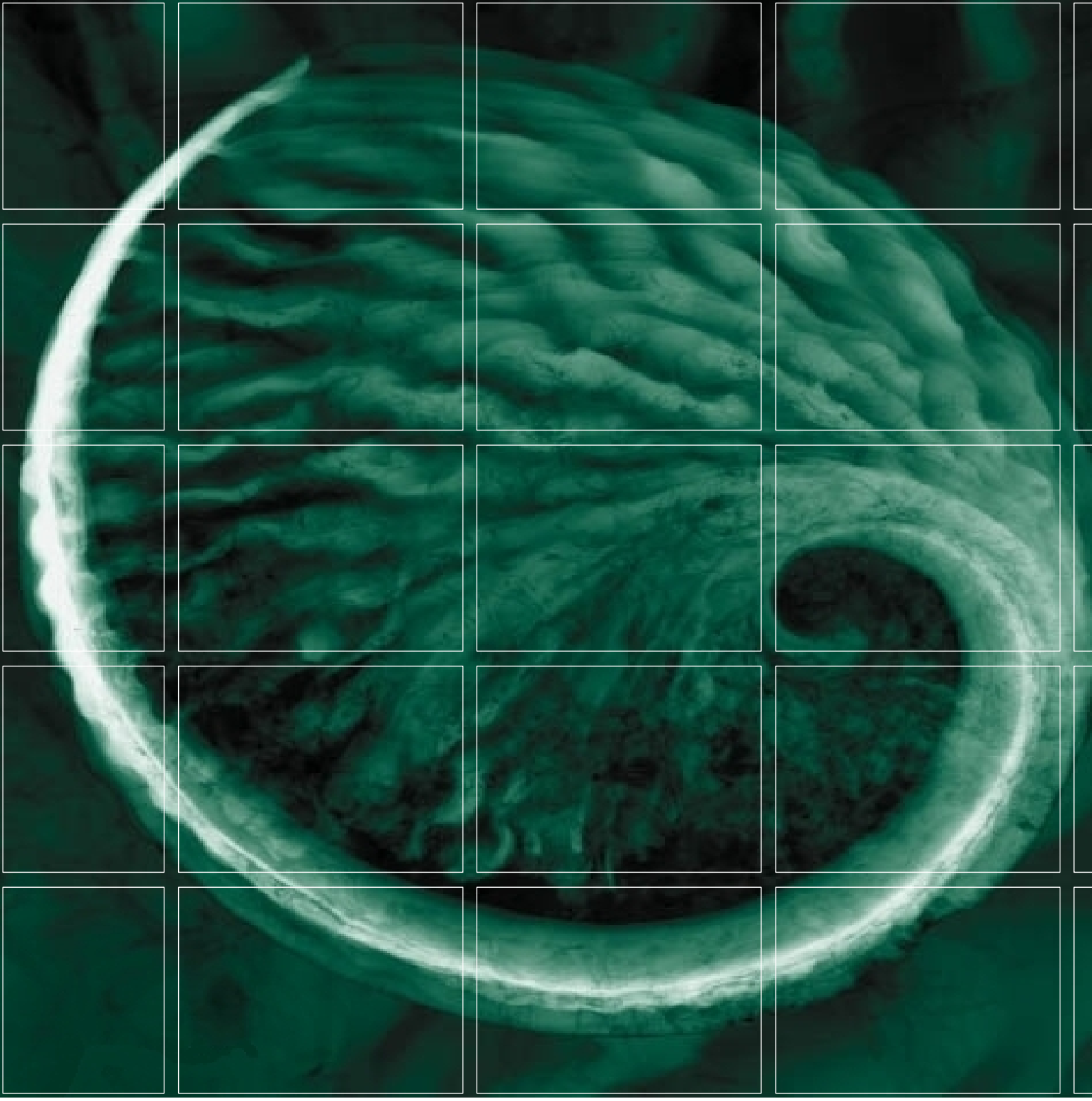
ANNEX M

Traffic Impact Assessment Report



Fern Bay Seaside Village

Traffic Impact Assessment

Aspen Group

February 2009
0063154TIA Final
www.erm.com

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Approved by:	*Paul Douglass*
Position:	Partner
Signed:	
Date:	*10 February, 2009*

Environmental Resources Management Australia Pty Ltd Quality System

Fern Bay Seaside Village

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CONTENTS

CONTENTS

ANNEXURES

FIGURES

1 INTRODUCTION

1.1 BACKGROUND

The Aspen Property Group commissioned Environmental Resources Management Australia Pty Ltd (ERM) to undertake a traffic impact assessment for a proposed residential village at Fern Bay, known as Fern Bay Seaside Village. The site is described as Lot 16, DP 258848, No. 85 Nelson Bay Road, Fern Bay and is within the Port Stephens local government area. The site's location is illustrated in *Figure 1.1*.

Chapter 1 of this report provides background information, a description of the proposed development, details of relevant planning considerations and issues raised by the Roads and Traffic Authority of NSW. *Chapter 2* provides an examination of the existing road network and *Chapter 3* addresses the proposed road network. An assessment of traffic impacts is provided in *Chapter 4* and the final chapter, *Chapter 5*, draws conclusions on the suitability of the proposed development having regard to traffic considerations.

1.2 APPROVED DEVELOPMENT

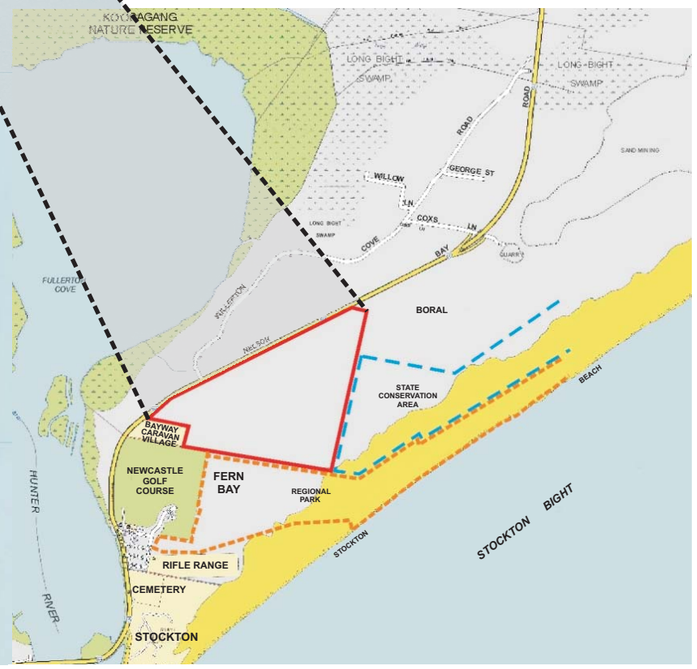
There is an existing approval to subdivide part of the site into residential lots and at this stage 149 lots have been completed. The remaining lots within this consent will not be acted upon and the existing 149 lots form part of the Master Plan approval. The Master Plan approval relates to approximately 947 lots of which 149 have already been constructed.

The existing Development Consent also proposed a site for a future school. The school site is also now proposed to be developed for residential purposes given the Department of Education and Training has confirmed that it is no longer required for educational purposes.

1.3 PROPOSED DEVELOPMENT

Fern Bay Seaside Village is proposed to comprise:

- approximately 950 residential lots in total (of which 149 have been constructed);
- open space lots which will include formal parks and an Aboriginal heritage reserve within 2(a) zoned land and conservation reserves within 1(a), 2(a) and 7(a) zoned land. These areas of open space are designed to provide opportunities for passive and active recreation, stormwater management and the protection of sites of Aboriginal heritage significance and ecological corridors;



Legend

Fern Bay Estate

Figure 1.1

Locality Plan

Client:	Aspen Group Pty Ltd		
Project:	Fern Bay Estate		
Drawing No:	0063154hv_traffic_01		
Date:	04/06/07	Drawing size:	A3
Drawn by:	SP	Reviewed by:	DP
Source:	-		
Scale:	Not to Scale		

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- community, recreational and commercial facilities;
- new public roads, fire trails, cycleways and pedestrian trails; and
- bushfire buffers (asset protection zones).

Those approved lots and roads within 200 metres of the northern boundary of the site are not proposed to be constructed. Instead this area is proposed to form part of a minimum 200 metre wide ecological corridor that will connect the site with the vegetated areas to the north and south as part of the proposed Master Plan.

The residential lots within the village are proposed to comprise:

- integrated housing lots;
- standard villa lots ranging in size from 340 to 399 m^2;
- premium villa lots ranging in size from 400 to 449 m^2;
- courtyard lots ranging in size from 450 to 589 m^2;
- conventional lots 590m^2 and greater in size;
- duplex lots 750 m^2 and greater in size; and
- standard residential lots that form part of the approved subdivision that are 550 m^2 and greater in size.

Figure 1.2 provides an overview of the proposed development that is the subject of this traffic impact assessment.

1.4 PLANNING CONSIDERATIONS

1.4.1 Port Stephens Council

Port Stephens Development Control Plan 2007, Section B1 Subdivision and Streets, provides assistance with the preparation and assessment of development applications for subdivision, and the design and construction of engineering works associated with subdivisions and developments. It includes minimum standards for new subdivisions.

Section B1 of DCP 2007 contains requirements that apply to the design of roads and states that the provision of a road system within a subdivision should:

- provide convenient and safe access for pedestrians and cyclists;
- provide safe, logical and hierarchical transport linkages;

Legend

- Managed Community Reserves/Parks[1]
- Community Conservation Lands[2]
- Local Activity Centre
- Mixed Use Residential Development
- Commercial Development
- Cultural Heritage Reserve
- Part of the Approved Subdivision Area
- Potential Stormwater Management Infrastructure
- Pathway
- Fire Trail
- 10 metre Asset Protection Zone
- 20 metre Asset Protection Zone
- 25 metre Asset Protection Zone

Notes:

1 Managed Community Reserves/Parks are areas of active and passive recreation for community purposes and do not form part of the community land.

2 Community lands are the 'Conservation Lands' to be managed for ecological and environmental values.

Figure 1.2

Project Plan

Client:	Aspen Group Pty Ltd		
Project:	Fern Bay Seaside Village		
Drawing No:	0063154hv_Traffic_03		
Date:	10/2/09	Drawing size:	A3
Drawn by:	SP	Reviewed by:	PD
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- provide appropriate access for emergency and service vehicles;
- provide a convenient way for public utilities;
- provide an opportunity for street landscape,
- provide convenient parking for visitors; and
- have appropriate regard for the climate, geology and topography of the area.

Clause 5.3 of DCP PS3 specifies minimum road reserve and carriageway widths that apply to urban roads. These minimum road widths are documented in *Table 1.1*.

Table 1.1 Minimum Widths of Urban Roads

Class of Road	Lots/ Dwellings	Carriageway Width	Total Road Width (including Road Reserve)
Accessway	< 5	4.0 – 6.0	8.0
Cul-de-sac	< 12	6.0	13.5
Local Access	12 to 50	8.0 – 9.0 (Bus routes)	16.0 – 17.0
Collector	50 to 200	11.0 (Bus routes)	19.0
Distributor	> 200	11.0 – 13.0	19.0 – 21.0

Source: Port Stephens Development Control Plan 2007

1.4.2 Coastal Design Guidelines for NSW

The *Coastal Design Guidelines for NSW* was produced in 2003 by the Coastal Council. The document is designed to provide a framework for discussion and decision making involving coastal planning, design and development proposals between all stakeholders in the context of caring for the natural beauty and amenity of coastal beaches, headlands, waterways and ecology upstream.

Part 1 of the Guidelines defines seven coastal settlement types, which can be used to analyse and understand urban development along the NSW coast. One of these settlement types is new coastal settlements. The desired future character of new coastal settlements is described in Part 1 of the Guidelines. Part 2 of the Guidelines provides design guidelines to help achieve the desired future character for coastal settlements.

With regard to traffic issues, the Guidelines specify that new coastal settlements should provide a street pattern that:

- is interconnected and permeable;
- responds to the landform and views corridors;
- creates public neighbourhood centres and a main street;

- avoids privatised enclaves; and
- responds to pedestrian and cycle distances and connects to a local and regional network.

1.5 CONSULTATION

1.5.1 Roads and Traffic Authority

The NSW Roads and Traffic Authority (RTA) has previously provided the following advice on the development of the site for residential purposes:

- any works on Nelson Bay Road are subject to RTA approval under the *Roads Act 1993*;
- a traffic impact study is required in accordance with the RTA's *Guide to Traffic Generating Developments* (1993);
- analysis of proposed intersection treatments should be carried out using SIDRA with both input and output data being provided;
- the movement network should be designed to ensure good local connectivity, permeability and legibility throughout the site;
- the road network should be designed to accommodate an efficient public transport system for each stage of construction as well as the completed development;
- the location of bus stops should be identified prior to commencement of each development stage;
- the development should incorporate a comprehensive network of pedestrian and cycleway paths linking residential areas to recreation/community facilities; and
- a noise impact assessment is required for the proposed residential lots adjacent to Nelson Bay Road and appropriate noise abatement measures are to be provided as required outside the Nelson Bay Road reserve.

2 EXISTING ROAD NETWORK

2.1 ROADS

A number of roads have been constructed within the village for the first stage. The site is located on the south (eastern) side of Nelson Bay Road (MR 108), approximately five kilometres south of Cabbage Tree Road (MR302) at Williamtown and approximately three kilometres north of Stockton Bridge.

There are two proposed site access points to Nelson Bay Road, approximately 1.15 kilometres apart resulting in a loop distributor/collector road network serving the future site traffic (refer to *Figure 1.2).*

The southern site access point is a recently constructed four-way roundabout and currently allows access into the site. The northern site access point will be a right turn ban (left-in left-out) T-intersection.

At both the proposed access intersection locations, Nelson Bay Road is a two-lane, relatively straight and level road with good visibility (sight distances for approaching traffic of over 500 metres) in both directions. The current speed limit is 100 km/hr.

To the south of the Fullerton Cove site access location, Nelson Bay Road continues as a two-lane road for approximately 1,700 metres before widening into four lanes and passing the existing settlement of Fern Bay, the intersection with Fullerton Street (leading to Stockton) and the approaches to Stockton Bridge. There are 80 km/hr and 70 km/hr speed limits in these areas.

To the west of the site, Fullerton Cove Road is a collector loop road approximately 5.5 kilometres in length, which has both northern and southern intersections with Nelson Bay Road and serves approximately 75 rural properties. The bus depot on Fullerton Cove Road is responsible for most of the existing heavy vehicle traffic usage of the road.

Other connections to the north and south are provided by the existing network of classified main roads, via Williamtown to Tomago, Raymond Terrace, Medowie and Bob's Farm and via the Stockton Bridge to Kooragang Island, the Tourle Street Bridge and Industrial Drive (MR 316), which distribute traffic east and west to destinations throughout the Newcastle area.

The Tourle Street Bridge is subject to planning studies for upgrade works by the RTA. According to the RTA construction for a new bridge is likely to commence in the next couple of months. Nelson Bay Road is also to be upgraded in several areas north of the site, in the vicinity of Williamtown in the short to medium term. Whilst preliminary plans have been prepared there is currently no upgrade works planned for Nelson Bay Road adjacent to the site.

2.2 *ROAD VOLUME DATA*

The historic growth trends in daily traffic volumes on the major road network have been determined from RTA surveys and are summarised in *Table 2.1*, including estimates for the year 2014.

Table 2.1 Road Volume Data and Predicted Year 2014 Flows (Vehicles/day)

Road and (location)	1992 Data & Count	1995 Data	1998 Data	2001 Data	Year 2004 Estimate & Count	Year 2014[4] Estimate
Nelson Bay Road						
East of Medowie Road	9,560	14,315	-	10,406	11,427	12,049
North of Cabbage Tree Rd	10,745	13,364	14,893	15,401	16,420	19,815
North of Site	10,299[1]	-	-		14,500[1]	18,000
South of Site	10,750[1]	-	-		14,950[1]	18,450
At Stockton Bridge	15,355	16,532	17,482	17,357	17,770	19,145
Tourle Street Bridge						
North of Industrial Drive	-	23,393	24,637	23,650	23,893	24,207
Industrial Drive						
West of Tourle St	21,285	-	-	-	22,461	23,147
East of Tourle St	-	29,746	29,549	30,334	30,628	31,608
Cabbage Tree Road						
West of Nelson Bay Road	2,564	4,004	4,547	4,591	4,885	5,863
Medowie Road						
North of Nelson bay Road	3,967	5,407	5,669	6,123	6,481	7,674
Fullerton Road						
East of Nelson Bay Road	6,652	6,309	6,620	7,100	7,496	8,814
Fullerton Cove Road						
South End	462[1]	-	-		340[1]	500[3]

(1) Estimated from peak hour intersection counts
(2) Estimated from Traffic Growth Trend Year 1992 with similar growth to Station 'East of Tourle Street'
(3) Estimated figure with some rural residential growth along Fullerton Cover Road
(4) Estimated from Traffic Growth Trend Year 1995 to 2001

The current capacity of the major road network in the locality has been assessed with reference to daily traffic capacity limits for Levels of Service A to E based on identified road characteristics:

- level terrain;
- 7 percent heavy vehicles;
- peak hour = 9.5 percent daily traffic (64 percent and 36 percent directional flow);

- typical lane width = 3.5 metres; and
- shoulder width = 1.5 metres or 2 metres.

For the two-lane rural sections of Nelson Bay Road, the following daily traffic capacity limits apply:

- Level of Service A = 2,200;
- Level of Service B = 5,100;
- Level of Service C = 8,700;
- Level of Service D = 14,700; and
- Level of Service E = 24,600.

For the Tourle Street Bridge, which is an urban environment and has a more equal balance of peak hour directional flows, a higher ultimate daily traffic capacity limit is applicable, namely:

- Level of Service E = 27,500.

For the four-lane rural sections of Nelson Bay Road including Stockton Bridge, the daily traffic capacity is significantly increased in comparison to two-lane sections, as follows:

- Level of Service A/B = 26,100;
- Level of Service C = 34,800;
- Level of Service D = 44,100; and
- Level of Service E = 58,100.

2.2.1 Nelson Bay Road

Based on the 2014 flow predictions given in *Table 2.1*, the two-lane sections of Nelson Bay Road near the site are likely to drop to Level of Service D within the next 10 years. This will require upgrading to four lanes where a Level of Service A/B could be attained.

2.2.2 Fullerton Cove Road

Traffic volumes in Fullerton Cove Road were not considered likely to increase significantly above existing levels, maintaining its current Level of Service A. Unless development occurred to increase flows, no major upgrading works would be expected.

2.3 INTERSECTIONS

2.3.1 Nelson Bay Road/Fullerton Cove Road

The Nelson Bay Road/Fullerton Cove Road intersection is currently a four lane roundabout.

A morning peak hour intersection traffic count was undertaken at the intersection of Nelson Bay Road with Fullerton Cove Road (south end) on 3rd June 2004 (refer to *Table 2.2*). The count identified the actual peak hour as 7.30 to 8.30 am.

Table 2.2 ***Peak Hour Count, Nelson Bay Road/Fullerton Cove Road Intersection, 3 June 2004***

Movement Direction	Peak Hour Count (vehicles)
Nelson Bay Road south west bound through	970
Nelson Bay Road north east bound through	503
Left turn into Fullerton Cove Road	11
Right turn into Fullerton Cove Road	0
Left turn out from Fullerton Cove Road	0
Right turn out from Fullerton Cove Road	17

This intersection was modelled to compare the existing operation with the proposed intersection upgrade. This is outlined later in this report.

2.3.2 Other Intersections

Existing major road intersections in the locality have been examined and found to provide generally adequate capacity to safely accommodate existing turning traffic. In most cases, as a result of major road improvements, they also provide a significant margin of spare capacity to accommodate future traffic growth namely:

- north of the site at Cox's Lane a full grade separated interchange has been constructed for sand quarry traffic;
- at Williamtown three major intersections have been constructed at the airport access (seagull type) and at the two intersections of Nelson Bay Road with Cabbage Tree Road and Medowie Road (large roundabouts);
- the two rural intersections at the northern and southern ends of Fullerton Cove Road have been constructed to a Type-B intersection standard; and
- south of the site at Fern Bay, there are intersections with Type-C standard protected right turn lanes at all significant local road access locations and a seagull type acceleration lane intersection is provided at the Stockton turn-off (eg Fullerton Road).

2.4 *PUBLIC TRANSPORT, CYCLING AND PEDESTRIAN FACILITIES*

Bus services in the area are currently operated primarily by Port Stephens Coaches. Port Stephens Coaches service a route along Nelson Bay Road to Newcastle, which detours in the Fullerton Cove locality along Fullerton Cove Road. This service has a daytime frequency of approximately one per hour.

Blue Ribbon Coaches also operate some services between Maitland, Lemon Tree Passage, Medowie, Williamtown, Fern Bay, Stockton and Newcastle. There are currently approximately 28 services per day to and from the Stockton Ferry and a further four to five services daily direct to Newcastle.

In comparison with most other areas of the Sydney, Newcastle and Wollongong metropolitan regions, cycling is a relatively popular method of travel within the Port Stephens local government area (LGA). There are currently some sections of off-road cycleway and sealed shoulder suitable for cycling use along Nelson Bay Road within Port Stephens LGA that could in the future be extended to Stockton. Bicycles are also able to be carried on the Stockton Ferry allowing access to Newcastle.

There is an existing paved pedestrian footpath along the south (eastern) side of Nelson Bay Road, commencing approximately one kilometre south of the site and continuing for a further 1.5 kilometres through the existing Fern Bay settlement.

There are no other defined pedestrian crossing facilities on Nelson Bay Road in the locality of the proposed development other than the grassed median strip on the Fern Bay to Stockton Bridge section, which commences approximately 1,700 metres south of the site.

3 PROPOSED ROAD NETWORK

3.1 ROAD NETWORK

Figure 1.2 illustrates the conceptual road layout for Fern Bay Seaside Village. This includes:

- a loop collector road extending through the subdivision, connecting the two proposed access points to Nelson Bay Road and the eastern and western development precincts. This is primarily a divided road of approximately 20 to 25 metres roadway width;
- local roads which circulate throughout the area to allow access to areas of development;
- a design sympathetic to the urban design objectives and environmental constraints of the site, enabling a great diversity of housing choice;
- access across divided roads near areas of traffic generation; and
- access to the beach via a four-wheel drive track which is proposed to be constructed to the south of the site on land under the control of the Department of Environment and Conservation (DEC).

3.2 ACCESS INTERSECTIONS

The proposed development includes two access intersections:

- a four-way two-lane roundabout; and
- the construction of a right turn ban (left-in left-out) T-intersection with Nelson Bay Road located approximately 1.15 kilometres to the north east of the existing Nelson Bay/Fullerton Cove Road intersection.

3.3 DESIGN CONSIDERATIONS

3.3.1 *Existing Site Traffic Generation*

The existing road networks consist of the main collector road known as Seaside Boulevard, and a series of minor roads which service the first and second stage of the development.

3.3.2 Future Traffic Generation and Distribution

The traffic generation rates (based on RTA (1993) where applicable) given in *Table 3.1* were assumed for the proposed development.

Table 3.1 Adopted Traffic Generation Rates, Proposed Fern Bay Development

Development Component	Estimate of Number of Dwellings	Daily Generation Rate	Weekday Peak Hour Generation
Standard (Low Density) Residential	300	9 trips/dwelling	0.85 trips/dwelling
Medium Density Residential	650	5.125 trips/dwelling	0.52 trips/dwelling

Other land uses within the village were not included in the traffic modelling at this stage as:

- the details of all of the community, recreational and commercial facilities to be provided on site are still to be finalised. However it is recognised that most users of these facilities will be residents from within the subdivision; and
- the proposed community nursery will be used by residents only, so will not generate significant external traffic movements.

The proportion of internal and external site traffic generation have been assumed in accordance with NSW RTA (1993) guidelines for new subdivisions (25% internal/75% external).

It was assumed that 70 percent of external residential movements would utilise the southern (Fullerton Cove Road) intersection to and from the site. The remainder would utilise the northern (left-in left-out) T-intersection. A 70%/30% south west/north east split was assumed, in order to favour movements towards Newcastle.

A summary of the future site daily traffic generation and distribution is presented in *Tables 3.3, 3.4* and *3.5* in accordance with the above parameters.

Table 3.2 Future Distribution of Site Traffic

Distribution	Percentage of Trips from Residential Dwellings (%)
% External trips	75
% Internal trips	25
External % North East (via Nelson Bay Road)	30
External % South West (via Nelson Bay Road)	70
% in morning peak hour	35
% out morning peak hour	65
External Trips to Fullerton Cove intersection	70
External Trips to left-in left-out intersection (out south west bound & in north east bound only)	30

Table 3.3 Future Development Traffic Generation

Development Component	Estimated Quantity	Total Generation (Daily Trips)	Total Generation (Peak Hour Trips)
Standard Housing	300 lots	2700	225
Medium Density	650 Dwellings	3331	333
Total Residential Generation	**6,031**	**588**	

Table 3.4 Future Development Generation - Weekday Daily Traffic

Development Component	Internal Trips (@ 25% of total)	External Trips	
		To/From North	To/ From South
Total Residential Components	1,508	1,357	3,166

3.3.3 Encouraging Use of Varied Traffic Modes

The future site road network has been designed to maximise potential usage of alternative travel modes to the private car, predominantly bus, walking and cycling, for a range of internal and externally based trips.

It is likely that the site will require a new bus route to be developed independent of existing bus routes. It is envisaged this would extend along the main loop collector road into the urban area, entering and exiting from either access intersection. The site will maximise the future accessibility of all residences to public transport by locating the majority of lots within a 300 metre walking distance of the designated bus route.

In addition, the most recent NSW best practice guidelines, Draft State Environmental Planning Policy No. 66 - Integration of Land Use and Transport have been considered in the site design, namely:

- new and upgraded arterial and orbital roles are designed to provide for trunk public transport services between centres. This includes providing for stops and interchange with feeder services;

- new public transport routes:

  - link two or more primary attractors such as railway stations and town centres;

  - link with secondary attractors such as schools, hospitals, post offices and leisure/entertainment centres located along the route;

- encourage a mix of trip purposes:

  - at nodes or stops such as shops, childcare centres, post offices and homes;

  - provides two-way passenger loads on public transport services;

  - maximises asset utilisation and reduces empty return trips;

  - priority is given to improving services to major centres containing employment opportunities and community facilities;

  - a balance is achieved between fast, direct services to major centres and frequent stopping services that provide local access; and

  - bus stops are located to maximise the patronage catchment and to consider personal safety, lighting and traffic management.

4 TRAFFIC IMPACT ASSESSMENT

4.1 ADEQUACY OF INTERNAL ROAD NETWORK

The adequacy of the proposed internal site road network is discussed below with reference to Development Control Plan PS3 – Subdivision Guidelines (DCP PS3) and other relevant matters in terms of the following:

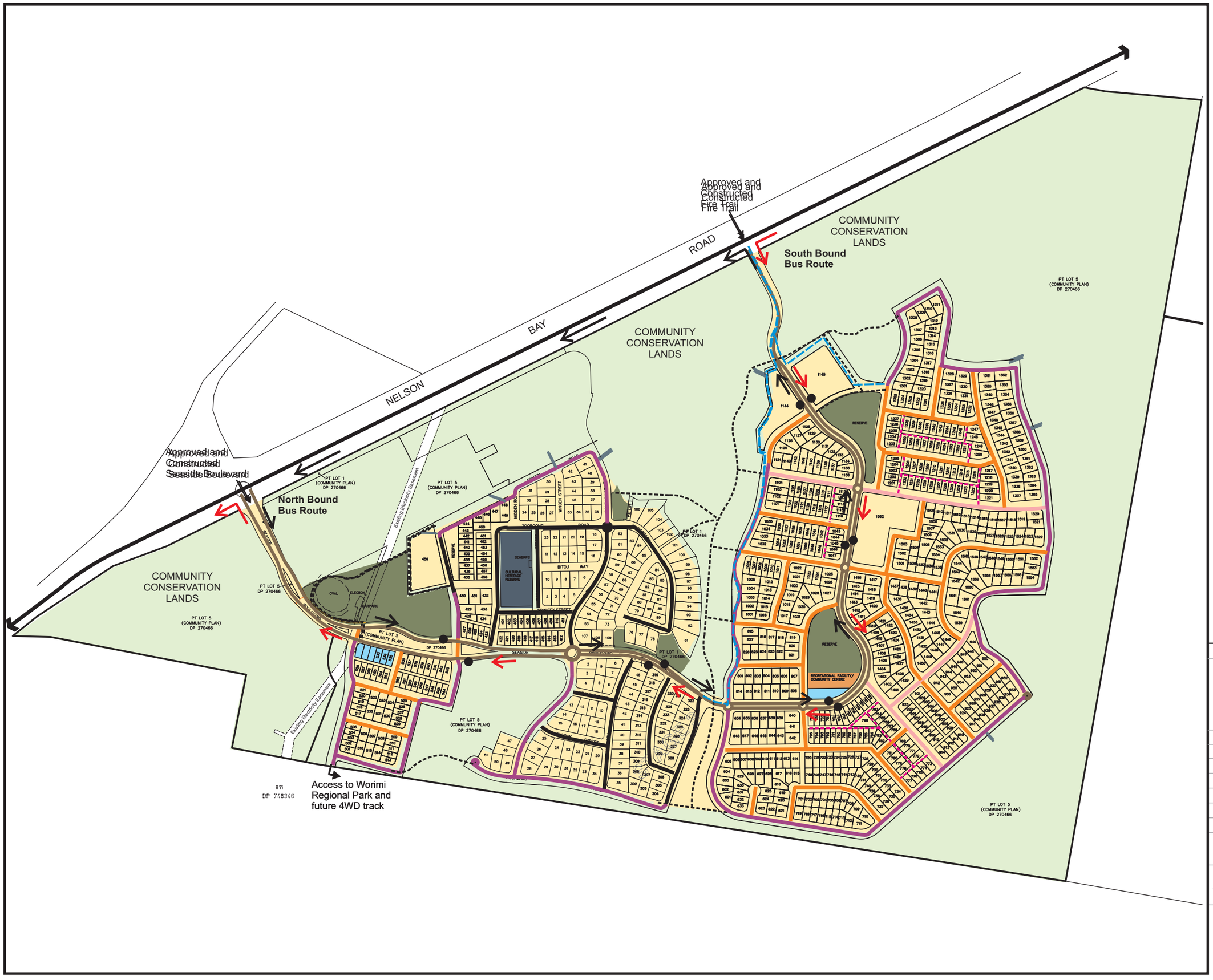
- the main loop collector road; and
- other local roads.

The main loop collector road would be required to accommodate predicted daily traffic usage of between 3,000 to 6,000 vehicles daily at the western end and between 1,000 and 3,000 vehicles daily in the east. The collector road loop road would also serve as a bus route and would be designed accordingly, with regularly-spaced bus stop locations.

The effect of the right turn ban (left-turn only) traffic restriction at the northern site access to Nelson Bay Road would reduce traffic flows in the eastern half of the main loop collector road. It is estimated that the distribution would be a 70 percent/30 percent split between the southern and northern access intersections respectively.

Other local roads will all generally carry less than 1,000 vehicle movements per day.

Clause 5.3 of DCP PS3 specifies minimum road reserve and carriageway widths that apply to urban roads. These minimum road widths are documented in *Table 4.1* along with an assessment of the proposed subdivision's compliance with these minimum standards. The proposed road widths for the village are illustrated in *Figure 4.1*.



Legend

- Managed Community Reserves/Parks[1]
- Community Conservation Lands[2]
- Local Activity Centre
- Mixed Use Residential Development
- Commercial Development
- Cultural Heritage Reserve
- Part of the Approved Subdivision Area
- Potential Stormwater Management Infrastructure
- Pathway
- Fire Trail
- Collector Road with minor bus route- variable width (minimum 17m wide road reserve)
- Neighbourhood Street - 20m wide road reserve
- Neighbourhood Street - 17.5m wide road reserve (existing approved DA and proposed adjacent development)
- Neighbourhood Street - 15m wide road reserve
- Rear Lane
- Perimeter Road - 20m wide road reserve
- Bus Route Direction
- Bus Stop

Notes:

1 Managed Community Reserves/Parks are areas of active and passive recreation for community purposes and do not form part of the community land.

2 Community lands are the 'Conservation Lands' to be managed for ecological and environmental values.

Figure 4.1

Road Hierarchy

Client:	Aspen Group Pty Ltd		
Project:	Fern Bay Seaside Village		
Drawing No:	0063154hv_Traffic_04		
Date:	10/2/09	Drawing size:	A3
Drawn by:	SP	Reviewed by:	PD
Source:			
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Table 4.1 Minimum Widths of Urban Roads

Class	Lots Dwelling	Carriage-way Width	Total Road Width (including Road Reserve	Proposed Road Widths in Fern Bay Seaside Village	Compliance
Accessway	< 5	3.5	12.5	N/A	N/A
Cul-de-sac	< 12	5.5	14.5	No cul-de-sacs proposed	N/A
Local Access	12 to 50	6.5	17.5	15 m, 17.5 m and 20 m wide road reserves	part ✓
Collector	50 to 200	8	17	Variable width but at least 17 m wide road reserve	✓
Distributor	> 200	11	20	Variable width but at least 17 m wide road reserve	part ✓
Bus Route	Major	13	22	Variable width but at least 17 m wide road reserve	part ✓

As illustrated in *Table 4.1* and *Figure 4.1*, the widths of proposed roads within Fern Bay Seaside Village generally comply with DCP 2007 however some variations are proposed to the standard road widths are required for some of these roads. The proposed roads follow an efficient grid pattern, which provides motorists with a variety of route selection options and thereby promotes dispersed traffic flows.

Rear lanes with eight metre wide road reserves are also proposed to be provided at the rear of some of the proposed villa, courtyard and conventional lots. Providing these rear lanes for vehicular access assists in minimising potential pedestrian and vehicle conflict and helps to encourage active street frontages.

4.2 ADEQUACY OF EXTERNAL NETWORK

4.2.1 Additional Traffic on External Road Network

The predicted increases in daily traffic flows external to the site will be a maximum of +3,166 vehicle movements daily to the south west of the site and +1,357 vehicle movements daily to the north east. No additional vehicle movements are expected from Fullerton Cove Road.

Elsewhere, the traffic volume increases at specific locations will progressively decrease with distance away from the site as indicated by *Figure 4.2* and *Table 4.2*.

Table 4.2 ***Additional Daily Traffic Volumes, Year 2014***

Road (and Location)	Year 2004 Estimated Volume	Year 2014 Estimated Volume	Year 2014 Additional Development Traffic	% Increase with Additional Development
Nelson Bay Road				
East of Medowie Road	11,427	12,049	586	5.1
Nth of Cabbage Tree Rd	16,420	19,815	977	4.9
North East of Site	14,500(1)	18,000	1357	7.5
South West of Site	14,950(1)	18,450	3166	17.2
At Stockton Bridge	17,770	19,145	2651	13.8
Tourle Street Bridge				
North of Industrial Dr	23,893	24,207	2651	11.0
Industrial Drive				
West of Tourle St	22,461	23,147	1113	4.8
East of Tourle St	30,628	31,608	1538	4.9
Cabbage Tree Road				
West of Nelson Bay Rd	4,885	5,863	380	6.5
Medowie Road				
Nth of Nelson Bay Rd	6,481	7,674	391	4.7
Fullerton Road				
East of Nelson Bay Rd	7,496	8,814	515	5.8
Fullerton Cove Road				
South End	340(1)	500(3)	0	

In percentage terms the future traffic increase in comparison to the base year 2014 traffic volumes will be noticeable (typically over five percent) over a wide area. This effect will extend as far as the Tourle Street Bridge, nearby sections of Nelson Bay Road, Fullerton Road and Cabbage Tree Road. The implications of these traffic increases are discussed in the following section.

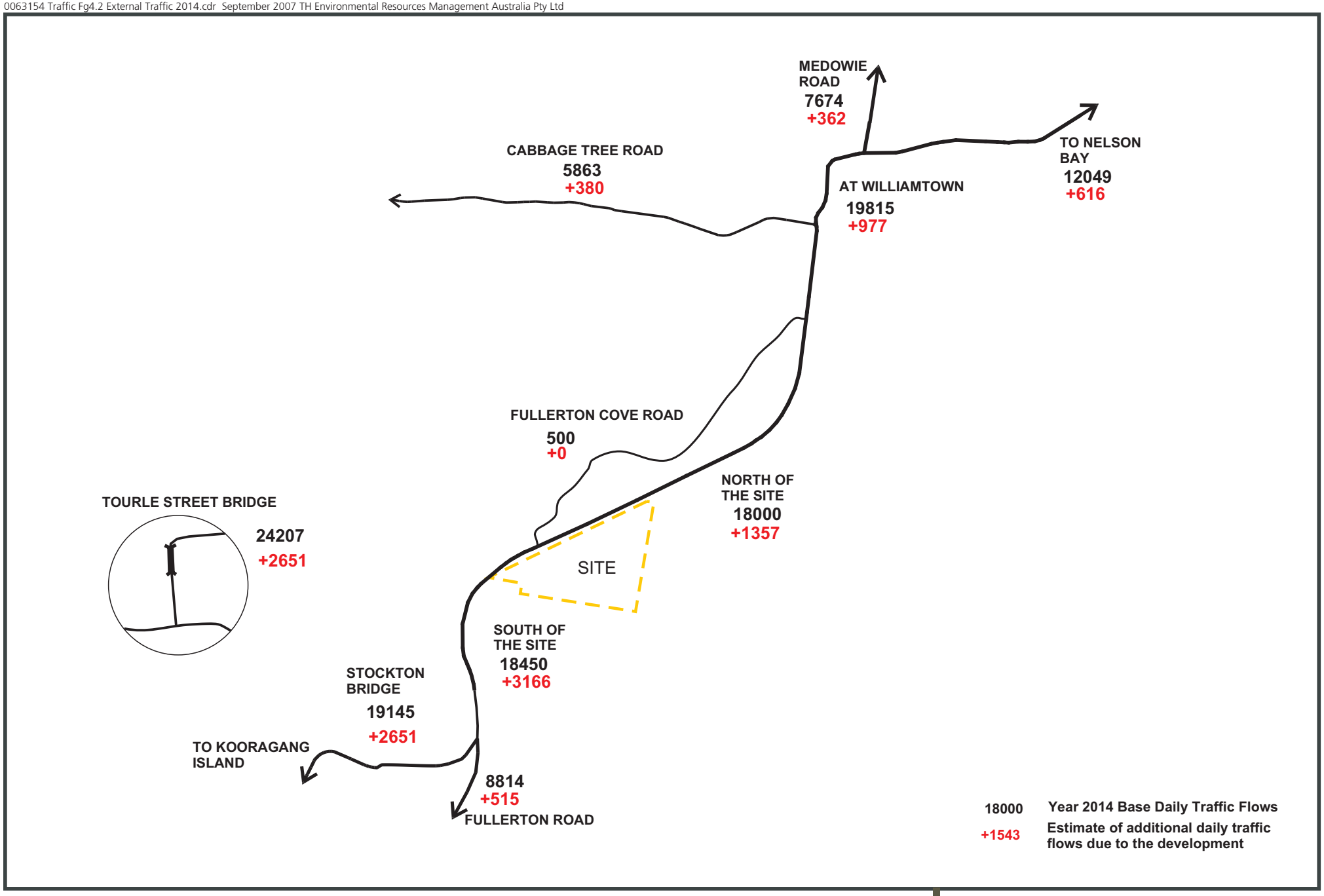


Figure 4.2 **Year 2014 Base and Additional Daily Traffic on External Roads**

Winten Property Group - CVC Limited - Fern Bay Estate

4.2.2 *Roadway Capacity of External Road Network*

The implications of the predicted development traffic increases are discussed below in relation to level of service standards for two-lane and four-lane sections of Nelson Bay Road.

Table 4.3 Analysis of External Road Network Capacity, 2004 and 2014 Projected Traffic Flows

Road Section	Roadway Capacity Standards (max AADT)	Existing Situation (Year 2004)	Future Base Situation (Year 2014)	With Development Traffic (Year 2014)
Nelson Bay Road between Cabbage Tree Road and Medowie Road (1.5 km):	A/B 26,100 C34,800 D44,100 E58,100	16,420 (LOS A/B)	19,815 (LOS A/B)	20,792 (LOS A/B)
Nelson Bay Road north east of site to Cabbage Tree Road (approximately 5 km)	A 2,200 B5,100 C8,700 D14,700 E24,600	14,500 (LOS D)	18,000 (LOS E)	19,357 (LOS E)
Nelson Bay Road south west of site to Vardon Road (approximately 2 km)	A2,200 B5,100 C8,700 D14,700 E24,600	14,950 (LOS D)	18,450 (LOS E)	21,616 (LOS E)
Stockton Bridge and four-lane sections of MR108 on Kooragang Island	A/B26,100 C34,800 D44,100 E58,100	17,770 (LOS A/B)	19,145 (LOS A/B)	21,796 (LOS A/B)
Tourle Street Bridge and two-lane sections of MR108 on Kooragang Is	(maximum AADT) LOS E 27,500	23,893 (LOS E)	24,207 (LOS E)	26,858 (LOS E)
Fullerton Road (to Stockton)	A 2,200 B5,100 C8,700 D14,700 E24,600	7,496 (LOS C)	8,814 (LOS D)	9,329 (LOS D)
Fullerton Cove Road		340 (LOS A)	500 (LOS A)	500 (LOS A)
Cabbage Tree Road	A 2,200 B5,100 C8,700 D14,700 E24,600	4,885 (LOS B)	5,863 (LOS C)	6,243 (LOS C)
Medowie Road	A 2,200 B5,100 C8,700 D14,700 E24,600	6,481 (LOS C)	7,674 (LOS C)	8,036 (LOS C)
Nelson Bay Road East of Medowie Road	A 2,200 B5,100 C8,700 D14,700 E24,600	11,427 (LOS D)	12,049 (LOS D)	12,665 (LOS D)

From the analysis provided in *Table 4.3* it is noted that:

- two-lane sections of Nelson Bay Road are likely to experience a reduction in level of service from 'D' to 'E' between the years 2004 and 2014 with traffic growth independent of the proposed development;
- there will be no change in the level of service of affected roads as a result of the proposed development based on a comparison between 2014 projected traffic flows pre- and post development;
- the Tourle Street Bridge is currently close to its capacity limit which will be exceeded by a combination of prevailing traffic growth and the proposed development. The proposed development traffic may bring forward the timing of the need for the bridge widening to four lanes; and
- Fullerton Cove Road was modelled to experience minimal growth in the base situation traffic. Future development traffic was considered negligible and overall volumes will remain below 1,000 per day, which is an appropriate local road standard.

It should be noted that the RTA and Port Stephens and Newcastle Councils have concept plans in place to account for future traffic growth in the area.

4.3 INTERSECTION CAPACITY

Future intersection performance has been assessed using the SIDRA traffic model on the basis of Year 2014 base case and future traffic volumes with development traffic at two intersections, namely:

- the southern site access intersection with Nelson Bay/Fullerton Cove Road (four-way roundabout); and
- the northern site access intersection with Nelson Bay Road (left-in left-out access only).

Traffic model input values for the proposed intersections under peak hour year 2014 conditions at the two intersections are illustrated in *Annex A*.

The peak hour traffic proportions for future development traffic have been assumed as 10 percent daily traffic movements, where required, with similar distribution to that indicated in *Table 3.3*. Heavy vehicle composition was conservatively estimated at 10 percent of total traffic flows on all roads. The reverse of the morning (AM) flows were assumed to occur in the afternoon (PM) peak.

The intersection analysis results are summarised in terms of degree of saturation, average vehicular delay and level of service for each intersection in *Table 4.4*. In all cases the future intersections with full development traffic will operate at a minimum Level of Service B with minimal delays. At the

southern site access intersection, the Level of Service with a four-lane roundabout will significantly improve from predicted 2014 conditions for the existing T-intersection where the both morning and afternoon peak hour conditions were shown to operated at a Level of Service 'F'. This large delay was due to traffic turning right from Fullerton Cove Road into Nelson Bay Road.

Table 4.4 Intersection Performance (Year 2014)

Intersection Type and Location	Peak Hour Period	Degree of Saturation	Level of Service	Average Delay(s)
Existing Fullerton Cove Road/Nelson Bay Road Intersection (at the proposed southern site access)	AM	0.783	F+	353.7
	PM	0.558	F+	222.9
Proposed Southern site access (Upgrade to 4-way roundabout with 2- lane entry on all approaches)	AM	0.454	B	15.0
	PM	0.439	B	20.6
Proposed Northern site access (Left turn only intersection)	AM	0.747	A	14
	PM	0.752	A	14

4.4 *PUBLIC TRANSPORT, CYCLIST AND PEDESTRIAN FACILITIES*

The village is proposed to be serviced by a public bus service and both Blue Ribbon Blue Ribbon Bus Company and Port Stephens Coaches have expressed an interest in providing this service. The proposed bus route is along the main road running through the centre of the village (refer to *Figure 1.2*). This service has the potential to link to the ferry service that operates between Stockton and Newcastle.

Designated pedestrian pathways are to be provided throughout the village as illustrated in *Figure 1.2*. These will link the eastern and western residential areas. No pedestrian facilities are proposed for Nelson Bay Road.

The village's roads will be cycle friendly with the low speed traffic environment allowing on-road cycle movements. The interconnected street pattern of the village also promotes the use of cycling as an alternative mode of transport.

5 *CONCLUSION*

Fern Bay Seaside Village will result in an increase in traffic volumes along Nelson Bay Road and other roads in the local road network. The traffic increase on Nelson Bay Road is predicted to result in a maximum of 3,166 additional daily vehicle movements to the south west of the site and 1,357 additional daily vehicle movements to the north east.

In percentage terms, the future traffic increase in comparison to the base year 2014 traffic volumes will be noticeable (typically over five percent) over a wide area as far as the Tourle Street Bridge, nearby sections of Nelson Bay Road, Fullerton Road and Cabbage Tree Road. However, there will be no change in the level of service of affected roads as a result of the proposed development based on a comparison between 2014 projected traffic flows pre- and post development.

The RTA and Port Stephens and Newcastle Councils have concept plans in place to account for future traffic growth in the area. This proposed development is consistent with what is envisaged in these plans.

Traffic modelling results indicate the proposed southern site access intersection with Fullerton Cove Road/Nelson Bay Road (a four-way roundabout) will all operate at a Level of Service 'B' with slight delays and spare capacity. The Level of Service with a four-lane roundabout will significantly improve from predicted 2014 conditions for the existing T-intersection where under peak hour conditions a Level of Service 'F' prevails. This large delay was due to traffic turning from Fullerton Cove Road into Nelson Bay Road. This roundabout has been approved by the RTA and is currently under construction.

The northern site access intersection with Nelson Bay Road (left turn access only) will operate at a Level of Service 'A' with minimal delays when the site is fully developed.

The road conceptual design makes adequate provision for future bus routes along the internal collector road network. Designated pedestrian pathways are to be provided throughout the development, linking the eastern and western residential areas. Cyclists will be accommodated within the proposed road network.

REFERENCES

Coastal Council (2003) **Coastal Design Guidelines for NSW**

GHD (1992) **Fern Bay Residential Release Area, Transportation & Traffic Planning Issues.** Report for Port Stephens Shire Council

Port Stephens Council (2001) **Development Control Plan PS3 – Subdivision Guidelines**

RTA (1993) **Guide to Traffic Generating Developments**

Urbec Consultants (1992) **Residential, Retail, Commercial, Community & Recreational Facility Needs – Fern Bay NSW**

Annex A

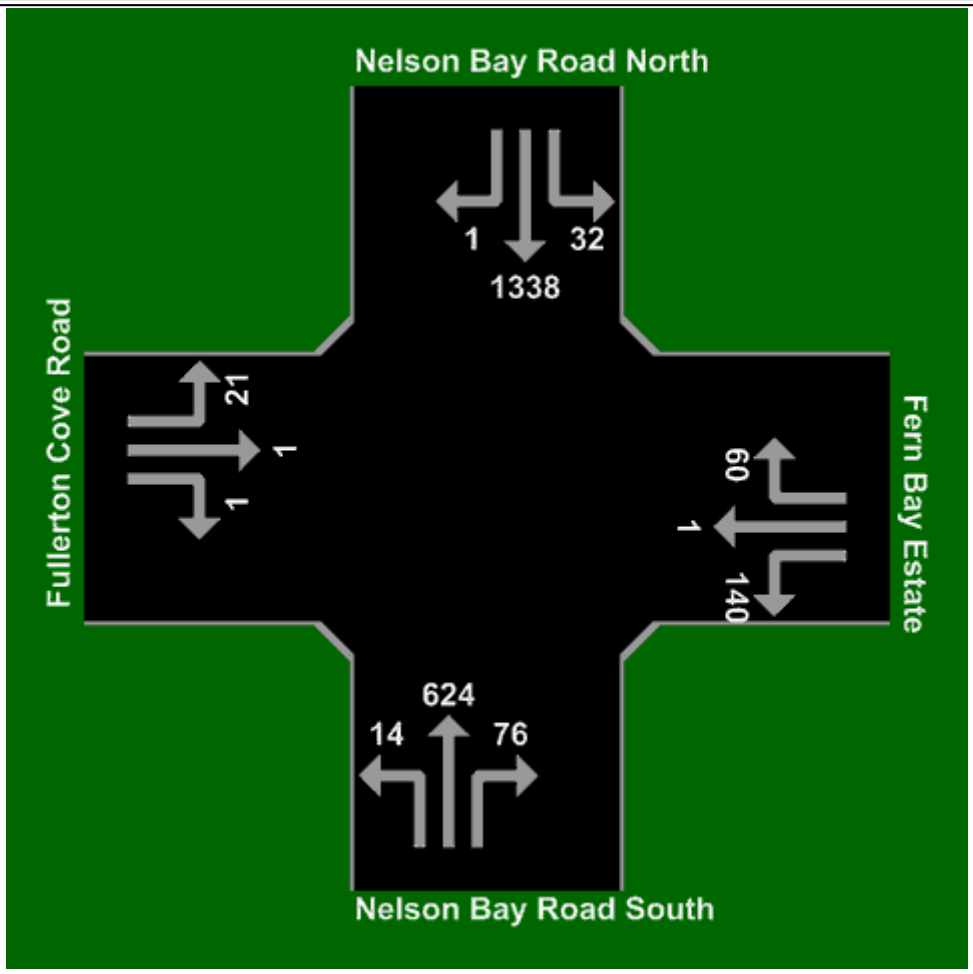
Traffic Model Diagrams

Input Volumes

akcelik & associates
aaTraffic SIDRA

Total flow rates as given by the user (veh/60 min)

Southern Roundabout Year 2014 With Development AM



Intersection Type

Roundabout

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Akcelik & Associates Pty Ltd

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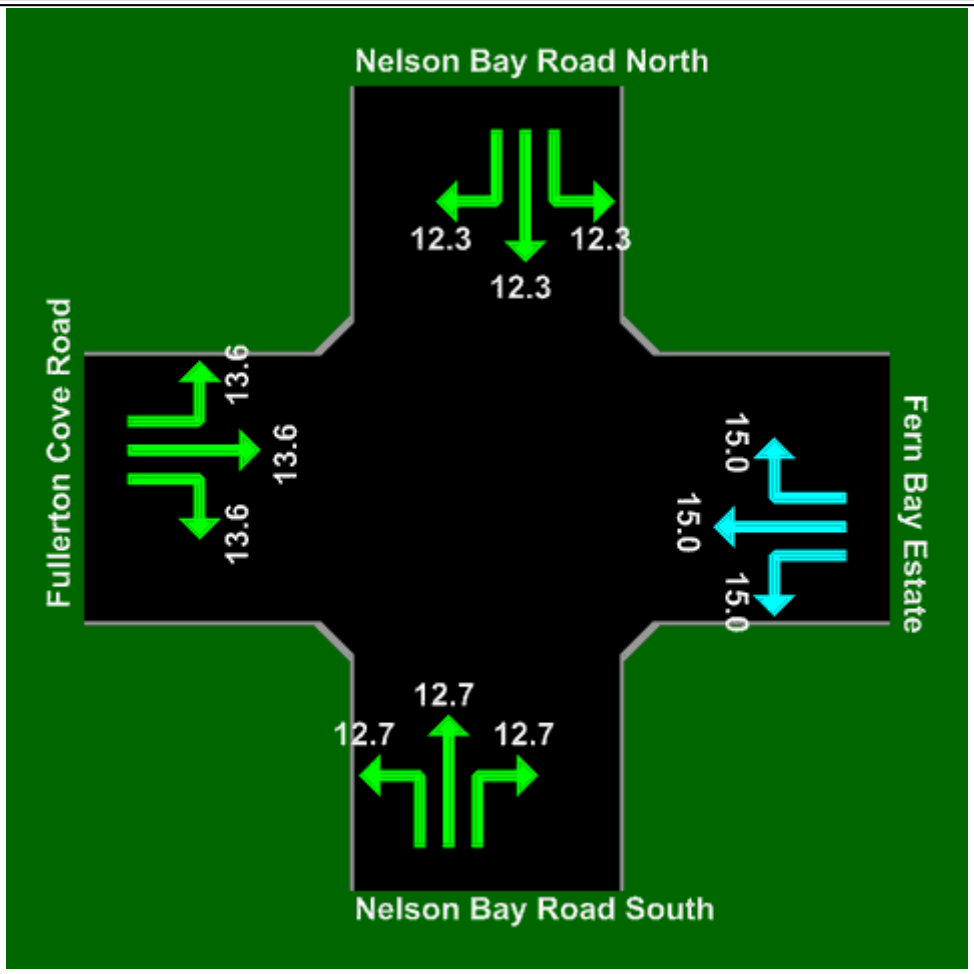
Control Delay (Average)

akcelik & associates
aaTraffic SIDRA

Average control delay per vehicle (seconds)

Southern Roundabout Year 2014 With Development AM



Intersection Type

Roundabout

Color code based on Level of Service

- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F

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Produced by aaSIDRA 2.0.3.217

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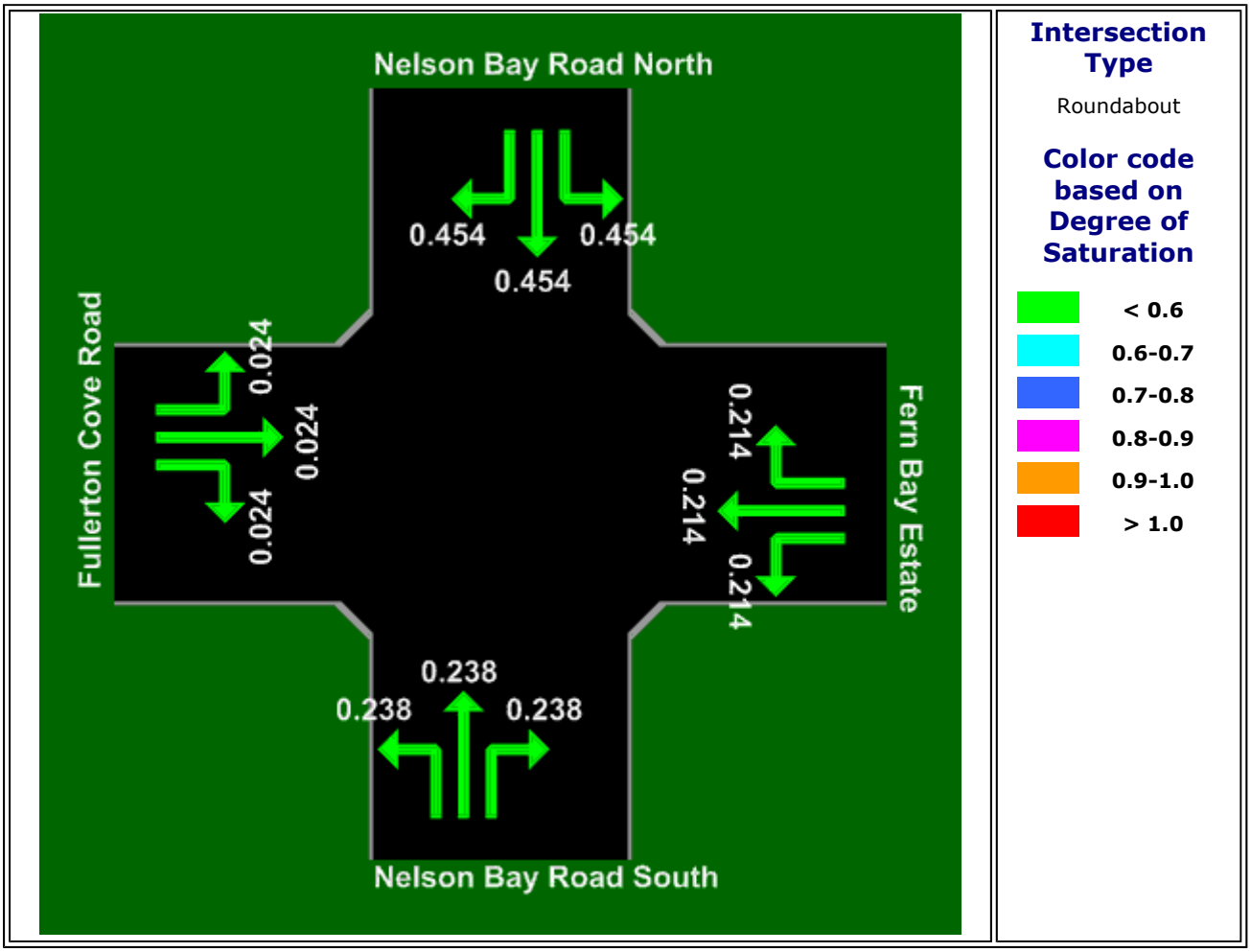
Degree of Saturation

akcelik & associates
aaTraffic SIDRA

Demand Volume / Capacity (v/c) ratio

Southern Roundabout Year 2014 With Development AM



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Input Volumes

akcelik & associates
aaTraffic SIDRA

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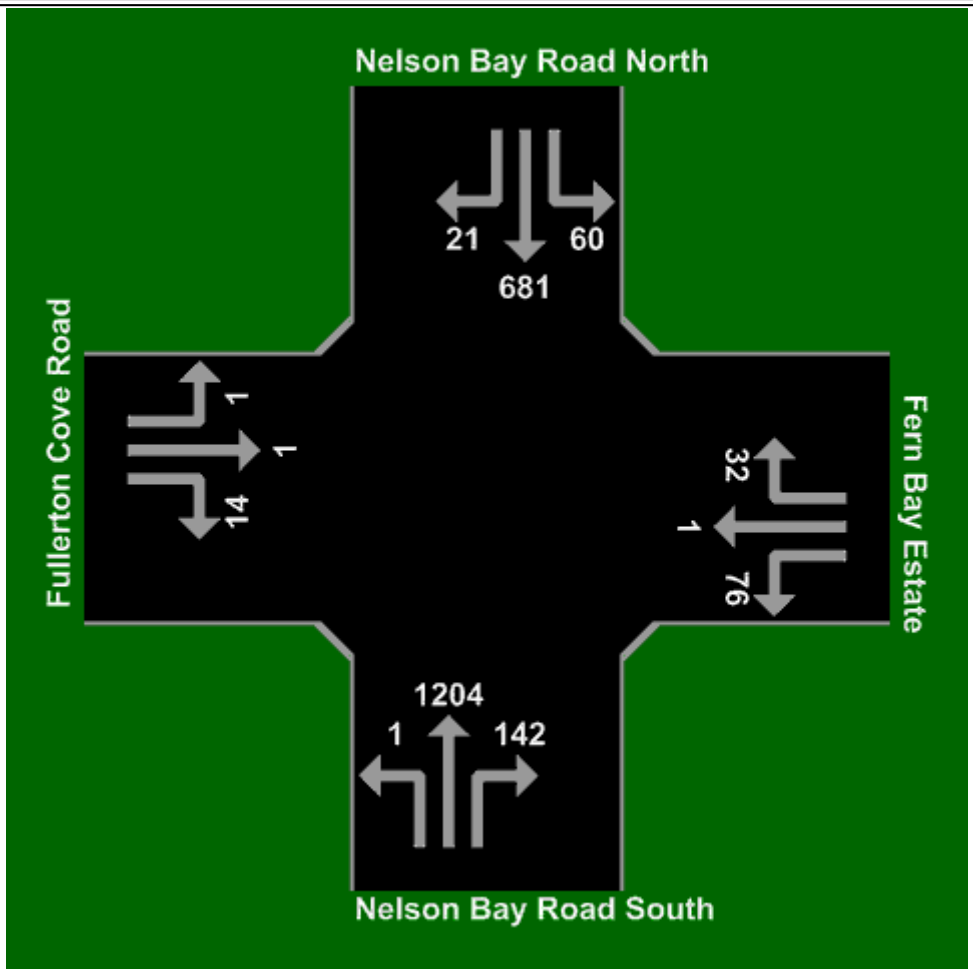

Intersection Type

Roundabout

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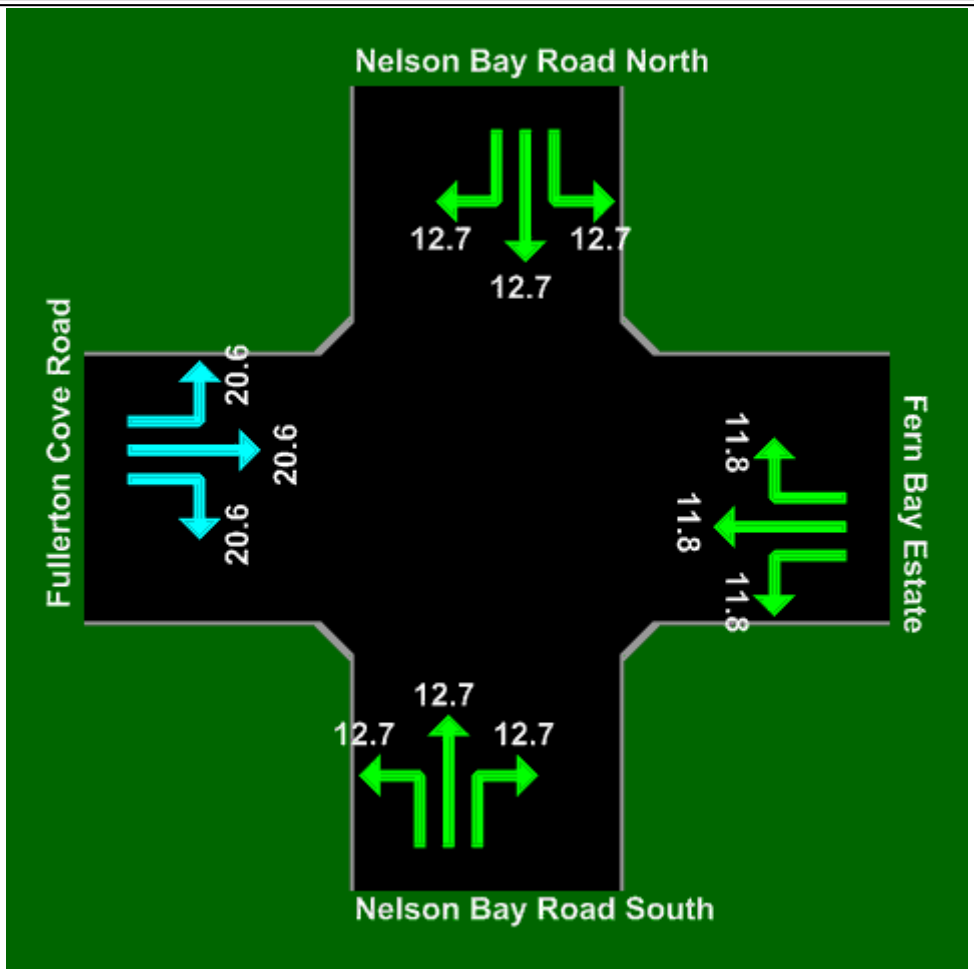
Control Delay (Average)

akcelik & associates
aaTraffic SIDRA

Average control delay per vehicle (seconds)

Southern Roundabout Year 2014 With Development PM



Intersection Type

Roundabout

Color code based on Level of Service

- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F

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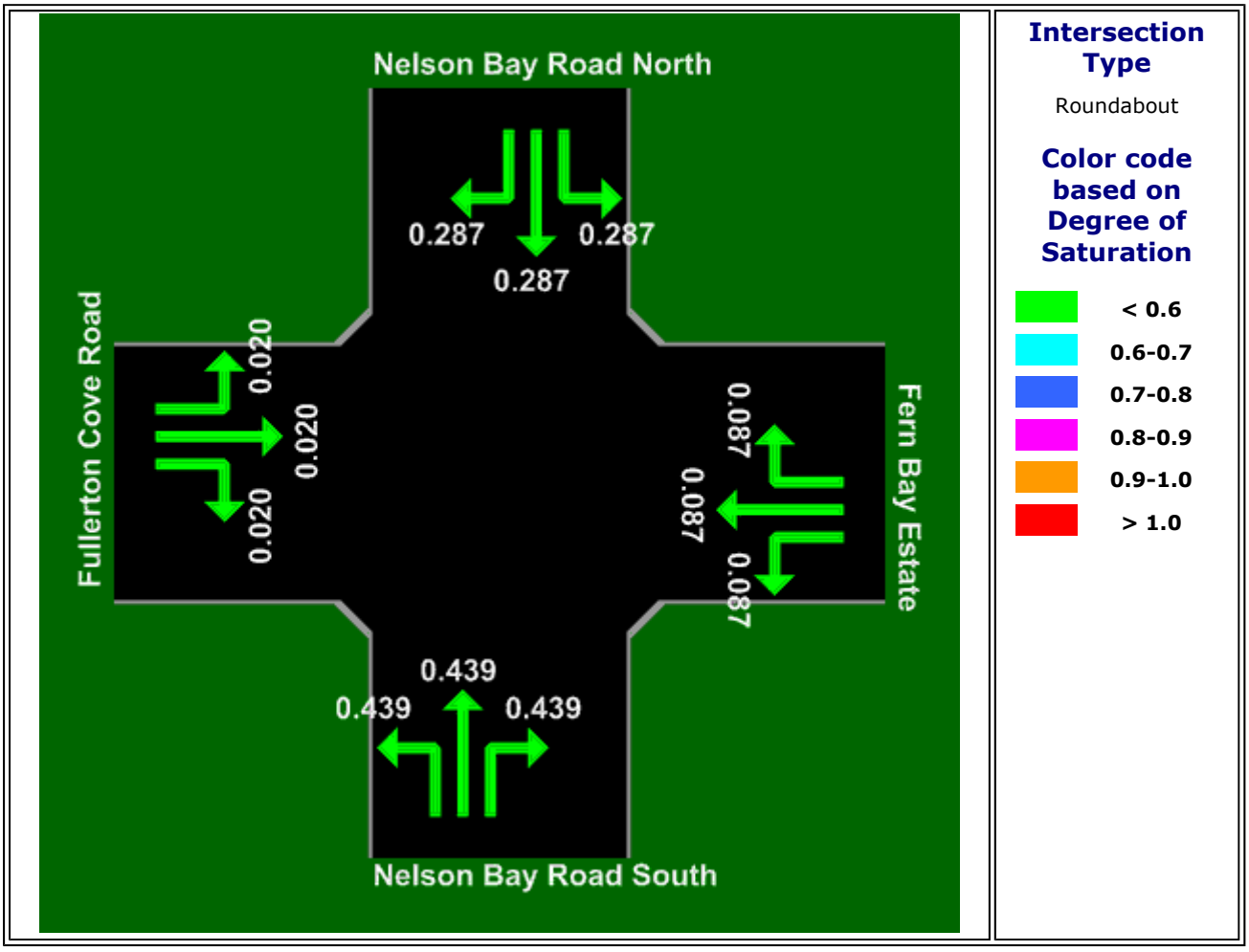
Degree of Saturation

akcelik & associates
aaTraffic SIDRA

Demand Volume / Capacity (v/c) ratio

Southern Roundabout Year 2014 With Development PM



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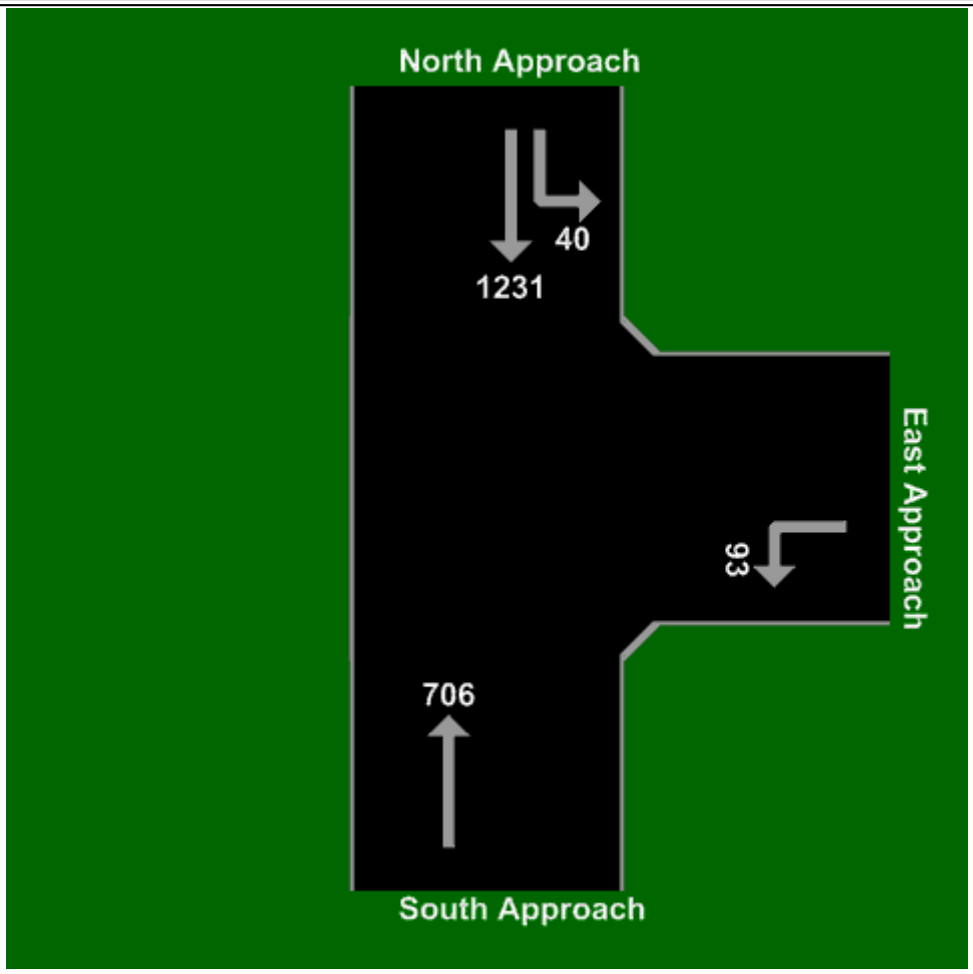
Input Volumes

akcelik & associates
aaTraffic SIDRA

Total flow rates as given by the user (veh/60 min)

Northern Left-in Left-out Intersection With Development AM



Intersection Type

Give-way

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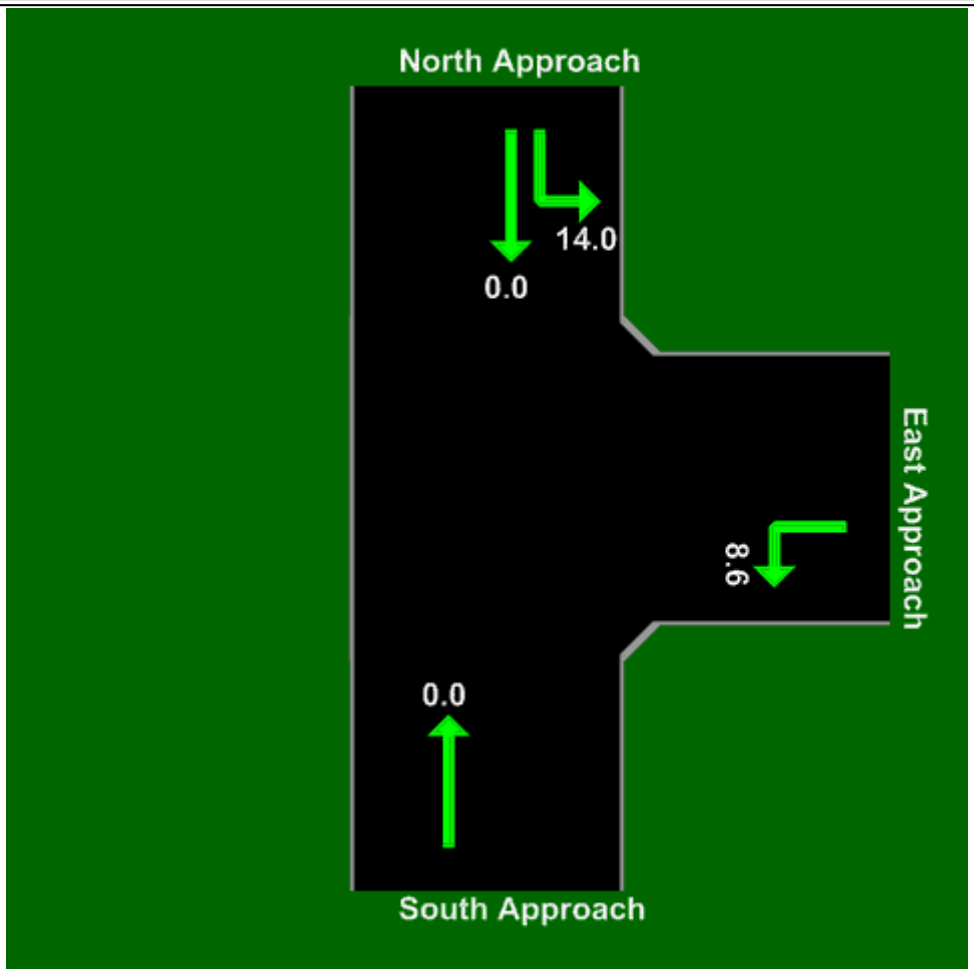
Control Delay (Average)

akcelik & associates
aaTraffic SIDRA

Average control delay per vehicle (seconds)

Northern Left-in Left-out Intersection With Development AM



Intersection Type

Give-way

Color code based on Level of Service

- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F

Continuous movement LOS based on density.

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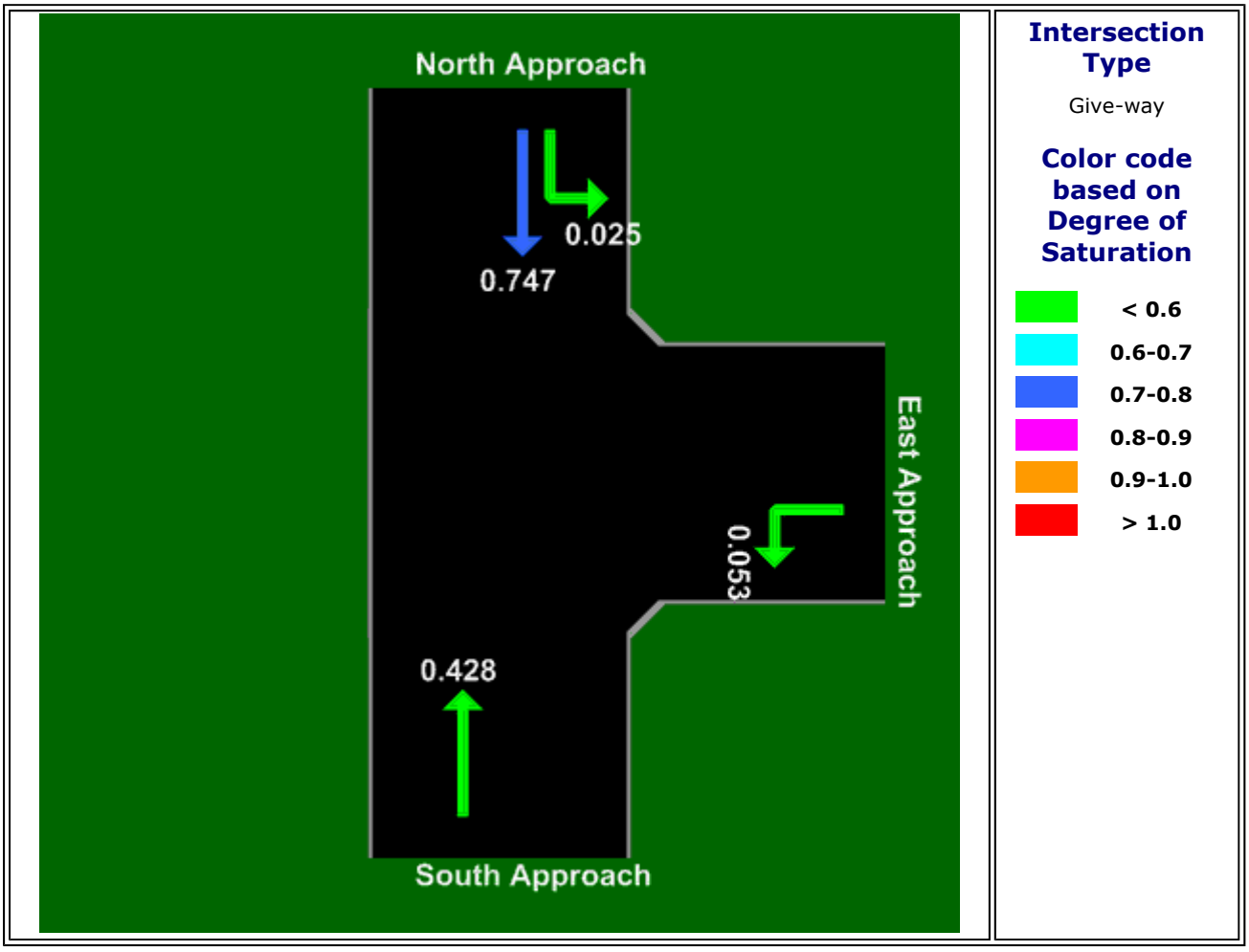
Degree of Saturation

akcelik & associates
aaTraffic SIDRA

Demand Volume / Capacity (v/c) ratio

Northern Left-in Left-out Intersection With Development AM



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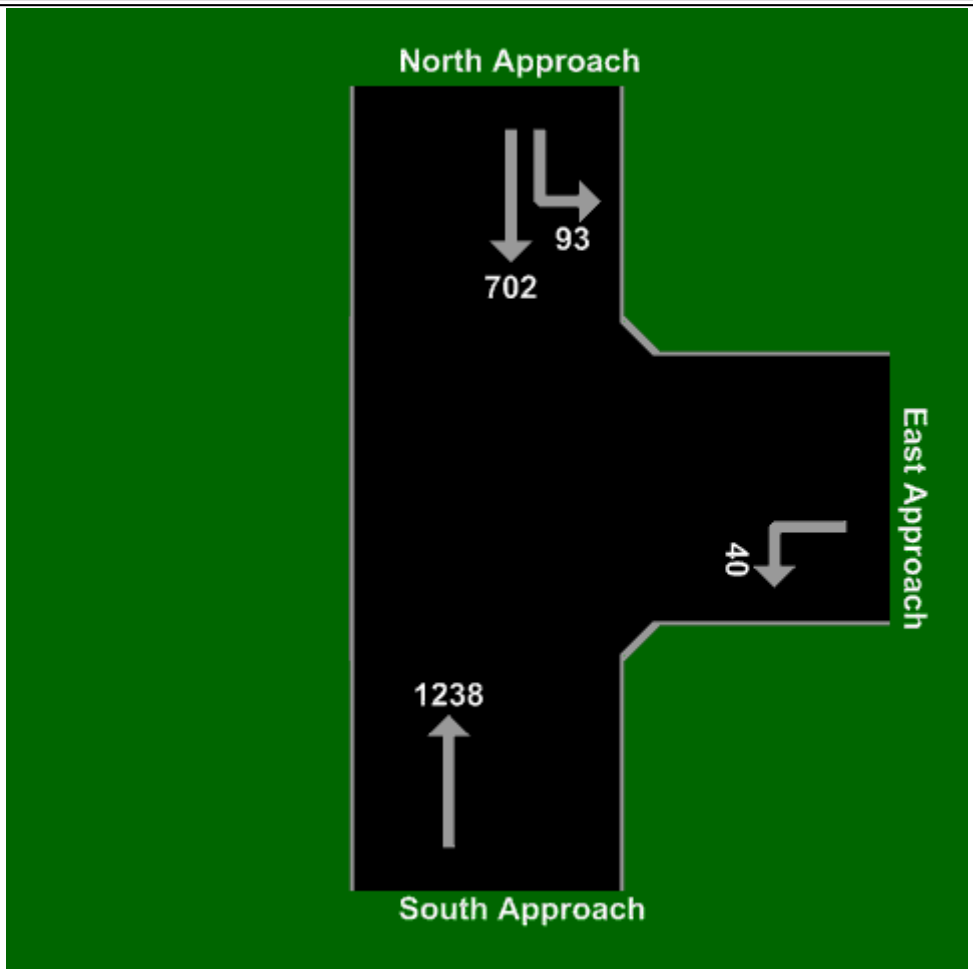
Input Volumes

akcelik & associates
aaTraffic SIDRA

Total flow rates as given by the user (veh/60 min)

Northern Left-in Left-out Intersection With Development PM



Intersection Type

Give-way

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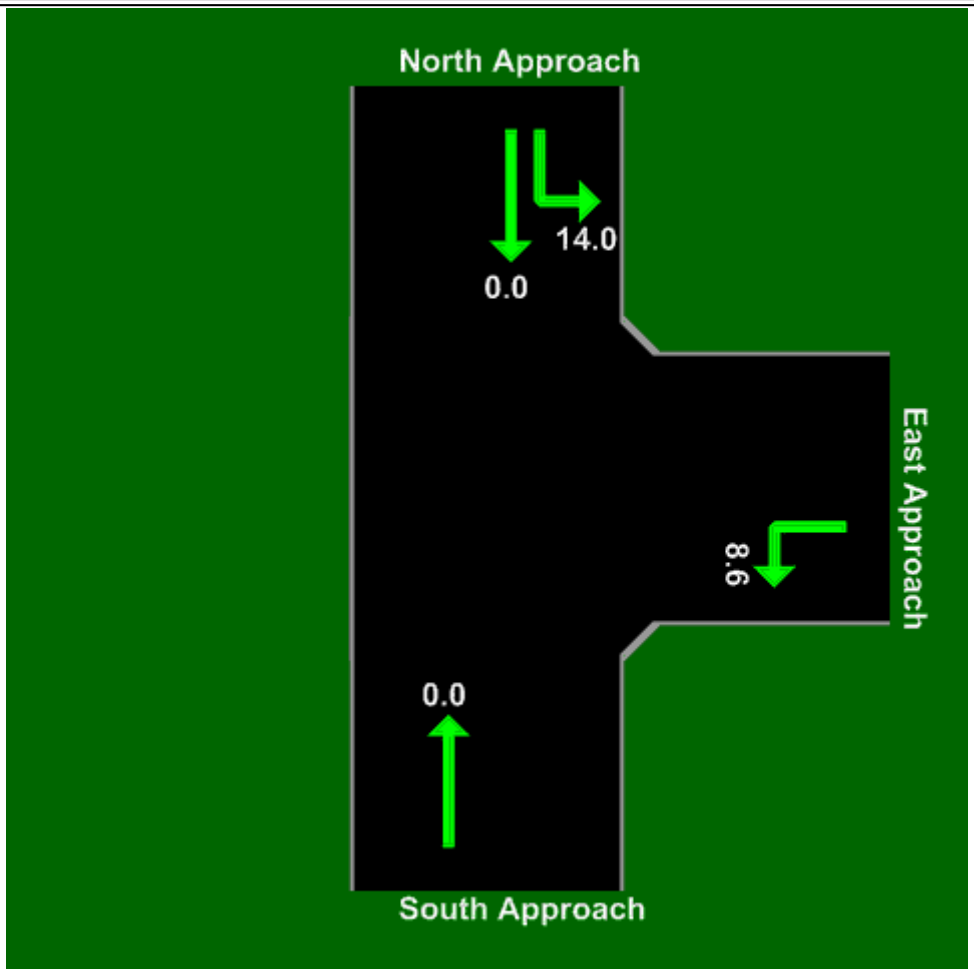
Control Delay (Average)

akcelik & associates
aaTraffic SIDRA

Average control delay per vehicle (seconds)

Northern Left-in Left-out Intersection With Development PM



Intersection Type

Give-way

Color code based on Level of Service

- LOS A
- LOS B
- LOS C
- LOS D
- LOS E
- LOS F

Continuous movement LOS based on density.

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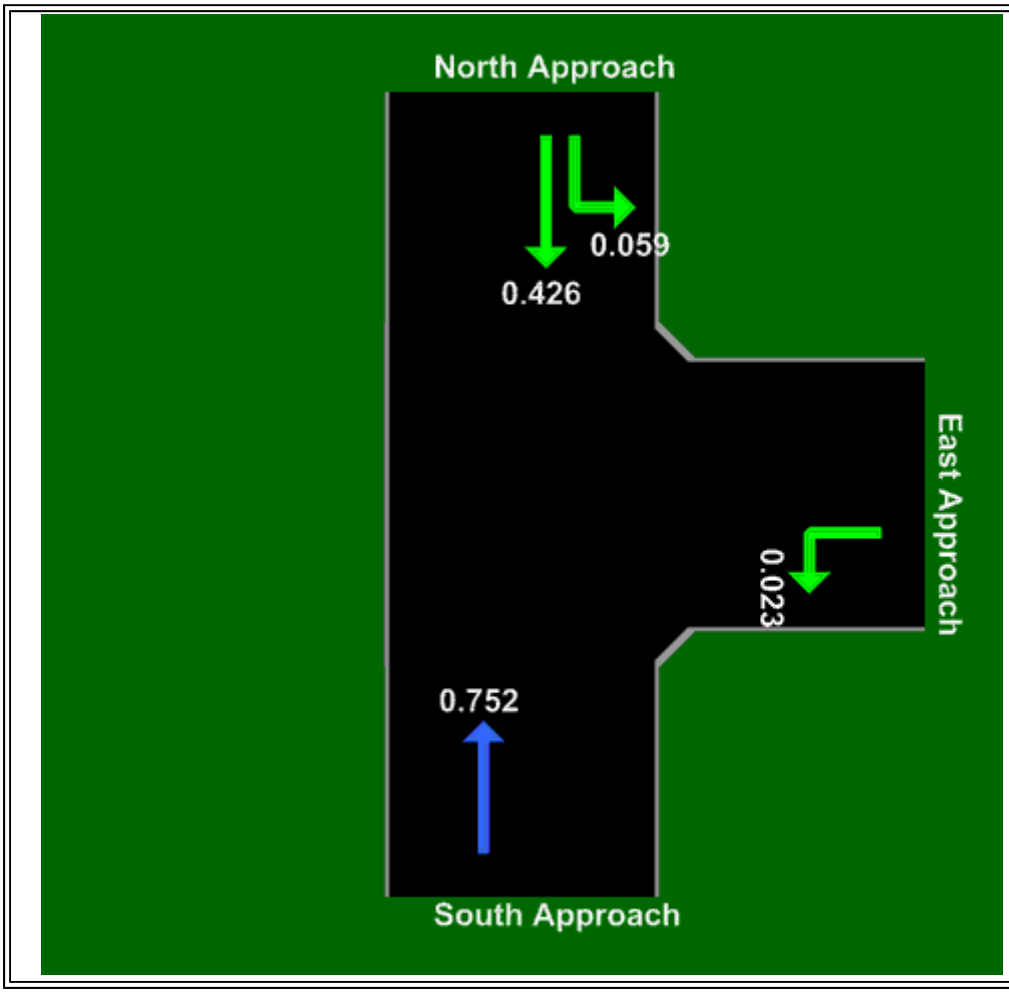
Degree of Saturation

akcelik & associates
aaTraffic SIDRA

Demand Volume / Capacity (v/c) ratio

Northern Left-in Left-out Intersection With Development PM



Intersection Type

Give-way

Color code based on Degree of Saturation

	< 0.6
	0.6-0.7
	0.7-0.8
	0.8-0.9
	0.9-1.0
	> 1.0

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