part of a branded franchise already present in Nowra, potential impacts are likely to be weighted towards sister stations, especially if they offer customer loyalty benefits (Coles Express, Woolworths discount fuel dockets). On the other hand, with an operator new to the area (such as Puma) impacts would be more dispersed.

### 4.3.2 Potential Café/Restaurant/Fast Food Impacts

The forecast $4.0m in sales generated by the food outlets will similarly be redirected from a range of outlets from within Nowra, other areas of Shoalhaven and beyond. Of this, $2.0m is expected to originate from Shoalhaven residents and $2.0m from visitors and through traffic.

[15] ABS *Survey of Motor Vehicle Use, Australia, 12 months ended 31 October 2014.* Tables 4 and 5, Cat No. 9208.

As noted in section 4.2.1, growth in Shoalhaven household meals out/takeaway food spending will increase by $20.5m between 2018 and 2028. Levels of impact upon any one trader are therefore likely to be modest and quickly ameliorated by growth in resident spending and visitor spending. As with fuel sales, the proposed highway service centre is also expected to capture food spending that might otherwise not occur in Nowra.

### 4.3.3 Impact Implications

Based on the analyses undertaken and described above, the forecast levels of sales at 2018 are, in our opinion, unlikely to impact the viability and level of service offered by existing service station and food outlets in or near the Nowra township. Growth in traffic volumes along the Princes Highway in the vicinity of the subject site, together with projected increases in resident spending for meals/out takeaway food in Shoalhaven, are sufficient to ameliorate economic impacts on affected businesses over time.

As is discussed in section 5, the proposed highway service centre will generate a number of significant benefits which further add to the demand and need for the new facility.

## 4.4 Alternative Sites

Highway service centres provide extensive parking and rest areas for heavy vehicle drivers as well as the motoring public and, as previously noted, this can include parking areas for up to 25 B-double parking spaces as well as parking for buses and recreational vehicles and trailer parking spaces. Coupled with the separate refueling plazas for light and heavy vehicles, convenience store, amenities and other features and amenities that constitute a highway service centre, they therefore require relatively large sites adjacent to, and with easy access from, the highway it serves.

The subject site is large enough to provide the facilities and amenities comprising a highway service centre and is well located to facilitate easy and safe ingress from the Princes Highway and ingress/egress via BTU Road.

In November 2016 Foresight Partners conducted a field reconnaissance of the South Nowra-Nowra Hill Business Development and General Industry areas commencing around 2km north of the subject site to identify and evaluate potential alternative locations capable of development for a highway service centre.

### 4.4.1 West Side (Northbound) of Princes Highway

General Industry zoned land extends from the Princes Highway west to Albatross Road and is Nowra's (and Shoalhaven's) major industry employment area (Flinders Industrial Estate). Our reconnaissance of the area revealed that it has ample vacant land for industrial development but no suitable vacant sites with frontage or access to the Princes Highway.

Only one vacant site was noted (Figure 4.2). This triangular site of 1.98ha (Lot 463 Princes Highway) is located between the Highway and Nowra Hill Road (a no through road). The

small size and shape of the site would be difficult to accommodate the features and amenity of a highway service centre. This site is only be accessible to northbound traffic.

**Figure 4.2: Vacant Industrial Site, Nowra Hill Road and Princes Highway**


Source: Google Earth Pro, February 2016 aerial photography.

Locations elsewhere in the General Industry area would not meet the locational needs of a highway service centre, nor would it provide the rest and revival options specific to heavy vehicle drivers.

A 2010 feasibility study conducted by Austroads concluded that heavy vehicle parking in industrial zoned areas is best suited to supplement existing rest areas where parking availability may be limited rather than as a preferred location for new rest areas[16]. The study collected the views of drivers towards rest areas located within industrial zoned land, including that:

- diverting from the route to access rest areas is not supported by heavy vehicle drivers due to the additional time and distance added, unless the facilities available

[16] *Feasibility Study – Parking and Rest Opportunities in Areas Zoned for Industrial Purposes: Options Assessment,* May 2010. Austroads Research Report AP-R354/10, Page 13.

were of a high standard with accessibility to nearby food services and amenities; and

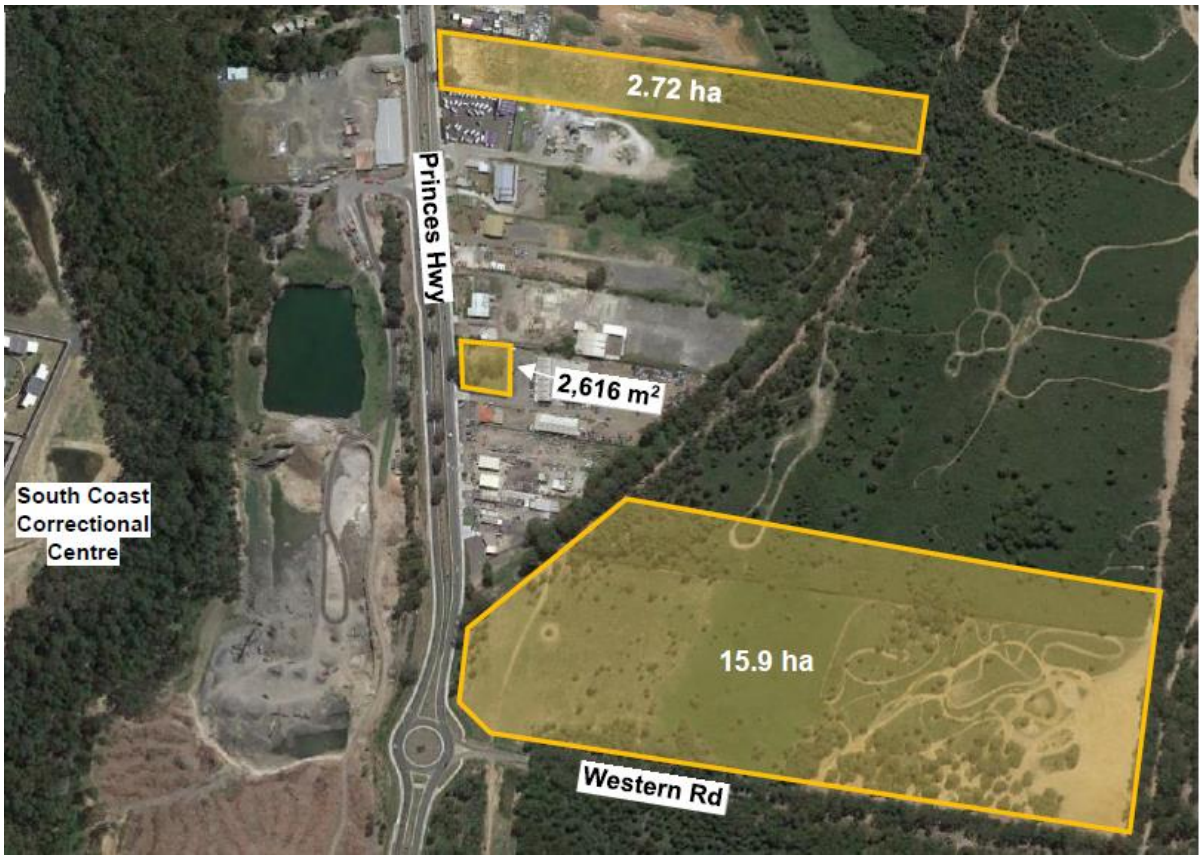
- parking in scarcely used areas was less preferable for drivers over concerns for personal safety.

Although the study noted that industrial land areas are often suitable for rest areas due to an often pre-existing capacity for heavy vehicle access, the general lack of amenities limits their appeal to potential users.

### 4.4.2 East Side (Southbound) of Princes Highway

The Business Development zoned land fronting the Princes Highway is largely developed, with many of the sites (vacant and developed) being long with narrow frontages (Figure 4.3). Although all but two properties are developed, several have vacant or underutilised land at the rear. Given that highway frontage and access are critical locational features of a highway service centre, locating at the back of an existing development is not a viable option.

**Figure 4.3: Vacant Business Development Sites, East side of Princes Highway**




Source: Google Earth Pro, February 2016 aerial photography.

The two vacant sites with frontage and direct access to the Princes Highway (southbound only) comprise:

- A 2.72ha site at 244 Princes Highway, which measures about 60 metres by 473 metres. Such a long and narrow site is awkward and with only a 60 metre frontage, it could be difficult to provide the visibility and accessibility desirable for a highway service centre and food retailers as is proposed for the subject site.

- A 2,616m² site at 276 Princes Highway. A highway service centre could not be accommodated on this site.

Amalgamating two or more developed but (seemingly) under-utilised sites with frontage to Princes Highway could produce a suitable site to accommodate a highway service centre as is proposed for the subject site. However, even if it were an available option, it would not represent a good economic and land use outcome.

Business Development zoned land supports a large number of large and small businesses comprising large format retailers, home improvement retailers, service trades and vehicle sales and services which benefit from Princes Highway exposure and access. These uses generally represent a higher and better land use than a highway service centre for relatively higher value Business Development zoned land and would generate and support higher levels of employment per hectare.

A third vacant site is located at Warra Warra Road (Lot 2 Old Southern Road), also shown in Figure 4.3. This is a very large site (15.9ha) within the Business Development zone and it does not have the site geometry constraints of other identified vacant sites. Although it would not be accessible directly from the Princes Highway, it would have good visibility from both directions. Access would be via Warra Warra Road roundabout intersection with the Princes Highway, which would allow northbound access for all vehicles. Consequently, this site could physically accommodate a highway service centre on its western portion.

However, an application lodged in October 2016 with Shoalhaven City Council seeks to develop a $10.9m bulky goods centre totaling about 11,880m² of retail and commercial floorspace over the western part of this site. The development is to be known as “Southern Gateway” and its proponents envisage it as a “landmark structure” at the southern entrance to the South Nowra precinct. If approved, the site is likely to be developed in stages.

The envisaged uses are permitted with consent within the B5 Business Development zone. Consequently, this site is unlikely to be available for a highway service centre. Furthermore, highway service centres are not a permitted use in the B5 Zone.

In our opinion, existing vacant sites within the General Industry or Business Development zones in the Nowra Hill – South Nowra area are unsuitable, or unavailable, for a highway service centre, and nor would it represent the best economic use of such sites. The subject site is suitable and available for development as a highway service centre.

# 5. NEED FOR HIGHWAY SERVICE CENTRE

Continued population growth and a corresponding increase in economic activity will drive the need and demand for additional highway service facilities along the Princes Highway. Approval of the proposed development will contribute to meeting the current and future demand of residents, visitors, heavy vehicle drivers and other road users passing through the Nowra area.

While projected future population growth in Shoalhaven is modest, overall population growth will still generate increases in both resident generated and passing traffic volumes along the Princes Highway and generate need for additional service station and food services.

There are other benefits that also contribute to the community and economic need for the proposed highway service centre

## 5.1 Employment

The highway service centre will directly support construction jobs during its construction phase. The number of jobs (job years) supported will be a function of the project's capital costs, which are still to be finalised. Once operational, the highway service centre is likely to employ 30 to 50 people in full-time, part-time and casual positions, depending on the hours of operation of the food outlets.

## 5.2 Road Safety

A key benefit of the highway service centre is its potential contribution to road safety.

Management of driver fatigue is a significant part of road safety, and adequate provision of rest stops has been a major focus of federal and state road authorities for lowering the road toll. Given the need for such provisions, the NSW RMS has indicated a general support of the proposed highway service centre development and its role as a rest stop in South Nowra along the Princes Highway.

Long haul road freight in Australia is borne mainly by articulated vehicles, representing 45% of the total 17.6 billion heavy vehicle kilometers traveled in Australia over a 12 month period ending October 2014[17]. Driver fatigue management is critical for this type of travel.

The provision of rest areas for heavy vehicles on the Australian road network is integral to ensuring drivers have appropriate locations where they can stop during their journey for effective rest and meet their fatigue management obligations. Heavy vehicle rest areas provided by state road authorities, together with commercial truck stop facilities and company depots, form part of Australia's road freight logistics infrastructure.

[17] *Survey of Motor Vehicle Use, Australia*, October 2014. Australian Bureau of Statistics, Cat 92080.

The previously noted Austroads' feasibility study examining the establishment of rest areas in industrial areas identified a number of issues and concerns of truck operators relating to rest areas generally[18]. The report identified that operators consistently reported problems with the number, location and quality of rest facilities, citing:

- inadequate sites can lead to fatigue or drivers breaching driving hours requirements;
- hard-stand areas are needed in all new and existing rest areas to help drivers comply with operating standards in all weather conditions;
- need for facilities integrated with fuel, food showers and potentially accommodation at strategic locations to improve productivity; and
- the needs and requirements of female driver/operators differ for that of males.

Operators also identified that personal safety for drivers is a major disincentive to parking away from heavily used areas. Also, diversion off a driver's route (to an industrial area) for rest breaks is not desirable as it can add to the driving hours and kilometres travelled, and may even involve breaking down loads in order to access food and other services (within towns). Drivers prefer to use existing stops that provide food and other facilities for socialising and may be unwilling to go to new areas (off-route).

A June 2011 survey conducted jointly by the National Roads and Motorists' Association and the Transport Workers Union of over 320 heavy vehicle drivers found that[19]:

- 75% of heavy vehicle drivers responded that they found rest stops in NSW inadequate and scarce, while two-thirds admitted to having driven while tired; and
- 33% wanted new rest areas to be built closer to service stations and town centres, while a further 85% wanted bypasses to divert travel away from major towns.

The proposed highway service centre on the subject site would be located close to town but without the need to divert off the highway into the industrial areas. As it is specifically designed to cater to truck and heavy vehicle traffic using the Princes Highway, the proposed highway service centre will provide all drivers with more options for rest, fuel and food without deviating from the Princes Highway.

## 5.3 Conclusions

From our investigations we conclude that there is a demonstrable strong need for the proposed highway service centre on the proposed site:

- there are no similar highway service centres meeting RMS guidelines along the Princes Highway south of Sydney to eastern Melbourne;

[18] Feasibility Study – *Parking and Rest Opportunities in Areas Zoned for Industrial Purposes: Options Assessment,* May 2010. Austroads Research Report AP-R354/10.

[19] *BusinessWise Survey*, June 2011. National Roads and Motorists' Association/Transport Workers Union.

- all of South Nowra's Princes Highway service stations are located on the southbound side the Highway and the proposed highway service centre will be safely accessible by northbound and southbound travelers;

- the development will generate net community benefits through its contribution to road safety for the motoring public and especially heavy vehicle drivers; and

- its potential economic impacts will not threaten the viability or level of service presently enjoyed by residents and visitors but will enhance the overall level of service by providing a facility not available in the region. Any potential impacts are likely to be short term and would be made good through the provision of a new and multi-functional facility.


# APPENDIX 2

## Traffic Report

# SOUTH NOWRA SERVICE CENTRE
# PLANNING PROPOSAL
# TRAFFIC IMPACT ASSESSMENT

**FOR**

**RECEP HALILOGLU**


**Gold Coast**
Suite 26, 58 Riverwalk Avenue
Robina QLD 4226
P: (07) 5562 5377
W: www.bitziosconsulting.com.au

**Brisbane**
Level 2, 428 Upper Edward Street
Spring Hill QLD 4000
P: (07) 3831 4442
E: admin@bitziosconsulting.com.au

**Sydney**
Studio 203, 3 Gladstone Street
Newtown NSW 2042
P: (02) 9557 6202



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## Tables



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# 1. INTRODUCTION

## 1.1 BACKGROUND

Bitzios Consulting has been engaged by Recep Haliloglu to prepare a traffic impact assessment for a planning proposal for a service centre development located at 18 Woncor Avenue, Nowra (DP1154597; Lot 2). The location of the proposed development is illustrated in Figure 1.1 below.


*Source: Google Maps*

**Figure 1.1: Development Site Location**

## 1.2 NEED FOR DEVELOPMENT

It is understood that Roads and Maritime Services (RMS) are supportive of the proposed Highway Service Centre location. Given that no combined truck refuelling / rest stop facilities are located near the site at Nowra Hill, it is considered an ideal development to battle driver fatigue and support drivers to "stop, revive, and survive". The *Princes Highway Corridor Strategy 2016* highlights key issues which align with the need for a Highway Service Centre at the proposed location, which include:

- providing an appropriate number and standard of heavy vehicle rest areas;
- supporting freight access to Port of Eden; and
- providing access for heavy vehicles up to 26m B-Doubles (up to 85 tonnes).

Future upgrades proposed along the Princes Highway will increase freight movements through Nowra and past the proposed site. In addition, since the proposed service centre is located just south of central Nowra, the economic benefit will remain within the Nowra area.

## 1.3 SCOPE

The scope of this traffic impact assessment includes:

- a review of the existing road network and traffic conditions at the site and the surrounds;
- an estimation of background traffic volumes at year-of-completion (2019) and at 10 years post-completion (2029);
- an estimation of the development's traffic generation and distribution onto the surrounding road network;
- an analysis using SIDRA intersection analysis software of the surrounding intersection capacities at year-of-completion (2019) and at 10 years post-completion (2029);
- an assessment of on-site parking provisions against Roads and Maritime Services (RMS) requirements; and
- an assessment of access and servicing arrangements against the Shoalhaven DCP.

# 2. EXISTING CONDITIONS

## 2.1 SUBJECT SITE

The subject site is located on Woncor Avenue, Nowra Hill (Lot 2 DP1154597). The lot is within a Rural Landscape zone.

## 2.2 ROAD NETWORK

Details of the surrounding network are provided in Table 2.1 below.

**Table 2.1: Surrounding Road Network Details**

| Road Name | Number of Lanes | Speed Limit | Divided | Jurisdiction | Hierarchy | Details |
|---|---|---|---|---|---|---|
| Princes Highway | 4 | 100 km/h | Yes | Roads and Maritime Services (RMS) | Arterial | State-controlled major arterial road. |
| BTU Road | 2 | 50 km/h | No | Shoalhaven City Council | Arterial | Arterial road, connecting Princes Highway to Nowra Hill |
| Woncor Avenue | 2 | 50 km/h | No | | Local access | No-through local access road. |
| Forest Road | 2 | 60 km/h | No | | Local collector | Local collector, connecting Princes Highway to Callala and Beecroft Peninsula. |

## 2.3 BACKGROUND TRAFFIC VOLUMES

Background traffic volumes were obtained from traffic surveys undertaken by Skyhigh – The Traffic Survey Company for:

- Princes Highway / BTU Road intersection counts – Friday 8th November 2013; and
- Princes Highway / Forest Road intersection counts – Friday 8th November 2013.

The Skyhigh traffic survey results are provided in Appendix A.

Nowra is a popular tourist destination and therefore experiences varying volumes of traffic at different periods of the year. A Shoalhaven City Council study of the *Traffic Design Day and Hour* has been used to determine the correct seasonality factor for the Princes Highway. Since the traffic counts were undertaken on Friday 8th November 2013 (equivalent to Friday 7th November 2008) a trip factor is to be applied to the AM and PM peaks based on the day of the 100th highest annual hour (12th December) for the Princes Highway combined results recorded in the 2008 dataset. This equates to seasonality factors of 106.7% for the AM peak and 105.2% for the PM peak, which have been applied to all assessed road volumes.

# 3. PROPOSED DEVELOPMENT

## 3.1 SERVICE CENTRE

The proposed service centre includes a service station for car and truck refuelling, a drive-thru fast food outlet, four (4) non-drive-thru fast food outlets and a trucker's lounge. The internal parking layout includes 60 car parking spaces, 10 recreational vehicle spaces, two (2) bus parking spaces and 25 truck parking spaces.

The proposed concept plans are provided in Appendix B.

## 3.2 ACCESS ARRANGEMENTS

The preferred access arrangement for the proposed development includes the following access points:

- Left-in access on Princes Highway via a new northbound off-ramp; and
- Left-in / right-out access on Woncor Avenue.

The provision of the new northbound off-ramp is expected to reduce traffic on BTU Road and Woncor Avenue, as well as reduce impacts to the operation of the Princes Highway / BTU Road intersection. It is understood that the client will address all concerns raised by RMS for the access ramp in the development application stage.

On this basis, a number of scenarios have been considered in the traffic assessment. In the event the RMS requirements cannot be satisfied in the development application stage, a 'worst case' scenario was considered whereby no off-ramp is provided and all traffic accessing the proposed development from the Princes Highway will do so via the Princes Highway / BTU Road intersection.

The concept plan for the off-ramp access from Princes Highway Northbound is provided in Appendix B.

# 4. TRAFFIC ASSESSMENT

## 4.1 EXPECTED CURRENT YEAR TRAFFIC VOLUMES

A compounding growth rate of 1% p.a. has been applied to the 2013 traffic volumes to forecast the current year (2017) traffic volumes. This growth rate is consistent with the growth rate applied in the *South Nowra Service Centre Preliminary Traffic Analysis*. The surveyed 2013 AM and PM peak background traffic volumes for the two intersections are provided in Appendix C (Sheet 1). The normal and peak season AM and PM peaks of the expected current year (2017) background traffic volumes for the two intersections are provided in Appendix C (Sheet 2 & 3).

## 4.2 BACKGROUND TRAFFIC GROWTH

The same compounding growth rate of 1% p.a. and seasonality factor of 106.7% for AM volumes and 105.2% for PM volumes is applied to the 2013 traffic volumes to forecast the peak season current year-of-completion (2019) and 10 years post-completion (2029) traffic volumes. This growth rate is consistent with the growth rate applied to forecast the current year (2017) traffic volumes.

## 4.3 FORECAST TRAFFIC VOLUMES

The normal and peak season AM and PM peaks for the year-of-completion (2019) and 10 years post-completion (2029) background traffic volumes for the two intersections are provided in Appendix C (Sheets 4 – 7).

## 4.4 TRAFFIC GENERATION

Traffic generation rates have been sourced from the RMS *Guide to Traffic Generating Developments (2002)*, and the *Institute of Transportation Engineers Trip Generation Rates 8th Edition (2008)*. A linked trip discount factor of 15% has been applied to all food and drink outlet land uses, accounting for multi-component use within the site as per RMS guidelines. Note that the land area for each of the food and drink outlets is taken as the gross floor area for each plus the proportional food court area.

The expected site traffic generated during AM and PM peak hours is shown in Table 4.1 and Table 4.2 respectively.

**Table 4.1: Peak AM Site Traffic Generation**

| Land Use | Source | Quantity | Trip Rate | Linked Trip Discount | Number of Trips |
|---|---|---|---|---|---|
| Service Station | RMS | 350 $m^2$ | 59 trips per 100$m^2$ | 0% | 207.9 |
| Food and Drink Outlet (drive-thru) | RMS | 338.2 $m^2$ | 162 trips per hour | 25% | 121.5 |
| Food and Drink Outlet 1 (non-drive-thru) | ITE | 160.2 $m^2$ | 4.5 trips per 100$m^2$ | 25% | 5.4 |
| Food and Drink Outlet 2 (non-drive-thru) | ITE | 124.6 $m^2$ | 4.5 trips per 100$m^2$ | 25% | 4.2 |
| Food and Drink Outlet 3 (non-drive-thru) | ITE | 124.6 $m^2$ | 4.5 trips per 100$m^2$ | 25% | 4.2 |
| Food and Drink Outlet 4 (non-drive-thru) | ITE | 142.4 $m^2$ | 4.5 trips per 100$m^2$ | 25% | 4.8 |
| Truck Stop | ITE | 5000 $m^2$ | 0.18 trips per 100$m^2$ | 0% | 9.0 |
| | | | | **Total** | **357** |

**Table 4.2: Peak PM Site Traffic Generation**

| Land Use | Source | Quantity | Trip Rate | Linked Trip Discount | Number of Trips |
|---|---|---|---|---|---|
| Service Station | RMS | 350 $m^2$ | 66 trips per 100$m^2$ | 0% | 231.0 |
| Food and Drink Outlet (drive-thru) | RMS | 338.2 $m^2$ | 180 trips per hour | 25% | 135.0 |
| Food and Drink Outlet 1 (non-drive-thru) | ITE | 160.2 $m^2$ | 5 trips per 100$m^2$ | 25% | 6.0 |
| Food and Drink Outlet 2 (non-drive-thru) | ITE | 124.6 $m^2$ | 5 trips per 100$m^2$ | 25% | 4.7 |
| Food and Drink Outlet 3 (non-drive-thru) | ITE | 124.6 $m^2$ | 5 trips per 100$m^2$ | 25% | 4.7 |
| Food and Drink Outlet 4 (non-drive-thru) | ITE | 142.4 $m^2$ | 5 trips per 100$m^2$ | 25% | 5.3 |
| Truck Stop | ITE | 5000 $m^2$ | 0.16 trips per 100$m^2$ | 0% | 8.1 |
| | | | | **Total** | **395** |

The proposed development is expected to generate a total 357 trips during AM peak hour and 395 trips during PM peak hour. The proposed developments IN:OUT trip splits are expected to be 50%:50% for all land uses except the truck stop component which is expected to have a 40%:60% trip split, referring to the *ITE Handbook 2nd Edition (2004)*. Table 4.3 details the expected IN:OUT development trip splits.

**Table 4.3: Development Trip Splits at Peak Times**

| Land Use | AM Split Percentage | | PM Split Percentage | | AM Trips | | PM Trips | |
|---|---|---|---|---|---|---|---|---|
| | IN | OUT | IN | OUT | IN | OUT | IN | OUT |
| Service Station | 50% | 50% | 50% | 50% | 104.0 | 104.0 | 115.5 | 115.5 |
| Food and Drink Outlet (drive-thru) | 50% | 50% | 50% | 50% | 60.8 | 60.8 | 67.5 | 67.5 |
| Food and Drink Outlet 1 (non-drive-thru) | 50% | 50% | 50% | 50% | 2.7 | 2.7 | 3.0 | 3.0 |
| Food and Drink Outlet 2 (non-drive-thru) | 50% | 50% | 50% | 50% | 2.1 | 2.1 | 2.3 | 2.3 |
| Food and Drink Outlet 3 (non-drive-thru) | 50% | 50% | 50% | 50% | 2.1 | 2.1 | 2.3 | 2.3 |
| Food and Drink Outlet 4 (non-drive-thru) | 50% | 50% | 50% | 50% | 2.4 | 2.4 | 2.7 | 2.7 |
| Truck Stop | 40% | 60% | 40% | 60% | 3.6 | 5.4 | 3.2 | 4.9 |
| | | | | **Total** | **178** | **179** | **197** | **198** |

The proposed development will generate new trips to the surrounding road network, as well as diverting road users into the development who are already using the surrounding road network.

Since the development is a service centre, it is reasonable to expect that a large portion of trips will be pass-by trade. To account for these existing trips of the network that will drop in as part of an origin-destination primary purpose trip, concessions have been applied. These concessions are consistent with those adopted for the Ballina Service Centre traffic impact assessment.

Table 4.4 details the expected number of diverted trips and new trips to the development.

**Table 4.4: Development Pass-By Trip Concessions**

| Land Use | Pass-By Trip Percentage | New Trip Percentage | Total Pass-By AM Trips | Total New AM Trips | Total Pass-By PM Trips | Total New PM Trips |
|---|---|---|---|---|---|---|
| Service Station | 90% | 10% | 93.6 | 10.4 | 104.0 | 11.6 |
| Food and Drink Outlet (drive-thru) | 80% | 20% | 48.6 | 12.2 | 54.0 | 13.5 |
| Food and Drink Outlet 1 (non-drive-thru) | 80% | 20% | 2.2 | 0.5 | 2.4 | 0.6 |
| Food and Drink Outlet 2 (non-drive-thru) | 80% | 20% | 1.7 | 0.4 | 1.9 | 0.5 |
| Food and Drink Outlet 3 (non-drive-thru) | 80% | 20% | 1.7 | 0.4 | 1.9 | 0.5 |
| Food and Drink Outlet 4 (non-drive-thru) | 80% | 20% | 1.9 | 0.5 | 2.1 | 0.5 |
| Truck Stop | 95% | 5% | 3.4 | 0.2 | 3.1 | 0.2 |
| | | **Total** | **153** | **25** | **169** | **27** |

## 4.5 TRAFFIC DISTRIBUTION

The expected traffic distribution for the proposed development has been derived on the basis of the expected catchment to use the service centre. It is noted that four (4) service stations currently exist on the Princes Highway Southbound to the north of the proposed development. Given they primarily service the southbound catchment, it is reasonable to expect that of the traffic originating from the Princes Highway catchment, 90% of this traffic will be northbound traffic.

As a measure to ensure majority of development trips from the Princes Highway catchment originate from the south, roadside advertising signage should not be provided along the Princes Highway Southbound, north of the development. Further to this, southbound motorists on the Princes Highway will not physically view the proposed development until they have travelled south of the Princes Highway / BTU Road intersection.

Given the existing layout of the Princes Highway / BTU Road intersection, it is critical to ensure that the right turn movements associated with southbound traffic on the Princes Highway are minimised to reduce operational impacts to the intersection.

The expected traffic distribution, respective development trips and pass-by trip reductions for the proposed development are provided in Appendix C (Sheets 8 – 10).

## 4.6 DESIGN TRAFFIC VOLUMES

The expected design traffic volumes (i.e. background traffic plus new development trips) for the development for year-of-completion (2019) and 10 years post-completion (2029) are provided in Appendix C (Sheets 11 - 14).

## 4.7 PRINCES HIGHWAY LEFT-IN OFF-RAMP TRAFFIC VOLUMES

The proposed left-in off-ramp will divert all traffic visiting the development from the southern approach of the Princes Highway / BTU Road intersection. The expected traffic distribution, development trips, pass-by trip reductions, 2019 design traffic volumes and 2029 design traffic volumes for this scenario are provided in Appendix C (Sheets 15 – 21).

# 5. INTERSECTION PERFORMANCE ANALYSIS

## 5.1 METHODOLOGY

SIDRA Intersection 7.0 Plus is used to model the effects of expected background and design traffic on the surrounding intersections. The model years analysed are year-of completion (2019) and 10 years post-completion (2029). The intersections and modelling scenarios analysed are as follows:

- Princes Highway / BTU Road priority-controlled intersection;
    - forecast background scenario;
    - no upgrades design scenario;
    - design scenario with off-ramp entry;
    - design scenario with BTU Road left-turn slip lane upgrade; and
    - design scenario with BTU Road off-ramp entry and left turn slip lane upgrade.
- BTU Road / Woncor Avenue priority-controlled intersection;
    - forecast background scenario; and
    - design scenario.

## 5.2 PRINCES HIGHWAY / BTU ROAD INTERSECTION

### 5.2.1 Forecast Background Scenario

The SIDRA model of the Princes Highway / BTU Road intersection is illustrated in Figure 5.1.

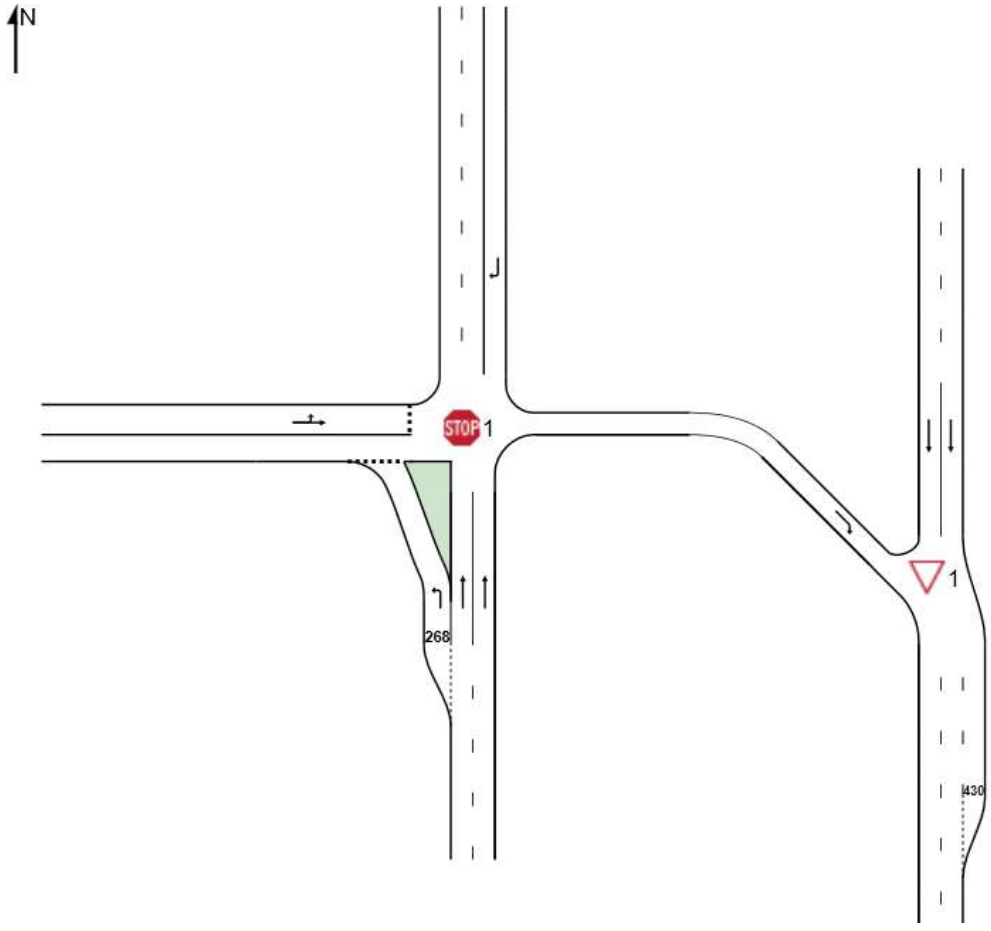



**Figure 5.1: Princes Highway / BTU Road Intersection SIDRA Configuration**

The SIDRA assessment results for the AM and PM peak background traffic scenarios for the Princes Highway / BTU Road intersection are provided in Table 5.1.

**Table 5.1: Princes Highway / BTU Road Priority-Controlled Intersection Background Scenario SIDRA Summary**

| Road Name | Movement | 2019 Background Traffic | | | 2029 Background Traffic | | |
|---|---|---|---|---|---|---|---|
| | | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) |
| **AM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.062 | 8.7 | 1.9 | 0.069 | 8.7 | 2.1 |
| | Through | 0.347 | 0.0 | 0.0 | 0.383 | 0.1 | 0.0 |
| Princes Highway (North) | Through | 0.168 | 0.0 | 0.0 | 0.186 | 0.0 | 0.0 |
| | Right | 0.022 | 6.5 | 0.0 | 0.025 | 6.5 | 0.0 |
| BTU Road (West) | Left | 0.336 | 14.4 | 10.3 | 0.500 | 22.3 | 15.9 |
| | Right | 0.336 | 37.1 | 10.3 | 0.500 | 55.5 | 15.9 |
| **PM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.021 | 8.8 | 0.6 | 0.023 | 8.8 | 0.7 |
| | Through | 0.265 | 0.0 | 0.0 | 0.292 | 0.0 | 0.0 |
| Princes Highway (North) | Through | 0.364 | 0.0 | 0.0 | 0.402 | 0.1 | 0.0 |
| | Right | 0.020 | 6.6 | 0.0 | 0.021 | 6.6 | 0.0 |
| BTU Road (West) | Left | 0.609 | 17.0 | 28.4 | 0.816 | 31.9 | 50.2 |
| | Right | 0.609 | 27.2 | 28.4 | 0.816 | 45.6 | 50.2 |

Table 5.1 shows that the Princes Highway / BTU Road intersection is anticipated to operate outside of acceptable limits (DOS > 0.8) approaching year 2029, irrespective of the proposed development. The SIDRA results indicate operational failure of the minor BTU Road western approach during PM peak hour for the year 2029 background traffic scenario. The operational failure of a minor road approach to a priority-controlled intersection, indicates there is potential for drivers to accept unsafe gaps.

Detailed SIDRA outputs are provided in Appendix D.

### 5.2.2 No Upgrades Development Scenario

The no upgrades scenario tests the sensitivity of the existing intersection to support background traffic volumes as well as additional development traffic volumes, to demonstrate the overall impact of the development to the traffic network. The SIDRA assessment results for the AM and PM peak design traffic scenarios for the Princes Highway / BTU Road intersection with no upgrades, are provided in Table 5.2.

**Table 5.2: Princes Highway / BTU Road Priority-Controlled Intersection No Upgrades Design Scenario SIDRA Summary**

| Road Name | Movement | 2019 Design Traffic | | | 2029 Design Traffic | | |
|---|---|---|---|---|---|---|---|
| | | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) |
| **AM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.187 | 8.8 | 6.4 | 0.194 | 8.8 | 6.6 |
| | Through | 0.311 | 0.0 | 0.0 | 0.348 | 0.0 | 0.0 |
| Princes Highway (North) | Through | 0.164 | 0.0 | 0.0 | 0.182 | 0.0 | 0.0 |
| | Right | 0.033 | 6.5 | 0.0 | 0.035 | 6.5 | 0.0 |
| BTU Road (West) | Left | 0.696 | 19.9 | 38.2 | 0.915 | 48.6 | 81.4 |
| | Right | 0.696 | 45.4 | 38.2 | 0.915 | 85.3 | 81.4 |
| **PM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.150 | 8.7 | 4.9 | 0.159 | 8.9 | 0.7 |
| | Through | 0.217 | 0.0 | 0.0 | 0.252 | 0.0 | 0.0 |
| Princes Highway (North) | Through | 0.385 | 0.1 | 0.0 | 0.398 | 0.1 | 0.0 |
| | Right | 0.028 | 6.5 | 0.0 | 0.035 | 6.6 | 0.0 |
| BTU Road (West) | Left | 0.843 | 25.3 | 83.6 | 1.108 | 136.2 | 344.8 |
| | Right | 0.843 | 35.8 | 83.6 | 1.108 | 154.2 | 344.8 |

Table 5.2 shows that the Princes Highway / BTU Road intersection is anticipated to operate outside of acceptable limits (DOS > 0.8) for 2019. As with the forecast background traffic scenario, the SIDRA results indicate operational failure of the minor BTU Road western approach during PM peak hour. Detailed SIDRA outputs are provided in Appendix D.

Due to the importance of the Princes Highway infrastructure in maintaining the consistent movement of through traffic, a signalised intersection or roundabout is understood to be unsuitable as an upgrade option for this intersection. The following assessments of the Princes Highway / BTU Road intersection test the off-ramp entry to the development, a left-turn slip lane on the BTU Road western approach, and a combination of the two upgrades.

### 5.2.3 Off-Ramp Development Scenario

The following assessment tests the traffic impact of the development with the proposed Princes Highway northbound off-ramp upgrade. The benefit of the off-ramp to the Princes Highway / BTU Road intersection is that traffic seeking to access the development from Princes Highway northbound can use the off-ramp without travelling through the intersection. This improves the gap acceptance opportunities for drivers on the critical BTU Road (western) approach.

The SIDRA assessment results for the AM and PM peak design traffic scenarios for the Princes Highway / BTU Road intersection with the Princes Highway off-ramp upgrade, are provided in Table 5.3.

**Table 5.3: Princes Highway / BTU Road Priority-Controlled Intersection with Princes Highway Off-Ramp Design Scenario SIDRA Summary**

| Road Name | Movement | 2019 Design Traffic | | | 2029 Design Traffic | | |
|---|---|---|---|---|---|---|---|
| | | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) |
| **AM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.063 | 8.7 | 1.9 | 0.071 | 8.7 | 2.1 |
| | Through | 0.311 | 0.0 | 0.0 | 0.348 | 0.0 | 0.0 |
| Princes Highway (North) | Through | 0.164 | 0.0 | 0.0 | 0.182 | 0.0 | 0.0 |
| | Right | 0.033 | 6.5 | 0.0 | 0.035 | 6.5 | 0.0 |
| BTU Road (West) | Left | 0.649 | 17.6 | 33.6 | 0.844 | 33.4 | 59.5 |
| | Right | 0.649 | 38.8 | 33.6 | 0.844 | 63.9 | 59.5 |
| **PM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.021 | 8.7 | 0.6 | 0.023 | 8.9 | 0.7 |
| | Through | 0.217 | 0.0 | 0.0 | 0.252 | 0.0 | 0.0 |
| Princes Highway (North) | Through | 0.385 | 0.1 | 0.0 | 0.398 | 0.1 | 0.0 |
| | Right | 0.028 | 6.5 | 0.0 | 0.035 | 6.6 | 0.0 |
| BTU Road (West) | Left | 0.775 | 18.0 | 65.0 | 1.006 | 66.9 | 205.1 |
| | Right | 0.775 | 27.7 | 65.0 | 1.006 | 81.4 | 205.1 |

Table 5.3 shows that while the upgrade does improve the level of service for the critical BTU Road western approach, the Princes Highway / BTU Road intersection is still anticipated to operate outside of acceptable limits (DOS > 0.8) for this approach for the 2029 design scenario. Detailed SIDRA outputs are provided in Appendix D.

### 5.2.4 Left-Turn Slip Lane Development Scenario

The following assessment tests the traffic impact of the development with the inclusion of a left-turn slip lane on the BTU Road western approach and acceleration lane on the Princes Highway northbound. The lengths of the slip lane and acceleration lane modelled are 200m and 230m respectively. The benefit of the slip lane upgrade is that traffic turning left from the BTU Road western approach can safely enter and accelerate onto Princes Highway northbound without needing to queue and impact the travel speeds of through vehicles. It will also reduce the queueing traffic on the BTU Road western approach to right-turning traffic only.

The SIDRA assessment results for the AM and PM peak design traffic scenarios for the Princes Highway / BTU Road intersection with the BTU Road left-turn slip lane, are provided in Table 5.4.

**Table 5.4: Princes Highway / BTU Road Priority-Controlled Intersection with BTU Road Left-Turn Slip Upgrade Design Traffic SIDRA Summary**

| Road Name | Movement | 2019 Design Traffic | | | 2029 Design Traffic | | |
|---|---|---|---|---|---|---|---|
| | | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) |
| **AM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.187 | 8.8 | 6.4 | 0.194 | 8.8 | 6.6 |
| | Through | 0.311 | 0.0 | 0.0 | 0.348 | 0.0 | 0.0 |
| Princes Highway (North) | Through | 0.164 | 0.0 | 0.0 | 0.182 | 0.0 | 0.0 |
| | Right | 0.033 | 6.8 | 0.0 | 0.035 | 6.8 | 0.0 |
| BTU Road (West) | Left | 0.119 | 5.8 | 0.0 | 0.121 | 5.8 | 0.0 |
| | Right | 0.356 | 35.6 | 10.5 | 0.524 | 55.1 | 15.7 |
| **PM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.156 | 8.9 | 5.4 | 0.159 | 8.9 | 5.5 |
| | Through | 0.224 | 0.0 | 0.0 | 0.252 | 0.0 | 0.0 |
| Princes Highway (North) | Through | 0.360 | 0.0 | 0.0 | 0.398 | 0.1 | 0.0 |
| | Right | 0.034 | 6.9 | 0.0 | 0.035 | 6.9 | 0.0 |
| BTU Road (West) | Left | 0.150 | 6.0 | 0.0 | 0.153 | 6.0 | 0.0 |
| | Right | 0.557 | 24.3 | 23.6 | 0.737 | 37.0 | 36.5 |

Table 5.4 shows that the Princes Highway / BTU Road intersection with the BTU Road left-turn slip upgrade is anticipated to operate within acceptable limits (DOS < 0.8) for both the 2019 and the 2029 design scenarios.

Detailed SIDRA outputs are provided in Appendix D.

The provision of the left turn slip lane upgrade is required for the subject intersection to operate within the acceptable limits in the 2029 design scenario. Notwithstanding this, the average delay for the right turn movement from BTU Road is above the favourable threshold (i.e. 30secs), significantly in the AM peak. However, it should be highlighted the inclusion of the left-turn slip lane ameliorates the impact the proposed development has on average vehicle delays at the BTU Road approach. Based on this, there is no net worsening to the Princes Highway / BTU Road intersection as a result the development with the inclusion of the left-turn slip lane upgrade when compared to the 2029 background traffic scenario.

### 5.2.5 All Upgrades Development Scenario

The SIDRA assessment results for the AM and PM peak design traffic scenarios for the Princes Highway / BTU Road intersection with both the Princes Highway northbound off-ramp and the BTU Road left-turn slip lane upgrades, are provided in Table 5.5.

**Table 5.5: Princes Highway / BTU Road Priority-Controlled Intersection with All Upgrades Design Traffic SIDRA Summary**

| Road Name | Movement | 2019 Design Traffic | | | 2029 Design Traffic | | |
|---|---|---|---|---|---|---|---|
| | | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) |
| **AM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.063 | 8.7 | 1.9 | 0.071 | 8.7 | 2.1 |
| | Through | 0.311 | 0.0 | 0.0 | 0.348 | 0.0 | 0.0 |
| Princes Highway (North) | Through | 0.164 | 0.0 | 0.0 | 0.182 | 0.0 | 0.0 |
| | Right | 0.033 | 6.8 | 0.0 | 0.035 | 6.8 | 0.0 |
| BTU Road (West) | Left | 0.119 | 5.8 | 0.0 | 0.121 | 5.8 | 0.0 |
| | Right | 0.309 | 30.2 | 9.1 | 0.452 | 44.9 | 13.5 |
| **PM Peak** | | | | | | | |
| Princes Highway (South) | Left | 0.021 | 8.9 | 0.7 | 0.023 | 8.9 | 0.7 |
| | Through | 0.224 | 0.0 | 0.0 | 0.252 | 0.0 | 0.0 |
| Princes Highway (North) | Through | 0.360 | 0.0 | 0.0 | 0.398 | 0.1 | 0.0 |
| | Right | 0.034 | 6.9 | 0.0 | 0.035 | 6.9 | 0.0 |
| BTU Road (West) | Left | 0.150 | 6.0 | 0.0 | 0.153 | 6.0 | 0.0 |
| | Right | 0.483 | 20.0 | 20.0 | 0.635 | 27.7 | 28.9 |

Table 5.5 shows that the Princes Highway / BTU Road intersection with the upgrade combination is anticipated to operate within acceptable limits (DOS < 0.8) for both the 2019 and 2029 design scenarios.

While it has been demonstrated that the Princes Highway / BTU Road intersection can operation within acceptable limits (DOS < 0.8) for both the 2019 and 2029 design scenarios with the inclusion of the left turn slip lane upgrade only, the provision the off-ramp has considerable benefits to the average delay of the right turn movement from BTU Road in the 2029 design scenario.

Other alterations to the Princes Highway / BTU Road intersection were considered for assessment however were not pursued due to the likely adverse impacts. One scenario included the closure of the median to right turning vehicles from BTU Road. This arrangement would require vehicles seeking to turn right out of BTU Road to instead travel approximately 1.5km north to the Princes Highway / Warra Warra Road roundabout to U-turn before proceeding south along the Princes Highway. Not only would this add an additional 3.0km of travel distance, but also increase the average delay for vehicles on the northern approach to the roundabout.

Detailed SIDRA outputs are provided in Appendix D.

## 5.3 BTU ROAD / WONCOR AVENUE INTERSECTION

The SIDRA model of the BTU Road / Woncor Avenue intersection is illustrated in Figure 5.2

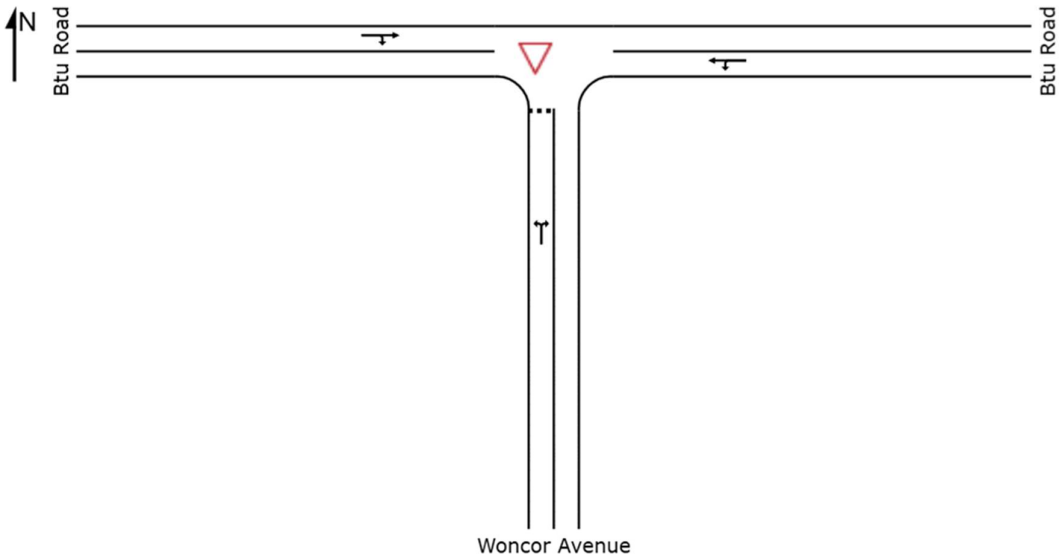



**Figure 5.2: BTU Road / Woncor Avenue Intersection SIDRA Configuration**

The SIDRA assessment results for AM and PM peak hour volumes for background and design traffic for the Princes Highway / Forest Road intersection are provided in Table 5.6, noting that traffic volumes include all development traffic travelling through the intersection (i.e. if the proposed left-in access ramp is not provided) as a conservative model.

**Table 5.6: BTU Road / Woncor Avenue Priority-Controlled Intersection 2019 and 2029 SIDRA Summary**

| Road Name | Movement | 2019 Background Traffic | | | 2019 Design Traffic | | |
|---|---|---|---|---|---|---|---|
| | | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) |
| **AM Peak** | | | | | | | |
| Woncor Avenue (South) | Left | 0.002 | 4.9 | 0.0 | 0.194 | 5.1 | 5.7 |
| | Right | 0.002 | 5.2 | 0.0 | 0.194 | 5.1 | 5.7 |
| BTU Road (East) | Left | 0.063 | 5.5 | 0.0 | 0.156 | 5.7 | 0.0 |
| | Through | 0.063 | 0.0 | 0.0 | 0.156 | 0.0 | 0.0 |
| BTU Road (West) | Through | 0.039 | 0.0 | 0.0 | 0.040 | 0.0 | 0.0 |
| | Right | 0.039 | 5.4 | 0.0 | 0.040 | 5.7 | 0.0 |
| **PM Peak** | | | | | | | |
| Woncor Avenue (South) | Left | 0.002 | 4.7 | 0.0 | 0.242 | 5.1 | 7.3 |
| | Right | 0.002 | 5.4 | 0.0 | 0.242 | 6.9 | 7.3 |
| BTU Road (East) | Left | 0.032 | 5.5 | 0.0 | 0.151 | 5.9 | 0.0 |
| | Through | 0.032 | 0.0 | 0.0 | 0.151 | 0.0 | 0.0 |
| BTU Road (West) | Through | 0.109 | 0.0 | 0.0 | 0.110 | 0.0 | 0.0 |
| | Right | 0.109 | 0.0 | 0.0 | 0.110 | 5.7 | 0.0 |
| **Road Name** | **Movement** | **2029 Background Traffic** | | | **2029 Design Traffic** | | |
| | | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) | DOS (v/c) | Avg. Delay (s) | 95%ile Back of Queue (m) |
| **AM Peak** | | | | | | | |
| Woncor Avenue (South) | Left | 0.002 | 4.9 | 0.0 | 0.177 | 5.0 | 4.4 |
| | Right | 0.002 | 5.2 | 0.0 | 0.177 | 5.8 | 4.4 |
| BTU Road (East) | Left | 0.069 | 5.5 | 0.0 | 0.156 | 5.6 | 0.0 |
| | Through | 0.069 | 0.0 | 0.0 | 0.156 | 0.0 | 0.0 |
| BTU Road (West) | Through | 0.044 | 0.0 | 0.0 | 0.043 | 0.0 | 0.0 |
| | Right | 0.044 | 5.4 | 0.0 | 0.043 | 5.4 | 0.0 |
| **PM Peak** | | | | | | | |
| Woncor Avenue (South) | Left | 0.002 | 4.7 | 0.0 | 0.215 | 4.7 | 5.4 |
| | Right | 0.002 | 5.5 | 0.0 | 0.215 | 6.3 | 5.4 |
| BTU Road (East) | Left | 0.031 | 5.5 | 0.0 | 0.127 | 5.6 | 0.0 |
| | Through | 0.031 | 0.0 | 0.0 | 0.127 | 0.0 | 0.0 |
| BTU Road (West) | Through | 0.119 | 0.0 | 0.0 | 0.119 | 0.0 | 0.0 |
| | Right | 0.119 | 5.5 | 0.0 | 0.119 | 5.5 | 0.0 |

Table 5.6 shows that the BTU Road / Woncor Avenue intersection is anticipated to operate within acceptable limits (DOS < 0.8) for both the 2019 and 2029 design scenarios. Detailed SIDRA outputs are provided in Appendix D.

# 6. PARKING ASSESSMENT

## 6.1 CAR PARKING ASSESSMENT

RMS *Guide to Traffic Generating Developments (2002)* was used to source the car parking rates for the proposed development. Table 6.1 details the car parking requirement and provision.

**Table 6.1: Car Parking Requirement and Provision**

| Land Use | Quantity | RMS Parking Rate | Minimum Parking Requirement | Propose Parking Provision |
|---|---|---|---|---|
| Service Station | 350m$^2$ | 5 spaces per 100 m$^2$ GFA | 18 spaces | 60 spaces |
| Additional Restaurants | 500m$^2$ | 15 spaces per 100m$^2$ GFA | 75 spaces | |
| | | **Total** | **93 spaces** | **60 spaces** |

Based on the number of car parking spaces provided and the adopted parking rate above, the proposed car parking does not meet the minimum car parking requirements, with a short-fall of 33 spaces.

Notwithstanding the above, the provision of car parking at a service centre should be relative to the traffic volumes travelling past the subject site. The Alison Twin Service Centres on the Pacific Motorway (M1) north of Wyong provides approximately 240 (i.e. 120 at each site) car parking spaces for an average daily traffic count of 71,285 vehicles per day in 2016. Further to this, each site provides similar sized facilities (i.e. fuel bowsers, fast food outlets, rest facilities) to those proposed at the subject site. The average daily traffic count for the Princes Highway at Nowra Hill is approximately 12,000 vehicles per day in the northbound direction during peak season, which is significantly less than the volumes travelling past the site at Alison, NSW. On this basis, the proposed service centre would require approximately 40 car parking spaces, resulting in a surplus of 20 spaces compared to other similar sites.

Although the proposed car parking provision is less the RMS requirement, the provision of 60 car parking spaces is considered reasonable given the proposed development's location and expected patronage.

In accordance with the Building Code of Australia (BCA) requirements, a minimum of one (1) persons with disabilities (PWD) parking space is required where access for the disabled is expected. The proposed development plans to provide two (2) PWD parking spaces adjacent to a shared area and kerb access ramp as per AS2890.6 requirements. These spaces are located adjacent to the service station building entry.

## 6.2 HEAVY VEHICLE PARKING ASSESSMENT

RMS General Requirements for Highway Service Centres stipulates the on-site heavy vehicle parking provisions for highway service centres. Table 6.2 details the heavy vehicle parking requirement and provision.

**Table 6.2: Heavy Vehicle Parking Assessment**

| Vehicle Type | RMS Minimum Parking Provision | Total Parking Spaces |
|---|---|---|
| A-Double | 25 spaces | 25 spaces |
| Coach Bus | 2 spaces | 2 spaces |
| Recreational Vehicle | 10 spaces | 10 spaces |

Currently the largest vehicle permitted to use the Princes Highway is a 26m B-Double, so the on-site parking provision allows for 25 26m B-Double spaces. Based on the total number and type of heavy vehicle parking spaces provided, the proposed development meets the heavy vehicle parking requirements set by RMS.

## 6.3 BICYCLE PARKING ASSESSMENT

The development plans currently show no provision for bicycle parking. The Shoalhaven DCP stipulates that new developments should provide appropriate bicycle parking and storage facilities in accordance with Austroads Guidelines. Despite the existence of a bicycle lane on Princes Highway, given the nature of the road infrastructure a reduction of 50% in the bicycle parking provision is considered appropriate. The Austroads guidelines stipulate, "*it is sometimes appropriate to make available 50% of the level of provision recommended in the table at the initial installation stage; however, space should be set aside to allow 100% provision in the event that the full demand for bicycle parking is installed*."

The outcome of bicycle parking provisions for the site is shown in Table 6.3 below.

**Table 6.3: Bicycle Parking Assessment**

| Land Use | Quantity | Minimum Parking Rate | Minimum Parking Provision |
|---|---|---|---|
| Service Station | 350 $m^2$ | 1 long-term space per 800 $m^2$ | 0.4 |
| Take-away Food Outlet | 800 $m^2$ | 1 long-term space per 100 $m^2$ | 8 |
| | | 1 short-term space per 50 $m^2$ | 16 |
| | | **Total** | **25** |
| | | **50% Reduction** | **13** |

The minimum bicycle parking provision for this development is five (5) long-term and eight (8) short-term bicycle parking spaces in accordance with Austroads Guidelines. All bicycle spaces shall be designed in accordance with AS2890.3 requirements.

The site has sufficient area to accommodate a full parking demand as stipulated in Austroads Guidelines, and future development application plans shall demonstrate compliance to this.

# 7. ACCESS AND SERVICING ASSESSMENTS

## 7.1 ACCESS ASSESSMENT

The proposed development shall be accessed by three (3) points of access as follows;

- one (1) access IN only off-ramp from Princes Highway Northbound, which caters for the ingress of a 26m B-Double;
- one (1) access IN only crossover on Woncor Avenue, which caters for the ingress of a 26m B-Double; and
- one (1) access OUT only crossover on Woncor Avenue, which caters for the egress of a 26m B-Double.

Swept path diagrams for the development access arrangements are provided in Appendix E.

## 7.2 TURN WARRANTS ASSESSMENT

A turn warrants assessment was performed on the Btu Road / Woncor Avenue intersection for the Btu Road westbound left-turn and eastbound right-turn movements, to determine the level of upgrade required to maintain user safety. This assessment was undertaken in accordance with the *Austroads Guide to Road Design Part 4A*, for the 2029 design traffic volumes. The result of the left-turn turn warrants assessment is shown in Figure 7.1.

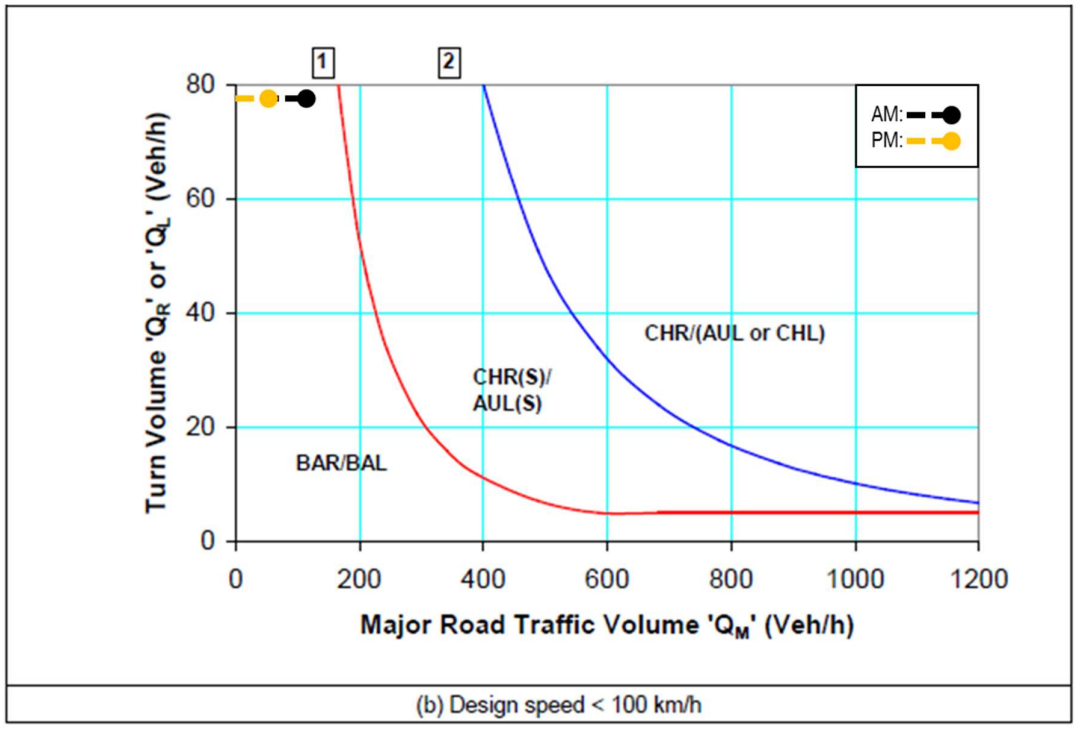



**Figure 7.1: BTU Road Left-Turn Turn Warrants Assessment**

The result of this turn warrants assessment shows that the BTU Road westbound left-turn to Woncor Avenue requires a Basic Augmented Left (BAL) treatment.

The result of the right-turn turn warrants assessment is shown in Figure 7.2.

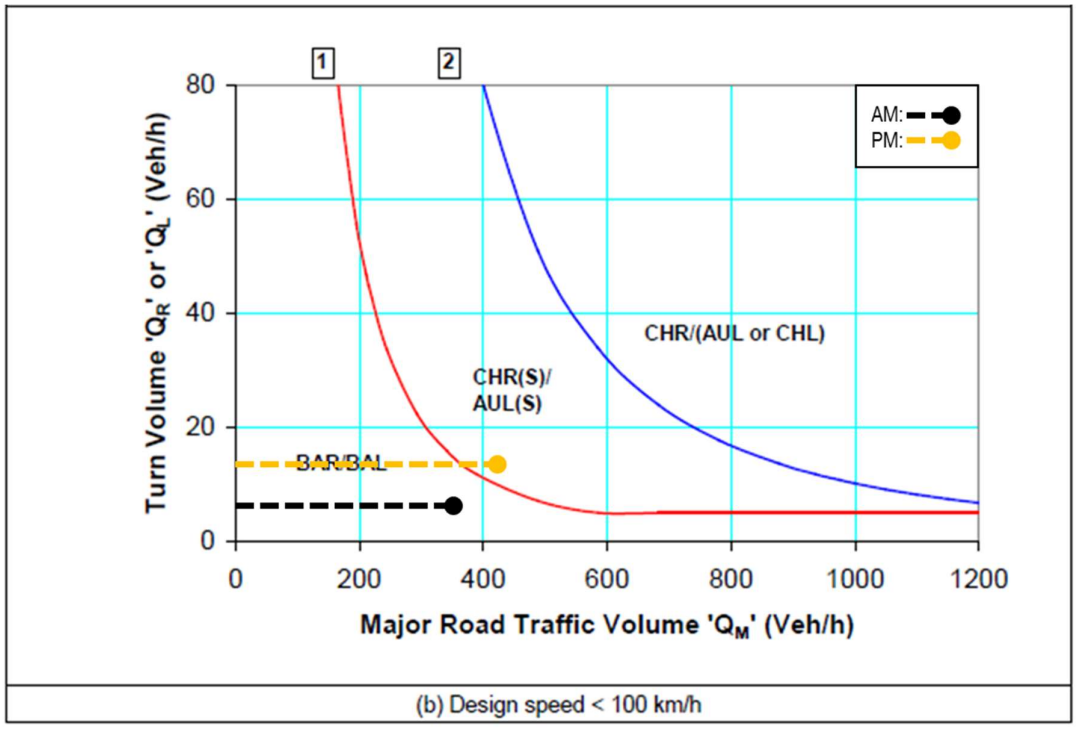



**Figure 7.2: BTU Road Right-Turn Turn Warrants Assessment**

The result of this turn warrants assessment shows that the BTU Road eastbound right-turn to Woncor Avenue requires a Short Channelised Right (CHR(S)) treatment.

## 7.3 SIGHT DISTANCE ASSESSMENT

Vehicles exiting on to Woncor Avenue have an unobstructed line of sight to oncoming vehicles, meeting the minimum desirable gap acceptance distance stipulated by *AS2890.1 Off-Street Car Parking* 2004 and *AS2890.2 Off-Street Commercial Vehicle Facilities 2002*; 83m sight for a 60 km/h road frontage speed. Figure 7.3 shows the available sight distances for the exit driveway.

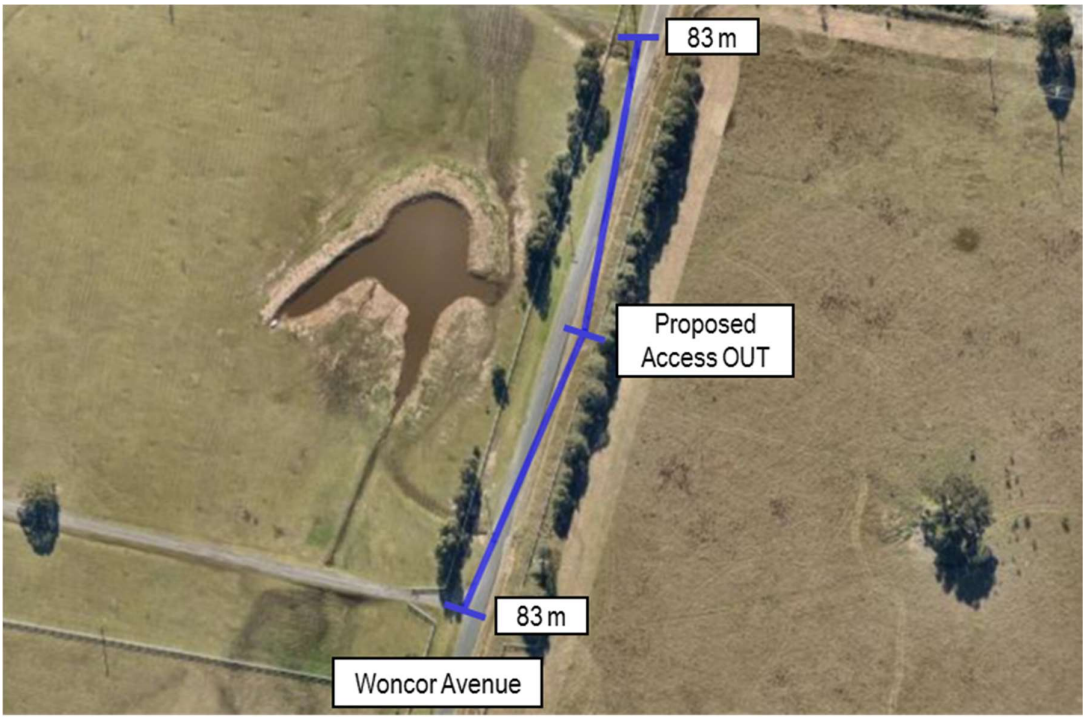



**Figure 7.3: Exit Driveway Sight Distance Compliance**

## 7.4 QUEUING ASSESSMENT

Table 7.1 shows the minimum queueing provision to be provided in accordance with the Shoalhaven DCP.

**Table 7.1: Queueing Assessment**

| Land Use | Minimum Queueing Provision | Total Queueing Spaces |
|---|---|---|
| Drive-In Take-Away Food and Drink Premises | 10 – 24 car spaces | 12 car spaces |

Based on the total number of queueing spaces provided, the proposed development meets the minimum queueing requirement.

## 7.5 SERVICING AND REFUSE ASSESSMENT

The Shoalhaven DCP stipulates that all service stations must cater for the manoeuvres of a 19m Semi-Trailer (Articulated Vehicle; AV). Swept paths for 26m B-Doubles already show the ability to ingress, egress and full on-site manoeuvrability, whilst still allowing traffic to manoeuvre through the site.

The design vehicle for servicing the fast food component (commercial, > 500m$^2$ GFA) of the development is a 12.5m Large Rigid Truck (Heavy Rigid Vehicle; HRV), while the design vehicle for refuse collection for the development is a front-lift Refuse Collection Vehicle (RCV). Loading and refuse collection will occur in the same designated area. Swept path diagrams in Appendix E show the ability of the 12.5m HRV to enter the site in a forward direction, access the loading / refuse area, and leave the site in a forward direction.

Given loading and refuse collection will occur in the same designated area, the preparation of a Service Vehicle Management Plan is recommended for the site to manage the arrival and operations of service vehicles.

## 7.6 CYCLE CONNECTIVITY

It is recommended that the proposed development provides connection to the existing cycleway that runs along the western side of the Princes Highway, so that there are no conflicting movements between cyclists and motorists accessing the development via the Princes Highway off-ramp entry. This strategy should address concerns raised by RMS regarding the design of the off-ramp entry, and will be addressed further in the development application stage.

# 8. CONCLUSION

The key findings from the traffic impact assessment above are as follows:

- the proposed development is expected to generate a total of 357 AM peak hour trips and 395 PM peak hour trips to the site access points;
- a total of 25 trips during AM peak hour and 27 trips during PM peak hour are expected to be new trips to the network;
- the provision of a 200m left-turn slip lane and a 230m acceleration lane is required for the Princes Highway / BTU Road intersection to operate within acceptable limits for the 2029 design scenario;
- the provision of the off-ramp as well as the left-turn slip lane reduces the average delay considerably for the critical BTU Road right-turn movement of the Princes Highway / BTU Road intersection;
- the BTU Road / Woncor Avenue intersection is anticipated to operate within acceptable limits for the 2029 design scenario;
- the proposed development does not meet the minimum car parking provision in accordance with RMS requirements by 33 spaces;
- notwithstanding this, the provision of 60 car parking spaces is considered reasonable given the proposed development's location and expected patronage in comparing the proposed development to other NSW service centres;
- the proposed number and type of heavy vehicle parking spaces (25 B-Double spaces, 2 coach bus spaces and 10 recreational vehicle spaces) meets the minimum provision in accordance with RMS requirements;
- the proposed development shall provide a minimum of five (5) long-term and eight (8) short-term bicycle parking spaces upon completion, as well as offer sufficient area to provide in the future nine (9) long-term and 16 short-term bicycle spaces in accordance with Austroads Guidelines;
- the access arrangements to and from the site allow for the ingress and egress of a 26m B-Double in accordance with RMS requirements;
- the Btu Road / Woncor Avenue requires a Basic Augmented Left treatment for the Btu Road westbound approach, and a Short Channelised Right treatment for the Btu Road eastbound approach in accordance with Austroads Guidelines;
- the proposed number of drive-thru queueing spaces (12 spaces) meets the minimum provision in accordance with the SDCP;
- sight distance at the proposed driveway exit (>83m for a 60 km/h road frontage speed) meets the minimum distance for desirable gap acceptance in accordance with AS2890;
- the on-site servicing and refuse access and form allows for the ingress, servicing and egress of a 12.5m Heavy Rigid Vehicle in accordance with the SDCP; and
- the proposed development should provide a connection to the existing cycleway that runs along the western side of Princes Highway.

# APPENDIX A

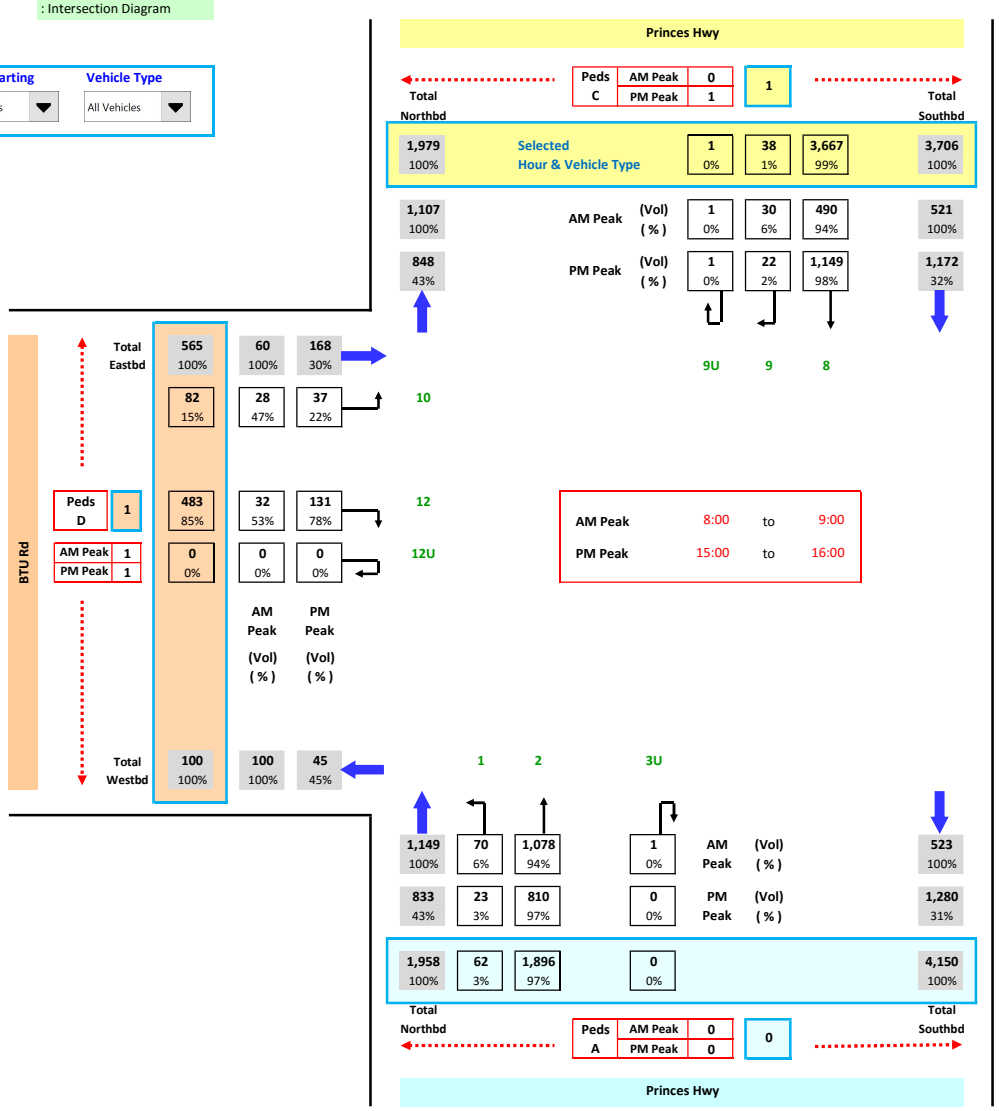
# TRAFFIC SURVEY DATA

**Job No.** : N1224
**Client** : Shoalhaven Council
**Suburb** : Shoalhaven
**Location** : 22. Princes Hwy / BTU Rd

**Day/Date** : Fri, 8th November 2013
**Weather** : Fine
**Description** : Classified Intersection Count
: Intersection Diagram

SKYHIGH - THE TRAFFIC SURVEY COMPANY

| Hour Starting | Vehicle Type |
|---|---|
| PM Totals | All Vehicles |

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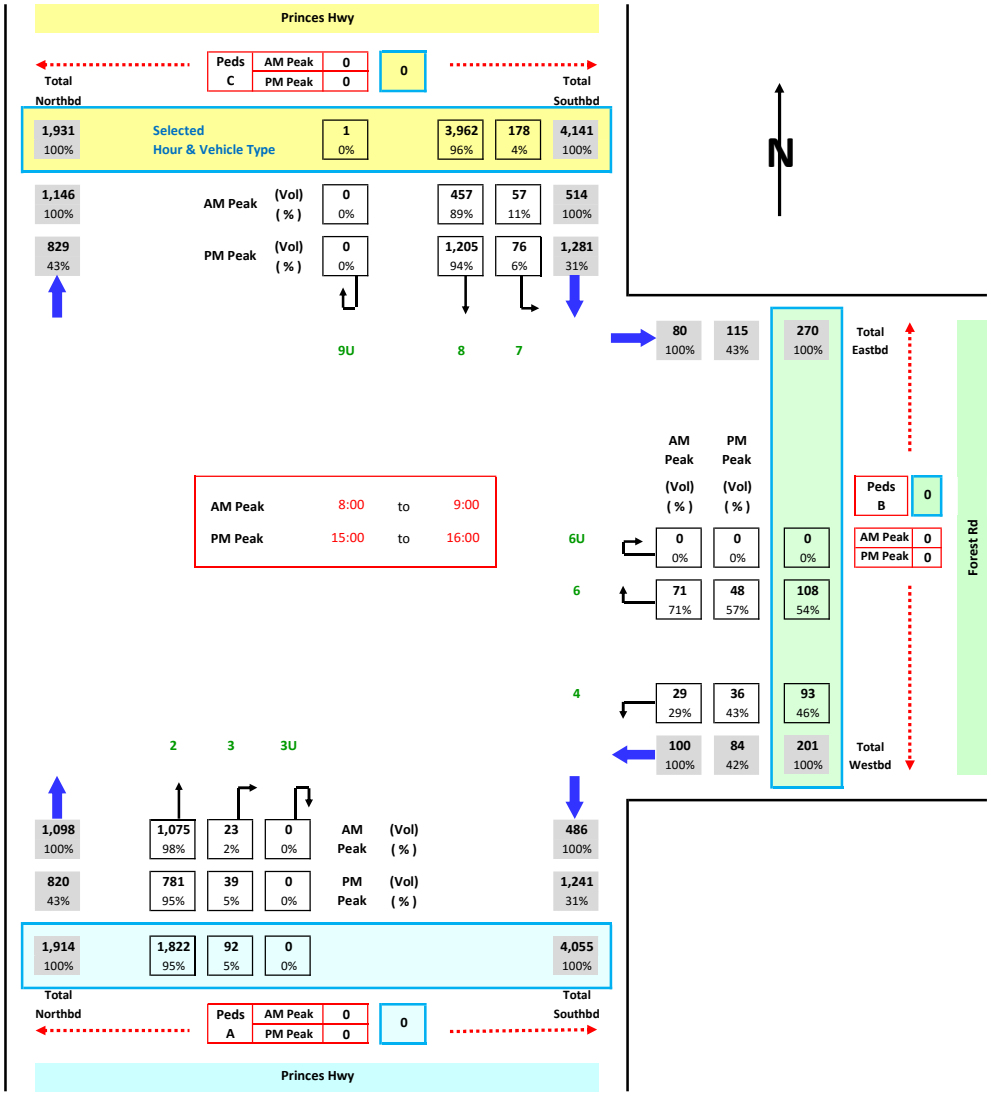
**Job No.** : N1224
**Client** : Shoalhaven Council
**Suburb** : Shoalhaven
**Location** : 23. Princes Hwy / Forest Rd

**Day/Date** : Fri, 8th November 2013
**Weather** : Fine
**Description** : Classified Intersection Count
: Intersection Diagram

| Hour Starting | Vehicle Type |
|---|---|
| PM Totals | All Vehicles |

SKYHIGH - THE TRAFFIC SURVEY COMPANY



# APPENDIX B

# DEVELOPMENT PLANS

PRELIMINARY

## DEVELOPMENT ASSESSMENT

TOTAL SITE AREA – 7.238 Ha

## BUILDING AREAS

- T1 FUEL SALES/SHOP – 350m²
- T2 F/FOOD & D/THRU – 190m²
- T3 F/FOOD – 90m²
- T4 F/FOOD – 70m²
- T5 F/FOOD – 70m²
- T6 F/FOOD – 80m²
- PUBLIC/TRUCKERS AMENITIES – 85m²
- PUBLIC DINING – 390m²

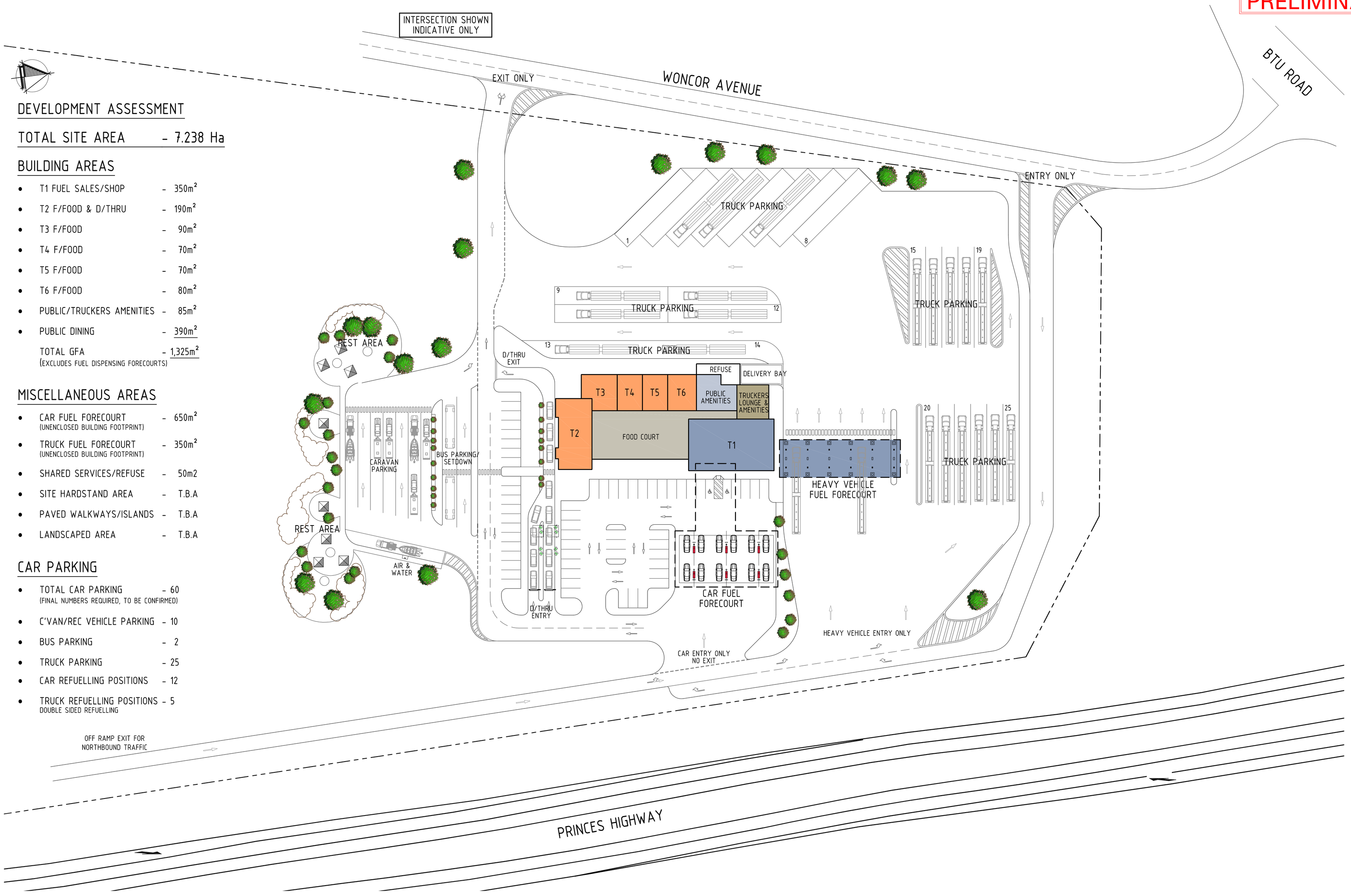
TOTAL GFA – 1,325m²
(EXCLUDES FUEL DISPENSING FORECOURTS)

## MISCELLANEOUS AREAS

- CAR FUEL FORECOURT – 650m²
  (UNENCLOSED BUILDING FOOTPRINT)
- TRUCK FUEL FORECOURT – 350m²
  (UNENCLOSED BUILDING FOOTPRINT)
- SHARED SERVICES/REFUSE – 50m2
- SITE HARDSTAND AREA – T.B.A
- PAVED WALKWAYS/ISLANDS – T.B.A
- LANDSCAPED AREA – T.B.A

## CAR PARKING

- TOTAL CAR PARKING – 60
  (FINAL NUMBERS REQUIRED, TO BE CONFIRMED)
- C'VAN/REC VEHICLE PARKING – 10
- BUS PARKING – 2
- TRUCK PARKING – 25
- CAR REFUELLING POSITIONS – 12
- TRUCK REFUELLING POSITIONS – 5
  DOUBLE SIDED REFUELLING




Consulting Engineer

VERVE BUILDING DESIGN CO.
BUILDING DESIGNERS LICENCE No. 1002212 PH. 07 3857 0942
OFFICE 1, LEVEL 1, 318 JUNCTION ROAD, CLAYFIELD QLD 4011 E: info@vervebd.com.au
imagine □ create □ deliver

□ commercial / industrial / retail
□ fast food restaurant design
□ travel centre / service stations
□ project concept to completion



Revision and approvals

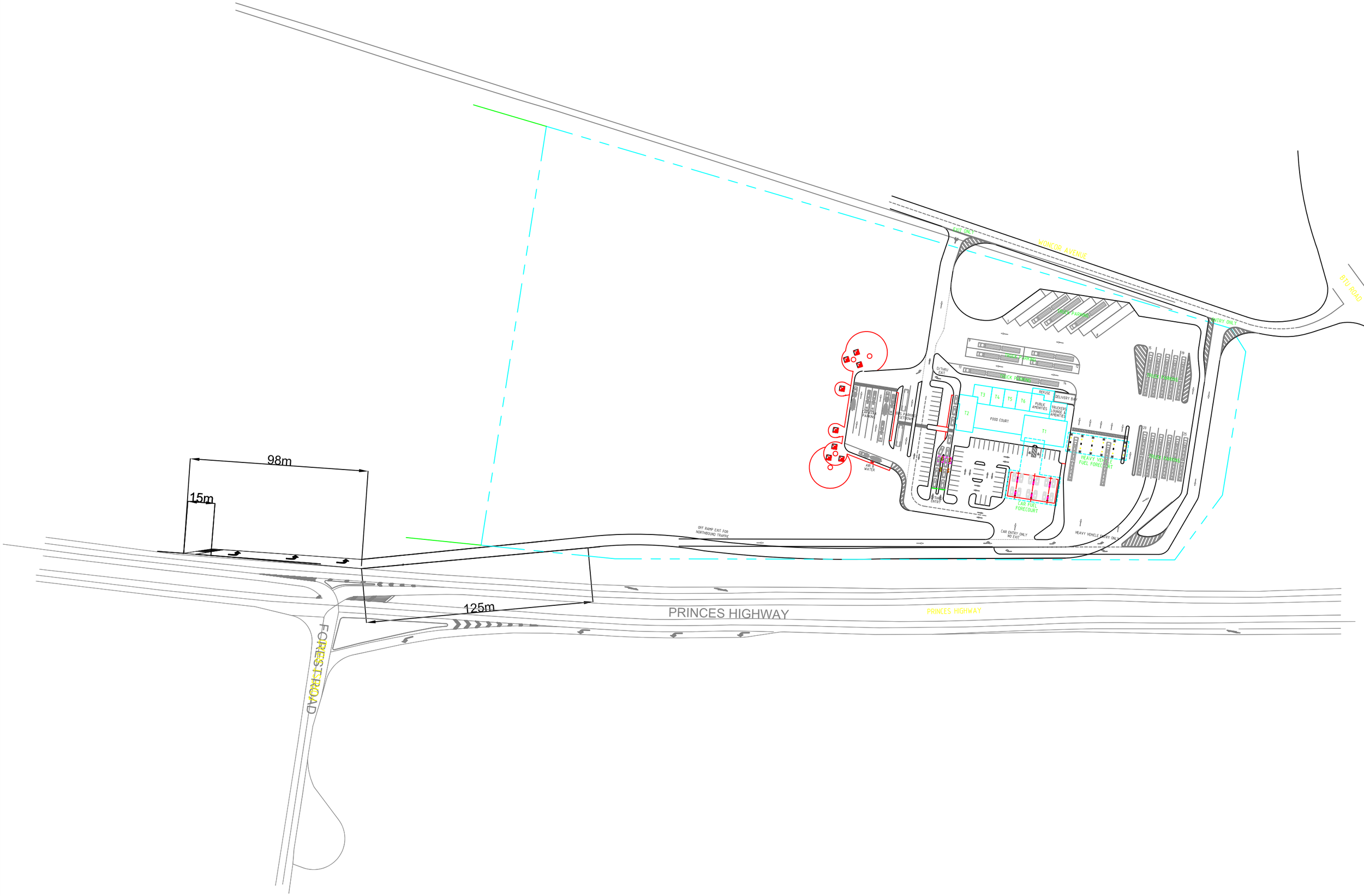
| Code | Date | Drn | Description | Dwn |
|---|---|---|---|---|
| P3 | 11.04.2017 | GN | PRELIMINARY ISSUE FOR INFORMATION | |

Project Description
PROPOSED HIGHWAY SERVICE CENTRE
LOT 2 WONCOR AVENUE, SOUTH NOWRA

Scale 1:500 @ A1 / 1:1000@A3
Approved
Drawn GN
Issued

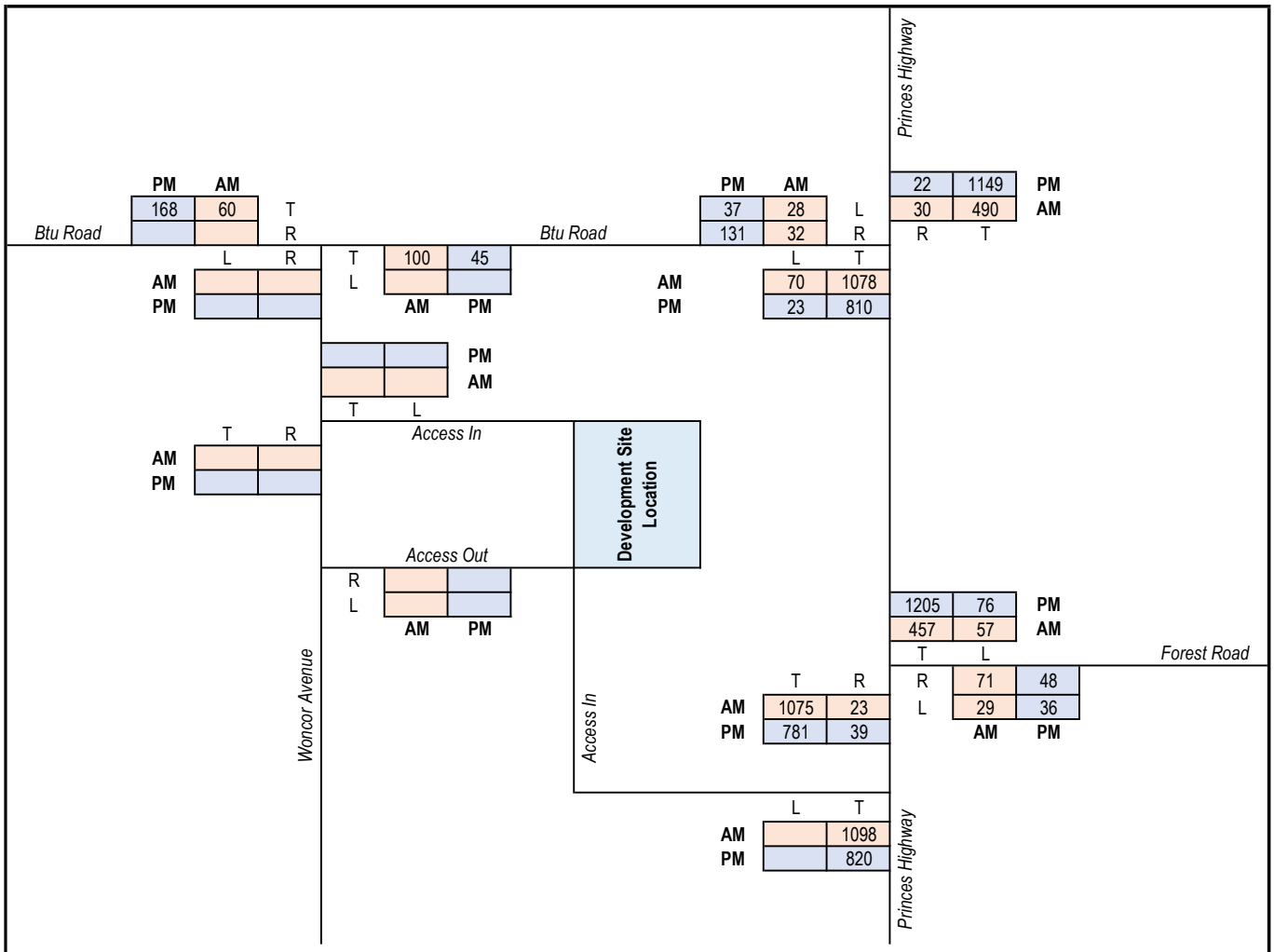
Drawing Title
SITE CONCEPT PLAN
OPTION 4

Drawing Number 16090-SK07
Revision P3


WONCOR AVENUE
EXIT ONLY
ENTRY ONLY
BTU ROAD
PRINCES HIGHWAY
FORREST ROAD
98m
15m
125m
OFF RAMP EXIT FOR NORTHBOUND TRAFFIC
TRUCK PARKING
CAR PARKING
TRUCK PARKING
D/THRU EXIT
REFUSE
DELIVERY BAY
PUBLIC AMENITIES
TRUCKERS LOUNGE & AMENITIES
T1
T2
T3
T4
T5
T6
FOOD COURT
AIR & WATER
CAR FUEL FORECOURT
HEAVY VEHICLE FUEL FORECOURT
CAR PARKING
CAR ENTRY ONLY NO EXIT
HEAVY VEHICLE ENTRY ONLY

# APPENDIX C

# TRAFFIC DIAGRAMS

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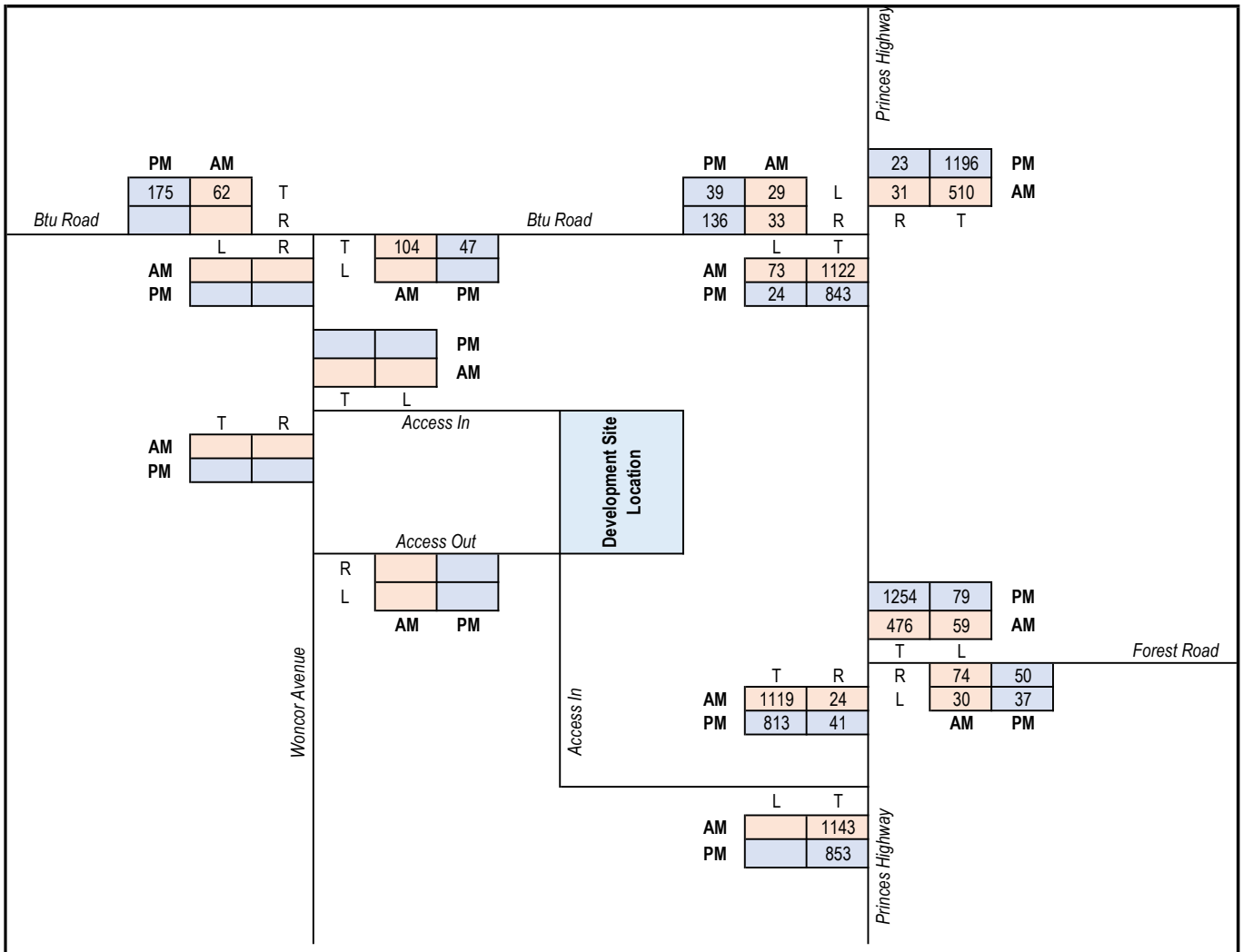
| | |
|---|---|
| Title: | **2013 Surveyed Background Traffic** |
| | *Sheet 1 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |

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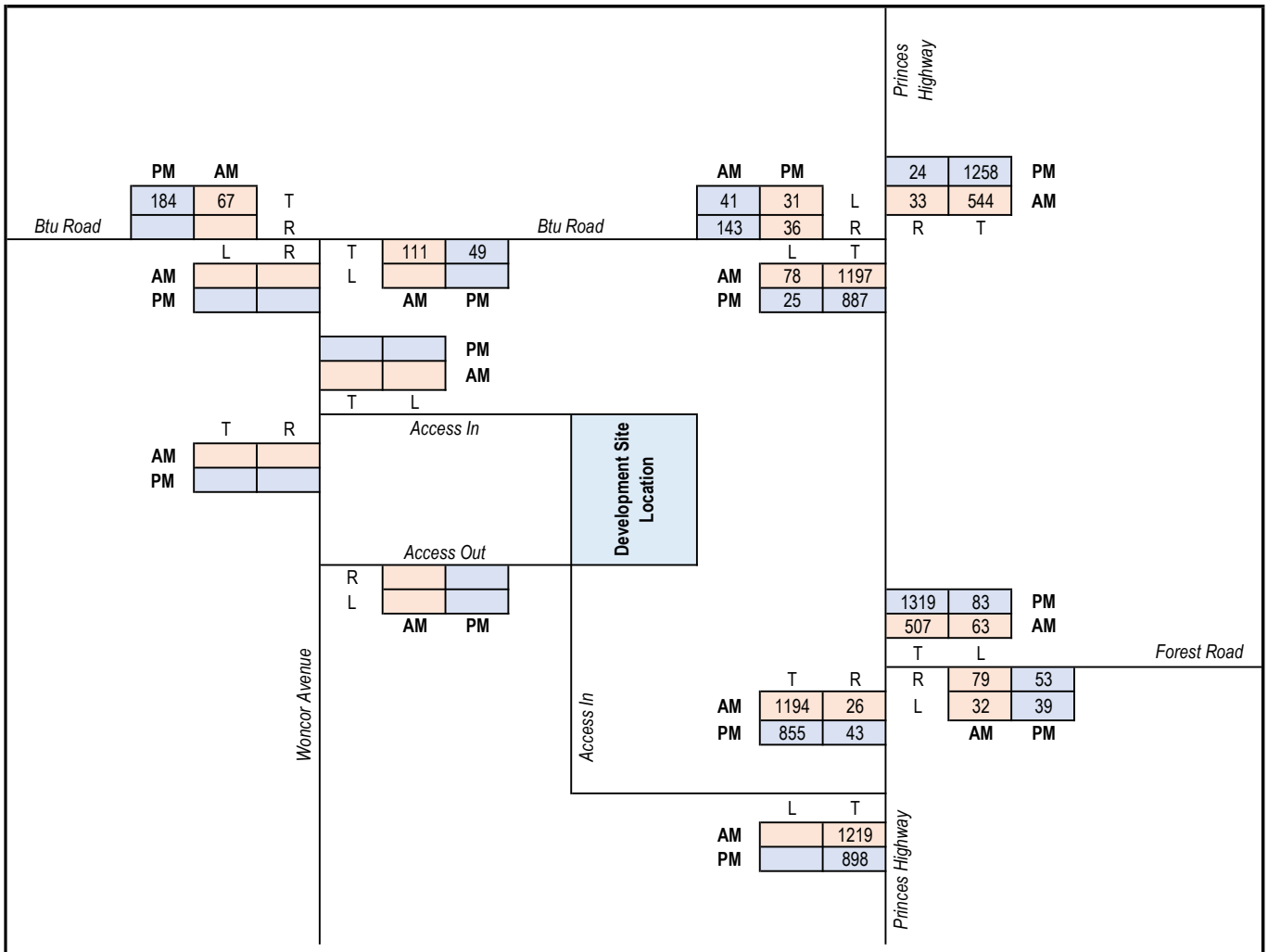
| Title: | **2017 Background Traffic** |
| | *Sheet 2 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |

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|---|---|
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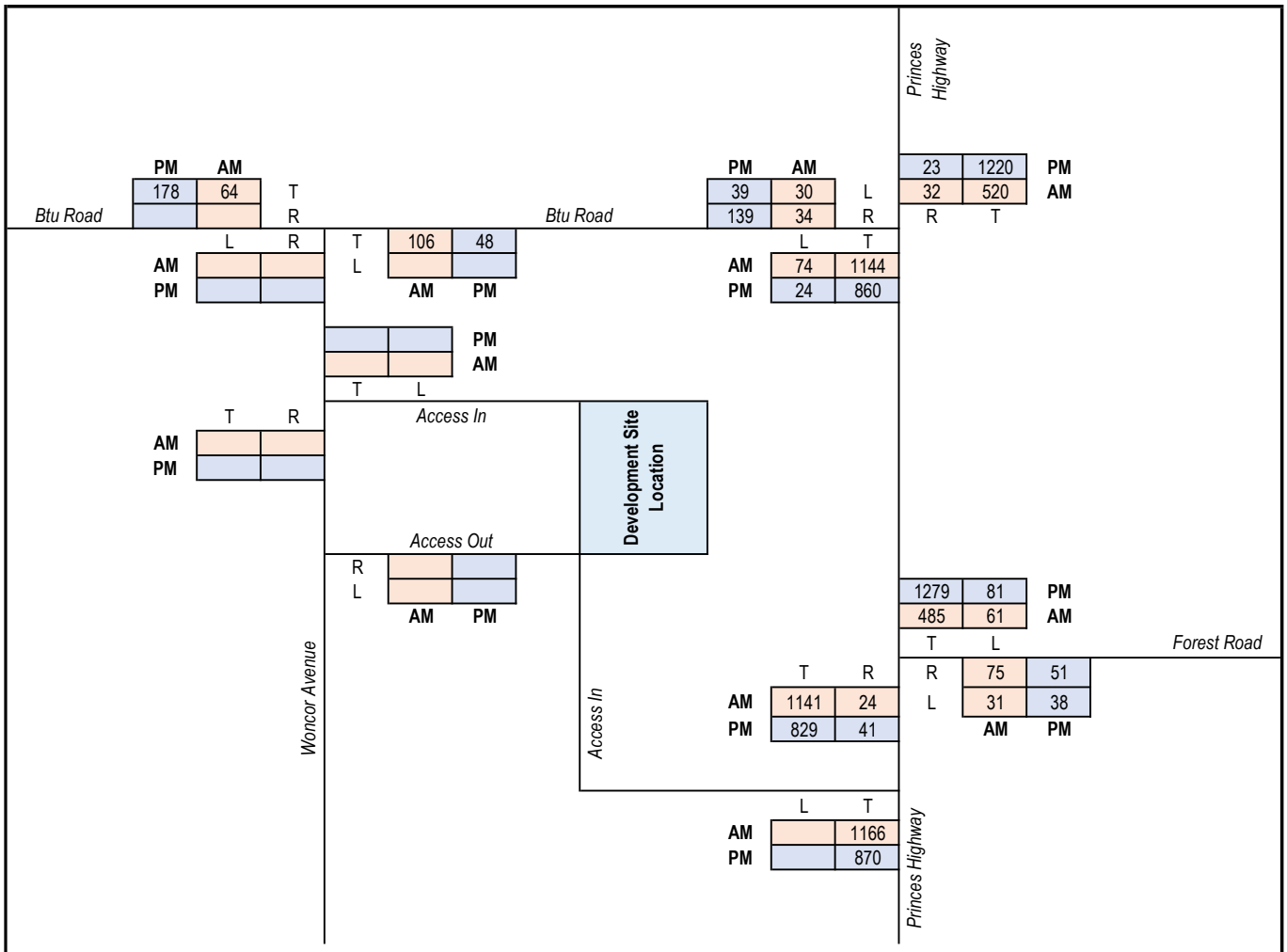
| | *Sheet 3 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |

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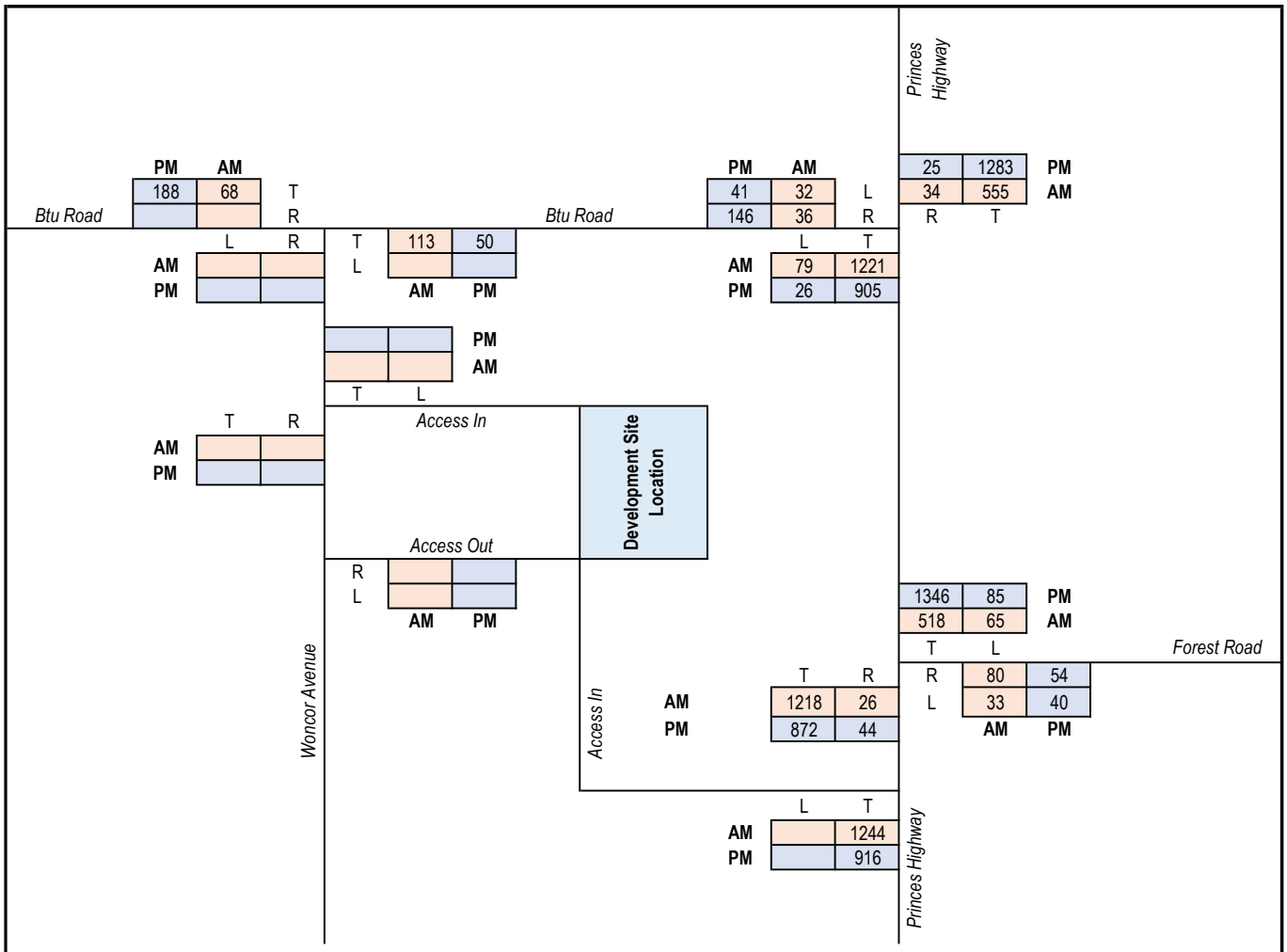
| | |
|---|---|
| Title: | **2019 Background Traffic** |
| | *Sheet 4 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |

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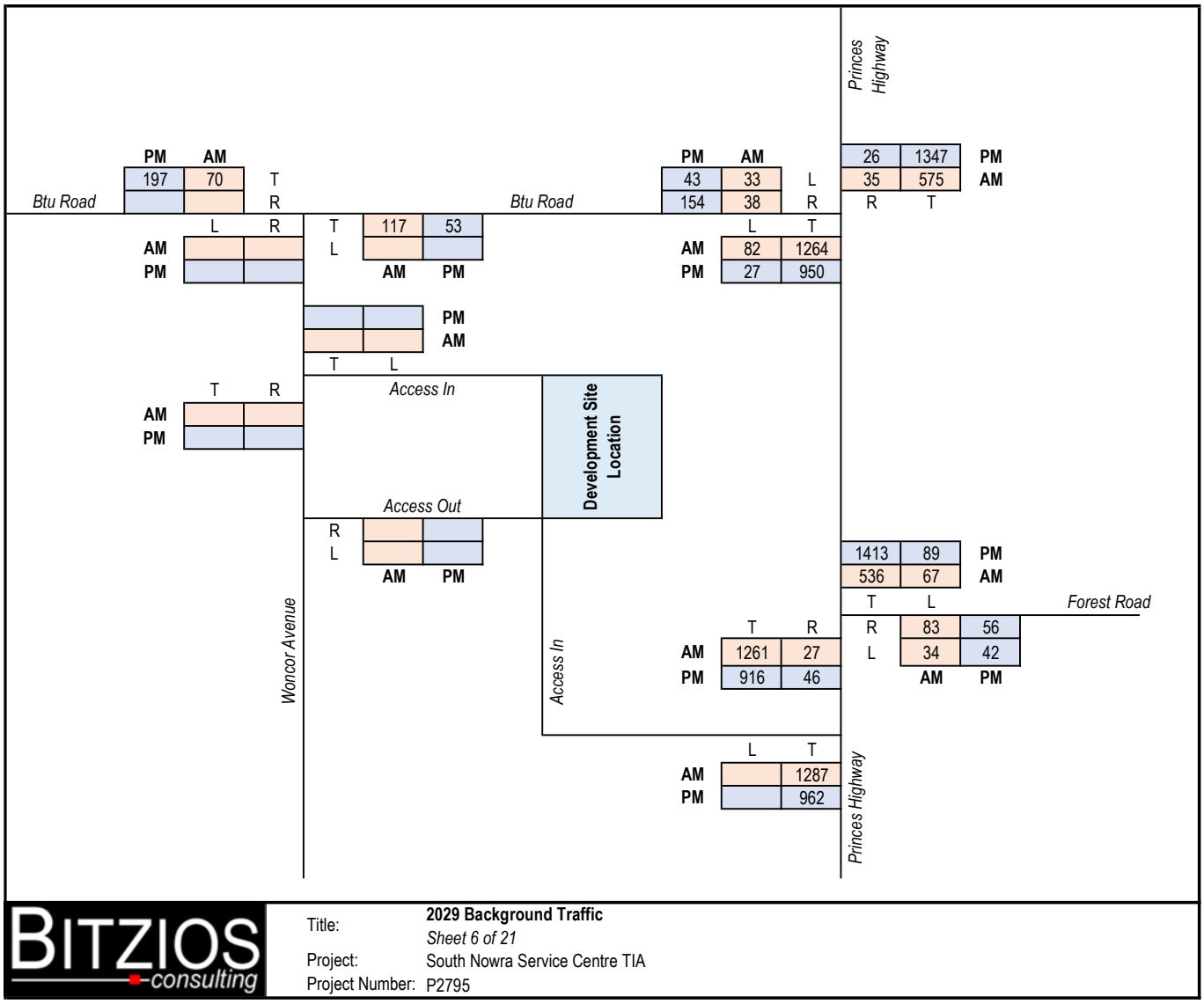
Title: **2019 Background Traffic - Seasonality Adjusted**
*Sheet 5 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795

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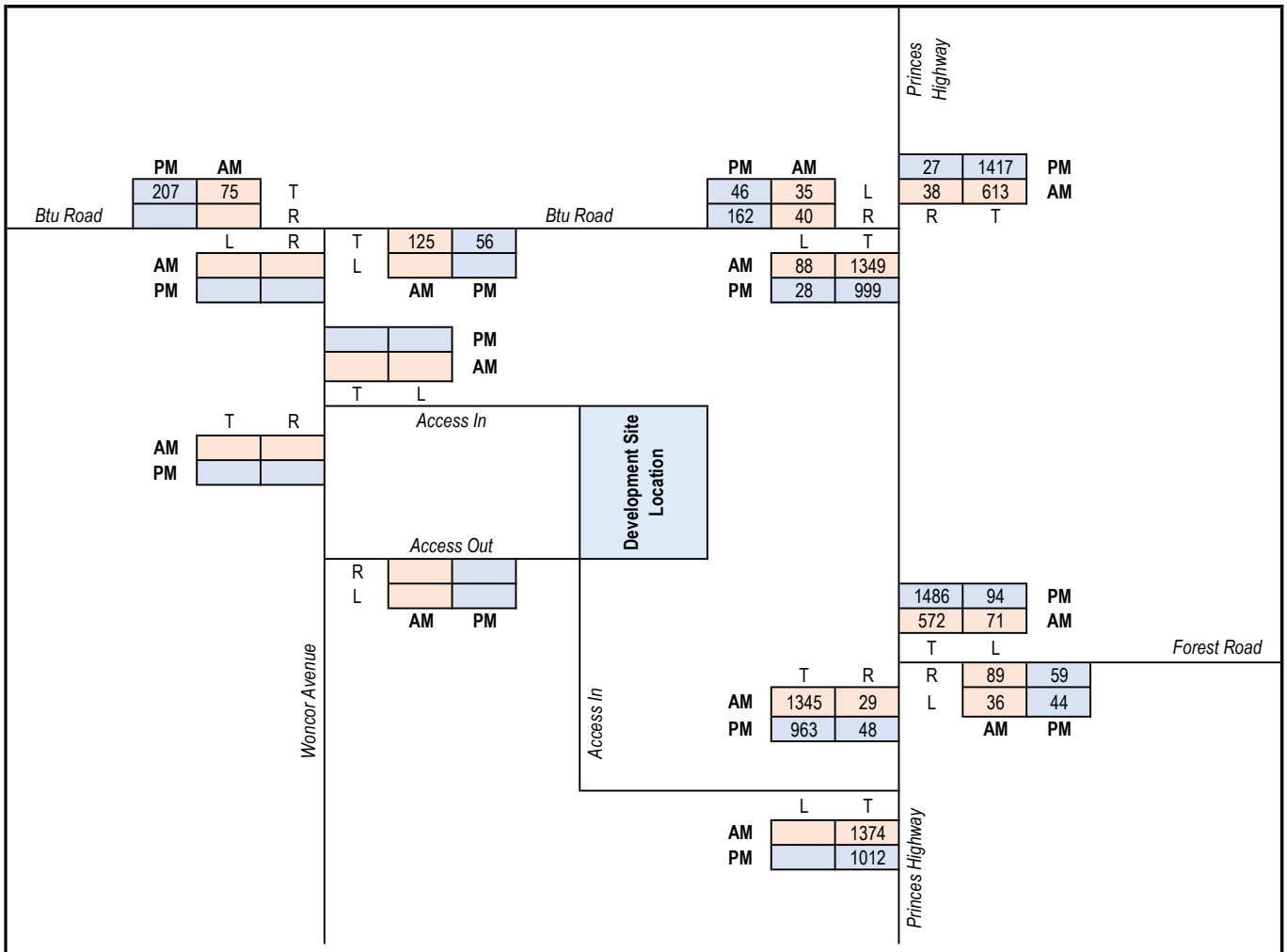
| | |
|---|---|
| Title: | **2029 Background Traffic** |
| | *Sheet 6 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |

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| | |
|---|---|
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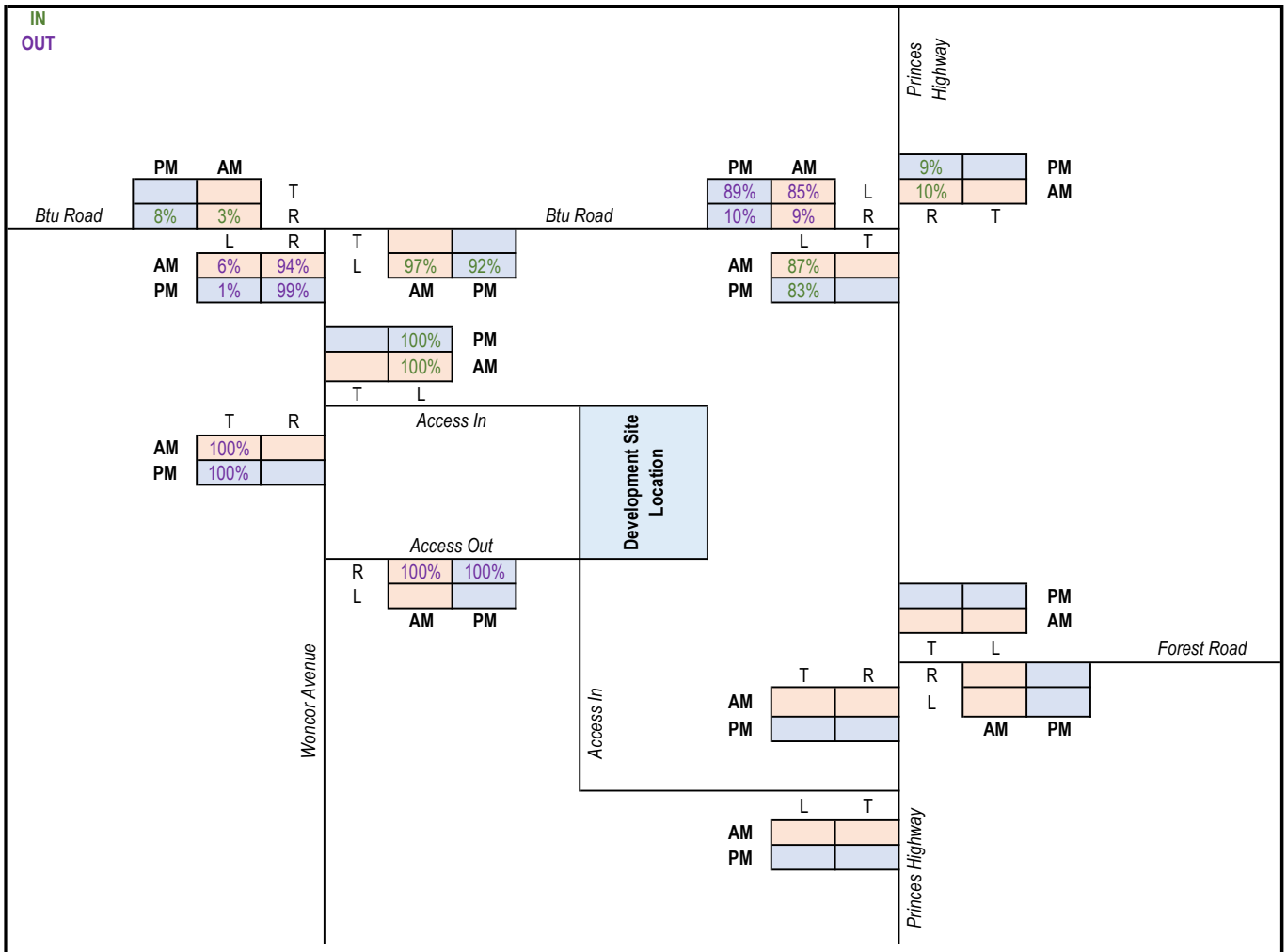
| | *Sheet 7 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |

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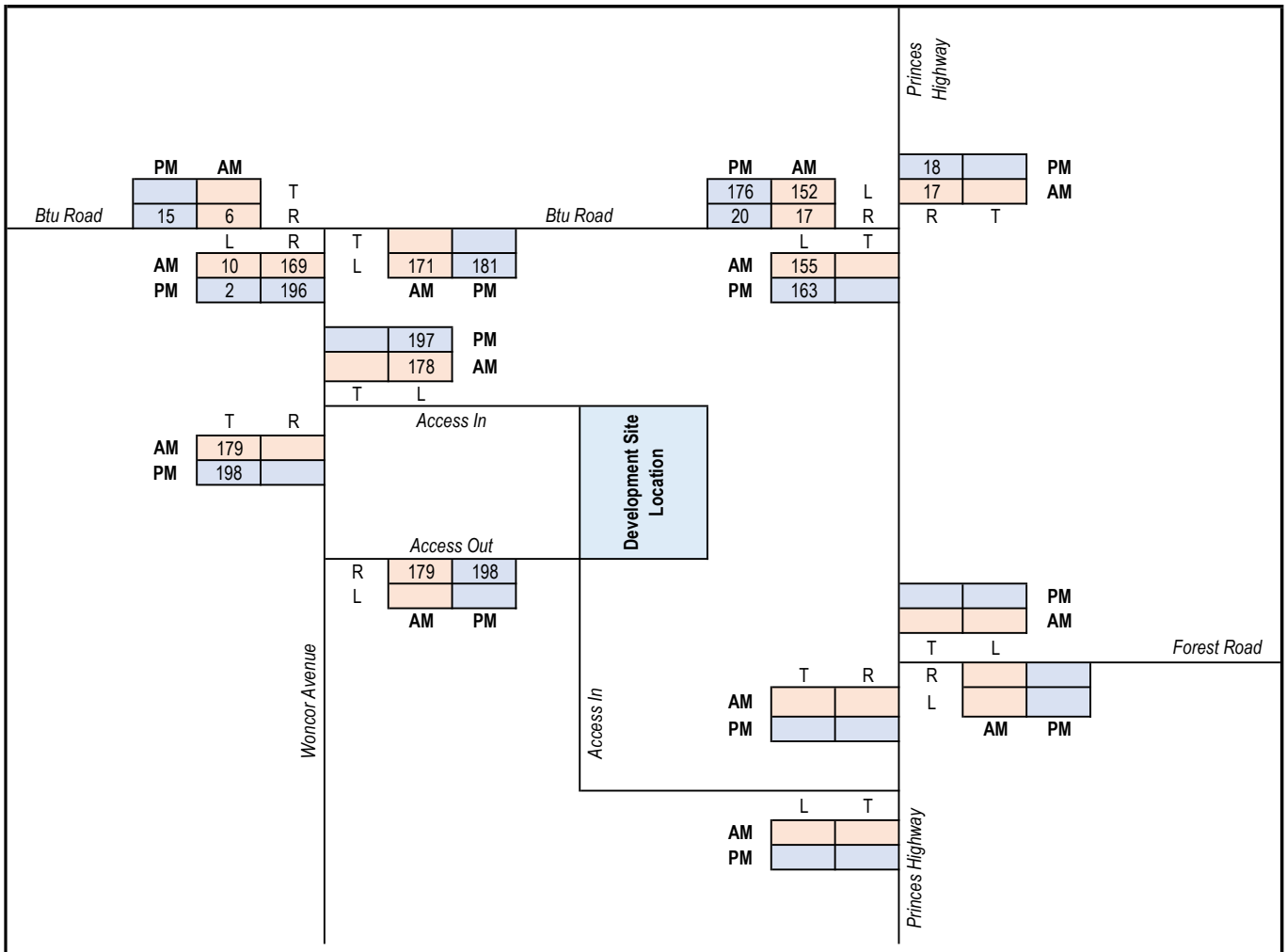
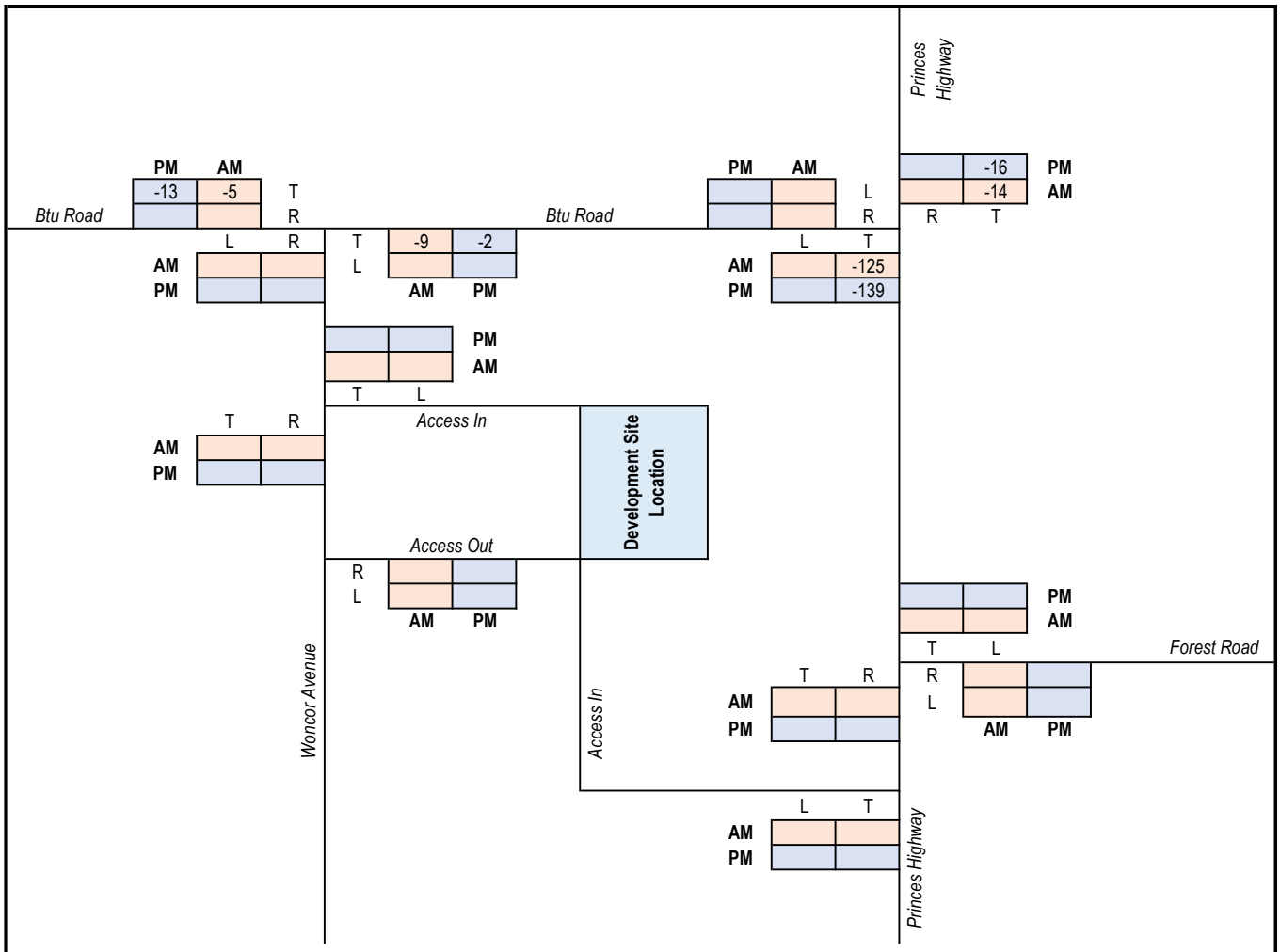
| | |
|---|---|
| Title: | **Development Traffic Distribution** |
| | *Sheet 8 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |



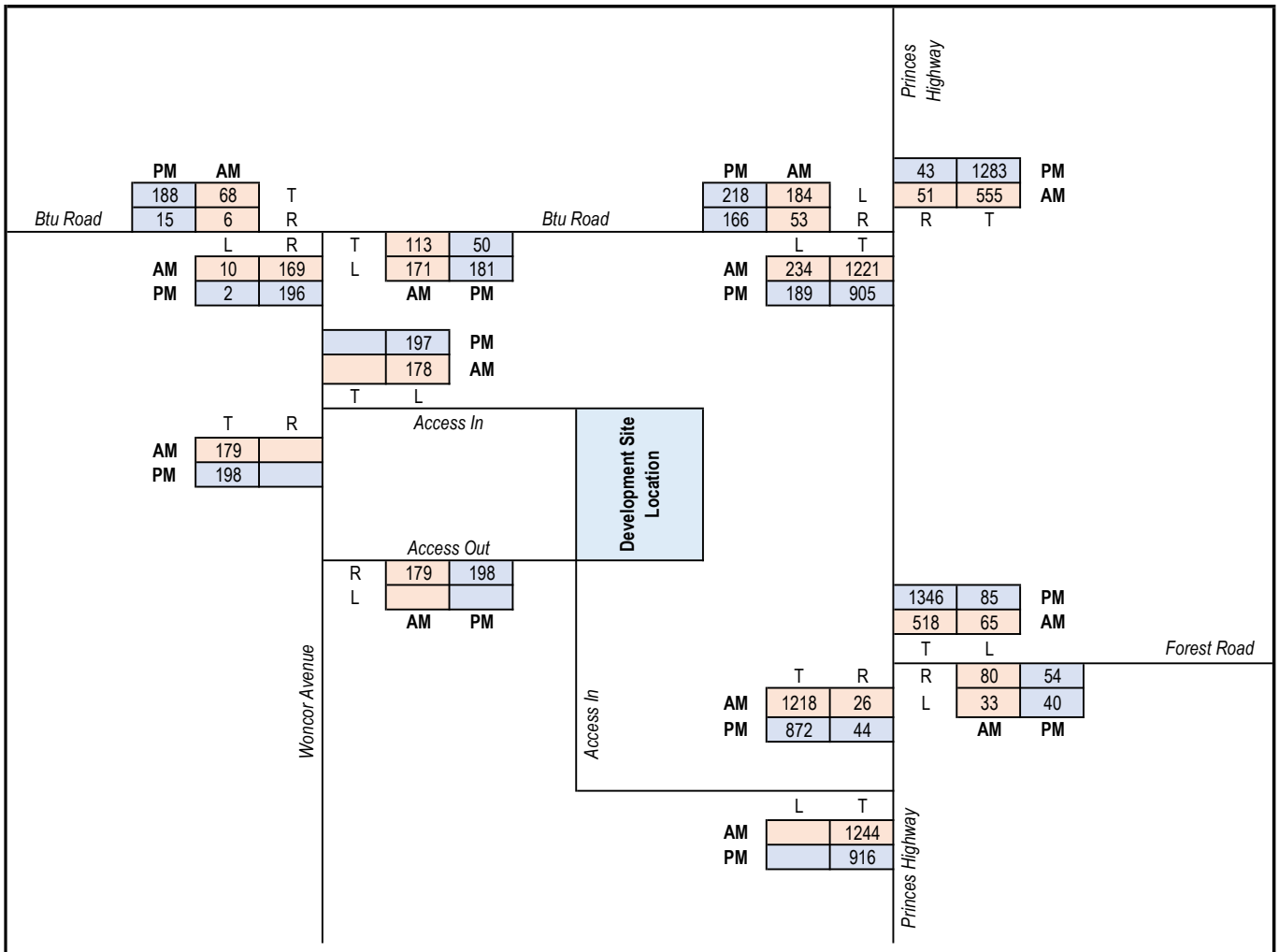

BITZIOS consulting

| | |
|---|---|
| Title: | **Development Trip Generation** |
| | *Sheet 9 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |



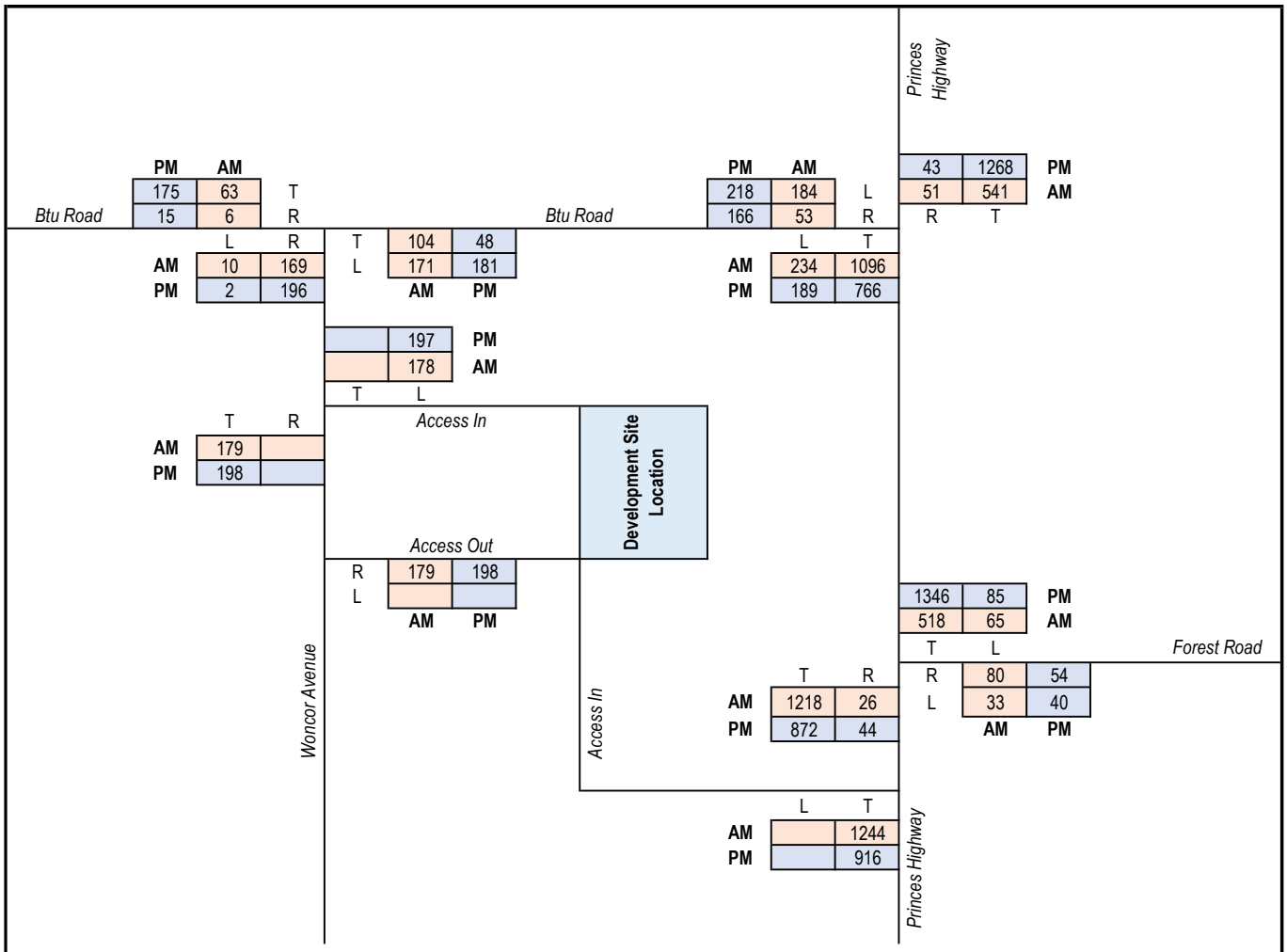

BITZIOS consulting

| | |
|---|---|
| Title: | **Development Pass-By Trip Reduction** |
| | *Sheet 10 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |



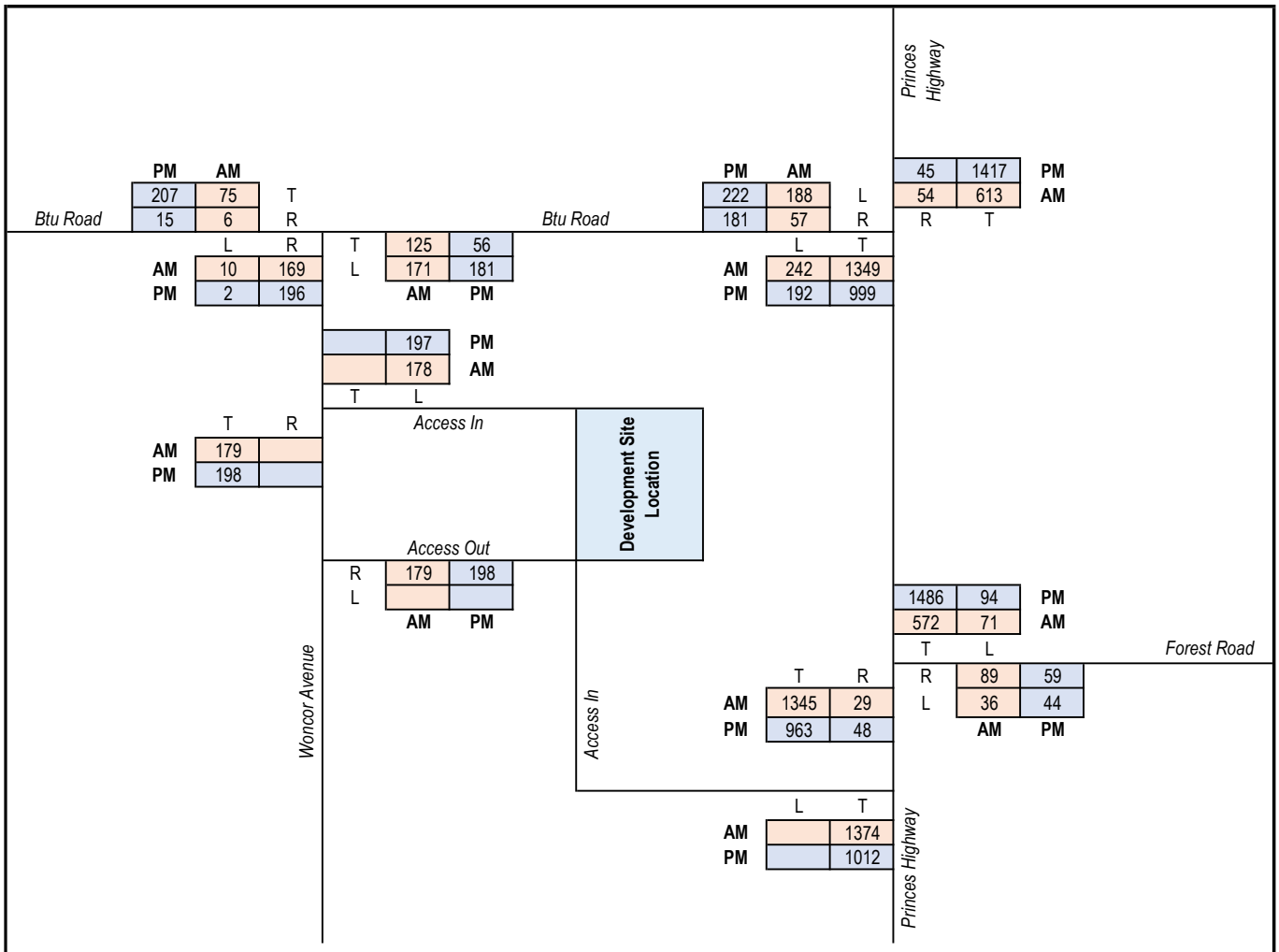

BITZIOS consulting

Title: **2019 Expected Design Traffic**
*Sheet 11 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795



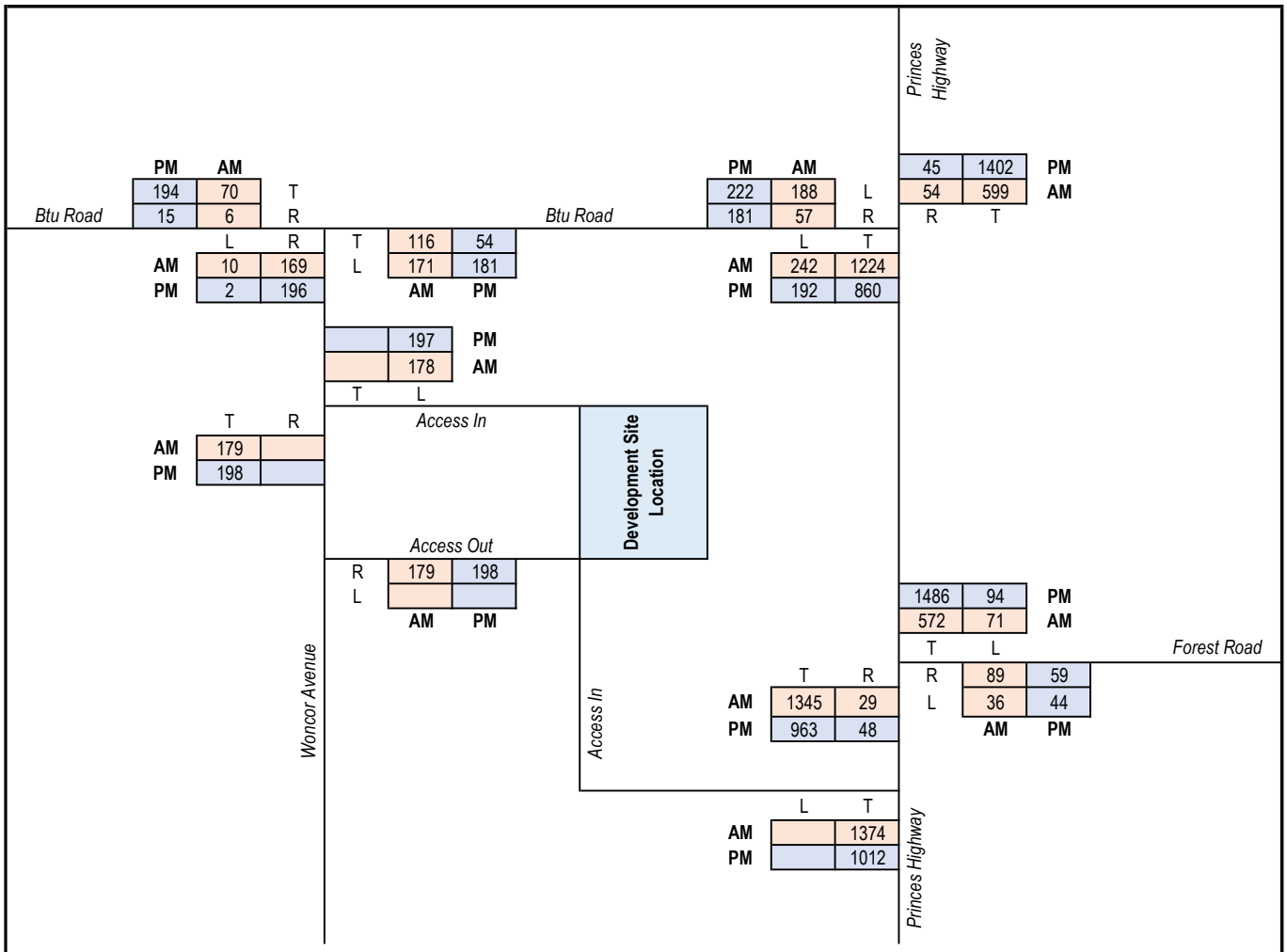

BITZIOS consulting

Title: **2019 Expected Design Traffic with Pass-By Reduction**
*Sheet 12 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795



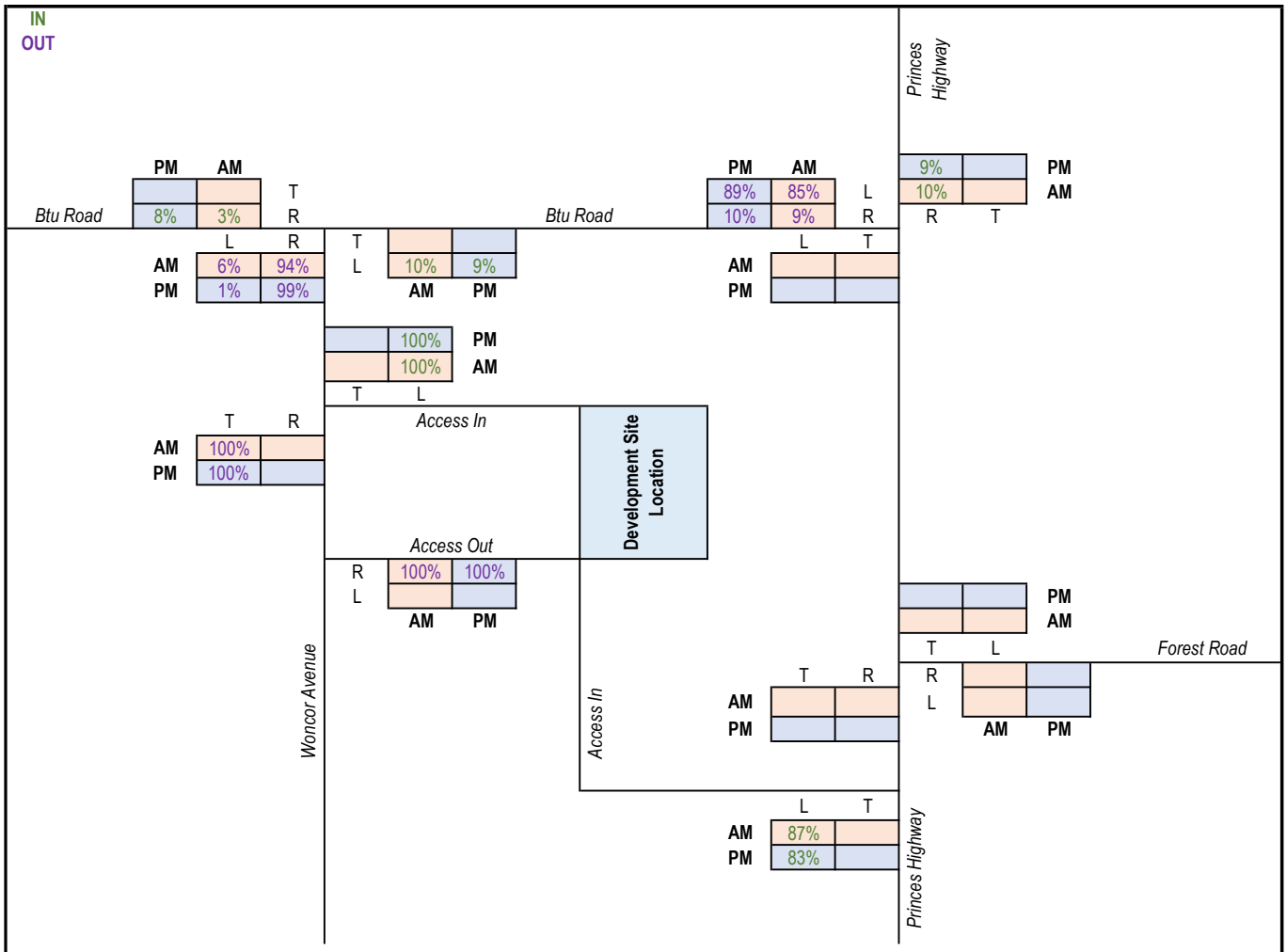

BITZIOS consulting

Title: **2029 Expected Design Traffic**
*Sheet 13 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795



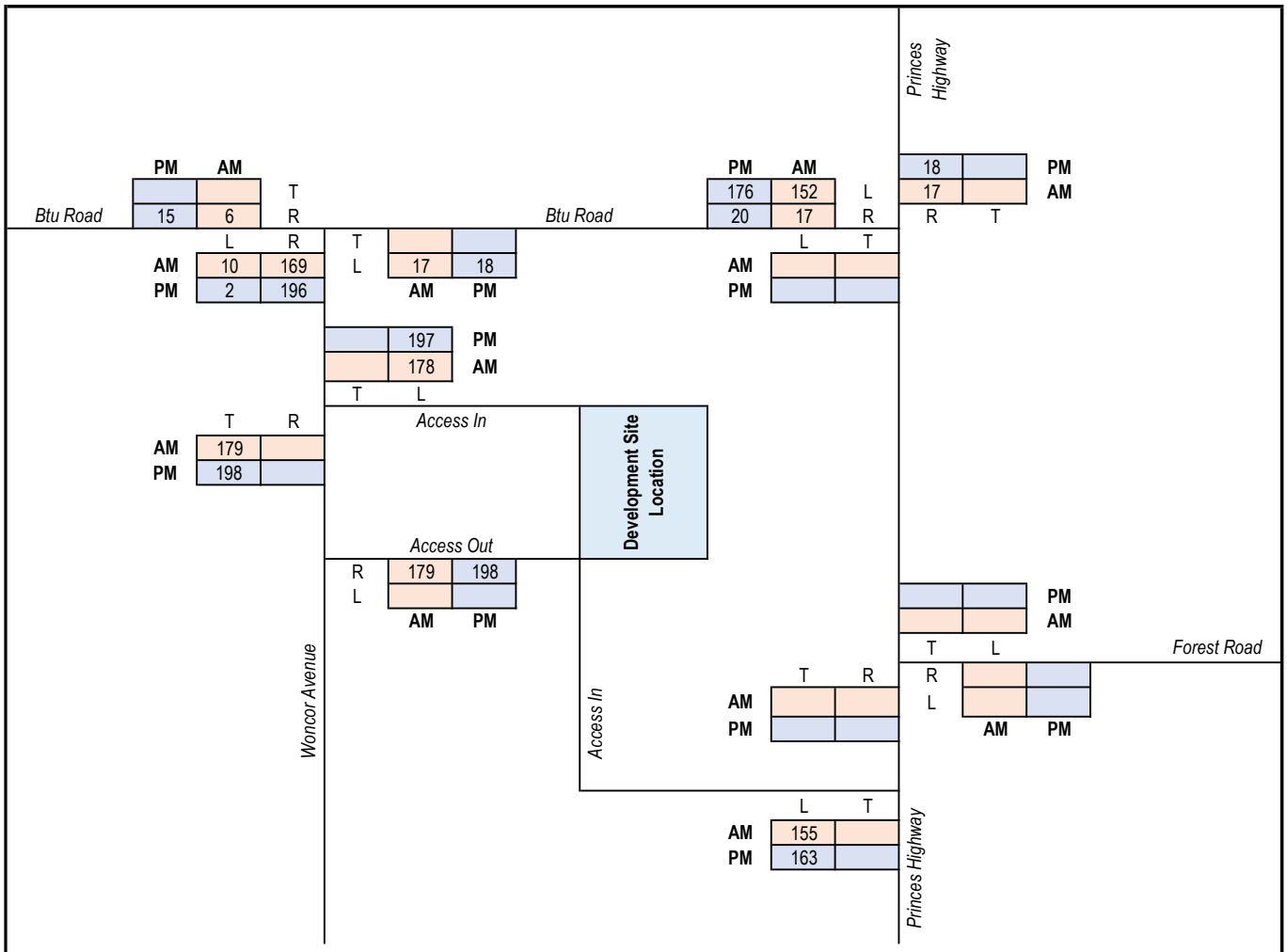

BITZIOS consulting

Title: **2029 Expected Design Traffic with Pass-By Reduction**
*Sheet 14 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795



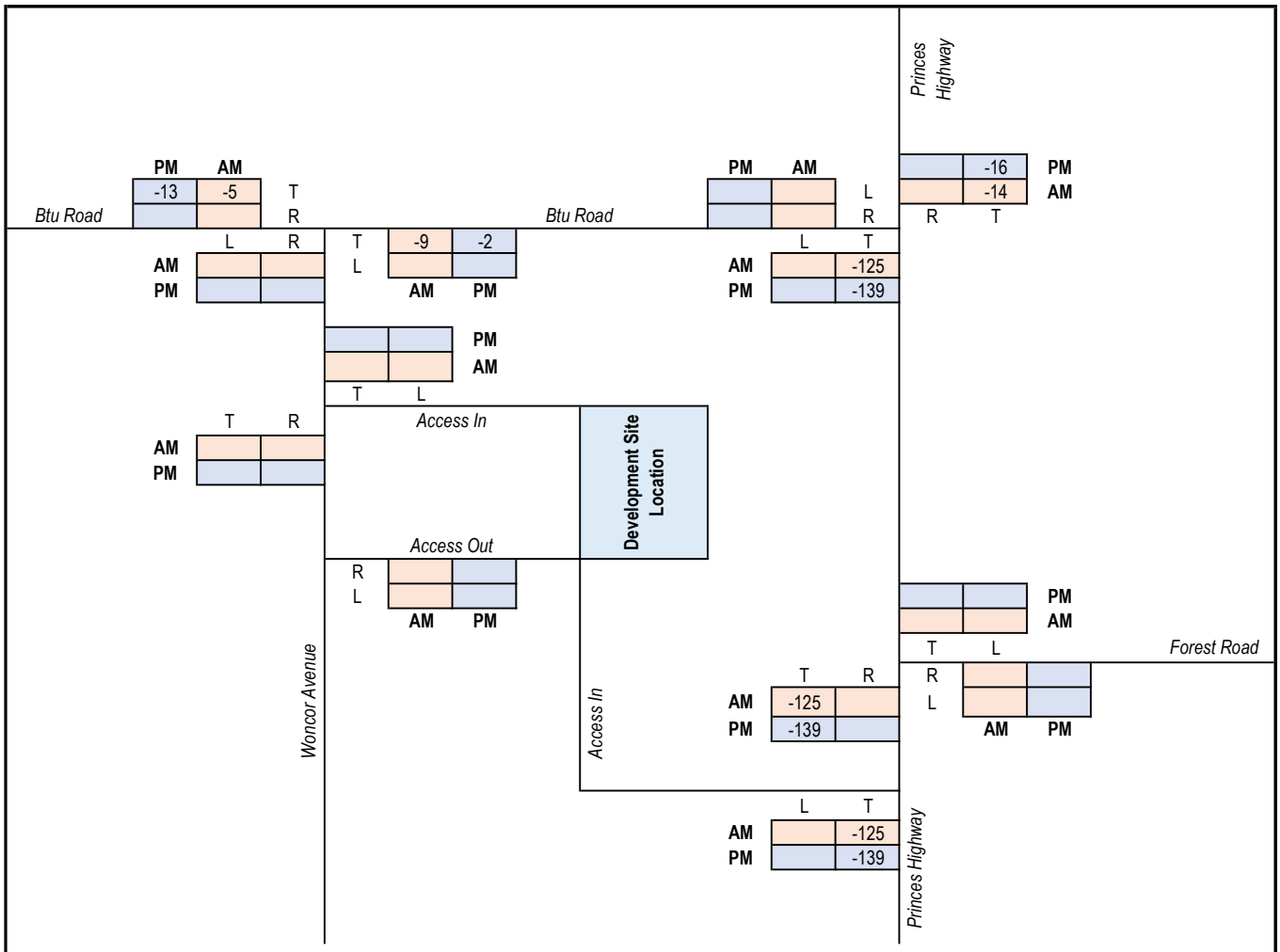

BITZIOS consulting

| | |
|---|---|
| Title: | **Development Traffic Distribution (Ramp Entry)** |
| | *Sheet 15 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |



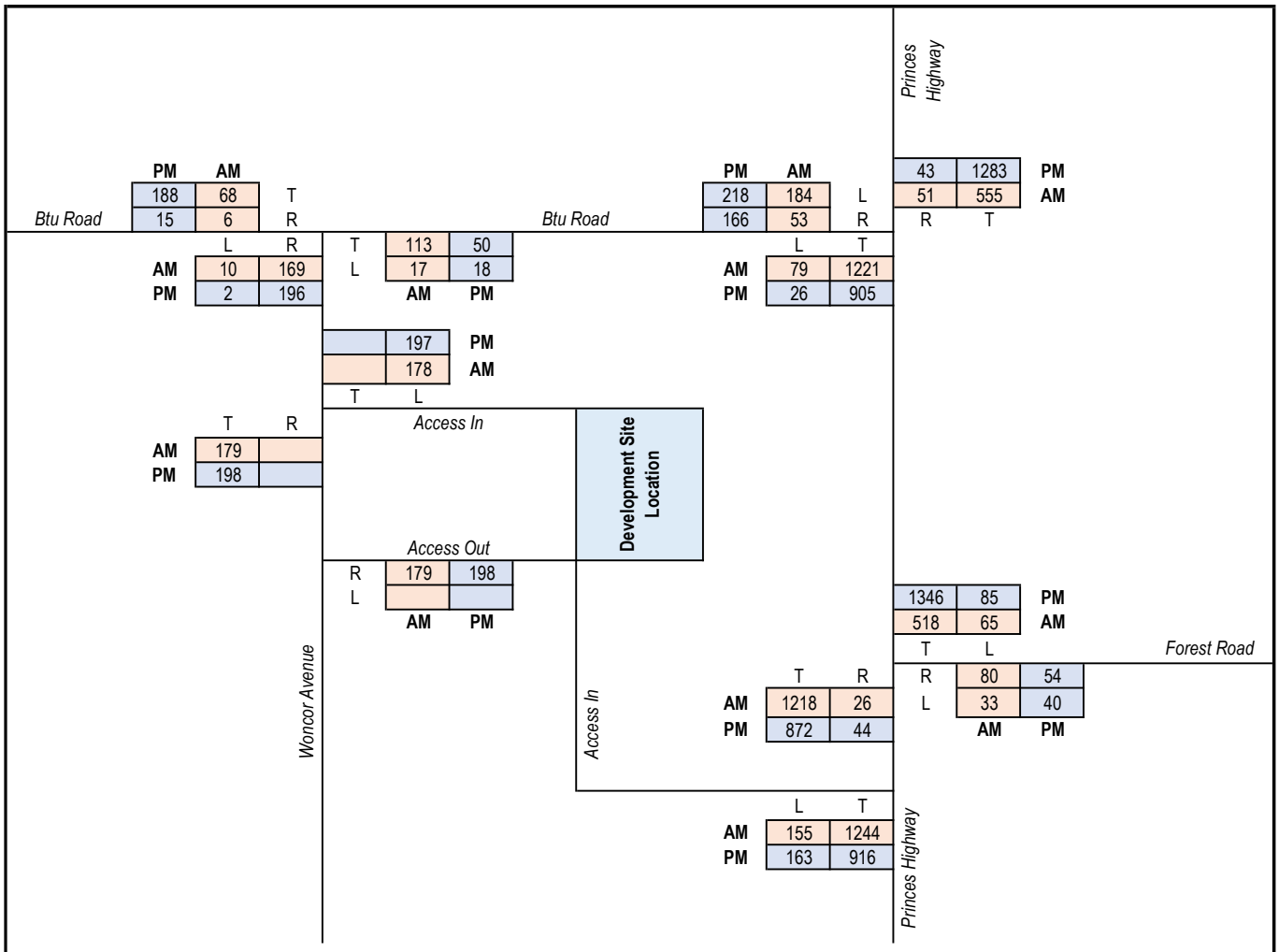

BITZIOS consulting

| | |
|---|---|
| Title: | **Development Trip Generation (Ramp Entry)** |
| | *Sheet 16 of 21* |
| Project: | South Nowra Service Centre TIA |
| Project Number: | P2795 |



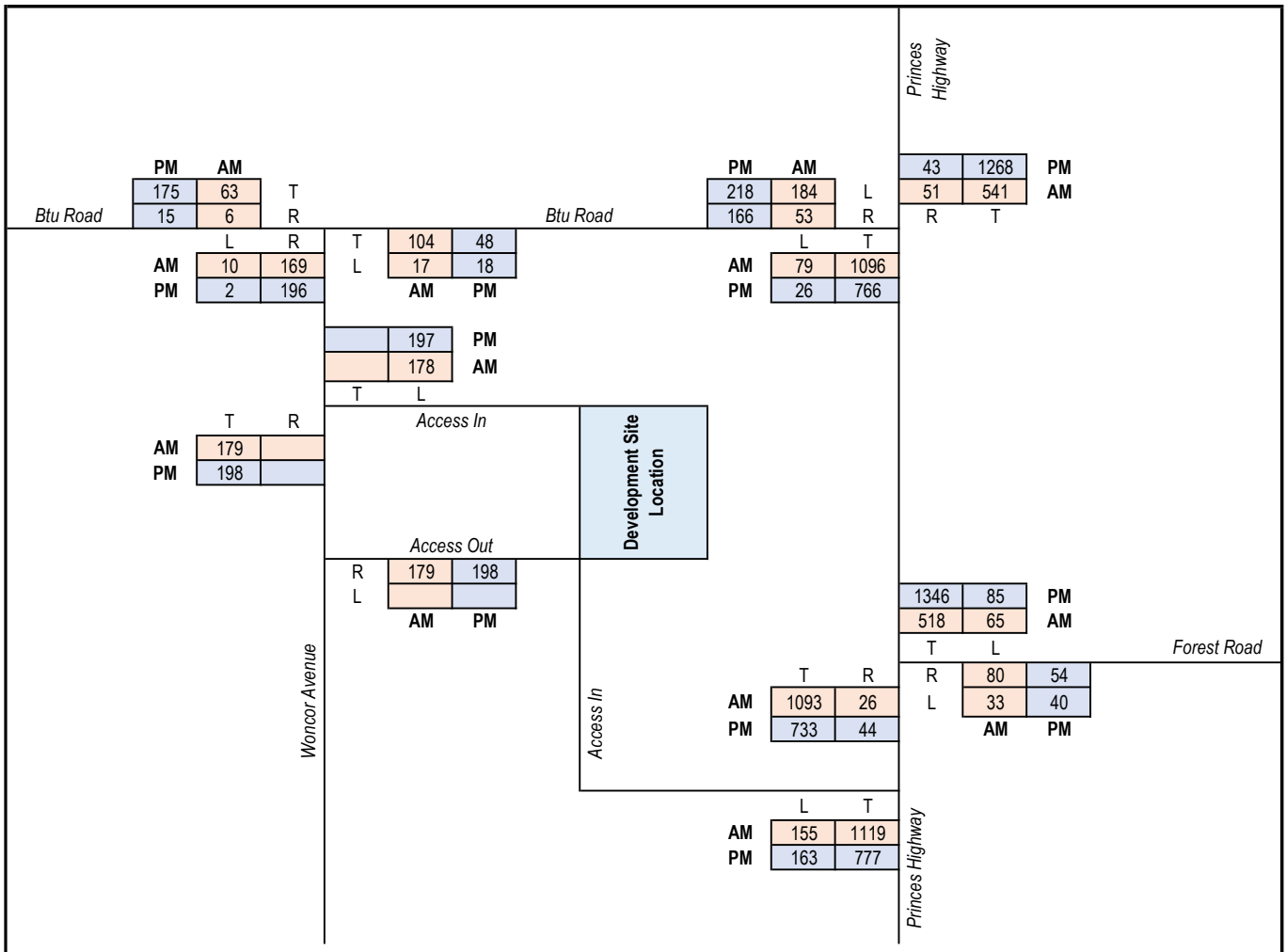

BITZIOS consulting

Title: **Development Pass-By Trip Reduction (Ramp Entry)**
*Sheet 17 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795



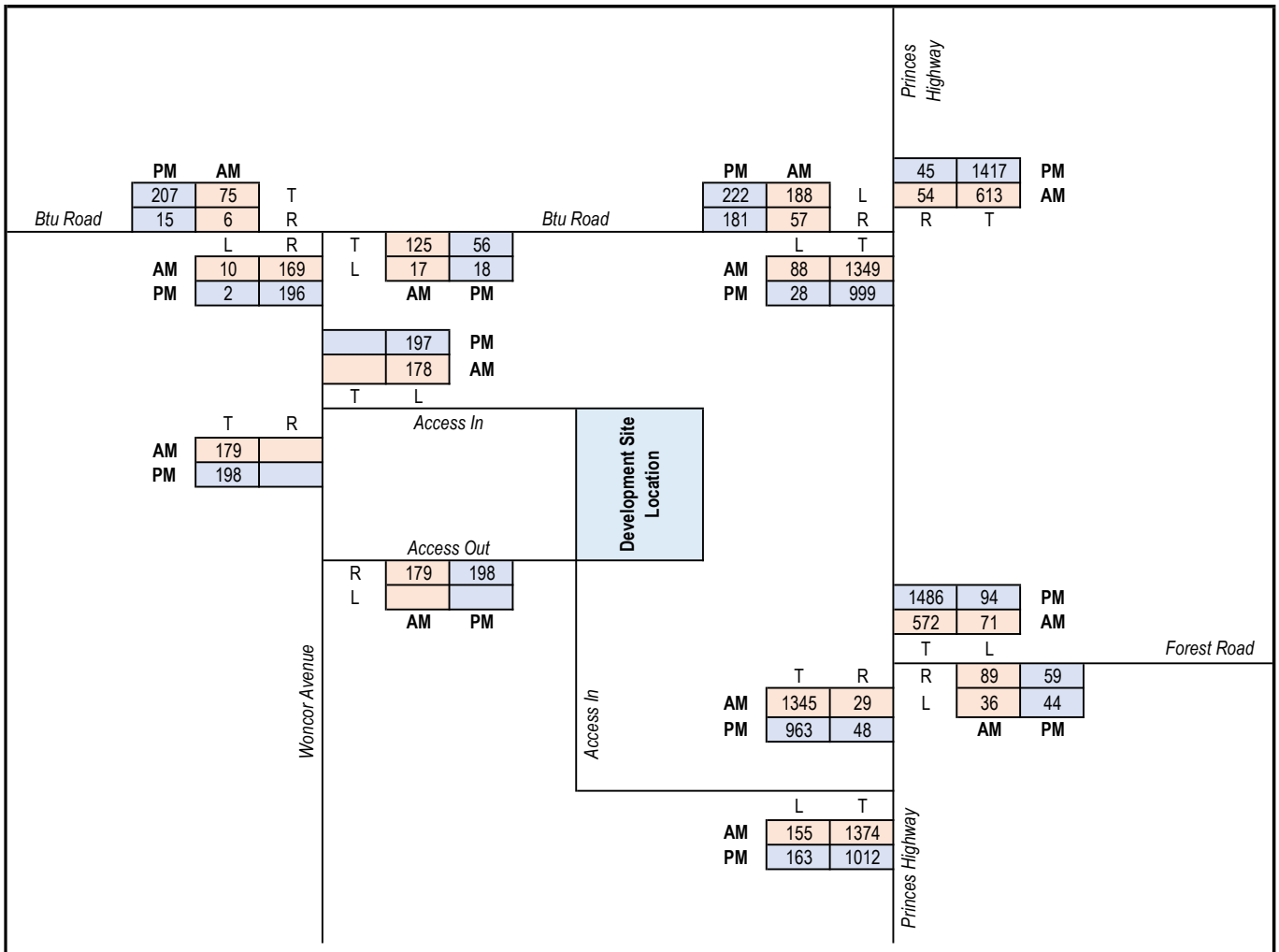

BITZIOS consulting

Title: **2019 Expected Design Traffic (Ramp Entry)**
*Sheet 18 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795



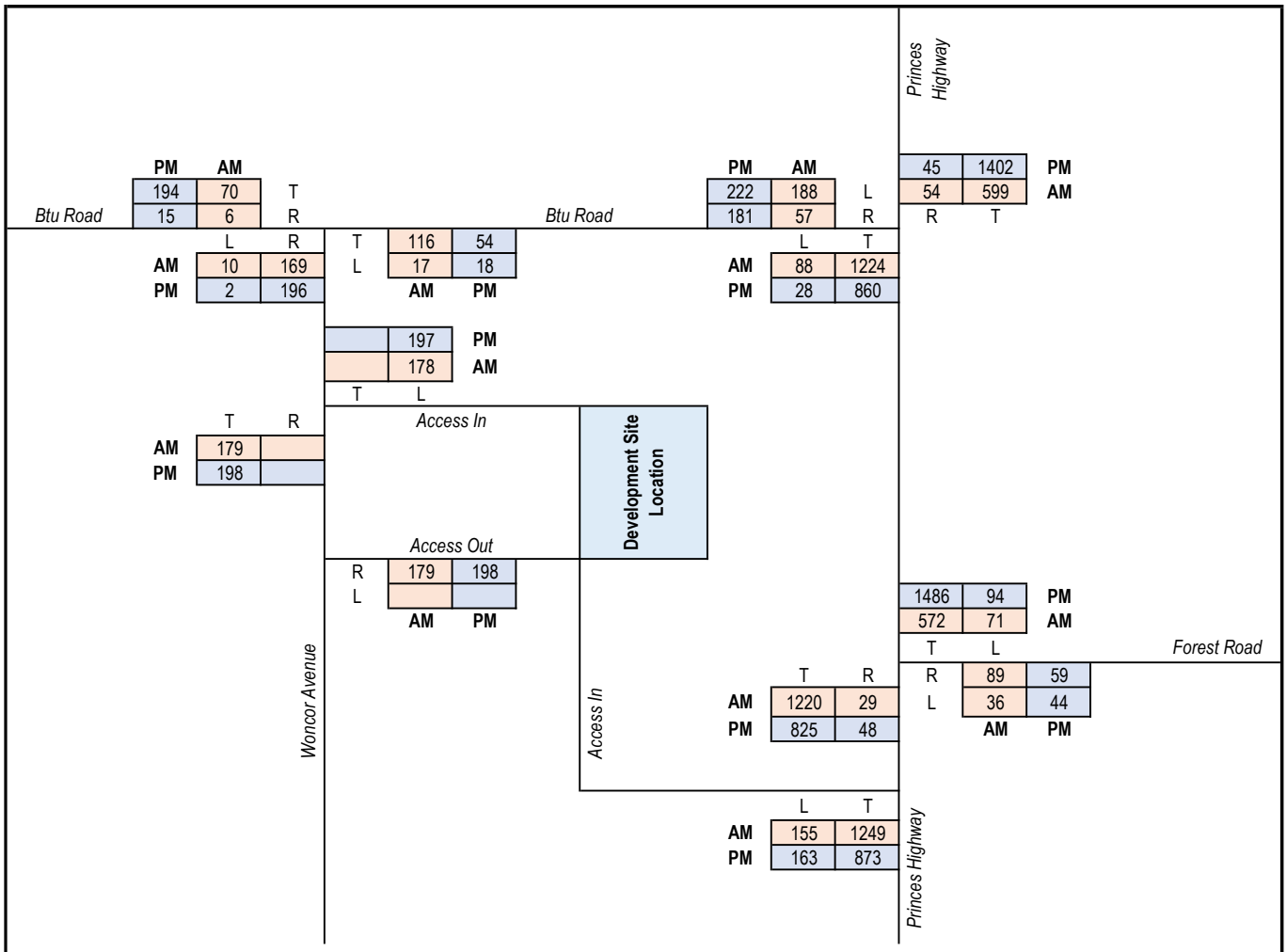

BITZIOS consulting

Title: **2019 Expected Design Traffic with Pass-By Reduction (Ramp Entry)**
*Sheet 19 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795




BITZIOS consulting

Title: **2029 Expected Design Traffic (Ramp Entry)**
*Sheet 20 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795




BITZIOS consulting

Title: **2029 Expected Design Traffic with Pass-By Reduction (Ramp Entry)**
*Sheet 21 of 21*
Project: South Nowra Service Centre TIA
Project Number: P2795

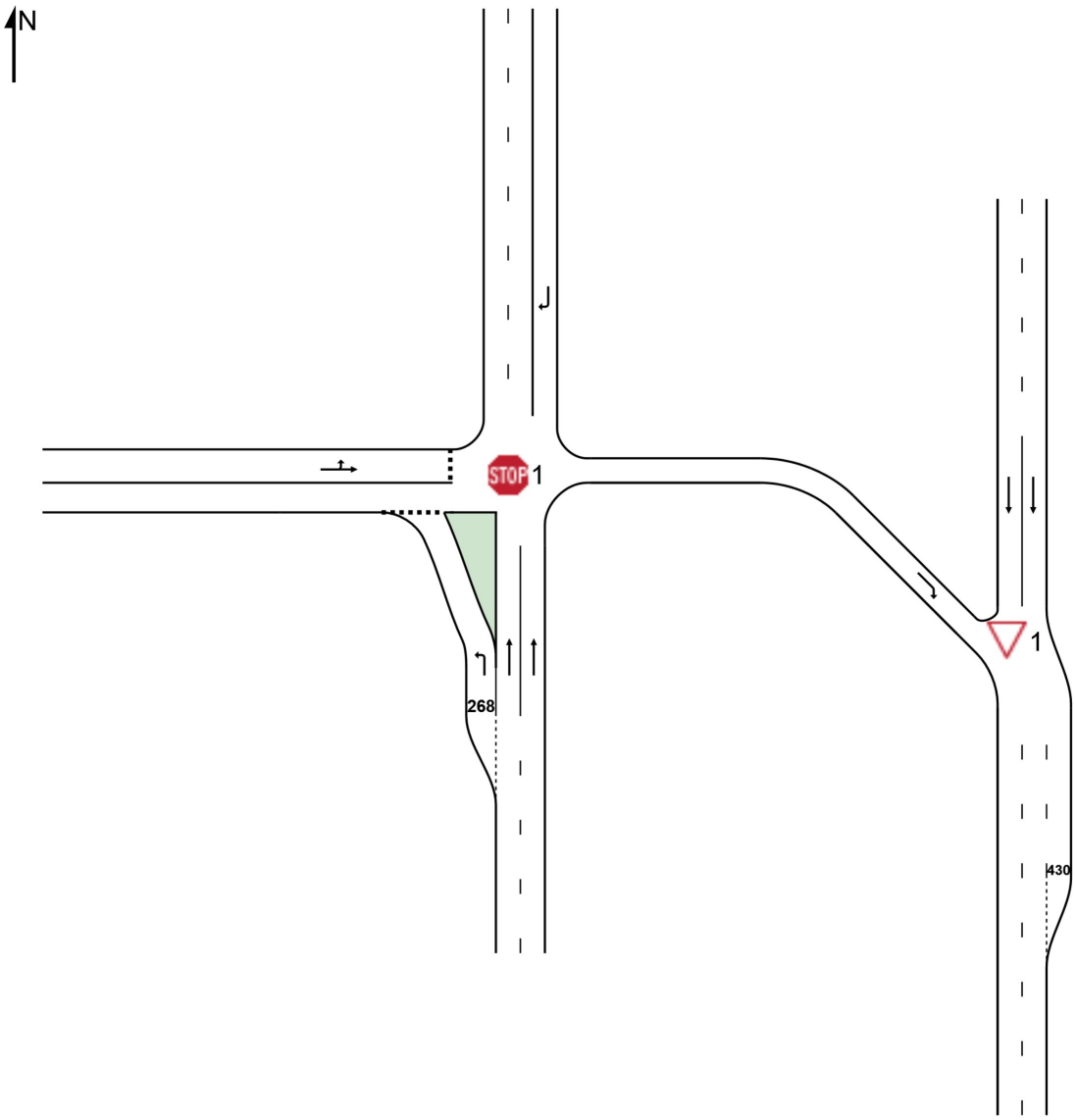
# APPENDIX D

# SIDRA OUTPUTS

# NETWORK LAYOUT

## Network: N101 [2019AM - BG]

New Network




| SITES IN NETWORK | |
|---|---|
| **Site ID** | **Site Name** |
| STOP 1 | 2019 AM Stage 1 \| BG SF |
| ▽1 | 2019 AM Stage 2 \| BG SF |


Organisation: BITZIOS CONSULTING | Created: Tuesday, 25 July 2017 3:32:42 PM
Project: P:\P2795 South Nowra Service Centre TIA\Technical Work\Models\P2795.005M BTU Road _ Princes Highway.sip7

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 1 | BG SF]

## Network: N101 [2019AM - BG]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Background Traffic Volumes
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 83 | 7.0 | 83 | 7.0 | 0.062 | 8.7 | LOS A | 0.3 | 1.9 | 0.12 | 0.60 | 62.5 |
| 5 | T1 | 1285 | 8.0 | 1285 | 8.0 | 0.347 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 1368 | 7.9 | 1368 | 7.9 | 0.347 | 0.6 | LOS A | 0.3 | 1.9 | 0.01 | 0.04 | 94.8 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 36 | 20.0 | 36 | 20.0 | 0.022 | 6.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| Approach | | 36 | 20.0 | 36 | 20.0 | 0.022 | 6.5 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 34 | 21.0 | 34 | 21.0 | 0.336 | 14.4 | LOS B | 1.3 | 10.3 | 0.85 | 0.99 | 35.1 |
| 2 | T1 | 38 | 16.0 | 38 | 16.0 | 0.336 | 36.6 | LOS E | 1.3 | 10.3 | 0.85 | 0.99 | 32.6 |
| Approach | | 72 | 18.4 | 72 | 18.4 | 0.336 | 26.1 | LOS D | 1.3 | 10.3 | 0.85 | 0.99 | 33.9 |
| All Vehicles | | 1476 | 8.7 | 1476 | 8.7 | 0.347 | 2.0 | NA | 1.3 | 10.3 | 0.05 | 0.10 | 87.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 2 | BG SF]

## Network: N101 [2019AM - BG]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Background Traffic Volumes
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total | Demand Flows HV | Arrival Flows Total | Arrival Flows HV | Deg. Satn | Average Delay | Level of Service | 95% Back of Queue Vehicles | 95% Back of Queue Distance | Prop. Queued | Effective Stop Rate | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | per veh | km/h |
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 584 | 19.0 | 584 | 19.0 | 0.168 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 584 | 19.0 | 584 | 19.0 | 0.168 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 38 | 16.0 | 38 | 16.0 | 0.022 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 38 | 16.0 | 38 | 16.0 | 0.022 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 622 | 18.8 | 622 | 18.8 | 0.168 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 98.9 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 1 | BG SF]

## Network: N101 [2019PM - BG]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Background Traffic Volumes
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 27 | 13.0 | 27 | 13.0 | 0.021 | 8.8 | LOS A | 0.1 | 0.6 | 0.11 | 0.60 | 62.3 |
| 5 | T1 | 953 | 13.0 | 953 | 13.0 | 0.265 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 980 | 13.0 | 980 | 13.0 | 0.265 | 0.3 | LOS A | 0.1 | 0.6 | 0.00 | 0.02 | 97.4 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 26 | 54.0 | 26 | 54.0 | 0.020 | 6.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 49.9 |
| Approach | | 26 | 54.0 | 26 | 54.0 | 0.020 | 6.6 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 49.9 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 43 | 32.0 | 43 | 32.0 | 0.609 | 17.0 | LOS C | 3.5 | 28.4 | 0.86 | 1.13 | 35.4 |
| 2 | T1 | 154 | 15.0 | 154 | 15.0 | 0.609 | 26.7 | LOS D | 3.5 | 28.4 | 0.86 | 1.13 | 33.6 |
| Approach | | 197 | 18.7 | 197 | 18.7 | 0.609 | 24.6 | LOS C | 3.5 | 28.4 | 0.86 | 1.13 | 34.0 |
| All Vehicles | | 1203 | 14.8 | 1203 | 14.8 | 0.609 | 4.4 | NA | 3.5 | 28.4 | 0.14 | 0.21 | 76.6 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 2 | BG SF]

## Network: N101 [2019PM - BG]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Background Traffic Volumes
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | 95% Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | per veh | km/h |
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1351 | 8.0 | 1351 | 8.0 | 0.364 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1351 | 8.0 | 1351 | 8.0 | 0.364 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 154 | 15.0 | 154 | 15.0 | 0.089 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| Approach | | 154 | 15.0 | 154 | 15.0 | 0.089 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| All Vehicles | | 1504 | 8.7 | 1504 | 8.7 | 0.364 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 1 | BG SF]

## Network: N101 [2029AM - BG]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Background Traffic Volumes
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 93 | 7.0 | 93 | 7.0 | 0.069 | 8.7 | LOS A | 0.3 | 2.1 | 0.13 | 0.60 | 62.5 |
| 5 | T1 | 1420 | 8.0 | 1420 | 8.0 | 0.383 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1513 | 7.9 | 1513 | 7.9 | 0.383 | 0.6 | LOS A | 0.3 | 2.1 | 0.01 | 0.04 | 94.7 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 40 | 20.0 | 40 | 20.0 | 0.025 | 6.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| Approach | | 40 | 20.0 | 40 | 20.0 | 0.025 | 6.5 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 37 | 21.0 | 37 | 21.0 | 0.500 | 22.3 | LOS C | 2.0 | 15.9 | 0.91 | 1.06 | 29.4 |
| 2 | T1 | 42 | 16.0 | 42 | 16.0 | 0.500 | 55.0 | LOS F | 2.0 | 15.9 | 0.91 | 1.06 | 26.3 |
| Approach | | 79 | 18.3 | 79 | 18.3 | 0.500 | 39.7 | LOS E | 2.0 | 15.9 | 0.91 | 1.06 | 27.9 |
| All Vehicles | | 1632 | 8.7 | 1632 | 8.7 | 0.500 | 2.6 | NA | 2.0 | 15.9 | 0.05 | 0.10 | 85.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 2 | BG SF]

## Network: N101 [2029AM - BG]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Background Traffic Volumes
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total | Demand Flows HV | Arrival Flows Total | Arrival Flows HV | Deg. Satn | Average Delay | Level of Service | 95% Back of Queue Vehicles | 95% Back of Queue Distance | Prop. Queued | Effective Stop Rate | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | per veh | km/h |
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 645 | 19.0 | 645 | 19.0 | 0.186 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 645 | 19.0 | 645 | 19.0 | 0.186 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 42 | 16.0 | 42 | 16.0 | 0.024 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 42 | 16.0 | 42 | 16.0 | 0.024 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 687 | 18.8 | 687 | 18.8 | 0.186 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.03 | 98.9 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 1 | BG SF]

## Network: N101 [2029PM - BG]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Background Traffic Volumes
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 29 | 13.0 | 29 | 13.0 | 0.023 | 8.8 | LOS A | 0.1 | 0.7 | 0.11 | 0.60 | 62.3 |
| 5 | T1 | 1052 | 13.0 | 1052 | 13.0 | 0.292 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 1081 | 13.0 | 1081 | 13.0 | 0.292 | 0.3 | LOS A | 0.1 | 0.7 | 0.00 | 0.02 | 97.4 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 28 | 54.0 | 28 | 54.0 | 0.021 | 6.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 49.9 |
| Approach | | 28 | 54.0 | 28 | 54.0 | 0.021 | 6.6 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 49.9 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 48 | 32.0 | 48 | 32.0 | 0.816 | 31.9 | LOS D | 6.2 | 50.2 | 0.93 | 1.41 | 28.3 |
| 2 | T1 | 171 | 15.0 | 171 | 15.0 | 0.816 | 45.1 | LOS E | 6.2 | 50.2 | 0.93 | 1.41 | 25.4 |
| Approach | | 219 | 18.8 | 219 | 18.8 | 0.816 | 42.2 | LOS E | 6.2 | 50.2 | 0.93 | 1.41 | 26.1 |
| All Vehicles | | 1328 | 14.8 | 1328 | 14.8 | 0.816 | 7.3 | NA | 6.2 | 50.2 | 0.16 | 0.26 | 70.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 2 | BG SF]

## Network: N101 [2029PM - BG]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Background Traffic Volumes
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total | Demand Flows HV | Arrival Flows Total | Arrival Flows HV | Deg. Satn | Average Delay | Level of Service | 95% Back of Queue Vehicles | 95% Back of Queue Distance | Prop. Queued | Effective Stop Rate | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | per veh | km/h |
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1492 | 8.0 | 1492 | 8.0 | 0.402 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1492 | 8.0 | 1492 | 8.0 | 0.402 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 171 | 15.0 | 171 | 15.0 | 0.099 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| Approach | | 171 | 15.0 | 171 | 15.0 | 0.099 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| All Vehicles | | 1662 | 8.7 | 1662 | 8.7 | 0.402 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 1 | DES SF - Do Nothing]

## Network: N101 [2019AM - Do Nothing]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Design Traffic Volumes - Do Nothing Option
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 246 | 7.0 | 246 | 7.0 | 0.187 | 8.8 | LOS A | 0.9 | 6.4 | 0.17 | 0.60 | 62.3 |
| 5 | T1 | 1154 | 8.0 | 1154 | 8.0 | 0.311 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 1400 | 7.8 | 1400 | 7.8 | 0.311 | 1.6 | LOS A | 0.9 | 6.4 | 0.03 | 0.11 | 87.1 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 54 | 20.0 | 54 | 20.0 | 0.033 | 6.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| Approach | | 54 | 20.0 | 54 | 20.0 | 0.033 | 6.5 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 194 | 21.0 | 194 | 21.0 | 0.696 | 19.9 | LOS C | 4.7 | 38.2 | 0.83 | 1.23 | 35.4 |
| 2 | T1 | 56 | 16.0 | 56 | 16.0 | 0.696 | 44.9 | LOS E | 4.7 | 38.2 | 0.83 | 1.23 | 33.0 |
| Approach | | 249 | 19.9 | 249 | 19.9 | 0.696 | 25.5 | LOS D | 4.7 | 38.2 | 0.83 | 1.23 | 35.0 |
| All Vehicles | | 1703 | 10.0 | 1703 | 10.0 | 0.696 | 5.2 | NA | 4.7 | 38.2 | 0.15 | 0.29 | 72.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 2 | DES SF - Do Nothing]

## Network: N101 [2019AM - Do Nothing]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Design Traffic Volumes - Do Nothing Option
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 569 | 19.0 | 569 | 19.0 | 0.164 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 569 | 19.0 | 569 | 19.0 | 0.164 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 56 | 16.0 | 56 | 16.0 | 0.032 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 56 | 16.0 | 56 | 16.0 | 0.032 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 625 | 18.7 | 625 | 18.7 | 0.164 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 1 | DES SF - Do Nothing]

## Network: N101 [2019PM - Do Nothing]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Design Traffic Volumes - Do Nothing Option
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 199 | 7.0 | 199 | 7.0 | 0.150 | 8.7 | LOS A | 0.7 | 4.9 | 0.15 | 0.60 | 62.4 |
| 5 | T1 | 806 | 8.0 | 806 | 8.0 | 0.217 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 1005 | 7.8 | 1005 | 7.8 | 0.217 | 1.7 | LOS A | 0.7 | 4.9 | 0.03 | 0.12 | 85.9 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 45 | 20.0 | 45 | 20.0 | 0.028 | 6.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| Approach | | 45 | 20.0 | 45 | 20.0 | 0.028 | 6.5 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 229 | 21.0 | 229 | 21.0 | 0.843 | 23.5 | LOS C | 10.3 | 83.6 | 0.83 | 1.56 | 33.9 |
| 2 | T1 | 175 | 16.0 | 175 | 16.0 | 0.843 | 35.3 | LOS E | 10.3 | 83.6 | 0.83 | 1.56 | 31.3 |
| Approach | | 404 | 18.8 | 404 | 18.8 | 0.843 | 28.6 | LOS D | 10.3 | 83.6 | 0.83 | 1.56 | 32.9 |
| All Vehicles | | 1455 | 11.2 | 1455 | 11.2 | 0.843 | 9.4 | NA | 10.3 | 83.6 | 0.25 | 0.54 | 61.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 2 | DES SF - Do Nothing]

## Network: N101 [2019PM - Do Nothing]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Design Traffic Volumes - Do Nothing Option
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1335 | 19.0 | 1335 | 19.0 | 0.385 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1335 | 19.0 | 1335 | 19.0 | 0.385 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 175 | 16.0 | 175 | 16.0 | 0.102 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 175 | 16.0 | 175 | 16.0 | 0.102 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 1509 | 18.7 | 1509 | 18.7 | 0.385 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 97.7 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 1 | DES SF - Do Nothing]

## Network: N101 [2029AM - Do Nothing]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Design Traffic Volumes - Do Nothing Option
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 255 | 7.0 | 255 | 7.0 | 0.194 | 8.8 | LOS A | 0.9 | 6.6 | 0.18 | 0.60 | 62.3 |
| 5 | T1 | 1288 | 8.0 | 1288 | 8.0 | 0.348 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1543 | 7.8 | 1543 | 7.8 | 0.348 | 1.5 | LOS A | 0.9 | 6.6 | 0.03 | 0.10 | 87.7 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 57 | 20.0 | 57 | 20.0 | 0.035 | 6.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| Approach | | 57 | 20.0 | 57 | 20.0 | 0.035 | 6.5 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 198 | 21.0 | 198 | 21.0 | 0.915 | 48.6 | LOS E | 9.9 | 81.4 | 0.92 | 1.78 | 24.4 |
| 2 | T1 | 60 | 16.0 | 60 | 16.0 | 0.915 | 84.8 | LOS F | 9.9 | 81.4 | 0.92 | 1.78 | 21.2 |
| Approach | | 258 | 19.8 | 258 | 19.8 | 0.915 | 57.0 | LOS F | 9.9 | 81.4 | 0.92 | 1.78 | 23.7 |
| All Vehicles | | 1858 | 9.9 | 1858 | 9.9 | 0.915 | 9.3 | NA | 9.9 | 81.4 | 0.15 | 0.35 | 65.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 2 | DES SF - Do Nothing]

## Network: N101 [2029AM - Do Nothing]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Design Traffic Volumes - Do Nothing Option
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 631 | 19.0 | 631 | 19.0 | 0.182 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 631 | 19.0 | 631 | 19.0 | 0.182 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 60 | 16.0 | 60 | 16.0 | 0.035 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 60 | 16.0 | 60 | 16.0 | 0.035 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 691 | 18.7 | 691 | 18.7 | 0.182 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 1 | DES SF - Do Nothing]

## Network: N101 [2029PM - Do Nothing]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Design Traffic Volumes - Do Nothing Option
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 202 | 13.0 | 202 | 13.0 | 0.159 | 8.9 | LOS A | 0.7 | 5.5 | 0.17 | 0.60 | 62.0 |
| 5 | T1 | 905 | 13.0 | 905 | 13.0 | 0.252 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 1107 | 13.0 | 1107 | 13.0 | 0.252 | 1.7 | LOS A | 0.7 | 5.5 | 0.03 | 0.11 | 86.6 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 47 | 54.0 | 47 | 54.0 | 0.035 | 6.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 49.9 |
| Approach | | 47 | 54.0 | 47 | 54.0 | 0.035 | 6.6 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 49.9 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 234 | 32.0 | 234 | 32.0 | 1.108 | 136.2 | LOS F | 40.8 | 344.8 | 1.00 | 3.56 | 13.1 |
| 2 | T1 | 191 | 15.0 | 191 | 15.0 | 1.108 | 153.7 | LOS F | 40.8 | 344.8 | 1.00 | 3.56 | 10.6 |
| Approach | | 424 | 24.4 | 424 | 24.4 | 1.108 | 144.1 | LOS F | 40.8 | 344.8 | 1.00 | 3.56 | 12.0 |
| All Vehicles | | 1579 | 17.3 | 1579 | 17.3 | 1.108 | 40.1 | NA | 40.8 | 344.8 | 0.29 | 1.05 | 35.2 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 2 | DES SF - Do Nothing]

## Network: N101 [2029PM - Do Nothing]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Design Traffic Volumes - Do Nothing Option
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1476 | 8.0 | 1476 | 8.0 | 0.398 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1476 | 8.0 | 1476 | 8.0 | 0.398 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 191 | 15.0 | 172 | 15.0 | 0.099 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| Approach | | 191 | 15.0 | 172[N1] | 15.0 | 0.099 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| All Vehicles | | 1666 | 8.8 | 1648[N1] | 8.9 | 0.398 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 1 | DES SF - Ramp]

## Network: N101 [2019AM - Ramp]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Design Traffic Volumes - Princes Road Ramp Entry
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 83 | 7.0 | 83 | 7.0 | 0.063 | 8.7 | LOS A | 0.3 | 1.9 | 0.15 | 0.60 | 62.4 |
| 5 | T1 | 1154 | 8.0 | 1154 | 8.0 | 0.311 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 1237 | 7.9 | 1237 | 7.9 | 0.311 | 0.6 | LOS A | 0.3 | 1.9 | 0.01 | 0.04 | 94.3 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 54 | 20.0 | 54 | 20.0 | 0.216 | 21.8 | LOS C | 0.7 | 6.1 | 0.84 | 0.96 | 40.3 |
| Approach | | 54 | 20.0 | 54 | 20.0 | 0.216 | 21.8 | NA | 0.7 | 6.1 | 0.84 | 0.96 | 40.3 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 194 | 21.0 | 194 | 21.0 | 0.649 | 17.6 | LOS C | 4.1 | 33.6 | 0.81 | 1.17 | 37.1 |
| 2 | T1 | 56 | 16.0 | 56 | 16.0 | 0.649 | 38.3 | LOS E | 4.1 | 33.6 | 0.81 | 1.17 | 35.1 |
| Approach | | 249 | 19.9 | 249 | 19.9 | 0.649 | 22.2 | LOS C | 4.1 | 33.6 | 0.81 | 1.17 | 36.7 |
| All Vehicles | | 1540 | 10.3 | 1540 | 10.3 | 0.649 | 4.9 | NA | 4.1 | 33.6 | 0.17 | 0.25 | 73.5 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 2 | DES SF - Ramp]

## Network: N101 [2019AM - Ramp]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Design Traffic Volumes - Princes Road Ramp Entry
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 569 | 19.0 | 569 | 19.0 | 0.164 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 569 | 19.0 | 569 | 19.0 | 0.164 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 56 | 16.0 | 56 | 16.0 | 0.032 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 56 | 16.0 | 56 | 16.0 | 0.032 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 625 | 18.7 | 625 | 18.7 | 0.164 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 1 | DES SF - Ramp]

## Network: N101 [2019PM - Ramp]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Design Traffic Volumes - Princes Road Ramp Entry
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 27 | 7.0 | 27 | 7.0 | 0.021 | 8.7 | LOS A | 0.1 | 0.6 | 0.13 | 0.60 | 62.5 |
| 5 | T1 | 806 | 8.0 | 806 | 8.0 | 0.217 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 834 | 8.0 | 834 | 8.0 | 0.217 | 0.3 | LOS A | 0.1 | 0.6 | 0.00 | 0.02 | 97.1 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 45 | 20.0 | 45 | 20.0 | 0.028 | 6.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| Approach | | 45 | 20.0 | 45 | 20.0 | 0.028 | 6.5 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 229 | 21.0 | 229 | 21.0 | 0.775 | 18.0 | LOS C | 8.0 | 65.0 | 0.79 | 1.36 | 37.3 |
| 2 | T1 | 175 | 16.0 | 175 | 16.0 | 0.775 | 27.2 | LOS D | 8.0 | 65.0 | 0.79 | 1.36 | 35.2 |
| Approach | | 404 | 18.8 | 404 | 18.8 | 0.775 | 21.9 | LOS C | 8.0 | 65.0 | 0.79 | 1.36 | 36.5 |
| All Vehicles | | 1283 | 11.8 | 1283 | 11.8 | 0.775 | 7.3 | NA | 8.0 | 65.0 | 0.25 | 0.46 | 64.7 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 2 | DES SF - Ramp]

## Network: N101 [2019PM - Ramp]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Design Traffic Volumes - Princes Road Ramp Entry
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1335 | 19.0 | 1335 | 19.0 | 0.385 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1335 | 19.0 | 1335 | 19.0 | 0.385 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 175 | 16.0 | 175 | 16.0 | 0.102 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 175 | 16.0 | 175 | 16.0 | 0.102 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 1509 | 18.7 | 1509 | 18.7 | 0.385 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 97.7 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 1 | DES SF - Ramp]

## Network: N101 [2029AM - Ramp]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Design Traffic Volumes - Princes Road Ramp Entry
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 93 | 7.0 | 93 | 7.0 | 0.071 | 8.7 | LOS A | 0.3 | 2.1 | 0.16 | 0.60 | 62.3 |
| 5 | T1 | 1288 | 8.0 | 1288 | 8.0 | 0.348 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1381 | 7.9 | 1381 | 7.9 | 0.348 | 0.6 | LOS A | 0.3 | 2.1 | 0.01 | 0.04 | 94.3 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 57 | 20.0 | 57 | 20.0 | 0.035 | 6.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| Approach | | 57 | 20.0 | 57 | 20.0 | 0.035 | 6.5 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 60.4 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 198 | 21.0 | 198 | 21.0 | 0.844 | 33.4 | LOS D | 7.3 | 59.5 | 0.90 | 1.52 | 29.2 |
| 2 | T1 | 60 | 16.0 | 60 | 16.0 | 0.844 | 63.4 | LOS F | 7.3 | 59.5 | 0.90 | 1.52 | 26.1 |
| Approach | | 258 | 19.8 | 258 | 19.8 | 0.844 | 40.4 | LOS E | 7.3 | 59.5 | 0.90 | 1.52 | 28.6 |
| All Vehicles | | 1696 | 10.1 | 1696 | 10.1 | 0.844 | 6.9 | NA | 7.3 | 59.5 | 0.15 | 0.29 | 70.2 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 2 | DES SF - Ramp]

## Network: N101 [2029AM - Ramp]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Design Traffic Volumes - Princes Road Ramp Entry
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total | Demand Flows HV | Arrival Flows Total | Arrival Flows HV | Deg. Satn | Average Delay | Level of Service | 95% Back of Queue Vehicles | 95% Back of Queue Distance | Prop. Queued | Effective Stop Rate | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | per veh | km/h |
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 631 | 19.0 | 631 | 19.0 | 0.182 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 631 | 19.0 | 631 | 19.0 | 0.182 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 60 | 16.0 | 60 | 16.0 | 0.035 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 60 | 16.0 | 60 | 16.0 | 0.035 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 691 | 18.7 | 691 | 18.7 | 0.182 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 1 | DES SF - Ramp]

## Network: N101 [2029PM - Ramp]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Design Traffic Volumes - Princes Road Ramp Entry
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 29 | 13.0 | 29 | 13.0 | 0.023 | 8.9 | LOS A | 0.1 | 0.7 | 0.15 | 0.59 | 62.1 |
| 5 | T1 | 905 | 13.0 | 905 | 13.0 | 0.252 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 935 | 13.0 | 935 | 13.0 | 0.252 | 0.3 | LOS A | 0.1 | 0.7 | 0.00 | 0.02 | 97.1 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 47 | 54.0 | 47 | 54.0 | 0.035 | 6.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.64 | 49.9 |
| Approach | | 47 | 54.0 | 47 | 54.0 | 0.035 | 6.6 | NA | 0.0 | 0.0 | 0.00 | 0.64 | 49.9 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 234 | 32.0 | 234 | 32.0 | 1.006 | 66.9 | LOS F | 24.2 | 205.1 | 1.00 | 2.60 | 20.9 |
| 2 | T1 | 191 | 15.0 | 191 | 15.0 | 1.006 | 80.9 | LOS F | 24.2 | 205.1 | 1.00 | 2.60 | 17.9 |
| Approach | | 424 | 24.4 | 424 | 24.4 | 1.006 | 73.2 | LOS F | 24.2 | 205.1 | 1.00 | 2.60 | 19.6 |
| All Vehicles | | 1406 | 17.8 | 1406 | 17.8 | 1.006 | 22.5 | NA | 24.2 | 205.1 | 0.30 | 0.82 | 45.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 2 | DES SF - Ramp]

## Network: N101 [2029PM - Ramp]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Design Traffic Volumes - Princes Road Ramp Entry
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1476 | 8.0 | 1476 | 8.0 | 0.398 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1476 | 8.0 | 1476 | 8.0 | 0.398 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 191 | 15.0 | 189 | 15.0 | 0.109 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| Approach | | 191 | 15.0 | 189[N1] | 15.0 | 0.109 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| All Vehicles | | 1666 | 8.8 | 1665[N1] | 8.8 | 0.398 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 97.8 |

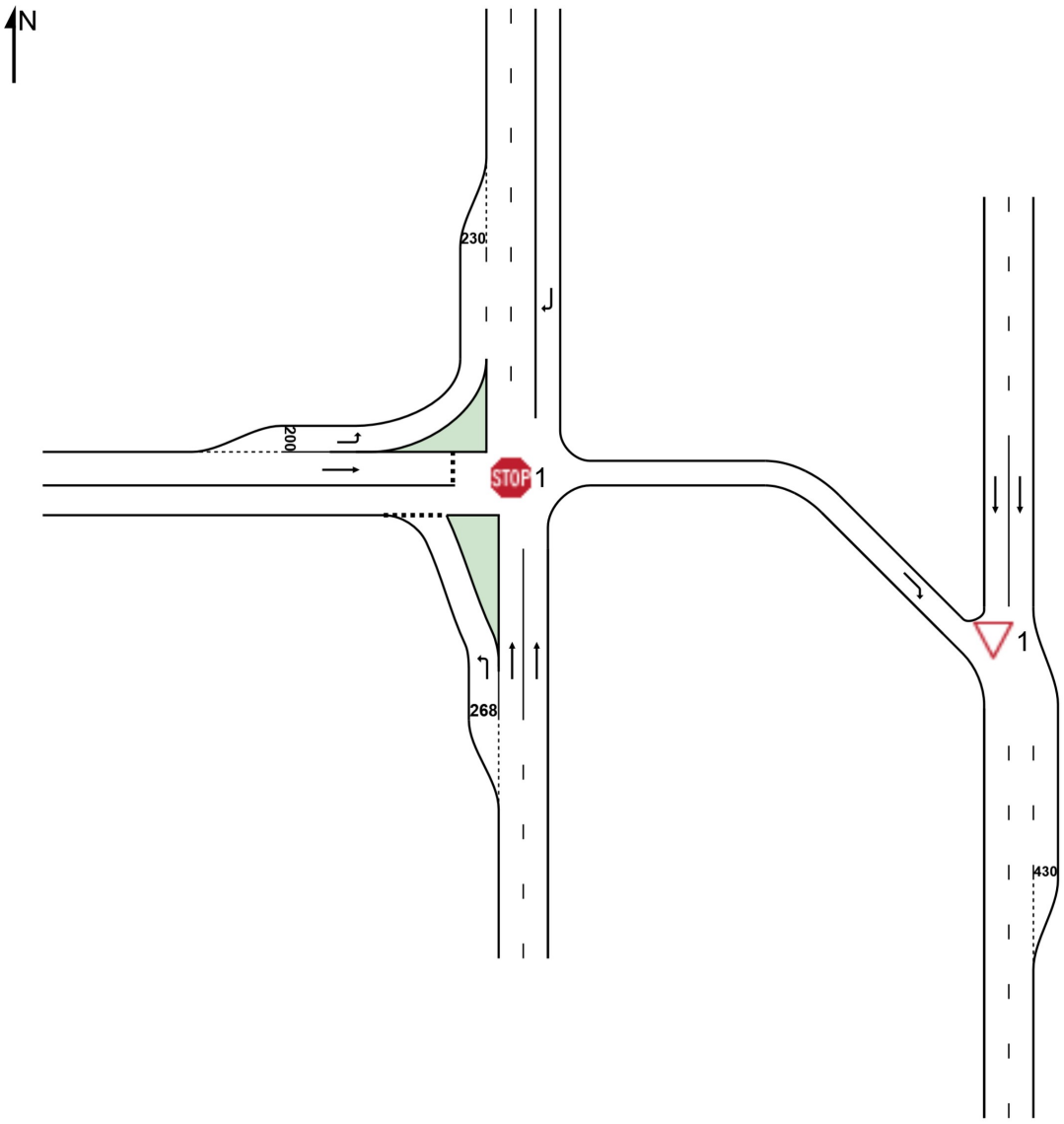
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

# NETWORK LAYOUT

## Network: N101 [2019AM - Slip Lane]

New Network




| SITES IN NETWORK | |
|---|---|
| **Site ID** | **Site Name** |
| STOP 1 | 2019 AM Stage 1 \| DES SF - Slip Lane |
| ▽ 1 | 2019 AM Stage 2 \| DES SF - Slip Lane |


Organisation: BITZIOS CONSULTING | Created: Tuesday, 25 July 2017 3:43:45 PM
Project: P:\P2795 South Nowra Service Centre TIA\Technical Work\Models\P2795.005M BTU Road _ Princes Highway.sip7

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 1 | DES SF - Slip Lane]

## Network: N101 [2019AM - Slip Lane]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 246 | 7.0 | 246 | 7.0 | 0.187 | 8.8 | LOS A | 0.9 | 6.4 | 0.17 | 0.60 | 62.3 |
| 5 | T1 | 1154 | 8.0 | 1154 | 8.0 | 0.311 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 1400 | 7.8 | 1400 | 7.8 | 0.311 | 1.6 | LOS A | 0.9 | 6.4 | 0.03 | 0.11 | 87.1 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 54 | 20.0 | 54 | 20.0 | 0.033 | 6.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.63 | 60.8 |
| Approach | | 54 | 20.0 | 54 | 20.0 | 0.033 | 6.8 | NA | 0.0 | 0.0 | 0.00 | 0.63 | 60.8 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 194 | 21.0 | 194 | 21.0 | 0.119 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.52 | 50.8 |
| 2 | T1 | 56 | 16.0 | 56 | 16.0 | 0.356 | 35.1 | LOS E | 1.3 | 10.5 | 0.92 | 1.01 | 28.2 |
| Approach | | 249 | 19.9 | 249 | 19.9 | 0.356 | 12.4 | LOS B | 1.3 | 10.5 | 0.21 | 0.63 | 44.6 |
| All Vehicles | | 1703 | 10.0 | 1703 | 10.0 | 0.356 | 3.3 | NA | 1.3 | 10.5 | 0.05 | 0.20 | 76.5 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 2 | DES SF - Slip Lane]

## Network: N101 [2019AM - Slip Lane]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 569 | 19.0 | 569 | 19.0 | 0.164 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 569 | 19.0 | 569 | 19.0 | 0.164 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 56 | 16.0 | 56 | 16.0 | 0.032 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 56 | 16.0 | 56 | 16.0 | 0.032 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 625 | 18.7 | 625 | 18.7 | 0.164 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 1 | DES SF - Slip Lane]

## Network: N101 [2019PM - Slip Lane]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 199 | 13.0 | 199 | 13.0 | 0.156 | 8.9 | LOS A | 0.7 | 5.4 | 0.17 | 0.60 | 62.0 |
| 5 | T1 | 806 | 13.0 | 806 | 13.0 | 0.224 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 1005 | 13.0 | 1005 | 13.0 | 0.224 | 1.8 | LOS A | 0.7 | 5.4 | 0.03 | 0.12 | 85.8 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 45 | 54.0 | 45 | 54.0 | 0.034 | 6.9 | LOS A | 0.0 | 0.0 | 0.00 | 0.62 | 50.7 |
| Approach | | 45 | 54.0 | 45 | 54.0 | 0.034 | 6.9 | NA | 0.0 | 0.0 | 0.00 | 0.62 | 50.7 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 229 | 32.0 | 229 | 32.0 | 0.150 | 6.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 49.8 |
| 2 | T1 | 175 | 15.0 | 175 | 15.0 | 0.557 | 23.8 | LOS C | 3.0 | 23.6 | 0.87 | 1.09 | 34.0 |
| Approach | | 404 | 24.7 | 404 | 24.7 | 0.557 | 13.7 | LOS B | 3.0 | 23.6 | 0.38 | 0.76 | 42.7 |
| All Vehicles | | 1455 | 17.5 | 1455 | 17.5 | 0.557 | 5.2 | NA | 3.0 | 23.6 | 0.13 | 0.31 | 67.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 2 | DES SF - Slip Lane]

## Network: N101 [2019PM - Slip Lane]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1335 | 8.0 | 1335 | 8.0 | 0.360 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1335 | 8.0 | 1335 | 8.0 | 0.360 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 175 | 15.0 | 175 | 15.0 | 0.101 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| Approach | | 175 | 15.0 | 175 | 15.0 | 0.101 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| All Vehicles | | 1509 | 8.8 | 1509 | 8.8 | 0.360 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 97.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 1 | DES SF - Slip Lane]

## Network: N101 [2029AM - Slip Lane]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 255 | 7.0 | 255 | 7.0 | 0.194 | 8.8 | LOS A | 0.9 | 6.6 | 0.18 | 0.60 | 62.3 |
| 5 | T1 | 1288 | 8.0 | 1288 | 8.0 | 0.348 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1543 | 7.8 | 1543 | 7.8 | 0.348 | 1.5 | LOS A | 0.9 | 6.6 | 0.03 | 0.10 | 87.7 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 57 | 20.0 | 57 | 20.0 | 0.035 | 6.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.63 | 60.8 |
| Approach | | 57 | 20.0 | 57 | 20.0 | 0.035 | 6.8 | NA | 0.0 | 0.0 | 0.00 | 0.63 | 60.8 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 198 | 21.0 | 198 | 21.0 | 0.121 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.52 | 50.8 |
| 2 | T1 | 60 | 16.0 | 60 | 16.0 | 0.524 | 54.6 | LOS D | 2.0 | 15.7 | 0.96 | 1.06 | 21.8 |
| Approach | | 258 | 19.8 | 258 | 19.8 | 0.524 | 17.2 | LOS B | 2.0 | 15.7 | 0.22 | 0.64 | 40.9 |
| All Vehicles | | 1858 | 9.9 | 1858 | 9.9 | 0.524 | 3.8 | NA | 2.0 | 15.7 | 0.06 | 0.19 | 75.8 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 2 | DES SF - Slip Lane]

## Network: N101 [2029AM - Slip Lane]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 631 | 19.0 | 631 | 19.0 | 0.182 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 631 | 19.0 | 631 | 19.0 | 0.182 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 60 | 16.0 | 60 | 16.0 | 0.035 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 60 | 16.0 | 60 | 16.0 | 0.035 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 691 | 18.7 | 691 | 18.7 | 0.182 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.4 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 1 | DES SF - Slip Lane]

## Network: N101 [2029PM - Slip Lane]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 202 | 13.0 | 202 | 13.0 | 0.159 | 8.9 | LOS A | 0.7 | 5.5 | 0.17 | 0.60 | 62.0 |
| 5 | T1 | 905 | 13.0 | 905 | 13.0 | 0.252 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 1107 | 13.0 | 1107 | 13.0 | 0.252 | 1.7 | LOS A | 0.7 | 5.5 | 0.03 | 0.11 | 86.6 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 47 | 54.0 | 47 | 54.0 | 0.035 | 6.9 | LOS A | 0.0 | 0.0 | 0.00 | 0.62 | 50.7 |
| Approach | | 47 | 54.0 | 47 | 54.0 | 0.035 | 6.9 | NA | 0.0 | 0.0 | 0.00 | 0.62 | 50.7 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 234 | 32.0 | 234 | 32.0 | 0.153 | 6.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 49.8 |
| 2 | T1 | 191 | 15.0 | 191 | 15.0 | 0.737 | 36.5 | LOS C | 4.6 | 36.5 | 0.94 | 1.26 | 27.6 |
| Approach | | 424 | 24.4 | 424 | 24.4 | 0.737 | 19.7 | LOS B | 4.6 | 36.5 | 0.42 | 0.85 | 38.3 |
| All Vehicles | | 1579 | 17.3 | 1579 | 17.3 | 0.737 | 6.7 | NA | 4.6 | 36.5 | 0.14 | 0.32 | 65.8 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 2 | DES SF - Slip Lane]

## Network: N101 [2029PM - Slip Lane]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1476 | 8.0 | 1476 | 8.0 | 0.398 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1476 | 8.0 | 1476 | 8.0 | 0.398 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 191 | 15.0 | 191 | 15.0 | 0.110 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| Approach | | 191 | 15.0 | 191 | 15.0 | 0.110 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| All Vehicles | | 1666 | 8.8 | 1666 | 8.8 | 0.398 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 97.8 |

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 1 | DES SF - Slip Lane and Ramp]

## Network: N101 [2019AM - Slip Lane and Ramp]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade and Princes Road Ramp Entry
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total | HV | Arrival Flows Total | HV | Deg. Satn | Average Delay | Level of Service | 95% Back of Queue Vehicles | Distance | Prop. Queued | Effective Stop Rate | Average Speed |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | veh/h | % | veh/h | % | v/c | sec | | veh | m | | per veh | km/h |
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 83 | 7.0 | 83 | 7.0 | 0.063 | 8.7 | LOS A | 0.3 | 1.9 | 0.15 | 0.60 | 62.4 |
| 5 | T1 | 1154 | 8.0 | 1154 | 8.0 | 0.311 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 1237 | 7.9 | 1237 | 7.9 | 0.311 | 0.6 | LOS A | 0.3 | 1.9 | 0.01 | 0.04 | 94.3 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 54 | 20.0 | 54 | 20.0 | 0.033 | 6.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.63 | 60.8 |
| Approach | | 54 | 20.0 | 54 | 20.0 | 0.033 | 6.8 | NA | 0.0 | 0.0 | 0.00 | 0.63 | 60.8 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 194 | 21.0 | 194 | 21.0 | 0.119 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.52 | 50.8 |
| 2 | T1 | 56 | 16.0 | 56 | 16.0 | 0.309 | 29.7 | LOS D | 1.1 | 9.1 | 0.90 | 0.99 | 30.7 |
| Approach | | 249 | 19.9 | 249 | 19.9 | 0.309 | 11.2 | LOS B | 1.1 | 9.1 | 0.20 | 0.62 | 45.6 |
| All Vehicles | | 1540 | 10.3 | 1540 | 10.3 | 0.311 | 2.6 | NA | 1.1 | 9.1 | 0.04 | 0.16 | 79.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 AM Stage 2 | DES SF - Slip Lane and Ramp]

## Network: N101 [2019AM - Slip Lane and Ramp]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 AM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade and Princes Road Ramp Entry
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 569 | 19.0 | 569 | 19.0 | 0.164 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 569 | 19.0 | 569 | 19.0 | 0.164 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 56 | 16.0 | 56 | 16.0 | 0.032 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 56 | 16.0 | 56 | 16.0 | 0.032 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 625 | 18.7 | 625 | 18.7 | 0.164 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 1 | DES SF - Slip Lane and Ramp]

## Network: N101 [2019PM - Slip Lane and Ramp]

Stage 1 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade and Princes Road Ramp Entry
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 27 | 13.0 | 27 | 13.0 | 0.021 | 8.9 | LOS A | 0.1 | 0.7 | 0.15 | 0.59 | 62.1 |
| 5 | T1 | 806 | 13.0 | 806 | 13.0 | 0.224 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 834 | 13.0 | 834 | 13.0 | 0.224 | 0.3 | LOS A | 0.1 | 0.7 | 0.00 | 0.02 | 97.0 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 45 | 54.0 | 45 | 54.0 | 0.034 | 6.9 | LOS A | 0.0 | 0.0 | 0.00 | 0.62 | 50.7 |
| Approach | | 45 | 54.0 | 45 | 54.0 | 0.034 | 6.9 | NA | 0.0 | 0.0 | 0.00 | 0.62 | 50.7 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 229 | 32.0 | 229 | 32.0 | 0.150 | 6.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 49.8 |
| 2 | T1 | 175 | 15.0 | 175 | 15.0 | 0.483 | 19.5 | LOS C | 2.5 | 20.0 | 0.83 | 1.04 | 36.9 |
| Approach | | 404 | 24.7 | 404 | 24.7 | 0.483 | 11.8 | LOS B | 2.5 | 20.0 | 0.36 | 0.74 | 44.3 |
| All Vehicles | | 1283 | 18.1 | 1283 | 18.1 | 0.483 | 4.2 | NA | 2.5 | 20.0 | 0.12 | 0.27 | 70.3 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2019 PM Stage 2 | DES SF - Slip Lane and Ramp]

## Network: N101 [2019PM - Slip Lane and Ramp]

Stage 2 - Intersection of BTU Road / Princes Highway
2019 PM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade and Princes Road Ramp Entry
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1335 | 8.0 | 1335 | 8.0 | 0.360 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1335 | 8.0 | 1335 | 8.0 | 0.360 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 175 | 15.0 | 175 | 15.0 | 0.101 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| Approach | | 175 | 15.0 | 175 | 15.0 | 0.101 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| All Vehicles | | 1509 | 8.8 | 1509 | 8.8 | 0.360 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 97.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 1 | DES SF - Slip Lane and Ramp]

## Network: N101 [2029AM - Slip Lane and Ramp]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade and Princes Road Ramp Entry
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 93 | 7.0 | 93 | 7.0 | 0.071 | 8.7 | LOS A | 0.3 | 2.1 | 0.16 | 0.60 | 62.3 |
| 5 | T1 | 1288 | 8.0 | 1288 | 8.0 | 0.348 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1381 | 7.9 | 1381 | 7.9 | 0.348 | 0.6 | LOS A | 0.3 | 2.1 | 0.01 | 0.04 | 94.3 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 57 | 20.0 | 57 | 20.0 | 0.035 | 6.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.63 | 60.8 |
| Approach | | 57 | 20.0 | 57 | 20.0 | 0.035 | 6.8 | NA | 0.0 | 0.0 | 0.00 | 0.63 | 60.8 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 198 | 21.0 | 198 | 21.0 | 0.121 | 5.8 | LOS A | 0.0 | 0.0 | 0.00 | 0.52 | 50.8 |
| 2 | T1 | 60 | 16.0 | 60 | 16.0 | 0.452 | 44.4 | LOS E | 1.7 | 13.5 | 0.94 | 1.04 | 24.7 |
| Approach | | 258 | 19.8 | 258 | 19.8 | 0.452 | 14.8 | LOS B | 1.7 | 13.5 | 0.22 | 0.64 | 42.6 |
| All Vehicles | | 1696 | 10.1 | 1696 | 10.1 | 0.452 | 3.0 | NA | 1.7 | 13.5 | 0.04 | 0.15 | 79.1 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 AM Stage 2 | DES SF - Slip Lane and Ramp]

## Network: N101 [2029AM - Slip Lane and Ramp]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 AM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade and Princes Road Ramp Entry
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 631 | 19.0 | 631 | 19.0 | 0.182 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| Approach | | 631 | 19.0 | 631 | 19.0 | 0.182 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.9 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 60 | 16.0 | 60 | 16.0 | 0.035 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| Approach | | 60 | 16.0 | 60 | 16.0 | 0.035 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 75.7 |
| All Vehicles | | 691 | 18.7 | 691 | 18.7 | 0.182 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 98.4 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 1 | DES SF - Slip Lane and Ramp]

## Network: N101 [2029PM - Slip Lane and Ramp]

Stage 1 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade and Princes Road Ramp Entry
Stop (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Princes Highway | | | | | | | | | | | | | |
| 4 | L2 | 29 | 13.0 | 29 | 13.0 | 0.023 | 8.9 | LOS A | 0.1 | 0.7 | 0.15 | 0.59 | 62.1 |
| 5 | T1 | 905 | 13.0 | 905 | 13.0 | 0.252 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.8 |
| Approach | | 935 | 13.0 | 935 | 13.0 | 0.252 | 0.3 | LOS A | 0.1 | 0.7 | 0.00 | 0.02 | 97.1 |
| North: Princes Highway | | | | | | | | | | | | | |
| 12 | R2 | 47 | 54.0 | 47 | 54.0 | 0.035 | 6.9 | LOS A | 0.0 | 0.0 | 0.00 | 0.62 | 50.7 |
| Approach | | 47 | 54.0 | 47 | 54.0 | 0.035 | 6.9 | NA | 0.0 | 0.0 | 0.00 | 0.62 | 50.7 |
| West: BTU Road | | | | | | | | | | | | | |
| 1 | L2 | 234 | 32.0 | 234 | 32.0 | 0.153 | 6.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 49.8 |
| 2 | T1 | 191 | 15.0 | 191 | 15.0 | 0.635 | 27.2 | LOS D | 3.7 | 28.9 | 0.90 | 1.15 | 32.0 |
| Approach | | 424 | 24.4 | 424 | 24.4 | 0.635 | 15.5 | LOS C | 3.7 | 28.9 | 0.40 | 0.80 | 41.2 |
| All Vehicles | | 1406 | 17.8 | 1406 | 17.8 | 0.635 | 5.1 | NA | 3.7 | 28.9 | 0.13 | 0.27 | 69.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# MOVEMENT SUMMARY

## Site: 1 [2029 PM Stage 2 | DES SF - Slip Lane and Ramp]

## Network: N101 [2029PM - Slip Lane and Ramp]

Stage 2 - Intersection of BTU Road / Princes Highway
2029 PM Peak
Design Traffic Volumes - Btu Road Left Turn Upgrade and Princes Road Ramp Entry
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

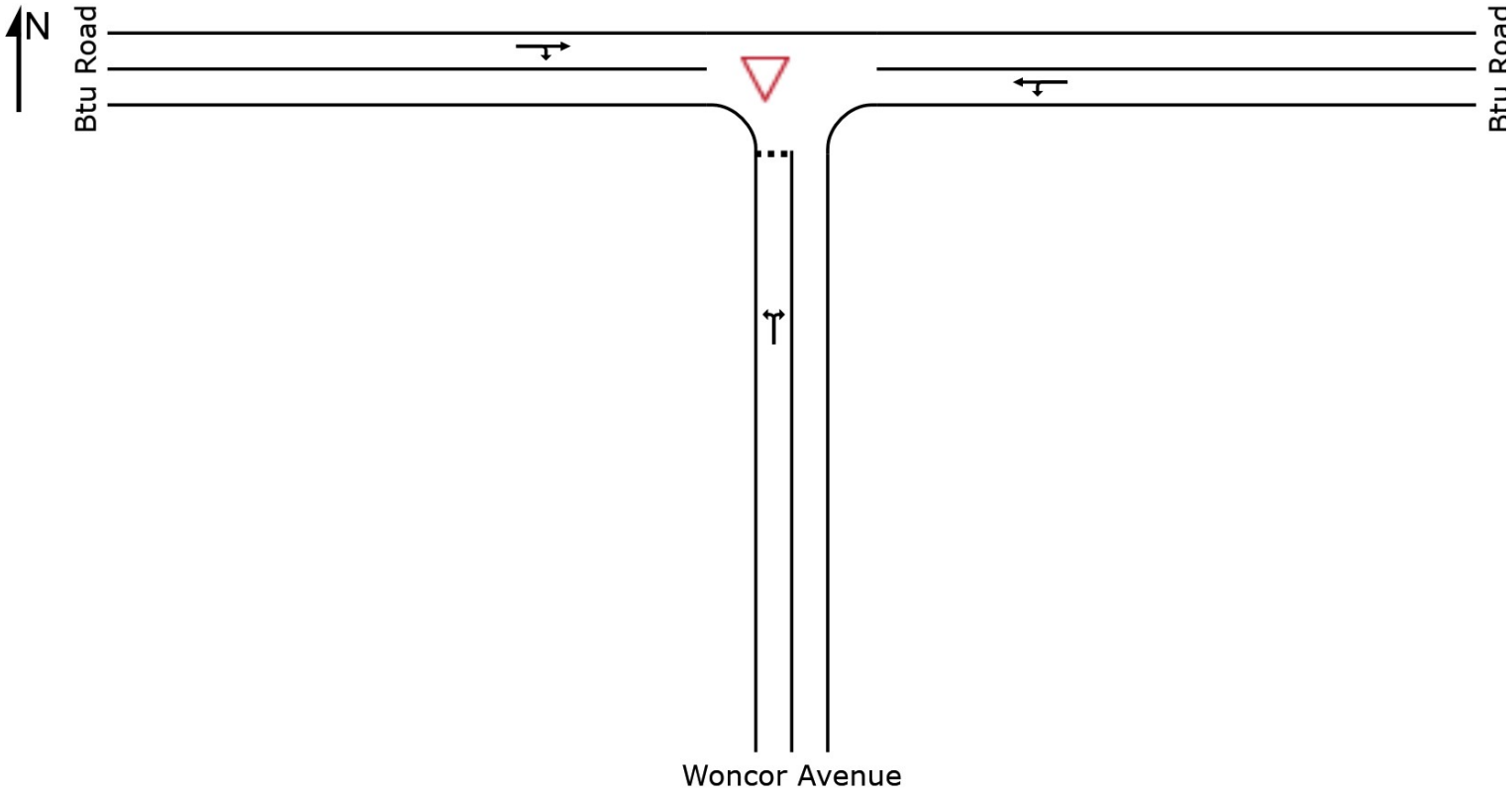
| Mov ID | OD Mov | Demand Flows Total veh/h | Demand Flows HV % | Arrival Flows Total veh/h | Arrival Flows HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| North: Princes Highway | | | | | | | | | | | | | |
| 11 | T1 | 1476 | 8.0 | 1476 | 8.0 | 0.398 | 0.1 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| Approach | | 1476 | 8.0 | 1476 | 8.0 | 0.398 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 99.7 |
| NorthWest: Southbound Merge Lane | | | | | | | | | | | | | |
| 32a | R1 | 191 | 15.0 | 191 | 15.0 | 0.110 | 0.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| Approach | | 191 | 15.0 | 191 | 15.0 | 0.110 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.42 | 76.1 |
| All Vehicles | | 1666 | 8.8 | 1666 | 8.8 | 0.398 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 97.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 3 (maximum specified: 10)

# SITE LAYOUT

## Site: 101 [2019 AM - BG Seasonality]

Btu Road / Woncor Avenue Priority-Controlled Intersection
Giveway / Yield (Two-Way)





Organisation: BITZIOS CONSULTING | Created: Friday, 30 June 2017 4:52:17 PM
Project: P:\P2795 South Nowra Service Centre TIA\Technical Work\Models\P2795.002M BTU Road _ Woncor Avenue.sip7

# MOVEMENT SUMMARY

## Site: 101 [2019 AM - BG Seasonality]

Btu Road / Woncor Avenue Priority-Controlled Intersection
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Woncor Avenue | | | | | | | | | | | |
| 1 | L2 | 1 | 0.0 | 0.002 | 4.9 | LOS A | 0.0 | 0.0 | 0.22 | 0.50 | 49.3 |
| 3 | R2 | 1 | 0.0 | 0.002 | 5.2 | LOS A | 0.0 | 0.0 | 0.22 | 0.50 | 48.8 |
| Approach | | 2 | 0.0 | 0.002 | 5.0 | LOS A | 0.0 | 0.0 | 0.22 | 0.50 | 49.0 |
| East: Btu Road | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 0.063 | 5.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 58.3 |
| 5 | T1 | 113 | 11.0 | 0.063 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.9 |
| Approach | | 114 | 10.9 | 0.063 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 59.9 |
| West: Btu Road | | | | | | | | | | | |
| 11 | T1 | 68 | 18.0 | 0.039 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.9 |
| 12 | R2 | 1 | 0.0 | 0.039 | 5.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 57.6 |
| Approach | | 69 | 17.7 | 0.039 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 59.9 |
| All Vehicles | | 185 | 13.3 | 0.063 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

# MOVEMENT SUMMARY

## Site: 101 [2019 PM - BG Seasonality]

Btu Road / Woncor Avenue Priority-Controlled Intersection
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Woncor Avenue | | | | | | | | | | | |
| 1 | L2 | 1 | 0.0 | 0.002 | 4.7 | LOS A | 0.0 | 0.0 | 0.14 | 0.51 | 49.4 |
| 3 | R2 | 1 | 0.0 | 0.002 | 5.4 | LOS A | 0.0 | 0.0 | 0.14 | 0.51 | 49.0 |
| Approach | | 2 | 0.0 | 0.002 | 5.1 | LOS A | 0.0 | 0.0 | 0.14 | 0.51 | 49.2 |
| East: Btu Road | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 0.032 | 5.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 58.2 |
| 5 | T1 | 50 | 34.0 | 0.032 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |
| Approach | | 51 | 33.3 | 0.032 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |
| West: Btu Road | | | | | | | | | | | |
| 11 | T1 | 188 | 19.0 | 0.109 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| 12 | R2 | 1 | 0.0 | 0.109 | 5.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 57.7 |
| Approach | | 189 | 18.9 | 0.109 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| All Vehicles | | 242 | 21.8 | 0.109 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

# MOVEMENT SUMMARY

## Site: 101 [2029 AM - BG Seasonality]

Btu Road / Woncor Avenue Priority-Controlled Intersection
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Woncor Avenue | | | | | | | | | | | |
| 1 | L2 | 1 | 0.0 | 0.002 | 4.9 | LOS A | 0.0 | 0.0 | 0.23 | 0.50 | 49.2 |
| 3 | R2 | 1 | 0.0 | 0.002 | 5.2 | LOS A | 0.0 | 0.0 | 0.23 | 0.50 | 48.8 |
| Approach | | 2 | 0.0 | 0.002 | 5.1 | LOS A | 0.0 | 0.0 | 0.23 | 0.50 | 49.0 |
| East: Btu Road | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 0.069 | 5.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 58.3 |
| 5 | T1 | 125 | 11.0 | 0.069 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 126 | 10.9 | 0.069 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| West: Btu Road | | | | | | | | | | | |
| 11 | T1 | 75 | 18.0 | 0.044 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.9 |
| 12 | R2 | 1 | 0.0 | 0.044 | 5.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 57.6 |
| Approach | | 76 | 17.8 | 0.044 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 59.9 |
| All Vehicles | | 204 | 13.4 | 0.069 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

# MOVEMENT SUMMARY

## Site: 101 [2029 PM - BG Seasonality]

Btu Road / Woncor Avenue Priority-Controlled Intersection
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Woncor Avenue | | | | | | | | | | | |
| 1 | L2 | 1 | 0.0 | 0.002 | 4.7 | LOS A | 0.0 | 0.0 | 0.14 | 0.51 | 49.4 |
| 3 | R2 | 1 | 0.0 | 0.002 | 5.5 | LOS A | 0.0 | 0.0 | 0.14 | 0.51 | 49.0 |
| Approach | | 2 | 0.0 | 0.002 | 5.1 | LOS A | 0.0 | 0.0 | 0.14 | 0.51 | 49.2 |
| East: Btu Road | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 0.031 | 5.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 58.3 |
| 5 | T1 | 56 | 11.0 | 0.031 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.9 |
| Approach | | 57 | 10.8 | 0.031 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 59.9 |
| West: Btu Road | | | | | | | | | | | |
| 11 | T1 | 207 | 18.0 | 0.119 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| 12 | R2 | 1 | 0.0 | 0.119 | 5.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 57.7 |
| Approach | | 208 | 17.9 | 0.119 | 0.0 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| All Vehicles | | 267 | 16.3 | 0.119 | 0.1 | NA | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

# MOVEMENT SUMMARY

## Site: 101 [2019 AM - DES Seasonality]

Btu Road / Woncor Avenue Priority-Controlled Intersection
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Woncor Avenue | | | | | | | | | | | |
| 1 | L2 | 9 | 11.0 | 0.160 | 5.1 | LOS A | 0.6 | 4.6 | 0.33 | 0.61 | 48.6 |
| 3 | R2 | 141 | 18.0 | 0.160 | 6.0 | LOS A | 0.6 | 4.6 | 0.33 | 0.61 | 47.9 |
| Approach | | 150 | 17.6 | 0.160 | 6.0 | LOS A | 0.6 | 4.6 | 0.33 | 0.61 | 47.9 |
| East: Btu Road | | | | | | | | | | | |
| 4 | L2 | 143 | 11.0 | 0.141 | 5.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.34 | 55.0 |
| 5 | T1 | 106 | 11.0 | 0.141 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.34 | 57.0 |
| Approach | | 249 | 11.0 | 0.141 | 3.3 | NA | 0.0 | 0.0 | 0.00 | 0.34 | 55.8 |
| West: Btu Road | | | | | | | | | | | |
| 11 | T1 | 63 | 18.0 | 0.039 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.05 | 59.6 |
| 12 | R2 | 5 | 18.0 | 0.039 | 5.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.05 | 56.4 |
| Approach | | 68 | 18.0 | 0.039 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 59.4 |
| All Vehicles | | 467 | 14.1 | 0.160 | 3.7 | NA | 0.6 | 4.6 | 0.11 | 0.38 | 53.5 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

# MOVEMENT SUMMARY

## Site: 101 [2019 PM - DES Seasonality]

Btu Road / Woncor Avenue Priority-Controlled Intersection
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Woncor Avenue | | | | | | | | | | | |
| 1 | L2 | 2 | 34.0 | 0.279 | 5.2 | LOS A | 1.1 | 8.7 | 0.45 | 0.71 | 47.1 |
| 3 | R2 | 223 | 19.0 | 0.279 | 7.1 | LOS A | 1.1 | 8.7 | 0.45 | 0.71 | 47.2 |
| Approach | | 225 | 19.1 | 0.279 | 7.1 | LOS A | 1.1 | 8.7 | 0.45 | 0.71 | 47.2 |
| East: Btu Road | | | | | | | | | | | |
| 4 | L2 | 206 | 34.0 | 0.168 | 6.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.47 | 53.0 |
| 5 | T1 | 48 | 34.0 | 0.168 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.47 | 55.8 |
| Approach | | 254 | 34.0 | 0.168 | 4.8 | NA | 0.0 | 0.0 | 0.00 | 0.47 | 53.5 |
| West: Btu Road | | | | | | | | | | | |
| 11 | T1 | 173 | 19.0 | 0.110 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.05 | 59.5 |
| 12 | R2 | 17 | 19.0 | 0.110 | 5.7 | LOS A | 0.0 | 0.0 | 0.00 | 0.05 | 56.3 |
| Approach | | 190 | 19.0 | 0.110 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 59.2 |
| All Vehicles | | 669 | 24.7 | 0.279 | 4.4 | NA | 1.1 | 8.7 | 0.15 | 0.43 | 52.6 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

# MOVEMENT SUMMARY

## Site: 101 [2029 AM - DES Seasonality]

Btu Road / Woncor Avenue Priority-Controlled Intersection
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Woncor Avenue | | | | | | | | | | | |
| 1 | L2 | 9 | 0.0 | 0.146 | 5.0 | LOS A | 0.5 | 3.6 | 0.32 | 0.61 | 49.0 |
| 3 | R2 | 141 | 0.0 | 0.146 | 5.7 | LOS A | 0.5 | 3.6 | 0.32 | 0.61 | 48.6 |
| Approach | | 150 | 0.0 | 0.146 | 5.7 | LOS A | 0.5 | 3.6 | 0.32 | 0.61 | 48.6 |
| East: Btu Road | | | | | | | | | | | |
| 4 | L2 | 143 | 0.0 | 0.142 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.32 | 55.5 |
| 5 | T1 | 118 | 11.0 | 0.142 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.32 | 57.0 |
| Approach | | 261 | 5.0 | 0.142 | 3.0 | NA | 0.0 | 0.0 | 0.00 | 0.32 | 56.2 |
| West: Btu Road | | | | | | | | | | | |
| 11 | T1 | 70 | 18.0 | 0.043 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.04 | 59.6 |
| 12 | R2 | 5 | 0.0 | 0.043 | 5.4 | LOS A | 0.0 | 0.0 | 0.00 | 0.04 | 57.3 |
| Approach | | 75 | 16.8 | 0.043 | 0.4 | NA | 0.0 | 0.0 | 0.00 | 0.04 | 59.4 |
| All Vehicles | | 486 | 5.3 | 0.146 | 3.4 | NA | 0.5 | 3.6 | 0.10 | 0.37 | 54.0 |

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

# MOVEMENT SUMMARY

## Site: 101 [2029 PM - DES Seasonality]

Btu Road / Woncor Avenue Priority-Controlled Intersection
Giveway / Yield (Two-Way)

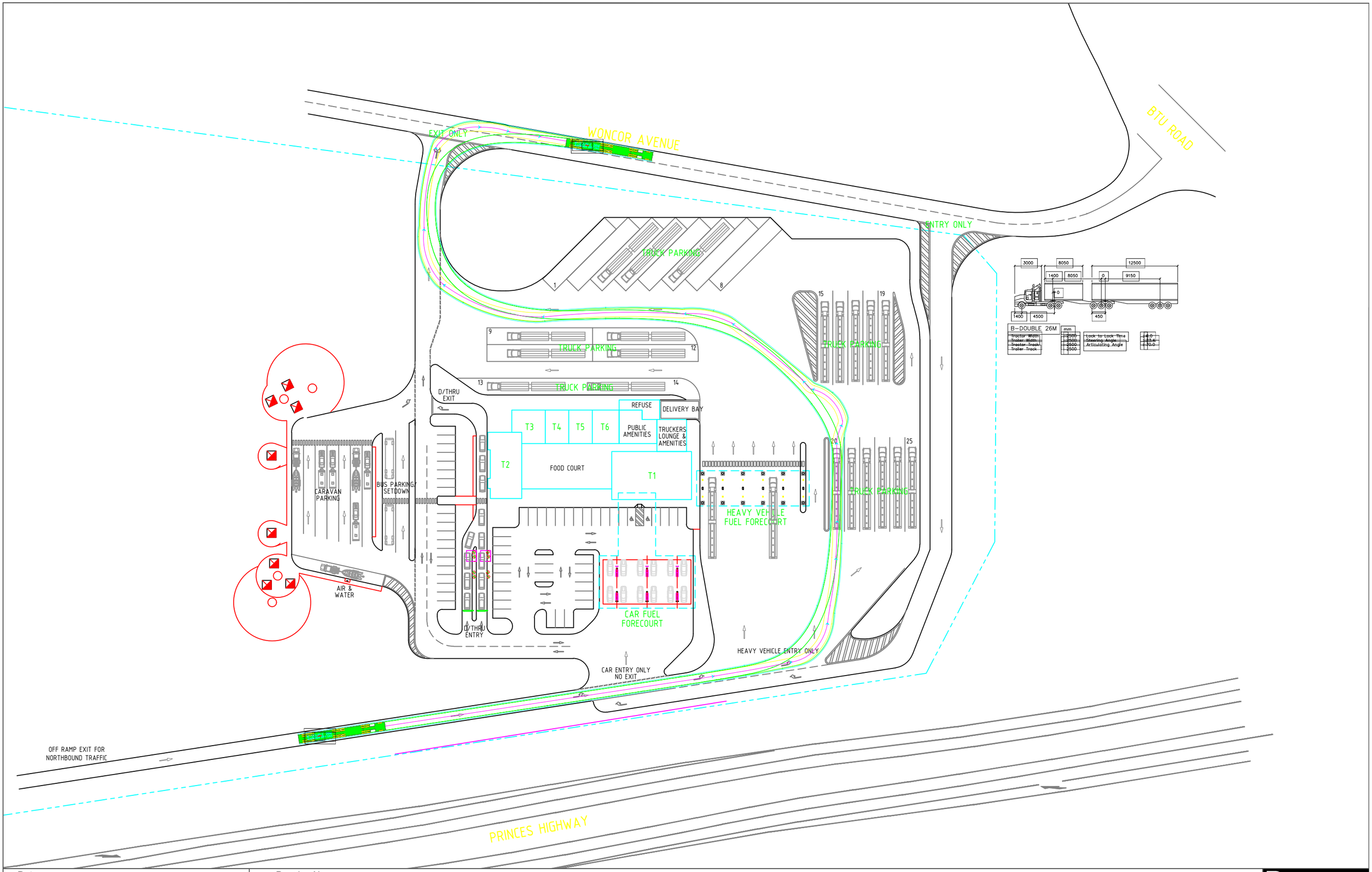
**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Woncor Avenue | | | | | | | | | | | |
| 1 | L2 | 92 | 0.0 | 0.305 | 4.8 | LOS A | 1.3 | 8.8 | 0.23 | 0.59 | 48.8 |
| 3 | R2 | 223 | 0.0 | 0.305 | 6.6 | LOS A | 1.3 | 8.8 | 0.23 | 0.59 | 48.4 |
| Approach | | 315 | 0.0 | 0.305 | 6.1 | LOS A | 1.3 | 8.8 | 0.23 | 0.59 | 48.5 |
| East: Btu Road | | | | | | | | | | | |
| 4 | L2 | 206 | 0.0 | 0.140 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.46 | 54.4 |
| 5 | T1 | 53 | 11.0 | 0.140 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.46 | 55.8 |
| Approach | | 259 | 2.3 | 0.140 | 4.4 | NA | 0.0 | 0.0 | 0.00 | 0.46 | 54.7 |
| West: Btu Road | | | | | | | | | | | |
| 11 | T1 | 193 | 18.0 | 0.120 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.05 | 59.5 |
| 12 | R2 | 17 | 0.0 | 0.120 | 5.5 | LOS A | 0.0 | 0.0 | 0.00 | 0.05 | 57.2 |
| Approach | | 210 | 16.5 | 0.120 | 0.5 | NA | 0.0 | 0.0 | 0.00 | 0.05 | 59.3 |
| All Vehicles | | 784 | 5.2 | 0.305 | 4.0 | NA | 1.3 | 8.8 | 0.09 | 0.40 | 53.1 |

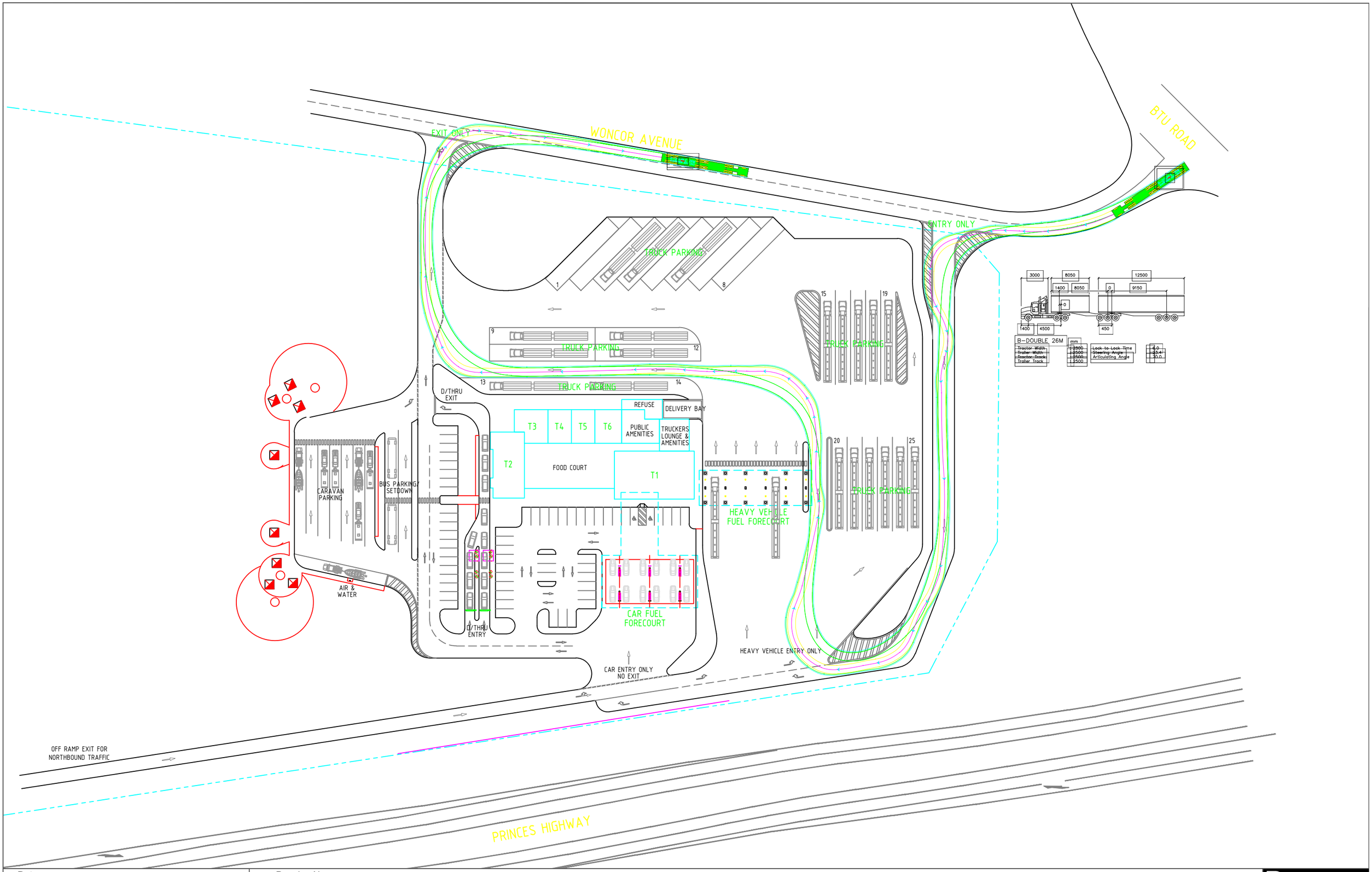
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and 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.

# APPENDIX E

# SWEPT PATH ASSESSMENT




| | | |
|---|---|---|
| Date: 25/07/2017 | Drawing Name: 26m B-Double Princes Highway Ingress Swept Path | BITZIOS consulting |
| Project No: P2795 | Project Name: South Nowra Service Centre Traffic Impact Assessment | Sheet 1 / Version A |




| | | |
|---|---|---|
| Date: 25/07/2017 | Drawing Name: 26m B-Double Woncor Avenue Ingress Swept Path | BITZIOS consulting |
| Project No: P2795 | Project Name: South Nowra Service Centre Traffic Impact Assessment | Sheet 2 / Version A |

1
8
9
12
TRUCK PARKING
13
14
TRUCK PARKING
D/THRU
EXIT
REFUSE
T3
T4
T5
T6
PUBLIC
AMENITIES
TRUCKERS
LOUNGE &
AMENITIES
T2
FOOD COURT
T1
15
19
TRUCK PARKING
20
25
TRUCK PARKING
HEAVY VEHICLE
FUEL FORECOURT
12500
2200
6850
SU TRUCK
mm
Width : 2500
Track : 2500
Lock to Lock Time : 6.0
Steering Angle : 36.6

| | | |
|---|---|---|
| Date: 25/07/2017 | Drawing Name: 12.5m Heavy Rigid Vehicle Servicing Swept Path | BITZIOS consulting |
| Project No: P2795 | Project Name: South Nowra Service Centre Traffic Impact Assessment | Sheet 3 / Version A |

# APPENDIX 3

Documents Outlining Pre-Lodgement Discussions with Council and RMS

## Bronwyn Seiden

From: monikaimportant@gmail.com
Sent: Friday, 9 October 2015 3:08 PM
To: Bronwyn Seiden
Subject: Fwd: Meeting on possible planning proposal for Lot 2 Woncor Ave, South Nowra

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Bronwyn.
The meeting information on initial stage .
Any further details feel free to contact me any time

Many Regards
Monika

Sent from my iPhone

Begin forwarded message:

> From: monikaimportant@gmail.com
> Date: 9 October 2015 at 11:49:22 AM AEDT
> To: reception@fnch.com.au
> Subject: Fwd: Meeting on possible planning proposal for Lot 2 Woncor Ave, South Nowra
>
> Sent from my iPhone
>
> Begin forwarded message:
>
> > From: Marie-Louise Foley <Marie-Louise.Foley@shoalhaven.nsw.gov.au>
> > Date: 25 September 2015 at 11:22:06 AM AEST
> > To: "'monikaimportant@gmail.com'" <monikaimportant@gmail.com>
> > Subject: FW: Meeting on possible planning proposal for Lot 2 Woncor Ave, South Nowra
> >
> > Hi Monica
> >
> > Following on from meeting on Friday 18 September here at Council, please find following a summary of the meeting and our advice to you in regards to your proposal.
> >
> > Your proposal is rezone land on the Princes Highway at Woncor Ave, South Nowra (Lot 2 DP 1154597) to zone B5 Business Development to allow for the development of a service station for light and heavy traffic, a restaurant, and a rest and recover area including shower facilities and a truck stop. It is intended to operate 24/7 with access from Woncor Ave.
> >
> > As advised in the meeting, staff recommend that you:
> >
> > - Request that 'highway service centre' be added as an additional permitted use for the site rather than requesting a rezoning to B5 Business Development;

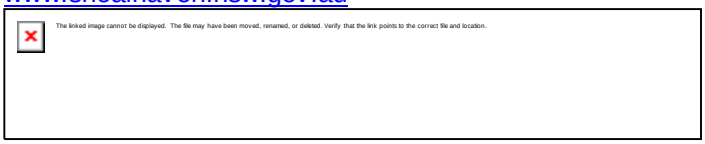
- Speak to RMS about their future plans for the Princes Highway in this location and the future western bypass of Nowra, and what works might be required on the Highway for your proposal;
- Speak to Greg Pullen, Council's Economic Development Manager (4429 3240) in regards to your proposal and any other proposal for a truck stop in South Nowra;
- Engage a planning consultant to prepare the planning proposal for you and to guide you through the process;
- Review State government and Council guidelines in regards to planning proposals, in particularly in regards to providing justification for the planning proposal; and
- Book in a pre-lodgement meeting with Council once you have prepared a planning proposal document.

If you have any further questions, please do not hesitate to contact me.

Regards

**Marie-Louise Foley**
**Coordinator – City Strategy**
Shoalhaven City Council

02 4429 3559 | 0417 276 639
Bridge Rd (PO Box 42) Nowra NSW 2541
foleyml@shoalhaven.nsw.gov.au
www.shoalhaven.nsw.gov.au



## Karen Mion

| | |
|---|---|
| From: | Karen Mion |
| Sent: | Wednesday, 25 November 2015 11:10 AM |
| To: | development.southern@rms.nsw.gov.au |
| Subject: | Attn: Chris Millet |
| Attachments: | Clauses Map - LEP.PNG |

Dear Chris,

We have been advised by your staff to contact you via email regarding inquires we have in connection to a potential Planning Proposal at South Nowra.

The site being considered by our client is Lot 2 DP 1154597. The Planning Proposal would result in a 'Highway Service Station' being permissible on the site.

On the 3 November 2015 we had a meeting with Council staff and were advised to discuss the matter with RMS prior to proceeding with the proposal.

Specifically Shoalhaven Council's Strategic Planners Michael Park and Marie-Louise Foley advised us to obtain comment from RMS on the following two matters:-

1. Plans for a Nowra Bypass

Clause 7.21 of the Shoalhaven LEP applies to land in the vicinity of the Western Bypass Corridor. The subject site is located to the south of this Bypass Corridor as shown on the attached map extract (subject site marked red and Corridor marked solid blue). Council staff advised that land to the north of Forest Road has been classified as a National Park and therefore they are concerned that the RMS may need to utilise land to the south of the currently marked corridor in order for the bypass to best connect with the Forrest Road / Princess Highway intersection. This will potentially impact on the subject site.

Following this meeting with Council (and prior to the meeting) we have attempted to discuss this matter with yourself or another appropriate person from your office. On 16 November Ivo from your office advised that he had the understanding that Council was not interested in such a Bypass and was unsure as to why Shoalhaven City Council would be directing us to gain comment from RMS on this matter. He advised that the request for information be put into an email attention to you to allow an appropriate response to be formed.

2. Access Requirements

While the 'Highway Service Station' is only at concept Planning Proposal stage, are there any initial comments RMS would want to make with regard to the type of access arrangements required to the site from the Highway. Should the Planning Proposal be supported it is intended that the Service Station cater for Heavy Vehicles travelling north. Furthermore, is the RMS likely to require a traffic report be undertaken as part of the Planning Proposal?

Given the above we would greatly appreciate the opportunity to meet with the appropriate representative from RMS to discuss this matter.

Regards,

Karen Mion
Town Planner
SET Consultants Pty Limited

SET CONSULTANTS PTY L
51 Graham Street Nov
PO Box 495 Nowra NSW 25
p 02 4421 45
Kiama 02 4233 20
mail@setconsultants.com
www.setconsultants.com

Our Ref: STH15/00228/02
Contact: Hala Sattouf 4221 2769

Transport Roads & Maritime Services

18 February 2016

Karen Mion
SET consutants
BY EMAIL: Karen@setconsultants.com.au

**PLANNING PROPOSAL – LOT 2 DP 1154597, PRINCES HIGHWAY & BTU ROAD, SOUTH NOWRA – PROPOSED SERVICE CENTRE**

Dear Madam

Roads and Maritime Services (RMS) refers to your email dated 25 November 2015 and the meeting held between RMS and SET Consultants on 12 January 2016 regarding the subject planning proposal.

RMS understands that an amendment to the Shoalhaven Local Environmental Plan 2014 would be required to rezone the subject land and allow a service centre to be constructed.

RMS notes your proposal currently includes a truck rest area. RMS considers that such a facility would provide a direct road safety benefit for truck drivers using the Princes Highway and an indirect road safety benefit for all other road users. RMS would be willing to consider the rezoning of the land to allow a service centre if it could be demonstrated that appropriate access arrangements would be provided which preserve road safety and traffic efficiency on the Princes Highway.

In response to your enquires regarding plans for a Nowra Bypass, RMS advises:

- The Western Bypass Corridor of Nowra is not a RMS proposal.
- There are no current RMS road proposals affecting the subject property.

In response to your enquires regarding access requirements, RMS advises:

- Given the scale of proposed development is still unclear and in the absence of a concept layout, RMS is unable to provide detailed access requirements at this stage. A traffic impact study (TIS) would be required in order to consider the proposal further. As a guide Table 2.1 of the RTA Guide to Traffic Generating Developments outlines the key issues that may be considered in preparing a TIS.
- RMS highlights that the Shaolin Temple proposal, which accesses the Princes Highway via Forest Road, has been approved by the Department of Planning (M13_0938). The temple has been conditioned to construct a grade separated interchange at the junction of the Princes Highway and Forest Road. As the subject property is located directly west of this junction, RMS considers that the required interchange which has the

potential to impact your service centre proposal. RMS recommends the developers liaise with one another on this matter and ensure this is addressed in the TIS.

- RMS notes the service centre is only proposed on the western side of the Princes Highway. The proposal has the potential to significantly increase right turn movements from the Princes Highway into the site by attracting southbound traffic. The TIS would need to consider and address this issue.
- Based on the traffic generation estimates, intersection modelling using SIDRA would need to be undertaken for the junction of the site access with the Princes Highway and the junction of BTU Road and the Princes Highway considering the following:
    - AM and PM peaks volumes and holiday peak volumes.
    - Existing traffic volumes with and without development and 10 year projected volumes with and without the development
    - The base SIDRA models must be calibrated with onsite observations in the AM and PM peak. This can be done by measuring existing queue lengths and delays.
- The TIS would need to identify suitable infrastructure required to ameliorate any traffic impacts and safety impacts associated with the development, including safe pedestrian arrangements within the site.
- RMS has a list of general requirements for highway service centres that should be considered in preparing any proposal for the subject site. Refer to Attachment 1.

RMS will reconsider the application once the above issues are addressed. If you have any questions please contact Hala Sattouf on 4221 2769.

Yours faithfully

Adam Berry
Network & Safety Manager
Network Management, Southern Region

CC: Shoalhaven City Council (via email to: council@shoalhaven.nsw.gov.au)

## Appendix 1 – General requirements for highway service centres

- Entry and exit arrangements, and internal configurations, would need to accommodate safe access for the largest vehicles using the route, or proposed to use the route in the future.
- Fuel sale plazas for light and heavy vehicles would need to be segregated and undercover.
- An emergency break down clearance point for highway vehicles to be inspected and towed for mechanical repair off-site would need to be provided.
- A minimum of 25 B-Double parking spaces that can also accommodate larger vehicles would need to be provided which are clearly marked and identified. Alternatively RMS would consider any analysis which supported a higher or low number of spaces.
- A minimum of 2 coach bus parking spaces would need to be provided which are clearly marked and identified, and are in addition to the designated B-Double parks. Alternatively RMS would consider any analysis which supported a higher or low number of spaces.
- A minimum of 10 recreation vehicle and trailer parking spaces would need to be provided which are easily and safely accessed. Alternatively RMS would consider any analysis which supported a higher or low number of spaces.
- Generally, RMS would require the facilities at highway service centres to operate 7 days a week, 24 hours a day. The facilities would need to include the following:
    - Service centre with convenience store.
    - A 'no obligation' rest area facility for users who choose not to utilise the food outlets, inclusive of an outdoor picnic / eating area(s).
    - A separate dining area and / or restaurant for heavy vehicle drivers.
- No sale of alcohol would be permitted.

Karen Mion

From: Bronwyn Seiden
Sent: Monday, 14 August 2017 2:41 PM
To: Karen Mion
Subject: FW: South Nowra - planning proposal (service centre)

---

From: Michael Park [mailto:Michael.Park@shoalhaven.nsw.gov.au]
Sent: Friday, 1 April 2016 3:40 PM
To: Bronwyn Seiden
Subject: RE: South Nowra - planning proposal (service centre)

Hi Bronwyn

Apologies for the delay. I don't have a great answer for you sorry.

As we discussed earlier, there are 2 options. You can submit a full PP that includes a market assessment that demonstrates a need for that type of development, and also considers whether there are existing suitably zoned sites in the area. Or alternatively, you can submit a letter of intent that we will try report up to Council to see whether they are generally supporting of the idea before you prepare a full blown PP.

Unfortunately, neither Tim or Gordon will guarantee that we will report it up to Council. Either Tim or the GM could refuse to report it up and ask for a full PP. So you would be taking the risk that it could delay the project by a month or so.

Sorry I cant give you more definitive advice. But if you have any questions, let me know.

Thanks again

Our Ref: STH15/00228
Contact: Andrew Lissenden 4221 2769

Transport Roads & Maritime Services

1 June 2017

Adrian Bitzios
Bitzios Consulting
BY EMAIL: Adrian@bitziosconsulting.com.au

**PRE DA ADVICE - LOT 2 DP 1154597, WONCOR AVENUE, NOWRA HILL – SERVICE CENTRE**

Dear Adrian

Roads and Maritime Services (RMS) refers to emails from Bitzios Consulting dated 11 April 2017 and 27 April 2017 regarding the above pre development application (DA) enquiry.

RMS has reviewed the submitted information, including the provided concept plan (copy attached – refer to Attachment 1), using the current RMS design reference documents, and offers the following comments in relation to access from the Princes Highway:

- The taper provided for the left in access from the Princes Highway is too short. It should be 35m for a design speed of 110km/hr in accordance with *Austroads Guide to Road Design (AGRD) – Part 4a: Unsignalised and Signalised Intersection*, Section 8.2.3. Any future plans lodged should be amended to demonstrate compliance with the above;
- Should the deceleration lane utilise the existing shoulder, the existing provision for cyclists would be removed. The access also presents a conflict with cyclists. Any future plans lodged should be amended to demonstrate how cyclists can be accommodated in the proposals access design;
- There should be a separation distance equivalent to 3 seconds travel time (or 95m) (refer to *RTA Road Design Guide,* Section 1, 1.10.5 and AGRD - *Part 4a: Unsignalised and Signalised Intersection*, Section 3.2.2) between the auxiliary left turn treatment (AUL) and the existing merge on Princes Highway to separate driver decision points. Any future plans lodged should be amended to demonstrate compliance with the above;
- The existing light poles, wire rope and other road infrastructure (e.g. drainage) impacted upon by the proposed access would need to be relocated. Any future plans lodged should clearly detail the location of infrastructure impacted upon (e.g. location of existing and proposed replacement location) and its replacement location;
- The geometry (horizontal and vertical) of the off ramp has not been detailed. The design speed of the off ramp and associated geometry dictates the required deceleration length of

the AUL lane. The deceleration length should be in accordance with AGRD Part 4A, Section 5.3.2. Any future plans lodged should be amended to demonstrate compliance with the above;

- An anti-gawk screen will be required. The anti-gawk screen location is required to be shown to enable RMS to make comment on the implications it could have on the road environment. Potential issues could include hazard in close proximity to highway traffic and obstruction of highway signage. The anti-gawk screen should be separate to any safety barrier and should be located outside of RMS owned land;
- The design vehicle for Princes Highway (and BTU Road) access that is to be used is a 26m B-Double truck;
- Any non-frangible roadside furniture should be located outside of the clear zone; and
- RMS notes that the Shaolin Tourist development proposal, which accesses the Princes Highway via Forest Road, has been approved by the Department of Planning and Environment (DPE). The DPE reference is MP06_0135. The approval has been conditioned to construct a grade separated interchange at the junction of the Princes Highway and Forest Road (refer to Conditions 23, 24 and 26). As the subject property is located directly west of this junction, RMS considers that the required interchange has the potential to impact the service centre proposal with reference to access off the Princes Highway. RMS recommends the developers liaise with one another on this matter and ensure this is addressed in the design as well as the Traffic Impact Study (TIS). Any design submitted will need to demonstrate how the above approved access can still be provided.

In addition to the above, the following comments are also provided for your consideration:

- Strategically, highway service centres should be located at intervals of approximately 40 to 60 minutes travel time along major routes so as to provide road safety and network efficiency benefits. The Princes Highway Corridor Strategy sets out a heavy vehicle rest area goal every 100 km, or based on constraints at least every 80 to 120 km. At this time a rest area exists at Bewong and the under construction Mount Ousley rest will ensure the above strategy requirements are met. Despite the above, RMS would generally support the provision of heavy vehicle facilities (i.e. parking, etc) at a new highway service centre;
- A traffic impact study (TIS) would be required in order to consider the proposal further. As a guide Table 2.1 of the *RTA Guide to Traffic Generating Developments* outlines the key issues that may be considered in preparing a TIS. The TIS would need to identify suitable infrastructure required to ameliorate any traffic impacts and safety impacts associated with the development, including safe pedestrian arrangements within the site;
- RMS notes the service centre is only proposed on the western side of the Princes Highway. The proposal has the potential to significantly increase right turn movements from the Princes Highway into the site by attracting southbound traffic. The TIS would need to consider and address this issue.

- Based on the traffic generation estimates, intersection modelling using SIDRA would need to be undertaken for the junction of the site access with Woncor Avenue, the junction of Woncor Avenue and BTU Road and the junction of BTU Road and the Princes Highway. This being required to determine whether the existing layouts of the intersections are adequate to accommodate the increased volumes from southbound movements into the proposed facility. The modelling would need to consider the following:

  - AM and PM peaks volumes and holiday peak volumes;
  - Existing traffic volumes with and without development and 10 year projected volumes with and without the development;
  - The base SIDRA models must be calibrated with onsite observations in the AM and PM peak. This can be done by measuring existing queue lengths and delays; and
  - Any additional works /suitability of the above intersections.

  Electronic copies of all SIDRA files should be submitted with any future DA to enable the RMS to review.

- RMS has acquired land that adjoins the site of the proposed service centre. The land was acquired for the Princes Highway upgrade at South Nowra which has now been completed (refer to Attachment 2 - land coloured blue on the plan with reference: RMS Plan No. 0001 404 AS 4011). This land will ultimately be declared a Controlled Access Road (CAR) whereby access will be restricted across the boundaries shown by orange colour. In addition, the property is subject to a Road Widening Order as shown by pink colour on the attached part copy of DP 1154597 (refer to Attachment 2). The Road Widening Order is no longer required by RMS and will ultimately be rescinded sometime after the declaration of the Highway as a CAR

- Sufficient detail is required to be shown on the plan for the proposed works that impact upon the Princes Highway road reserve. This detail should include, but not be limited to, identification of legal/registered property boundaries (including easements), identification of existing ground levels and proposed finish ground levels in the vicinity of works, identification of all existing and relocated infrastructure within the road reserve area (e.g. light poles, wire rope, drainage), etc;

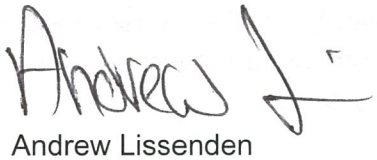
- Details are required on proposed batter/slope for the access works proposed within the Princes Highway road reserve. Supporting geotechnical information is required that details its stability; and

- RMS has a list of general requirements for highway service centres that should be considered/addressed in preparing any DA for the subject site (refer to Attachment3). Each of the points should be addressed as part of the TIS.

Please note that the above is pre DA advice based on the information provided by the proponent. The RMS position is subject to change, dependant on the information provided in any future development application.

If you have any questions please contact Andrew Lissenden on 4221 2769.

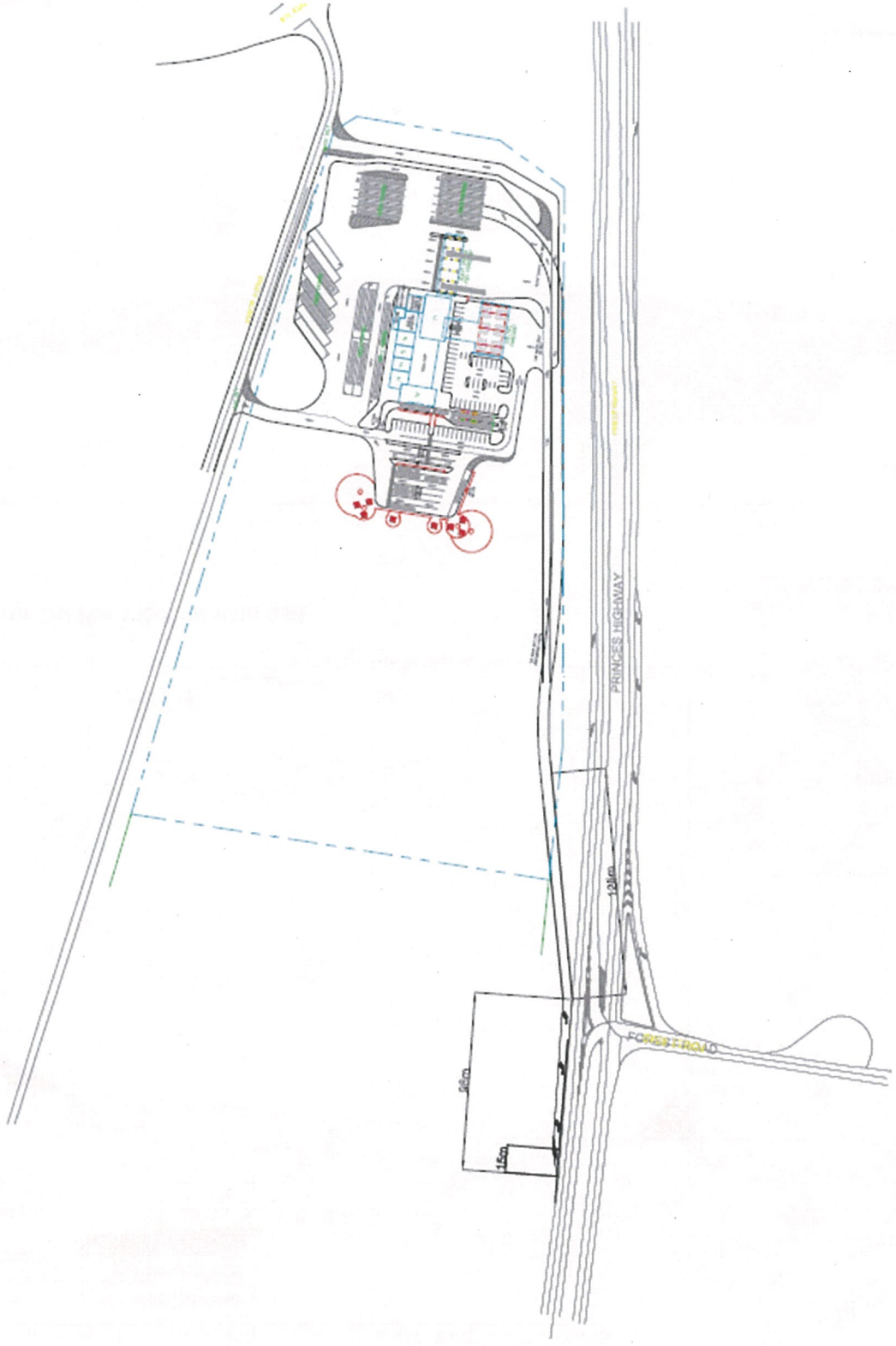
Yours faithfully



Andrew Lissenden
A/Manager Land Use
Southern Region

CC – CC: Shoalhaven City Council (via email to: council@shoalhaven.nsw.gov.au)

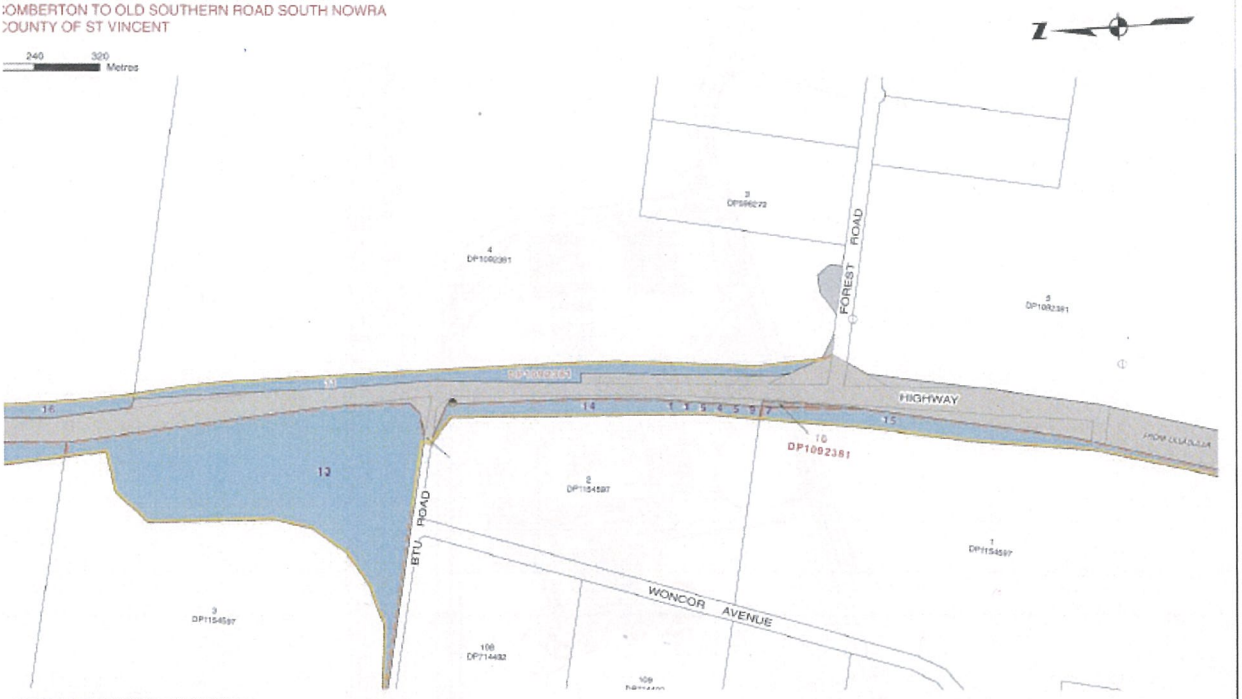
## Attachment 1 – Concept Design Submitted



## Attachment 2

AN
SS ROAD UNDER SECTION 49 OF THE ROADS ACT 1993
) UNDER SECTION 54 OF THE ROADS ACT 1993
:OMBERTON TO OLD SOUTHERN ROAD SOUTH NOWRA
:OUNTY OF ST VINCENT

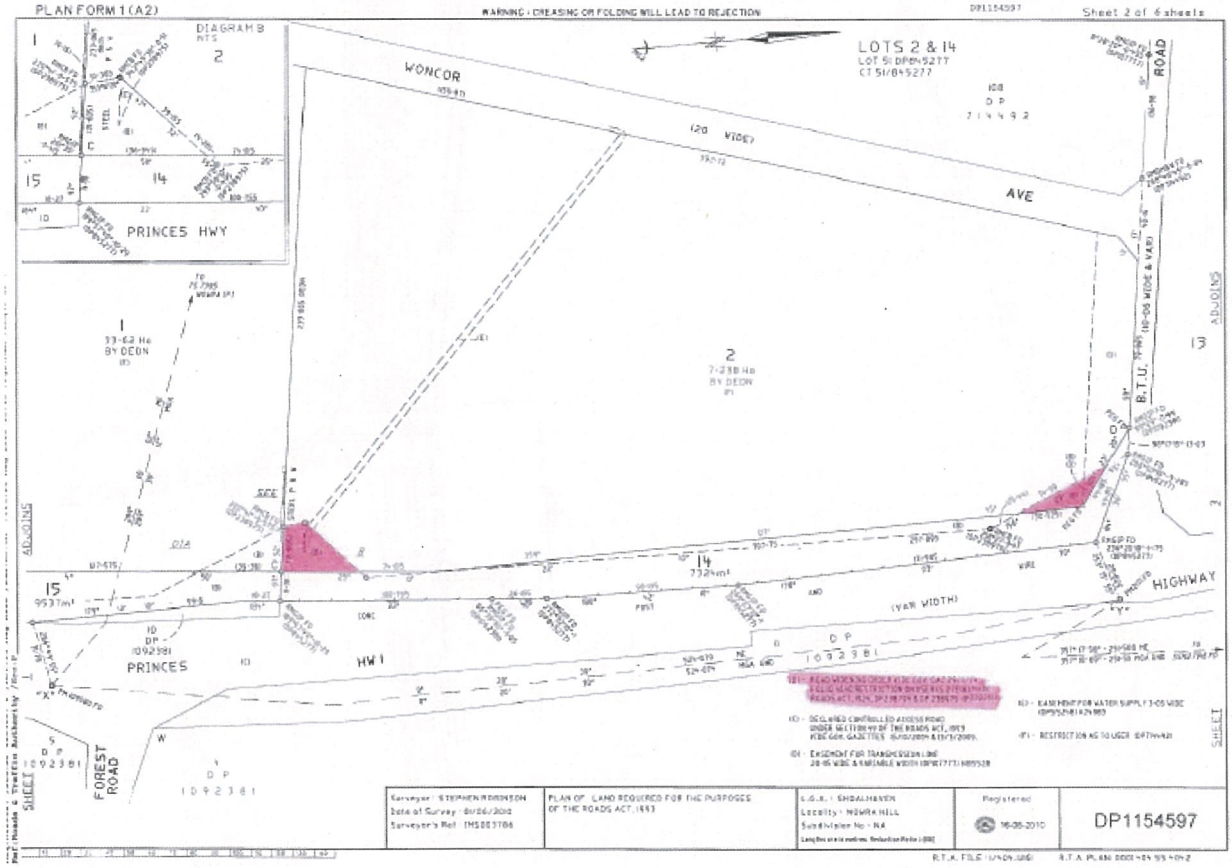
240 320 Metres




POINTS WHERE ACCESS WILL BE AVAILABLE TO OR FROM OTHER PUBLIC ROADS

BOUNDARIES WHERE ACCESS WILL BE RESTRICTED

**RMS Plan No. 0001 404 AC 4011** Sheet 3 of 3



## Attachment 3 – General requirements for highway service centres

- Entry and exit arrangements, and internal configurations, would need to accommodate safe access for the largest vehicles using the route, or proposed to use the route in the future.
- Fuel sale plazas for light and heavy vehicles would need to be segregated and undercover.
- An emergency break down clearance point for highway vehicles to be inspected and towed for mechanical repair off-site would need to be provided.
- A minimum of 25 B-Double parking spaces that can also accommodate larger vehicles would need to be provided which are clearly marked and identified. Alternatively RMS would consider any analysis which supported a higher or low number of spaces.
- A minimum of 2 coach bus parking spaces would need to be provided which are clearly marked and identified, and are in addition to the designated B-Double parks. Alternatively RMS would consider any analysis which supported a higher or low number of spaces.
- A minimum of 10 recreation vehicle and trailer parking spaces would need to be provided which are easily and safely accessed. Alternatively RMS would consider any analysis which supported a higher or low number of spaces.
- Generally, RMS would require the facilities at highway service centres to operate 7 days a week, 24 hours a day. The facilities would need to include the following:
  - Service centre with convenience store.
  - A 'no obligation' rest area facility for users who choose not to utilise the food outlets, inclusive of an outdoor picnic / eating area(s).
  - A separate dining area and / or restaurant for heavy vehicle drivers.
- No sale of alcohol would be permitted.

# APPENDIX 4

## 2014 ANEF Albatross Map

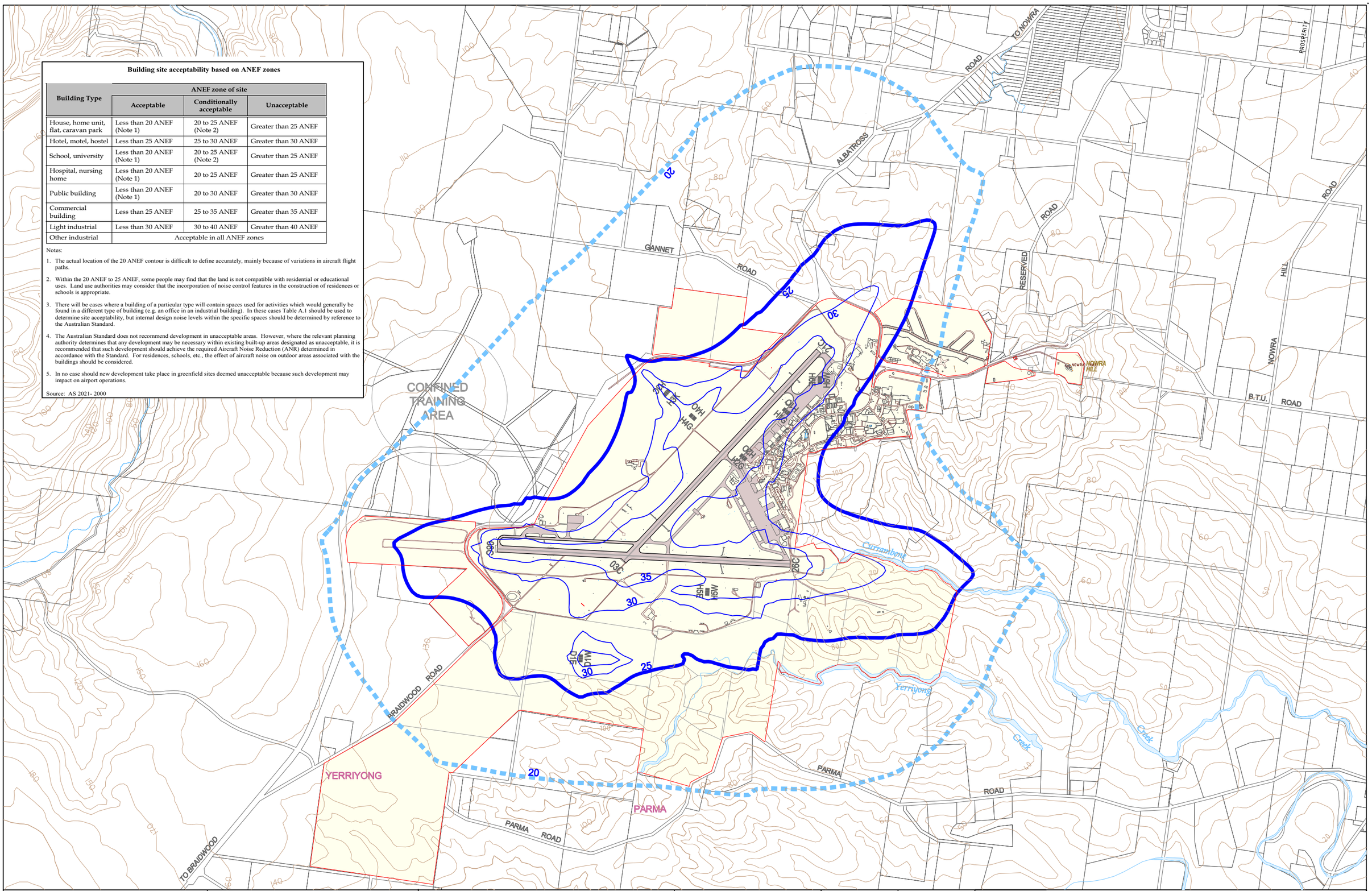
**Building site acceptability based on ANEF zones**

| Building Type | ANEF zone of site | | |
|---|---|---|---|
| | Acceptable | Conditionally acceptable | Unacceptable |
| House, home unit, flat, caravan park | Less than 20 ANEF (Note 1) | 20 to 25 ANEF (Note 2) | Greater than 25 ANEF |
| Hotel, motel, hostel | Less than 25 ANEF | 25 to 30 ANEF | Greater than 30 ANEF |
| School, university | Less than 20 ANEF (Note 1) | 20 to 25 ANEF (Note 2) | Greater than 25 ANEF |
| Hospital, nursing home | Less than 20 ANEF (Note 1) | 20 to 25 ANEF | Greater than 25 ANEF |
| Public building | Less than 20 ANEF (Note 1) | 20 to 30 ANEF | Greater than 30 ANEF |
| Commercial building | Less than 25 ANEF | 25 to 35 ANEF | Greater than 35 ANEF |
| Light industrial | Less than 30 ANEF | 30 to 40 ANEF | Greater than 40 ANEF |
| Other industrial | Acceptable in all ANEF zones | | |

Notes:

1. The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variations in aircraft flight paths.
2. Within the 20 ANEF to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate.
3. There will be cases where a building of a particular type will contain spaces used for activities which would generally be found in a different type of building (e.g. an office in an industrial building). In these cases Table A.1 should be used to determine site acceptability, but internal design noise levels within the specific spaces should be determined by reference to the Australian Standard.
4. The Australian Standard does not recommend development in unacceptable areas. However, where the relevant planning authority determines that any development may be necessary within existing built-up areas designated as unacceptable, it is recommended that such development should achieve the required Aircraft Noise Reduction (ANR) determined in accordance with the Standard. For residences, schools, etc., the effect of aircraft noise on outdoor areas associated with the buildings should be considered.
5. In no case should new development take place in greenfield sites deemed unacceptable because such development may impact on airport operations.

Source: AS 2021- 2000




*LEGEND:*

20
25
ANEF CONTOURS, SHOWING ANEF VALUES

*NOTES :*

1. *ANEF CONTOURS WERE GENERATED USING INM v6.1.*
2. *FOR TRACK, PROFILE AND AIRCRAFT MOVEMENT DETAILS REFER TO HMAS ALBATROSS 2014 ANEF SUMMARY REPORT (GHD), September 2004*

*This 2014 ANEF contour plan of HMAS Alatross is endorsed by*

Signature: Chris Bee (ASSPED) Date: 17 Jan 05

Chris Bee
Assistant Secretary Strategic Planning and Estate Development

SCALE IN METRES
250 0 250 500
( 1 : 25,000 for A3 size )

GHD
MANAGEMENT
ENGINEERING
ENVIRONMENT

23/10839/ALB DGN/SUMMARY/FIGURE 21 ANEF.DGN

AUSTRALIA
Department of Defence
SEPTEMBER 2004

# HMAS ALBATROSS, NOWRA NSW
# 2014 ANEF SUMMARY REPORT

## 2014 ANEF

# APPENDIX 5

# Potential Preliminary Concept Site Plan

PRELIMINARY

## DEVELOPMENT ASSESSMENT

TOTAL SITE AREA – 7.238 Ha

## BUILDING AREAS

- T1 FUEL SALES/SHOP – 350m²
- T2 F/FOOD & D/THRU – 190m²
- T3 F/FOOD – 90m²
- T4 F/FOOD – 70m²
- T5 F/FOOD – 70m²
- T6 F/FOOD – 80m²
- PUBLIC/TRUCKERS AMENITIES – 85m²
- PUBLIC DINING – 390m²

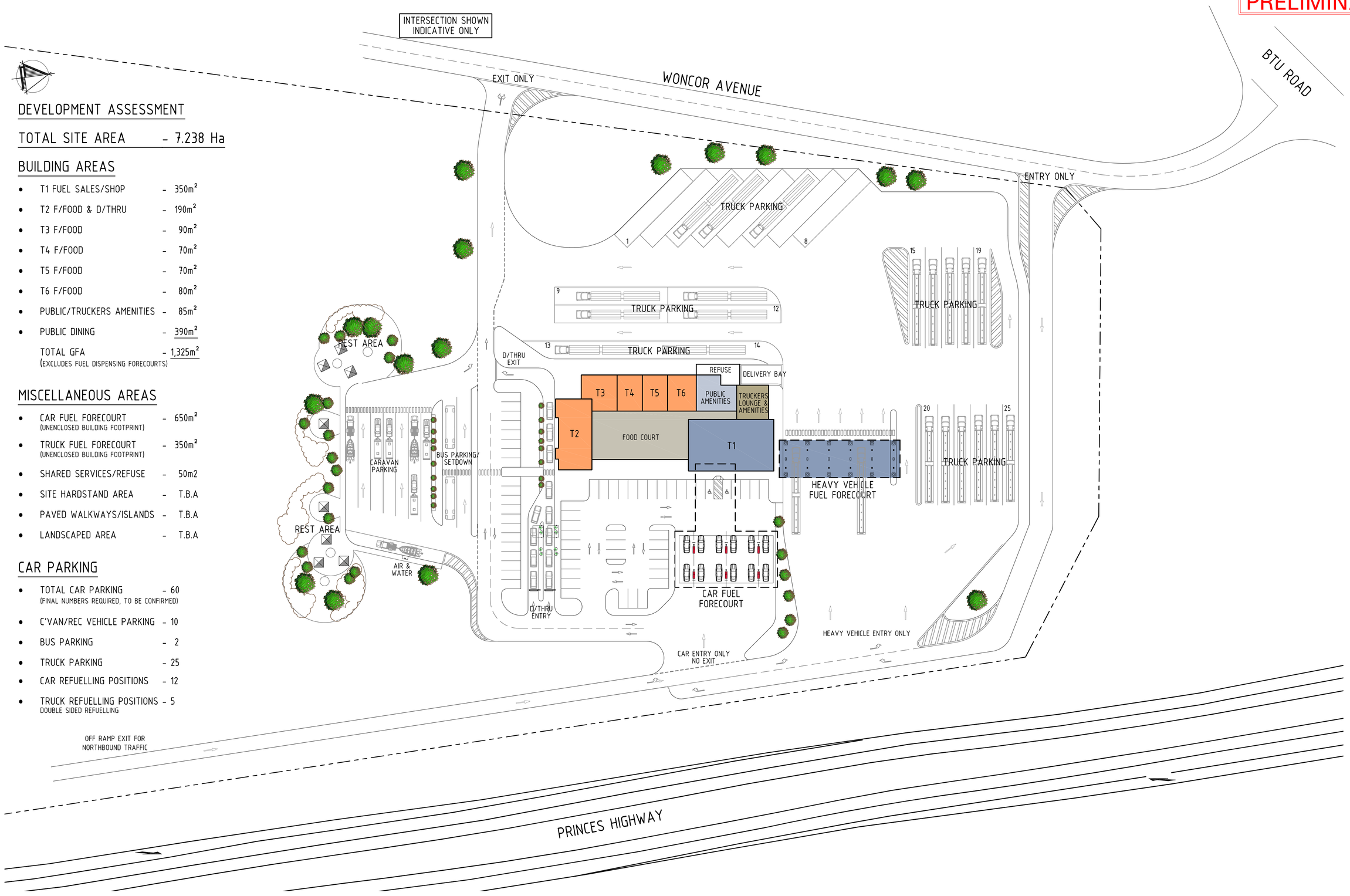
TOTAL GFA – 1,325m²
(EXCLUDES FUEL DISPENSING FORECOURTS)

## MISCELLANEOUS AREAS

- CAR FUEL FORECOURT – 650m²
  (UNENCLOSED BUILDING FOOTPRINT)
- TRUCK FUEL FORECOURT – 350m²
  (UNENCLOSED BUILDING FOOTPRINT)
- SHARED SERVICES/REFUSE – 50m2
- SITE HARDSTAND AREA – T.B.A
- PAVED WALKWAYS/ISLANDS – T.B.A
- LANDSCAPED AREA – T.B.A

## CAR PARKING

- TOTAL CAR PARKING – 60
  (FINAL NUMBERS REQUIRED, TO BE CONFIRMED)
- C'VAN/REC VEHICLE PARKING – 10
- BUS PARKING – 2
- TRUCK PARKING – 25
- CAR REFUELLING POSITIONS – 12
- TRUCK REFUELLING POSITIONS – 5
  DOUBLE SIDED REFUELLING




Consulting Engineer

VERVE BUILDING DESIGN CO.

BUILDING DESIGNERS LICENCE No. 1002212 PH. 07 3857 0942
OFFICE 1, LEVEL 1, 318 JUNCTION ROAD, CLAYFIELD QLD 4011 E: info@vervebd.com.au

imagine □ create □ deliver

□ commercial / industrial / retail
□ fast food restaurant design
□ travel centre / service stations
□ project concept to completion



Revision and approvals

| Code | Date | Drn | Description | Dwn |
|---|---|---|---|---|
| P3 | 11.04.2017 | GN | PRELIMINARY ISSUE FOR INFORMATION | |

Project Description
PROPOSED HIGHWAY SERVICE CENTRE
LOT 2 WONCOR AVENUE, SOUTH NOWRA

Drawing Title
SITE CONCEPT PLAN
OPTION 4

Scale 1:500 @ A1 / 1:1000@A3
Approved
Drawn GN
Issued

Drawing Number 16090-SK07
Revision P3