



ST MARYS
freight hub

SSD-7308 | Post Exhibition Assessment
Heavy Vehicle & Transport Analysis:
Summary Report

Response to the DPIE RFI letter dated 8 November 2019

January 2020

Prepared for

pacific***national***

Client: Pacific National
Document Type: SSD-7308 | Post Exhibition Assessment
Document Title: St Marys Freight Hub | Heavy Vehicle & Transport Analysis: Summary Report
Version: Final v2
Issue Date: 31 January 2020



Prepared By: Guy Evans | Director

If this document is not signed it is a draft.



© Urbanco Group Pty Ltd | ABN 56 616 790 302 | urbanco.com.au
"WeWork" 100 Harris Street PYRMONT NSW 2009 | PO Box 546 PYRMONT NSW 2009 | 02 9051 9333

This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of Urbanco Group Pty Ltd.

CONTENTS

PART A – TRANSPORT ROUTE ANALYSIS	1
1 Introduction	1
2 Scope of Analysis and Methodology	2
3 Site & Context	4
3.1 Land Details & Site Description	4
3.2 Site & Surrounds Context	5
4 Proposed Development	7
4.1 St Marys Freight Hub	7
5 Traffic Generation & Transport Destination	9
5.1 Traffic Trip Generation	9
5.2 Daily Traffic Profile	10
5.3 Customer Locations & Trip Destinations	12
6 Route Options	15
7 Existing Conditions	17
7.1 Road Function, Design and Condition	17
7.2 Traffic Management Facilities	19
7.3 Designated Heavy Vehicle Roads	21
7.4 Sensitive Land Uses	21
7.5 Existing Traffic Volumes	23
7.6 Road Safety and Crash Data	23
7.7 Public Transport, Pedestrians and Cyclists	23
7.8 Noise Levels	24
8 Route Metrics & Characteristics	25
9 Impact Conditions	27
9.1 Traffic Impacts	27
9.1.1 Trip Volumes	27
9.1.2 Road Function, Condition and Capacity	28
9.1.3 Road Safety	29
9.1.4 Traffic Amenity	29
9.1.5 Public Transport, Pedestrians and Cyclists	29
9.1.6 Summary of Traffic Impacts	29
9.2 Sensitive Land Uses	31
9.3 Environmental & Amenity Impacts	31
9.3.1 Congestion	31
9.3.2 Noise Impacts	31

9.3.3	Air Quality	33
9.3.4	Vehicle Light/Illumination	34
9.4	Productivity & Efficiency	34
10	Route Analysis	35
10.1	Traffic Analysis	35
10.2	Road Safety Analysis.....	36
10.3	Sensitive Receivers Analysis	36
10.4	Noise Impact Analysis	36
10.5	Air Quality Analysis	36
10.6	Night Time Alternate Route	36
11	Conclusion	37
	PART B – ROAD SAFETY AUDIT	38
1	Introduction	38
2	Key Findings	40
2.1	Pedestrians and Cyclists	40
2.2	Public Transport	40
2.3	Speed Limits.....	40
2.4	Sight Distance	40
2.5	B-Double Swept Path	40
2.6	Street Lighting	40
3	Response to Safety Issues	41
3.1	Speed Limit Signage	41
3.2	Sight Distance Issues.....	41
3.3	B-Double Swept Path	41
3.4	Street Lighting	42
4	Conclusion	43

APPENDICIES

Appendix 1 – DPIE RFI letter

Appendix 2 – Heavy Vehicle Route Options Assessment (Bitzios Consulting)

Appendix 3 – Truck Route Noise Impact Assessment (AECOM)

Appendix 4 – Offsite Air Quality Assessment (AECOM)

Appendix 5 – Road Safety Audit (Bitzios Consulting)

Appendix 6 – Heavy Vehicle Entry Design Concepts & Swept Paths (BG&E Consulting)

FIGURES

Part A – TRANSPORT ROUTE ANALYSIS

Figure 1 – Development Site & Subject Land

Figure 2 – Local Context

Figure 3 – Concept Layout

Figure 4 – Assumed Maximum Theoretical Daily Traffic Distribution Profile

Figure 5 – TEU Efficiency Analysis

Figure 6 – Key Destination Suburbs

Figure 7 – Route Options

Figure 8 – Existing Traffic Control Devices

Figure 9 – TfNSW approved 25/26m B-Double Routes

Figure 10 – Surrounding Land Uses

Part B – ROADS SAFETY AUDIT

Figure 1 – Scope Road Safety Audit

Figure 2 – Access Road Driveway Swept Paths

Figure 3 – Entry Concept Design

PART A – TRANSPORT ROUTE ANALYSIS

1 INTRODUCTION

The construction of the St Marys Freight Hub will enable the transport of shipping containers to and from the proposed intermodal terminal by rail from Port Botany and by road to customers in the Western Sydney Region. This proposed development will reduce road traffic by utilising the rail system to transport freight from Port Botany to St Marys.

Once shipping containers have been transported to St Marys via rail, semi-trailers, B-Double and High Productivity Vehicle (HPV) trucks will be utilised to transport the freight from the intermodal hub to customers located typically within a 20 kilometre radius of the Freight Hub.

As part of the determining the best heavy vehicle route from the St Marys Freight Hub to the M4 Motorway and Great Western Highway, route options have been considered to ensure the optimum route is adopted. There has been four (4) route options considered for the proposal. However, Route Option 3 has been removed from consideration in this summary report as it has fundamental constraints that cannot support heavy vehicles in Harris Street, which connects to Forrester Road to the west and Glossop Street to the east.

As part of a request for additional information, the Department of Planning Industry & Environment (DPIE) has requested a standalone document to demonstrate the various considerations undertaken in selecting the preferred route, which is the basis for this report. Part A of this summary report includes the heavy vehicle transport route analysis. Part B of this report includes the Road Safety Audit, which was also a request from the DPIE. A copy of the DPIE request for additional information is included in Appendix 1.

The transportation of the shipping containers to and from the intermodal hub requires a concise travel route that will provide appropriate access for heavy vehicles.

This summary report and accompanying technical assessments address the request for additional information from the Department of Planning, Industry and Environment including consideration of the varying potential impacts of different transportation routes on noise, traffic, amenity, safety and sensitive land uses.

2 SCOPE OF ANALYSIS AND METHODOLOGY

There has been four (4) route options considered and documented under the St Marys Freight Hub proposal. The exhibited Environmental Impact Statement proposed a single road transport route that proposed heavy vehicle access from a local industrial road within the St Marys industrial area. In response to submissions from Penrith Council and the local community, more detailed consideration of heavy vehicle access for the Freight Hub was undertaken and another three (3) transport routes were evaluated.

The scope of this analysis is to respond to the Department of Planning, Industry and Environment's request for a standalone document that analyses the four (4) road transport routes considered to service the St Marys Freight Hub (see Appendix 1).

In its letter dated 8 November 2019, the Department requested:

"The Department requests that you outline, in a single, consolidated document, your analysis of all feasible alternative heavy vehicle access routes. This analysis should demonstrate how you considered different aspects of amenity, including but not limited to day time and night time noise, traffic and transport access, including impacts to road user safety and any conflicts with public transport uses, and impacts on sensitive land uses (including schools (i.e. school zones), health facilities, and recreation areas)."

As part of the analysis the Department also requested:

"In preparing this analysis, the Department recommends that you give further consideration to use of alternative routes across the entirety of the proposed 24 hour operations, and also to the potential for alternative night time routes, in order to confirm a route or routes that minimise the number of residential properties impacted by road noise, and/or reduces impacts on sensitive land uses (eg. in the event that separate day time and night time routes are identified)."

This route analysis forms the response to the Department's request and potential impact on amenity for residents adjoining the respective transport routes forms part of this analysis. Route Option 3 has been removed from consideration in this summary report as it has fundamental constraints that cannot support heavy vehicles.

The NSW Heavy Vehicle Access Framework dated September 2018 by Transport for NSW deduces public amenity consideration from the National Heavy Vehicle Regulator (NHVR) Guidelines, as follows:

"Public amenity" is not defined in the HVNL. Under the NHVR Guidelines for granting access, public amenity considerations include noise, emissions, road congestion or dust imposing adverse effects on the community." (p19)

Given the underlying concern are impacts from heavy vehicles, the amenity considerations outlined in the NHVR Guideline and referenced in the TfNSW policy are appropriate.

To ensure the most up to date and accurate analysis is obtained, there has been extensive data collection to inform the analysis of the route options. A traffic survey has been undertaken on the roads subject to the route analysis. The traffic data provides current conditions of traffic volumes of light and heavy vehicles throughout a 24 hour period over a seven day week.

In addition, traffic noise emissions data has also been collected on the roads subject to the route analysis to confirm current noise impacts and establish the real impact from heavy vehicles from the

Freight Hub. The traffic data combined with the noise data provides highly accurate assessment tools to assess potential noise impacts from heavy traffic on sensitive receivers, particularly at night time. The traffic data is also useful to confirm the real impact relating to other amenity considerations such as emissions and dust.

The technical assessments to support the route analysis include traffic, noise and air quality. A Heavy Vehicle Route Options Assessment undertaken by Bitzios Consulting is in Appendix 2, which details the traffic and transport conditions of each route option, including existing conditions and any potential impacts caused by each route. The Assessment also proposes a number of mitigation strategies for each route which are summarised in this report.

A Truck Route Noise Impact Assessment has been undertaken by AECOM to assess the potential acoustic impacts of on-road heavy vehicles to surrounding land uses (see Appendix 3). Whilst AECOM concluded that the impacts from noise emissions would be less than 2dB in the noise assessments submitted for the St Marys Freight Hub proposal, the more detailed data collected on current traffic and noise conditions provides highly accurate results on noise impacts and compliance with NSW noise policy.

An air quality assessment has also been completed by AECOM accompanies this report (see Appendix 4). The Assessment specifies any impacts to air quality including emissions and dust/airborne particulate as a result of off-site on-road heavy vehicle activity.

This report collates the specialist information of all supporting technical assessments to provide a comprehensive assessment of the route options considered for the St Marys Freight Hub. Where additional mitigation measures may be necessary as a consequence of the additional investigations, these could be included to the statement of commitments for the Freight Hub.

3 SITE & CONTEXT

3.1 Land Details & Site Description

The area subject to development is approximately 9.9ha (identified as the ‘development site’) and is contained within three (3) allotments (identified as the ‘subject land’) identified as:

Lot 2 DP876781 – 2 Forrester Road, St Marys

Lot 3 DP876781 – 69-81 Lee Holm Road, St Marys

Lot 196 DP31912 – 196 Christie Street, St Marys

Pacific National also owns an additional allotment to the west of the subject land identified as Lot 2031 DP815293 Links Road, St Marys, which forms the broader Pacific National landholding (identified as the ‘broader land’).



Figure 1 – Development Site & Subject Land (Source: Nearmap)

The development site contains an active rail spur and is generally flat, cleared, highly disturbed and has been subject to extensive filling as part of the importation of material excavated from the Northside Sewerage Tunnel Project.

3.2 Site & Surrounds Context

The land subject to the St Marys Intermodal State Significant Development proposal is located within a large existing industrial area. There are numerous general industrial activities to the north and east that operate 24 hours a day and double shifts (morning and afternoon shifts) throughout the week.

The Main Western Railway Line is to the south, and South Creek and open parklands is to the west. There are residential dwellings and parklands to the south of the Railway Line.

The development site has frontage to Forrester Road, Lee Holm Road and Christie Street. All these frontages interface with existing industrial areas and connect to the regional road network, including Classified Regional and State Roads of Forrester Road, Glossop Street, Greater Western Highway, Mamre Road and Werrington Road.



Figure 2 – Local Context (Source: Nearmap)

- Construction of a wash bay area, building sites for offices, workshops, fuel storage area, and parking for staff and visitors.
- Construction of a water quality and stormwater management facilities.

The Freight Hub is an intermodal (road and rail) terminal and container park, with an operational capacity equivalent to 301,000 TEU (twenty-foot equivalent units shipping containers) annual throughput and associated shipping container handling operations.

The operational activities are contained within the development footprint in Figure 3 and there are no operational activities outside of the development site or on adjoining land owned by Pacific National proposed.

The proposed St Marys Freight Hub will be supported by a dedicated port shuttle service from Port Botany, with the road transport leg commencing at the St Marys Freight Hub.

The St Marys Freight Hub is proposed to operate up to 24 hours per day, 7 days per week, with approximately 60-80% of the heavy vehicle movements expected to occur between 6am and 6pm, 7 days a week.

Operations at the St Marys Freight Hub will include receiving full import containers from Port Botany by rail and transporting full containers from St Marys to customers in Western Sydney by truck, either semi-trailers, B-Doubles or High Productivity Vehicles (HPV). Trucks return to St Marys with empty containers, which are then returned to Port Botany by rail. Transport routes between St Marys and the customers will utilise Classified State and Regional Roads and approved heavy vehicle routes designated for B-Double vehicles. There is no use of local residential streets.

The proposed development will form an important part of a new port shuttle service to move containers to and from Port Botany. The port rail shuttle service and the Freight Hub will significantly increase the volume of freight being moved by rail, relieving the regional and state road network, including primary freight routes servicing Port Botany, of heavy vehicle and container freight traffic with a reduction of 8.7 million Vehicle Kilometres Travelled (VKT) per annum on Sydney's regional road network.

5 TRAFFIC GENERATION & TRANSPORT DESTINATION

5.1 Traffic Trip Generation

Traffic generation for the St Marys Freight Hub has been comprehensively explained and qualified by the key limiting factors that underpin traffic generation in the traffic and transport assessments already submitted for the development proposal.

In summary, truck trips are determined by five train paths with each train having a capacity of 87 twenty-foot equivalent units (TEUs). A train is limited to 87 TEUs due to the maximum inbound trailing weight allowance of 1992 tonnes and train length of approximately 600 metres in accordance with Sydney Trains and ARTC requirements.

A maximum capacity of 87 TEUs per train with 100 percent utilisation of the asset would equate to a theoretical capacity of 435 TEUs inbound by rail of Freight Hub per day.

A theoretical maximum truck trip generation has been applied in the reporting to test the worst-case scenario for traffic generation on the local road network.

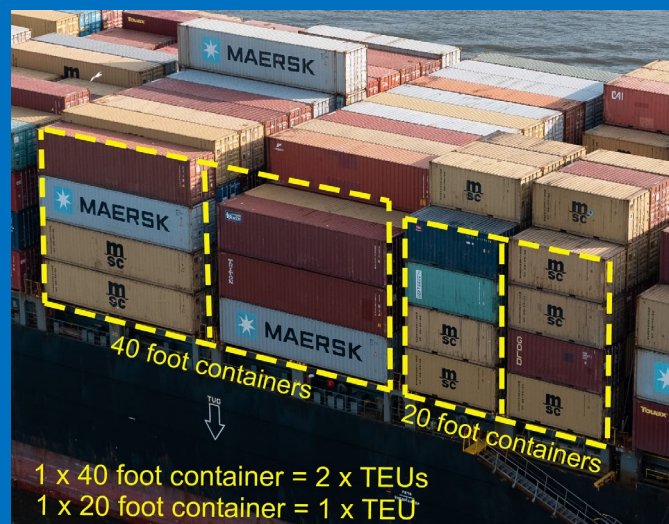
The theoretical maximum trip generation is based on all shipping containers leaving the Freight Hub at an average of two (2) TEUs per truck [Note: 2 TEUs equates to 1.25 containers per truck at 60% 40 foot containers and 40% 20 foot containers]. As the theoretical maximum inbound capacity is 435 TEUs arriving at St Marys by train per day, this equates to theoretical maximum of 218 truck movements out of St Marys per day. Trucks return to St Marys with empty containers for return to Port Botany by train at the same rate (218 trucks returning) which generates a total of 436 truck trips per day.

As the throughput is capped due to the maximum of five (5) train paths per day, this naturally imposes a limit on the number of truck trips for the Freight Hub. For the purposes of the traffic assessment, it is important to note that transport of TEUs has been assumed to be undertaken by a truck transporting an average of two (2) TEUs per truck trip to ensure a worst-case scenario is considered. In reality the Freight Hub will be serviced by a fleet of B-Double and High Productivity Vehicles trucks that have a greater carrying capacity of up to four (4) TEUs per truck, which increases efficiency, productivity and reduces the amount of truck trips. The greater capacity of the B-Double and High Productivity Vehicles trucks means the projected actual operational truck trip generation will be less than has been assumed in the theoretical traffic generation scenario applied to assess the worst-case.

It is important to note that operation of the Freight Hub does not involve the unpacking and distribution of the contents of the shipping containers, which is part of the operations of some other

What is a twenty-foot equivalent unit (TEU)?

A TEU is a unit of capacity for a shipping container which typically are in two sizes of either 20 foot or 40 foot in length. A 20 foot shipping container equals one (1) TEU and a 40 foot shipping container equals two (2) TEUs, as illustrated below.



intermodal facilities within the Sydney Metropolitan area. As there is no unpacking and distribution of the freight, the assumptions to determine traffic generation are straightforward and form a robust basis for calculating traffic generation for the proposed development.

In considering heavy vehicle traffic generation for St Marys, it is important to note:

- Peak hour traffic of 15 in / 15 out per hour is conservatively high as this is a theoretical maximum based on use of trucks transporting two (2) TEUs per trip which is a low utilisation rate and there is greater incentive to travel outside peak hours for better efficiency (reduced travel times)
- Projected import growth in operations are:
 - Year 1 = 75k TEUs
 - Year 2 = 100k TEUs
 - Year 3 onwards up to 110K to 150.5K TEUs
- Freight is import only and there is no export in the proposal
- There is no packing or unpacking of containers onsite
- All import freight remains within containers and containers are deployed by truck from onsite
- St Marys Freight Hub will be serviced by onsite truck fleet using quality equipment used for fleet (i.e. Euro 5 and 6 vehicles)
- Majority of customers are within 20km (Erskine Park, Eastern Creek) with a truck completing a delivery in 1.25 hours on average which is a conservatively short timeframe

Road transport from the St Marys Freight Hub to local customers in Western Sydney delivers the following key benefits:

- One truck from St Marys replaces 9-10 equivalent trucks traveling from Port Botany, and
- There is a reduction of 8.7 million Vehicle Kilometres Travelled per annum on Sydney's regional road network.

5.2 Daily Traffic Profile

A daily assumed traffic profile detailing hourly truck movements to and from the Freight Hub has been generated by Bitzios Consulting in their traffic assessment, which is illustrated in Figure 5. The profile applies the theoretical maximum truck trips and assumes that 80% of all daily trips will occur between 6am and 6pm. This equates to 174 truck trips on average in and out of the facility during this period which is approximately 15 trucks each way.

The morning peak hour for the Freight Hub facility is assumed to be between 8am and 9am whilst the afternoon peak period is estimated from 4:30pm to 5:30pm. The theoretical maximum truck trip generation has been assumed for the peak hour times to measure the impact of the theoretical worst-case scenario. The traffic profile graph of traffic trip data shows hourly 'in/out' truck movements for St Marys Freight Hub. To calculate the total combined hourly trips departing and arriving at the Freight Hub, the trip figures in the chart below need to be doubled. For example, at 8am the 'Truck Trips In/Out' is '15'. This means there are 15 trips in and 15 trips out in that hour.

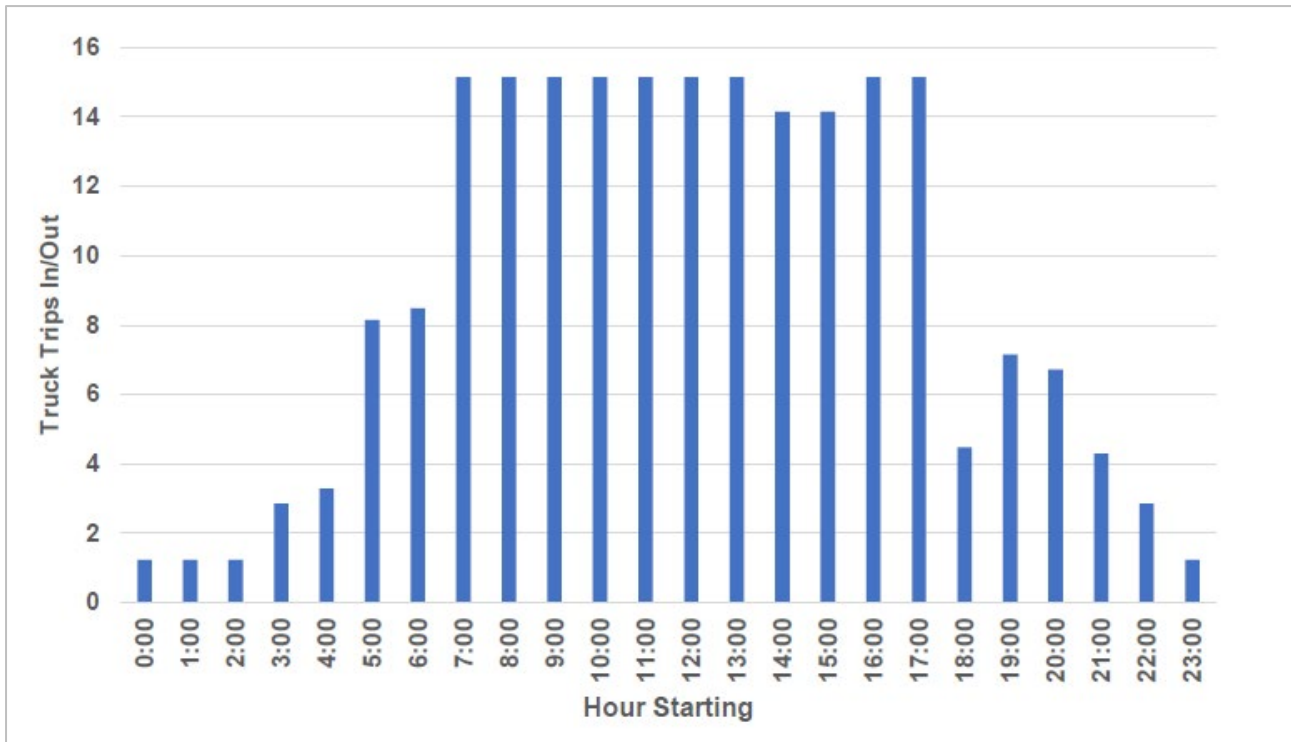


Figure 4 - Assumed Maximum Theoretical Daily Traffic Distribution Profile (Source: Bitzios Consulting)

As previously mentioned, a theoretical maximum has been applied to the traffic assessment to ensure the worst-case scenario has been considered in traffic modelling, impact assessment and safety considerations.

Actual operations of the Freight Hub will utilise trucks that have a greater carrying capacity and therefore be significantly more efficient in transporting shipping containers between the intermodal terminal and the nearby customers. However, this does not change the overall capacity as this is limited by the amount of TEUs that can be transported by rail to the Freight Hub. Regardless of the number of truck trips or type of truck fleet, the maximum number of TEUs inbound by rail is a constant limitation of capacity for the St Marys Freight Hub.

With increased efficiency in a more diverse fleet of trucks with greater carrying capacity, the assumption of two (2) TEUs per truck that was applied to calculate the theoretical maximum truck trips is lower than the likely operational scenario. A sliding scale of TEUs to truck trips has been prepared by Bitzios Consulting based on the constant maximum TEU throughput limited by inbound trains of 435 TEUs per day in Figure 5. The TEU Efficiency Analysis considers how many daily truck trips will be required as the average TEUs per truck increases.

**St Marys Freight Hub Truck Two-Way Traffic Generation Profiles
For Alternative TEUs per Truck Assumptions**

Start Hour	TEUs per Truck Assumption			
	2.0	2.4	3.2	4.0
0:00	2	2	2	1
1:00	2	2	2	1
2:00	2	2	2	1
3:00	6	5	4	3
4:00	7	5	4	3
5:00	16	14	10	8
6:00	17	14	11	8
7:00	30	25	19	15
8:00	30	25	19	15
9:00	30	25	19	15
10:00	30	25	19	15
11:00	30	25	19	15
12:00	30	25	19	15
13:00	30	25	19	15
14:00	28	24	18	14
15:00	28	24	18	14
16:00	30	25	19	15
17:00	30	25	19	15
18:00	9	7	6	4
19:00	14	12	9	7
20:00	13	11	8	7
21:00	9	7	5	4
22:00	6	5	4	3
23:00	2	2	2	1
TOTAL DAILY	436	363	272	218

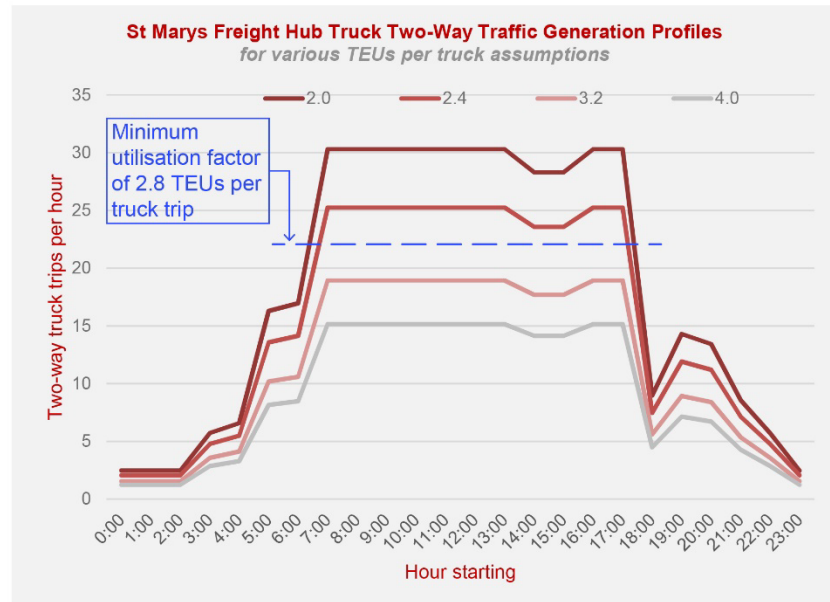


Figure 5 – TEU Efficiency Analysis (Source: Bitzios Consulting)

The expected operational scenario for the St Marys Freight Hub will adopt a higher efficiency, and therefore, will require less truck trips to move the same number of TEUs. It is projected the actual operational case will as a minimum transport 2.8 TEUs per truck on average.

5.3 Customer Locations & Trip Destinations

Route options for trucks traveling between the Freight Hub and the customers are determined based on a number of considerations. The route needs to be as direct as possible to reduce travel time and cost and given the type of vehicles used to transport the shipping containers there are dedicated roads that need to be used. Importantly, the routes should use Classified State and Regional Roads.

The main destination suburbs contain major warehousing operations in Western Sydney. Destination suburbs are typically to the east of the facility with Marsden Park to the northeast. The majority of customers receiving containers from the Freight Hub are within a 20 kilometre radius from the facility and almost all customers are to the east.

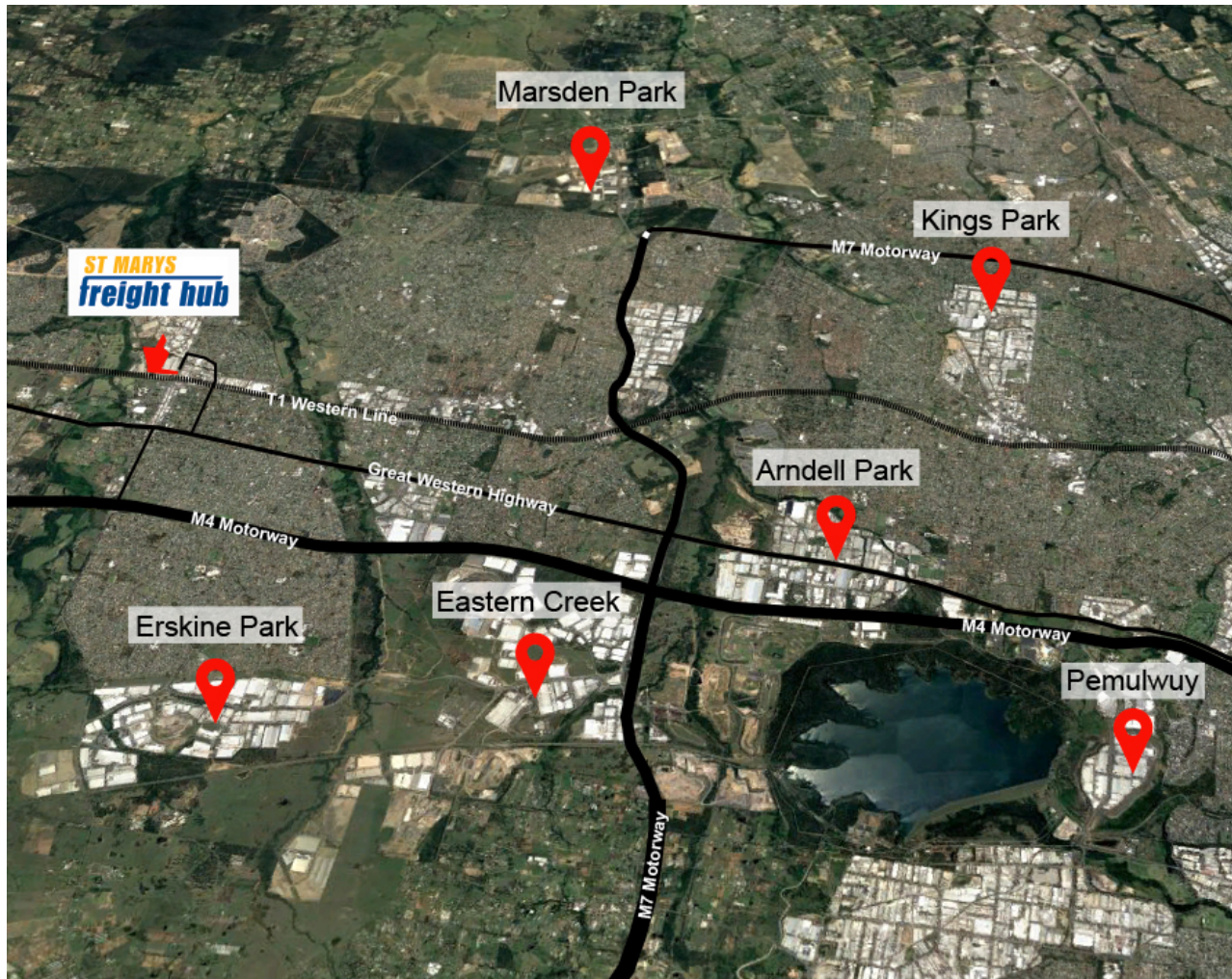


Figure 6 – Key Destination Suburbs

The key destination suburbs are illustrated in Figure 6 and listed in Table 1. There are two major roads that provide direct access to the east being the Great Western Highway and M4 Motorway. The M4 Motorway is more likely the preferred option as it does not have any traffic signals or conflict points with other intersections. It also allows traffic to travel at significantly greater speeds up to 100km/h.

Table 1: Key Destination Distances & Optimum Travel Times

Destination Suburb ¹	Typical Distance ²	Optimum Travel Time ²
Erskine Park	10km	16 mins
Arndell Park	12km	20 mins
Eastern Creek	14km	17 mins
Marsden Park	18km	25 mins
Pemulwuy	18km	22 mins
Kings Park	24km	28 mins

Notes: 1. Assumes use of designated B-Double and permitted heavy vehicle routes

2. Calculated by Google Maps

The main and most convenient interchange to the M4 Motorway is at Mamre Road. The 'St Marys Freight Hub Heavy Vehicle Route Options Assessment' (January 2020) by Bitzios Consulting models 85 percent of traffic generated by the Freight Hub will pass through the M4 Motorway / Mamre Road intersection. This is therefore the dominate travel route between the Freight Hub and the customers.

6 ROUTE OPTIONS

The four (4) route options considered for the St Marys Freight Hub proposal (see Figure 7) have evolved throughout a route assessment process. The transport route proposed in the exhibition of the Environmental Impact Statement is referred to as Option 1. Following matters raised in submissions from government and the local community, consideration of three (3) alternative routes to the exhibited route was undertaken post-exhibition as part of the formal Response to Submissions. These options are identified as Options 2, 3 and 4. However, due to the constraints of Harris Street not being able to support heavy vehicles, Option 3 has been removed from consideration.

During the Response to Submissions period, evaluation of the best route option was determined, and the design of the Freight Hub was revised to align with the best heavy vehicle route to service the facility. This required the respective light vehicle and heavy vehicle access points, which were deliberately separated for safety reasons, to be switched.

Noting the dominate travel destination of heavy vehicles is to the M4 Motorway / Mamre Road interchange (85% of vehicles) with a smaller volume of vehicle using Great Western Highway east, a description of each route option to move freight between the Freight Hub and major roadways is outlined below.

Route Option 1: Base Case (Exhibited Option)

- Base case route option was publicly exhibited in the Environmental Impact Statement.
- Heavy vehicle site access is from Lee Holm Road.
- Travel route uses Lee Holm Road, Christie Street, Forrester Road and Glossop Street.

Route Option 2: Alternate Route A

- Heavy vehicle site access is from Lee Holm Road.
- Travel route uses Lee Holm Road, Christie Street and Werrington Road.

Route Option 3: Alternate Route B

- Removed from consideration as Harris Street cannot support heavy vehicles.

Route Option 4: Alternate Route C

- Heavy vehicle site access is from Forrester Road.
- Outbound and inbound travel route uses Forrester Road and Glossop Street.

Night Time Alternative Option

Whilst it was not a consideration of the route options above, the Department has requested consideration of a separate route for night time heavy vehicle transport. The night time alternative option would divert heavy vehicle traffic between the hours of 10pm and 6am from Route Option 4. The night time route proposes two-way access from Forrester Road and circles around the industrial zone via Christie Street and Werrington Road to reconnect with Route Option 4 at the intersection of Great Western Highway and Mamre Road.

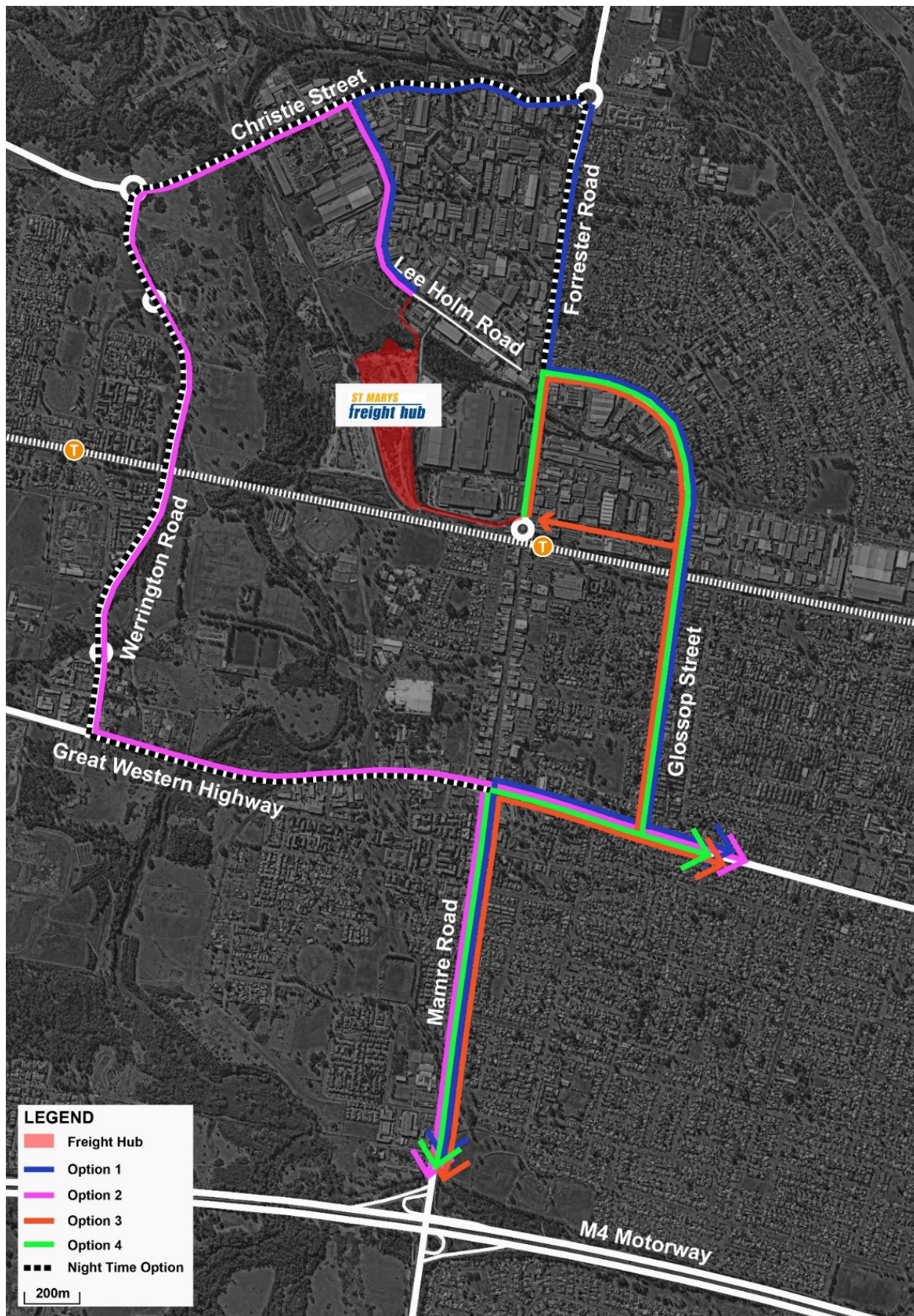


Figure 7 – Route Options

7 EXISTING CONDITIONS

Existing road conditions and allowances in the St Marys region have determined potential route options for heavy vehicles. The heavy vehicles used to transport freight for the Freight Hub are not permitted on residential streets and must use specific roads and routes to reach their respective destination.

A detailed description of the current road conditions, allowances for heavy vehicles, adjoining land uses and baseline amenity conditions (i.e noise) associated with the roads between the Freight Hub and connecting high-order road network is provided below.

7.1 Road Function, Design and Condition

The major through traffic roads in the local vicinity providing connections in the direction of the customer destinations for the Freight Hub are the Great Western Highway and M4 Western Motorway to the south. Connecting roads between the Freight Hub and these major roads include Forrester Road, Glossop Street, Lee Holm Road, Christie Street, Werrington Road and Mamre Road. These roads form collector roads and provide distribution functions for localised traffic. The existing conditions in regard to function, design and condition for the roads utilised in the different route options have been assessed by Bitzios Consulting (refer Appendix 2) and are graded in Table 2.

Table 2: Existing Road Conditions (Source: Bitzios Consulting)

Name	Classification	Function	Design	Condition
Forrester Road (south of Glossop Street)	Local Road	Local Industrial Road	<ul style="list-style-type: none"> • 2 lanes (two-way) • Undivided (double lines between intersections/access driveways) • 30-metre median parking lane provided southbound south of Glossop Street • 220-metre parking lane provided southbound north of Harris Street • Right turn lane provided along southbound carriageway • Cul-de-sac and limited short-term parking at southern end outside St Marys Railway Station 	<ul style="list-style-type: none"> • Most of the pavement in good condition • Entire section sealed
Forrester Road (north of Glossop Street)	Regional Road	Sub-arterial Road	<ul style="list-style-type: none"> • 4 wide lanes (two-way) • Divided • Some parking permitted northbound • Parking lanes provided southbound 	<ul style="list-style-type: none"> • Pavement in good condition • Entire section sealed

Name	Classification	Function	Design	Condition
Glossop Street	Regional Road	Sub-arterial Road	<ul style="list-style-type: none"> • 4 wide lanes (two-way) • Divided • No Stopping (6am-10am and 3pm-7pm Mon-Fri) southbound between Elm Street and Debrincat Avenue, no parking permitted elsewhere • Right turn lanes provided at key intersections 	<ul style="list-style-type: none"> • Pavement in good condition • Entire section sealed
Lee Holm Road	Local Road	Local Industrial Access Road	<ul style="list-style-type: none"> • Entire road 6 metres wide (two-way) • Undivided (no line marking) • Trucks have to use entire road to ingress/egress driveways • Parking permitted on both sides, restricting two-way traffic to one lane • Two corners with limited visibility 	<ul style="list-style-type: none"> • Pavement in good condition • Entire section sealed
Christie Street	Regional Road	Sub-arterial Road	<ul style="list-style-type: none"> • 2 lanes (two-way) • Undivided (double lines provided between intersections) • Parking lanes provided on both sides • No dedicated turn lanes 	<ul style="list-style-type: none"> • Pavement in good condition • Entire section sealed (except for a 90- metre section between the two bridges east of Werrington Road; lines are provided)
Werrington Road	Regional Road	Sub-arterial Road	<ul style="list-style-type: none"> • 2 lanes (two-way) • Undivided (double lines provided between intersections) • Parking permitted on both sides between The Kingsway and Great Western Highway 	<ul style="list-style-type: none"> • Pavement in moderate condition • Sealed between Christie Street and Parkes Avenue (eastern side) and between Rance Road and Great Western Highway (both sides) • Guard rails between Parkes Avenue and Rance Road (both sides)

Name	Classification	Function	Design	Condition
Great Western Highway	State Road	Arterial Road	<ul style="list-style-type: none"> • 6 lanes (two-way) • Divided • No parking permitted • Right turn lanes provided at key intersections 	<ul style="list-style-type: none"> • Pavement in good condition • Entire section sealed
Mamre Road	State Road	Arterial Road	<ul style="list-style-type: none"> • 4 lanes (two-way) • Divided between Hall Street and Banks Drive intersections (undivided elsewhere) • No parking permitted • Right turn lanes provided at key intersections 	<ul style="list-style-type: none"> • Pavement in good condition • Sealed between Great Highway and M4, unsealed south of M4

7.2 Traffic Management Facilities

The roads within the route options contain varying traffic management facilities and devices, as shown in Figure 8. Inclusive of all roads there are the following facilities:

- 13 traffic signals
- 4 roundabouts
- 4 school zones
- 1 pedestrian crossing



Figure 8 – Existing Traffic Management & Control Devices

7.3 Designated Heavy Vehicle Roads

Transport for NSW (TfNSW) manages the list of approved roads available for road freight transport throughout the State. The approved roads mean that certain types of heavy vehicles can use designated roads without approvals.

The TfNSW Restricted Access Vehicle (RAV) Maps show users which roads can be used for various types of heavy vehicles. Figure 9 is an extract from the TfNSW's RAV mapping that shows approved roads within the local vicinity of the Freight Hub that are available for use by B-Doubles. The roads shown in green in the mapping are available for use for B-Doubles up to 26m in length.

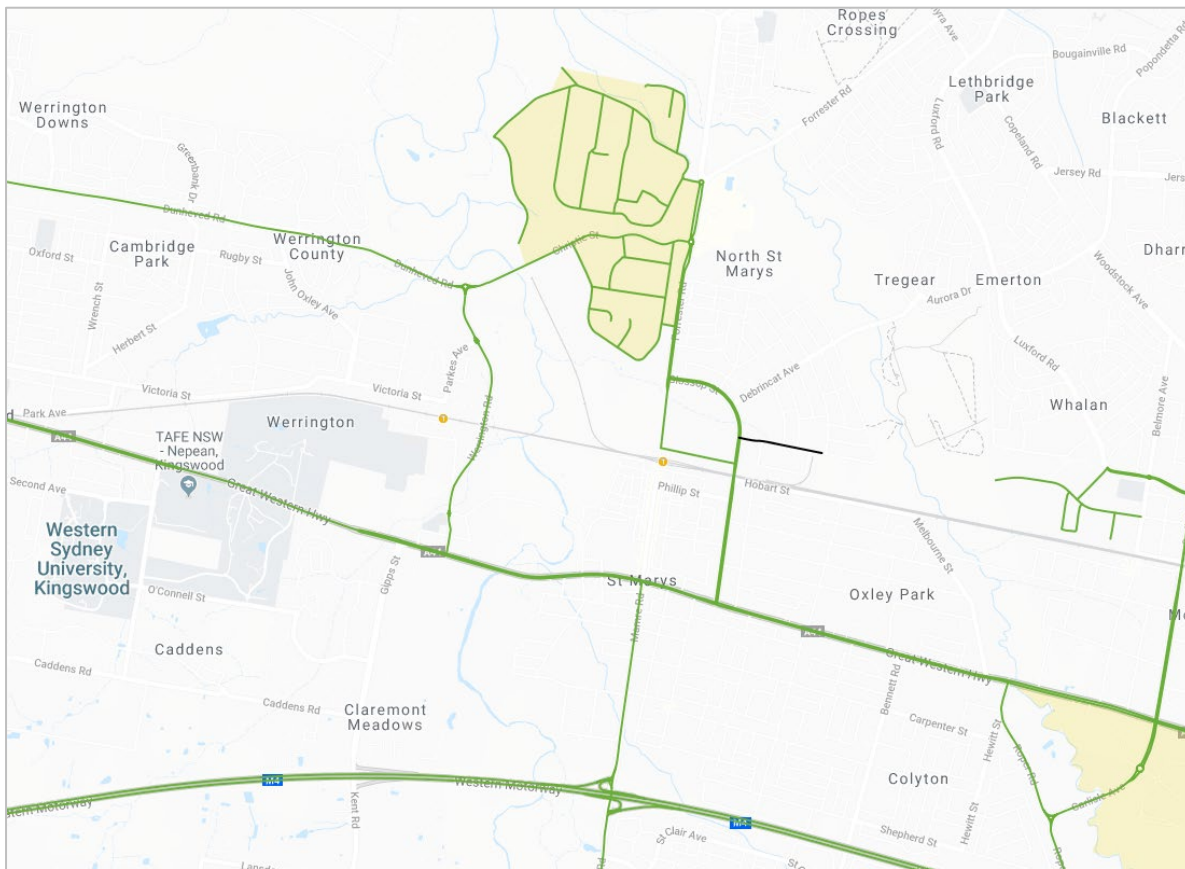


Figure 9 - TfNSW approved 25/26m B-Double Routes (Source: TfNSW RAV mapping)

7.4 Sensitive Land Uses

Land uses surrounding Freight Hub are predominately industrial with a variety of different land uses activities interfacing with the roads in the route options. Predominantly, the surrounding land uses are industrial, residential, commercial, education or recreational (Refer Figure 10).

Notable sensitive land uses include:

- Forrester Road, Glossop Street, Werrington Road, Greater Western Highway and Mamre Road are all adjacent to residential development.
- Werrington Road has frontage to three (3) schools, Mamre Road has frontage to one (1) school and Forrester Road (south) has frontage to a very small school with six (6) staff.

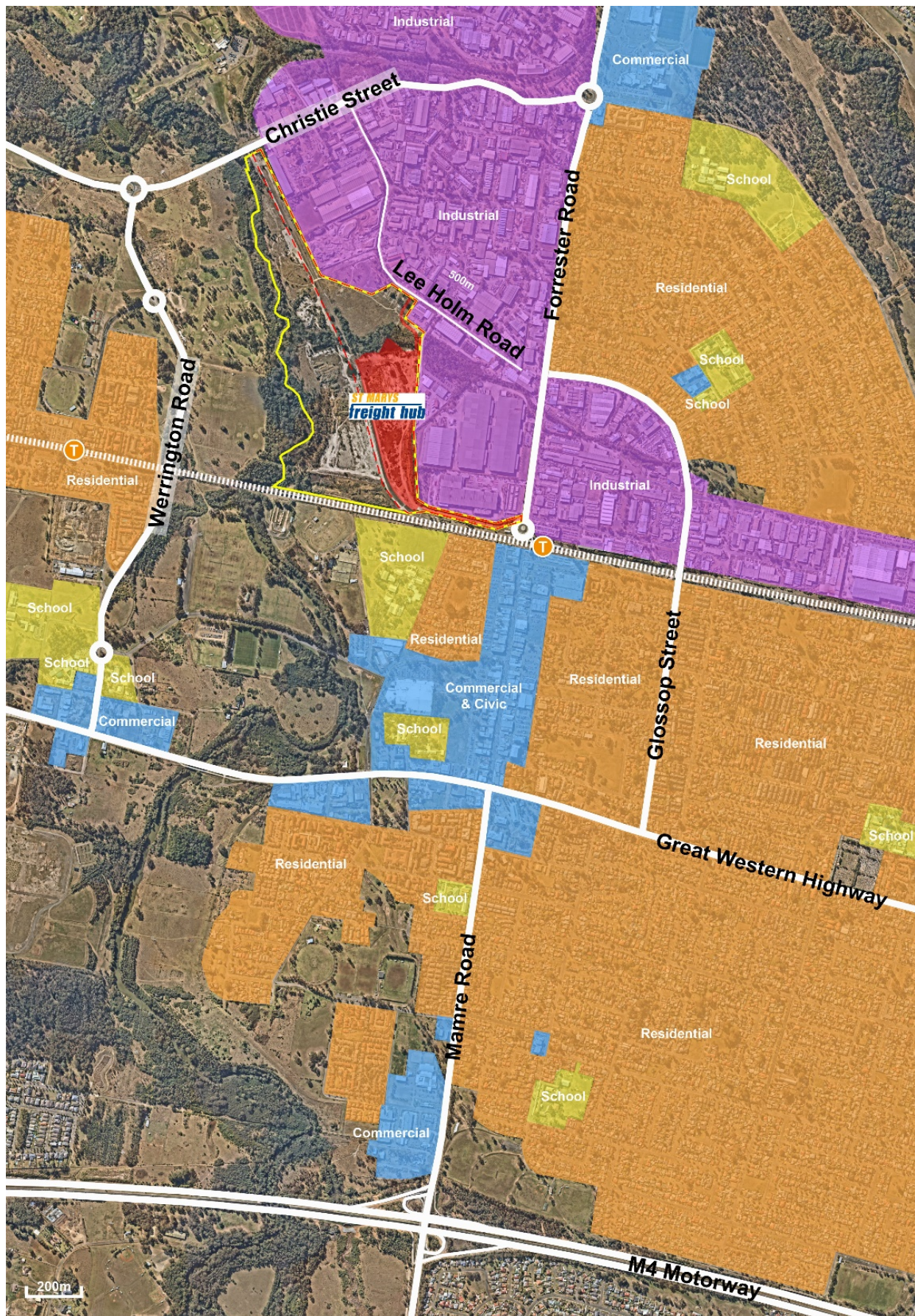


Figure 10 – Surrounding Land Uses

7.5 Existing Traffic Volumes

Traffic counts and surveys were undertaken by Bitzios Consulting between 12am on Tuesday 3 December and 12am Tuesday 10 December 2019. These surveys observed the number of vehicles utilising each tube location along the proposed routes at three different times of day, daytime (6am to 6pm), evening (6pm to 10pm), and night time (10pm to 6am). Table 3 demonstrates these trip volumes.

Table 3: Existing Daily Traffic Volumes (Source: Bitzios Consulting)

Location	Time Period	Existing Volume		
		Cars	Light Trucks	Heavy Trucks
Christie Street west of Lee Holm Road	6am – 6pm	98 742	9 697	1 883
	6pm – 10pm	22 066	1 195	129
	10pm – 6am	13 293	1 285	274
Werrington Road south of the Kingsway	6am – 6pm	75 211	8 207	1 133
	6pm – 10pm	19 757	1 475	70
	10pm – 6am	13 671	1 411	136
Mamre Road at No. 58	6am – 6pm	105 247	11 414	5 093
	6pm – 10pm	24 824	1 342	643
	10pm – 6am	18 036	1 525	659
Glossop Street at No. 16	6am – 6pm	88 912	11 778	4 912
	6pm – 10pm	19 310	1 056	417
	10pm – 6am	13 987	1 286	735
Forrester Road at No. 171	6am – 6pm	95 808	11 470	2 975
	6pm – 10pm	20 032	1 001	219
	10pm – 6am	15 204	1 378	457
Forrester Road at No. 75	6am – 6pm	15 757	1 775	259
	6pm – 10pm	3 629	98	19
	10pm – 6am	2 506	222	66

7.6 Road Safety and Crash Data

General crash data trends for 2014 to 2018 for the proposed four route options were obtained from Transport for NSW and assessed by Bitzios Consulting. This data demonstrated that there was an average of 80 crashes per year over the five-year period for all routes. Three of the crashes recorded over the five-year period resulted in fatalities, however, none of these involved an articulated truck.

7.7 Public Transport, Pedestrians and Cyclists

The area surrounding the proposed Intermodal Freight Hub is currently well-served by public transport. Given its proximity to major arterial roads and adjacency to St Marys Train Station, there are a variety of public transport options to and from the area. For all routes, there is a maximum of 14 bus routes which run along roads proposed to be utilised by heavy vehicles.

Bitzios Consulting's Heavy Vehicle Route Options Assessment found that there were formal footpaths along most roads within the study area located from the subject site and surrounding key locations. The cycle network surrounding the site consist of both on-road and off-road routes. The networks surrounding the site that are of interest and would be utilised by future on-site workers includes the low-difficulty footpath along Forrester Road north of Harris Street, the moderate difficulty on-road path along Forrester Road between Glossop Street and Christie Street, and the short off-road path along Christie Street between South Creek Bridge, just before Werrington Road.

7.8 Noise Levels

A Truck Route Noise Impact Assessment undertaken by AECOM investigated existing noise levels at anticipated worse-case locations along proposed routes during night periods (Refer Appendix 3). This required placing loggers on existing high noise level roads along proposed routes at the following locations:

- 151 Forrester Road, St Marys
- 150 Glossop Street, St Marys
- 304 Great Western Highway, St Marys
- 62 Mamre Road, St Marys
- 1 Werrington Road, St Marys
- Christie Street, St Marys

Table 4 provides results from the noise measurements taken by each logger demonstrating existing noise conditions along proposed routes.

The NSW Environmental Protection Authority's *NSW Road Noise Policy* details noise criteria for developments with the potential to generate additional traffic on arterial or sub-arterial roads.

The criteria are as follows:

- 60 dB(A) during the day (7am – 10pm)
- 55 dB(A) during the night (10pm – 7am)

Table 4: Existing Daytime and Night-time Noise Levels (Source: Aecom)

Logger Location	Noise Levels (dB(A))	
	Day (7am – 10pm)	Night (10pm – 7am)
Forrester Road	66	63
Glossop Street	65	62
Great Western Highway	74	70
Mamre Road	69	66
Werrington Road	71	67
Christie Street	65	61

As demonstrated by results in the table above, existing noise measurements show that the EPA's road noise criteria already exceed the policy standards at every logger location.

8 ROUTE METRICS & CHARACTERISTICS

Each of the four (4) routes have varying lengths and travel duration times. The routes also have different characteristics that have been considered to select the best route for transporting freight to the respective destination.

Around 85% of freight is transported through the M4 Motorway/Mamre Road Interchange. Therefore, as this is the predominate direction, the key considerations in the route analysis are the distances and characteristics between the St Marys Freight Hub and the Interchange. The table provided below demonstrates the metrics of each route between these points.

Table 5: Road Characteristics (Source: Bitzios Consulting)

Option	Distance to M4	Time to M4
1	7.8km	9-24 minutes
2	7.8km	8-22 minutes
4	5.2km	6-18 minutes
Night Alternative	8.9km	13 minutes ¹

Notes: 1. Assumes use of designated B-Double and permitted heavy vehicle routes
2. Route Option 3 is not included as not suitable for heavy vehicles

In the Assessment provided by Bitzios Consulting that accompanies this report, an analysis of each routes impact against capacity, safety, amenity and efficiency was undertaken. A summary of their findings between the Intermodal Freight Hub and the M4 is in the table provided below.

Table 6: Road Characteristics Summary (Source: Bitzios Consulting)

Opt.	Capacity	Safety	Amenity	Efficiency
1	<ul style="list-style-type: none"> 1-2% increase at key intersections Lee Holm Road is an industrial collector but is narrow in parts Christie, Forrester, Glossop, and Mamre roads already carry large trucks 	<ul style="list-style-type: none"> 60 crashes over last 5 years Concerns for sight lines at right turn out of Lee Holm Road and left turns into Lee Holm Road 	<ul style="list-style-type: none"> Route passes approximately 6.3km of residential land zoning Increases trucks along residential roads by an average of 10% at night One school zone on Mamre Road Bus routes along Glossop-Forrester, Christie, and Mamre roads 	<ul style="list-style-type: none"> Peak delays entering and exiting Lee Holm Road at Christie Street Future traffic growth from catchments north of Christie and Forrester roads will impact roundabout function

Opt.	Capacity	Safety	Amenity	Efficiency
2	<ul style="list-style-type: none"> 1-2% increase at key intersections Christie and Werrington roads single lane with small roundabouts but already carry large trucks Werrington Road, south of Gipps Road, there is a constrained urban cross section Trucks sweep across both lanes from Werrington Road on to Great Western Highway 	<ul style="list-style-type: none"> 48 crashes over last 5 years Concerns with sight lines for left turn out of Lee Holm Road and narrow parking lane for passing trucks returning to Lee Holm Road Werrington Road is not ideal for day time truck route due to conflicting uses and narrow road profile 	<ul style="list-style-type: none"> Approximately 1.8km of residential frontage along Mamre Road 15% truck increase on Werrington Road and 7.7% truck increase on Mamre Road at night Two school zones located on Mamre Road and Werrington Road Multiple bus routes located on Great Western Highway between Werrington and Mamre 	<ul style="list-style-type: none"> Delays at Christie/Dunheved road which is already at capacity Werrington Road/Great Western Highway heavily congested in peak hour
4	<ul style="list-style-type: none"> 1-2% increase at key intersections Forrester Road (south) already carries B-Doubles due to its width 	<ul style="list-style-type: none"> 62 crashes over last 5 years 	<ul style="list-style-type: none"> Passes approximately 5.3km of residential frontage on Glossop Road and Mamre Road 10% truck increase on Glossop Road and 7.7% truck increase on Mamre Road at night Two school zones Multiple bus routes 	<ul style="list-style-type: none"> Ease of access to Forrester Road (south) due to limited opposing traffic Traffic signals along route provide for controlled movements

Notes: 1. Route Option 3 is not included as not suitable for heavy vehicles

9 IMPACT CONDITIONS

9.1 Traffic Impacts

Bitzios Consulting has undertaken a comprehensive traffic analysis of the four (4) route options considered to service the St Marys Freight Hub (see Appendix 2).

9.1.1 Trip Volumes

A theoretical maximum possible trips volume of 218 heavy vehicles in and 218 heavy vehicles out has been applied to the traffic assessment for the proposed St Marys Intermodal Freight Hub, which totals 436 truck trips per day.

Following an assessment of traffic conditions by Bitzios Consulting on the different roads which are to be utilised as part of the proposed route options, this addition of vehicles to the road system will be negligible in its impact. A summary of the additional heavy vehicles at each time of day on the roads for proposed routes 1, 2 and 4 is provided in the Tables 7, 8 & 9 below.

Table 7: Additional Traffic Volumes – Route 1 (Source: Bitzios Consulting)

Location	Period	Existing Volume			Additional Volume*		
		Cars	Light Trucks	Heavy Trucks	Cars	Light Trucks	Heavy Trucks
Glossop Street at No. 16	6am-6pm	88,912	11,778	4,912	-	-	394
	6pm-10pm	19,310	1,056	417	-	-	8
	10pm-6am	13,987	1,286	735	-	-	34
Forrester Road at No. 171	6am-6pm	95,808	11,470	2,975	-	-	394
	6pm-10pm	20,032	1,001	219	-	-	8
	10pm-6am	15,204	1,378	457	-	-	34
Mamre Road at No. 58	6am-6pm	105,247	11,414	5,093	-	-	331
	6pm-10pm	24,824	1,342	643	-	-	7
	10pm-6am	18,036	1,525	659	-	-	29

Table 8: Additional Traffic Volumes – Route 2 (Source: Bitzios Consulting)

Location	Period	Existing Volume			Additional Volume*		
		Cars	Light Trucks	Heavy Trucks	Cars	Light Trucks	Heavy Trucks
Christie Street west of Lee Holm Drive	6am-6pm	98,742	9,697	1,883	-	-	394
	6pm-10pm	22,066	1,195	129	-	-	8
	10pm-6am	13,293	1,285	274	-	-	34
Werrington Road south of The Kingsway	6am-6pm	75,211	8,207	1,133	-	-	394
	6pm-10pm	19,757	1,475	70	-	-	8
	10pm-6am	13,671	1,411	136	-	-	34
Mamre Road at No. 58	6am-6pm	105,247	11,414	5,093	-	-	331
	6pm-10pm	24,824	1,342	643	-	-	7
	10pm-6am	18,036	1,525	659	-	-	29

Table 9: Additional Traffic Volumes – Route 4 (Source: Bitzios Consulting)

Location	Period	Existing Volume			Additional Volume*		
		Cars	Light Trucks	Heavy Trucks	Cars	Light Trucks	Heavy Trucks
Glossop Street at No. 16	6am-6pm	88,912	11,778	4,912	-	-	394
	6pm-10pm	19,310	1,056	417	-	-	8
	10pm-6am	13,987	1,286	735	-	-	34
Forrester Road at No. 171	6am-6pm	95,808	11,470	2,975	-	-	12
	6pm-10pm	20,032	1,001	219	-	-	0
	10pm-6am	15,204	1,378	457	-	-	1
Forrester Road at No. 75	6am-6pm	15,757	1,775	259	-	-	394
	6pm-10pm	3,629	98	19	-	-	8
	10pm-6am	2,506	222	66	-	-	34
Mamre Road at No. 58	6am-6pm	105,247	11,414	5,093	-	-	331
	6pm-10pm	24,824	1,342	643	-	-	7
	10pm-6am	18,036	1,525	659	-	-	29

The percentage increase of additional truck movements is significantly higher for Christie Street and Werrington than for both daytime and night time periods as compared with Glossop Street and Forrester Road.

9.1.2 Road Function, Condition and Capacity

All routes utilise TfNSW designated heavy vehicle roads, which are typically Classified State or Regional Roads.

Bitzios Consulting has calculated the impact that the additional heavy vehicles to the local road system would have on function and capacity. The freight hub proposes a maximum of 15 trucks in and 15 trucks out per hour which does not significantly worsen traffic capacity or road function across the network. The trucks from the Freight Hub will result in a 1-2% increase in traffic at key intersections for all route options, not having a detrimental impact to capacity.

The design of Lee Holm Road is not suited to heavy vehicles and Christie Street and Werrington Road has significantly more traffic management and control devices.

Table 10: Traffic Control Devices & Zones

Route Option	Traffic Signals	Roundabouts	School Zones	Pedestrian Crossings	Narrow Bridge
1	10	1	2	-	-
2	8	4	4	1	2
4	10	-	2	-	-
NT	8	4	N/A	1	2

Notes: 1. Route Option 3 is not included as not suitable for heavy vehicles

Route Option 4 has significantly less traffic control devices and safety zones. It also does not have any roundabouts. Option 2 and the night time option have significantly more roundabouts, most that

are not to heavy vehicle standards, and other constraints such as fewer travel lanes and narrow bridges.

9.1.3 Road Safety

Utilising the findings of Bitzios Consulting regarding trip volumes and route options, an estimate has been made in regard to the impact that trucks from the St Marys Freight Hub would have on road safety. Route Options 1 & 2 demonstrate a higher impact on safety at major intersections compared to other route options as they pass through more 2-lane links with parking.

Overall, following an evaluation of crash patterns against specific turning movements by the Freight Hub's trucks, Bitzios Consulting concluded that there would be a negligible change in crash likelihood and crash risk at major intersections.

9.1.4 Traffic Amenity

Increases of additional truck movements along each route is minimal as evident in the table below, in particular when considering existing heavy vehicle traffic conditions at night time.

Table 11: Night Time Truck Movements (Source: Bitzios Consulting)

Route Option	Night time Truck Movements
1	<ul style="list-style-type: none"> Forrester (north): + 12% trucks at night (7 / hour) Glossop: +10% trucks at night (7 / hour) Mamre: +7.7% trucks at night (6 / hour)
2	<ul style="list-style-type: none"> Werrington Road: +15% trucks at night (7 / hour) Mamre Road: +7.7% trucks at night (6 / hour)
4	<ul style="list-style-type: none"> Glossop: +10% trucks at night (7 / hour) Mamre: +7.7% trucks at night (6 / hour)
NT	<ul style="list-style-type: none"> Forrester (north): + 12% trucks at night (7 / hour) Werrington Road: +15% trucks at night (7 / hour) Mamre Road: +7.7% trucks at night (6 / hour)

Notes: 1. Route Option 3 is not included as not suitable for heavy vehicles

9.1.5 Public Transport, Pedestrians and Cyclists

Utilising the findings of Bitzios Consulting regarding trip volumes and route options, an estimate has been made on the impact that trucks from the St Marys Freight Hub would have on non-vehicular road users.

Due to the small amount of permanent on-site staff, there will be minimal impacts on the demand for public transport. Bitzios Consulting determined that the St Marys Freight Hub would cause no hinderance to surrounding pedestrian and cycling connections. These connections, alongside public transport stops, are sufficient to cater for access to and from the site by on-site workers.

Heavy vehicle movement will also not have an impact on public transport. This is due to the infrequency of buses along proposed routes meaning a minor increase in truck traffic is not expected to be impactful. The only shared path is located along Route Option 2 which is not marked as a 'low-difficulty' route meaning that only more experienced cyclists would utilise this route.

9.1.6 Summary of Traffic Impacts

Bitzios Consulting summarised the various traffic considerations in the route analysis, which is outlined in the table below.

Table 12: Summary of Traffic Impacts (Source: Bitzios Consulting)

Opt.	Volume, Capacity, Geometry Impacts	Safety Impacts	Amenity Impacts	Truck Movement Efficiency
1	<ul style="list-style-type: none"> 1%-2% increase at key intersections – minimal impact on volumes or capacity Lee Holm is an industrial collector but is narrow in parts due to street parking Christie, Forrester, Glossop, Mamre already carry large trucks. Christie is only a two lane road with on street parking 	<ul style="list-style-type: none"> 60 KSI crashes in last 5 years Sight line concerns with right turn out of Lee Holm by slow moving trucks Swept path concerns for left turns into Lee Holm for slow moving trucks 	<ul style="list-style-type: none"> Forrester (north), Glossop, Mamre have residential frontages. Passes about 5.4km of residential frontage length Forrester (north): + 12% trucks at night (7 p.h.) Glossop: +10% trucks at night (7 p.h.) Mamre: +7.7% trucks at night (6 p.h.) 1 x school zone (Mamre Road) Glossop-Forrester (north), Christie, Mamre are bus routes 	<ul style="list-style-type: none"> 9 (min), 24 (max) minutes to/from the M4 7.8 km to the M4 Peak delays entering and exiting Lee Holm at Christie Street, particularly for right turns out. Future traffic growth from catchments north of Christie/Forrester will impact the roundabout meaning increasing delays for trucks over time
2	<ul style="list-style-type: none"> 1%-2% increase at key intersections – minimal impact on volumes or capacity Lee Holm is an industrial collector but is narrow in parts due to street parking Christie and Werrington single lane each way with small roundabouts but already carry large trucks. Werrington south of Gipps has a constrained urban (slow speed) cross section. Truck sweeps across both lanes from Werrington into GWH 	<ul style="list-style-type: none"> 48 KSI crashes in last 5 years Sight line concerns with left turn out of Lee Holm by slow moving trucks Narrow parking lane for passing truck propped to turn right into Lee Holm Werrington not ideal for a day time truck route with sensitive conflicting uses and narrow road profile with on street parking near the school. 	<ul style="list-style-type: none"> No residential frontages on Werrington but houses backing onto road in close proximity in parts Mamre has residential frontages and passes about 1.8km of residential frontage length Werrington: +15% trucks at night (7 p.h.) Mamre: +7.7% trucks at night (6 p.h.) 2 x school zones (Werrington, Mamre) Great Western between Werrington and Mamre has multiple bus routes. Mamre a bus route 	<ul style="list-style-type: none"> 8 (min), 22 (max) minutes to/from M4 7.7 km to the M4 Delays at Christie/Dunheved – at capacity and worsening over time Werrington/Great Western heavily congested in peaks due to lack of capacity in Werrington Road
4	<ul style="list-style-type: none"> 1%-2% increase at key intersections – minimal impact on volumes or capacity Forrester (south) already carries B-Doubles and is wide enough 	<ul style="list-style-type: none"> 62 KSI crashes in last 5 years Forrester (south) has wide travel lanes and limited parking – minimal impacts Glossop, Great Western, Mamre are 4-lane truck carrying roads 	<ul style="list-style-type: none"> Glossop, Mamre have residential frontages. Passes about 5.3km of residential frontage length Glossop: +10% trucks at night (7 p.h.) Mamre: +7.7% trucks at night (6 p.h.) 2 x school zones (Forrester south, Mamre Road), although Forrester (south) school is very small Glossop-Forrester (north), Christie, Mamre are bus routes 	<ul style="list-style-type: none"> 6 (min), 18 (max) minutes to/from M4 4.5km to the M4 Ease of access via Forrester (south) due to limited opposing traffic Signals provide for controlled movements along the entire route Uses roads which still have peak period capacity

Notes: 1. Route Option 3 is not included as not suitable for heavy vehicles

9.2 Sensitive Land Uses

All routes travel through residential areas and schools directly fronting the. The table provided below summarises the length of road and number of dwellings passed for each route.

Table 13: Sensitive Land Summary (Source: Aecom)

Route Option	Residential	Schools
1	5.3km of residential frontage	2
2	1.75km of residential frontage	5
4	4.5km of residential frontage	1
Night Alternative	2.65km of residential frontage	N/A

Notes: 1. Route Option 3 is not included as not suitable for heavy vehicles

- Option 4 has 1km less frontage with residential properties than the Option 1, which was the exhibited option.
- Option 2 has the least frontage from residential properties with 1.75km. However, this would increase to 2.9km if heavy vehicle access was from Forrester Road, as is currently proposed.
- Option 2 has significantly more frontages to schools.

9.3 Environmental & Amenity Impacts

A number of specialist assessments have been prepared to assess the amenity impacts along the route options, including traffic, noise impacts and air quality in regard to emissions and pollution. Each of the amenity elements have been assessed and impact assessments are summarised below supported by specialist assessments in the Appendix where relevant.

9.3.1 Congestion

Given the addition of semi-trailer and B-Double trucks onto the road system in the St Marys region, there is potential for congestion. However, traffic assessment undertaken by Bitzios Consulting has determined that the theoretical maximum inbound and outbound trucks per day totals 436 (218 in and 218 out). The addition of these vehicles onto the road system in St Marys accounts for less than 1.0% of total traffic volumes at the eight (8) major intersections identified in the SEARs. Henceforth, there is a negligible incremental impact on intersection performance surrounding the site for the proposed freight hub.

Given that the introduction of the St Marys Freight Hub will reduce the amount of trucks travelling from Port Botany to Western Sydney, there are benefits to congestion levels in the Sydney region as a whole.

9.3.2 Noise Impacts

The Truck Route Noise Impact Assessment prepared by AECOM assessed the noise impacts from the additional heavy vehicles generated by the Freight for the daytime and night-time periods (see Appendix 3). The assessment was based on traffic data and noise emissions data that was collected in December 2019 specifically for the assessment.

The noise data confirms that all residential roads exceed the noise criteria standards for both daytime and night-time periods, as shown in Table 14.

When existing conditions exceed the noise criteria, the EPA's *NSW Road Noise Policy* requires that new development should not increase existing noise levels by more than 2 dB(A).

Table 14: Predicted Noise Increases (Source: Aecom)

Road	Type	Residential receivers	Heavy vehicles generated by the proposal		RNP criteria exceeded currently	Predicted road traffic noise increase	
			Day	Night		Day, LAeq 15hr, dB(A)	Night, LAeq 9hr, dB(A)
Forrester Road (north of Glossop Street)	Sub-arterial Road	Yes	376	60	Yes	0.1	0.1
Forrester Road (south of Glossop Street)	Sub-arterial Road	No	376	60	-	0.4	0.3
Glossop Street	Sub-arterial Road	Yes	376	60	Yes	0.1	0.1
Harris Street	Sub-arterial Road	No	188	30	-	0.4	0.2
Great Western Highway (east of Mamre Road)	Arterial Road	Yes	316	50	Yes	< 0.1	< 0.1
Great Western Highway (west of Mamre Road)	Arterial Road	Yes	376	60	Yes	0.1	0.1
Mamre Road	Arterial Road	Yes	316	50	Yes	0.1	< 0.1
Werrington Road	Sub-arterial Road	Yes	376	60	Yes	0.1	0.1
Christie Street	Sub-arterial Road	No	376	60	-	0.1	0.1
Lee Holm Road	Sub-arterial Road	No	376	60	-	0.7	0.5

The predicted noise level increases on all roads with residential receivers are 0.1 dB or less, which is a negligible increase in noise levels. The Noise Impact Assessment states that:

“Generally an increase of 50-60% in traffic volumes is required to increase traffic noise levels by 2 dB(A)”

and:

“proposed additional heavy vehicle volumes could increase by more than tenfold on the roads with residential receivers and the increase in road traffic noise levels would remain below 2 dB and therefore comply with the Road Noise Policy criteria.”

The negligible increases in noise emissions from heavy vehicles on all roads with residential receivers within all route options and compliance with the EPA’s *NSW Road Noise Policy* demonstrates there is no significant noise impacts along any of the route options.

9.3.3 Air Quality

The 'St Marys Freight Hub Offsite Transport Route Air Quality Assessment' has been prepared by AECOM (see Appendix 4) to assess potential amenity impacts along the transport routes the cumulative impacts on air quality, which includes assessment of the following elements:

- Particulate Matter (PM₁₀)
- Particulate Matter (PM_{2.5})
- Nitrogen dioxide (NO₂)

The impact assessment criteria in the EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (2016), the cumulative impacts have been modelled. The highest concentrations of pollutants for the incremental and cumulative scenarios are outlined in Tables 15 and 16 below.

Table 15: Summary of Air Quality Incremental Model Results – Option 4 (Source: Aecom)

Pollutant	Averaging Period	Highest Predicted Concentration at a Roadside Receptor (µg/m³) – Roads only		Increase (%) Due to Project Trucks
		Existing Traffic	Existing Traffic plus Project Trucks	
PM _{2.5}	Max. 24-hour	3.7	3.8	1.0
	Annual	1.5	1.5	<1
NO ₂ ¹	Max. 1-hour	136.1	137.2	<1
	Annual	17.8	18.3	2.8

AECOM's findings on the incremental impacts are:

"Incremental increases in maximum 24 hour and annual average local PM_{2.5} concentrations are essentially negligible (about 0.1 µg/m³) due to Project trucks on the transport routes. Most of the particulate emissions from trucks are in the PM_{2.5} fraction, and therefore PM₁₀ and TSP emissions will be only marginally more than the PM_{2.5} emissions. The percentage increase in PM₁₀ and TSP concentrations due to the Project will therefore also be negligible. Air quality impacts and associated loss of amenity due to Project related trucks using the transport routes in and out from the Project site are therefore negligible." (p10)

Table 16: Summary of Air Quality Cumulative Model Results – Option 4 (Source: Aecom)

Pollutant	Averaging Period	Highest Predicted Concentration at a Roadside Receptor (µg/m³) – Cumulative		Criteria (µg/m³)
		Existing Traffic	Existing Traffic plus Project Trucks	
PM _{2.5}	Max. 24-hour	27.2	27.3	25
	Annual	9.3	9.3	8
NO ₂ ¹	Max. 1-hour	166.2	167.3	246
	Annual	25.0	25.5	62

AECOM's findings on the cumulative impacts state the 'relative increase (as a percentage of existing pollutant concentrations) would be slightly higher than the relative Project increment... however it is still likely to be very low'.

AECOM concludes that there is an 'almost negligible increase in local pollutant concentrations' from the heavy vehicles and the 'associated loss of amenity along the transport routes due to the Project are likely to be negligible.'

9.3.4 Vehicle Light/Illumination

All sensitive receivers are located along existing major roads that are well-lit during night-time hours and no additional street lighting is required. Heavy vehicles from the Freight Hub will not expose any receivers to a noticeable increase in vehicle light or illumination due to the exiting traffic volumes using all roads within the route options.

9.4 Productivity & Efficiency

A primary consideration for determining a transport route is ensuring the selected path achieves a high standard of efficiency between two points, which generally means minimising travel distance and travel time, and reducing the amount of conflict points along the route.

There is a difference in travel length of 2.6km between Route Option 2 (7.8km) and Route Option 4 (5.2km) between the respective heavy vehicle access at the Freight Hub (heavy vehicle access for Option 2 from Lee Holm Road and Option 4 from Forrester Road) and the M4 Motorway/Mamre Road Interchange, which has 85% of heavy vehicle traffic from the Freight Hub traveling between these two points. On a round trip the difference is 5.2km per trip.

Based on the theoretical maximum trip generation that underpinned the St Marys traffic assessments of 436 trips per day, Route Option 2 would result in the following:

- an additional 396,760 truck vehicle kilometres travelled (VKT) per annum
- an additional 330,633 litres of fuel burn per annum

In addition, there is greater travel time for each delivery. It will take a truck travelling at an average speed of approximately 40km/h an additional eight and a half minutes to complete the round-trip using Route Option 2.

If the heavy vehicle entry for Route Option 2 was from Forrester Road instead of Lee Holm Road, as would be for the night time alternate route, the travel distance lengthens to 8.9km, which will further increase VKT, fuel burn and travel time.

The above calculations emphasise the importance for achieving efficiency and productivity objectives in transport freight with direct and efficient travel routes. These calculations also demonstrate the potential impacts route selection can have on commercial imperatives and that every kilometre is important in moving freight.

10 ROUTE ANALYSIS

10.1 Traffic Analysis

Bitzios Consulting completed a route analysis as part of their traffic assessment in Appendix 2. The analysis undertakes a comprehensive analysis of each potential route against each traffic consideration to demonstrate the benefits and risks associated with each route.

An evaluation scoring system with weighted criteria has been devised and applied to each route. A score out of 10 is applied to each route based on its travel time/distance and its impact to intersections, safety and amenity. The higher the score, the greater the impact the route option has on surrounding roads, development and the environment.

The weighting of each consideration was based on the purpose of the evaluation mainly being to address safety and amenity concerns raised by Penrith City Council and the Department of Planning, Industry and Environment.

The weighting of each consideration in determining the route scores was scaled as follows:

- Route length to the M4 = 10%
- Travel time to the M4 = 10%
- Traffic capacity impacts = 20%
- Traffic safety impacts = 30%
- Amenity impacts = 30%

The scores for each route can be found in Table 17.

Table 17: Traffic Evaluation Scoring System (Source: Bitzios Consulting)

Criterion	Option 1	Option 2	Option 4	Key reasonings
Route length to the M4 (for: emissions, operating costs)	10	10	7	Option 1 & 2 are much longer than Option 4 given the distance needed to travel north along Lee Holm Road and east or west along Christie Street before turning south towards the preferred destination of the M4 interchange.
Travel time to the M4 (for: efficiency/value of time)	10	9	7	Option 1 & 2 are much longer than Option 4 given the distance needed to travel north along Lee Holm Road and east or west along Christie Street before turning south towards the preferred destination of the M4 interchange
Traffic capacity impacts (# intersections x severity)	9	10	5	Options 1 & 2 impact more intersections than Option 4 and will create peak period delays at Lee Holm/Christie.
Traffic safety impacts (# conflict points x severity)	10	9	6	Option 1 & 2 impact more intersections and pass through more 2-lane links with parking where safety risks are greater
Amenity impacts (number of sensitive receptors x sensitivity)	10	7	9	Options 1 & 4 using Forrester Road and Glossop Street pass by far more residential properties than Option 2 does which is centred on Werrington Road which has no direct residential frontage.
Weighted Total	9.8	8.7	6.9	

Notes: 1. Route Option 3 is not included as not suitable for heavy vehicles & details have been removed from the table

Based on the weighting system, Bitzios Consulting confirm that Route Option 4 is overwhelmingly the best option considering safety, amenity, capacity and pavement and broader environmental impacts (based on route length).

Bitzios Consulting make the following recommendation for mitigation measure for Route Option 4:

“Intersection upgrades at Forrester Road/Glossop Street, as well as phase time optimisations at other intersections have already been proposed through previous investigations. If implemented, these measures will generally cater for future traffic growth (irrespective of the Freight Hub).”

Pedestrians have been observed walking along the western side of Forrester Road (south) and then crossing diagonally to the east near the Harris Road intersection and towards the station. While not ideal, this small number of pedestrians could continue this behaviour or, preferably, be directed through signage to continue on the western side of the street to the south of the proposed driveway with a pedestrian refuge-crossing provided just south of the driveway.”

10.2 Road Safety Analysis

There is a negligible change in crash likelihood and crash risk at major intersections for all route options. In addition, a Road Safety Audit has been undertaken for the Forrester Road entry to the intersection with Glossop Street with regard to the use of heavy vehicles.

10.3 Sensitive Receivers Analysis

Route Option 4 interfaces with residential properties less than Option 1 and more than Option 2 and the night time option. Option 2 has significantly more schools along its route. The night time option interfaces with less residential receivers than Option 4.

10.4 Noise Impact Analysis

Specialist noise modelling and advice confirms there is an increase on noise by 0.1dB or less on residential receivers for all route options. The increase in daytime and night time noise from heavy vehicles is considered negligible, and therefore, assessment of noise impacts for both daytime and night time periods does not promote a standout route.

10.5 Air Quality Analysis

Specialist air quality modelling and advice confirms associated loss of amenity along the transport routes from heavy vehicles are likely to be negligible, and therefore, assessment of air quality impacts does not promote a standout route.

10.6 Night Time Alternate Route

Consideration of a night time alternate option between the hours of 10pm and 6am using the Forrester Road entry and Forrester Road (north), Christie Street and Werrington Road for heavy vehicles has been undertaken as part of this route analysis.

On the basis any amenity impacts are negligible, in particular noise impacts (0.1dB or less), and the route increases travel distance, time, fuel burn and inefficiency, a separate night time route for heavy vehicle traffic for the St Marys Freight Hub is not warranted. It is also noted that the additional travel distance for heavy vehicles will increase greenhouse gas emissions.

11 CONCLUSION

The proposed St Marys Freight Hub will allow for easier transportation of cargo from Port Botany to Western Sydney. Utilising semi-trailer and B-Double trucks, the intermodal hub will allow shipping containers to be taken from the facility to a variety of customer locations within 20 kilometres of the subject site.

An analysis of four (4) route options and a separate night time alternate option has been undertaken to provide a comprehensive understanding of the considerations behind the preferred route option. The assessment has included the collection of recent traffic and noise data that has informed technical assessments for traffic impacts, noise impacts and air quality impacts for the route options.

Following consideration of the existing conditions, a theoretical maximum truck trip generation has been applied to measure the greatest impacts from heavy vehicles on the local road system and associated amenity impacts.

The findings of the route analysis and associated technical assessments support Option 4 as the optimal route for the St Marys Freight Hub. Option 4 has minimal amenity impacts and provides the most practical and reasonable route for transporting freight to customers to the east of the facility.

Consideration of the night time option has also been undertaken. However, given that there are no significant impacts on amenity during the night time hours for Route Option 4 and the night time option results in inefficiencies and loss of productivity, the implementation of an alternate night time route is not warranted.

This heavy vehicle route analysis addresses the request for additional information from the Department of Planning, Industry and Environment to undertake the route analysis for the St Marys Freight Hub.

PART B – ROAD SAFETY AUDIT

1 INTRODUCTION

The Department of Planning Industry & Environment has requested preparation of a Road Safety Audit to examine any potential road safety impacts as a result of the proposed heavy vehicle access point at Forrester Road, south of Glossop Street. A Road Safety Audit has been prepared by Bitzios Consulting which is included in Appendix 5. The audit assesses potential impacts to all road users, particularly focusing on pedestrians, cyclists, public transport users, and those parking at the southern end of Forrester Road. The version of the Road Safety Audit in Appendix 5 also includes the response comments from Pacific National.

The scope of the Road Safety Audit covers the proposed route for heavy vehicles along the Forrester Road route and its proposed driveway location at the entry to the Freight Hub.

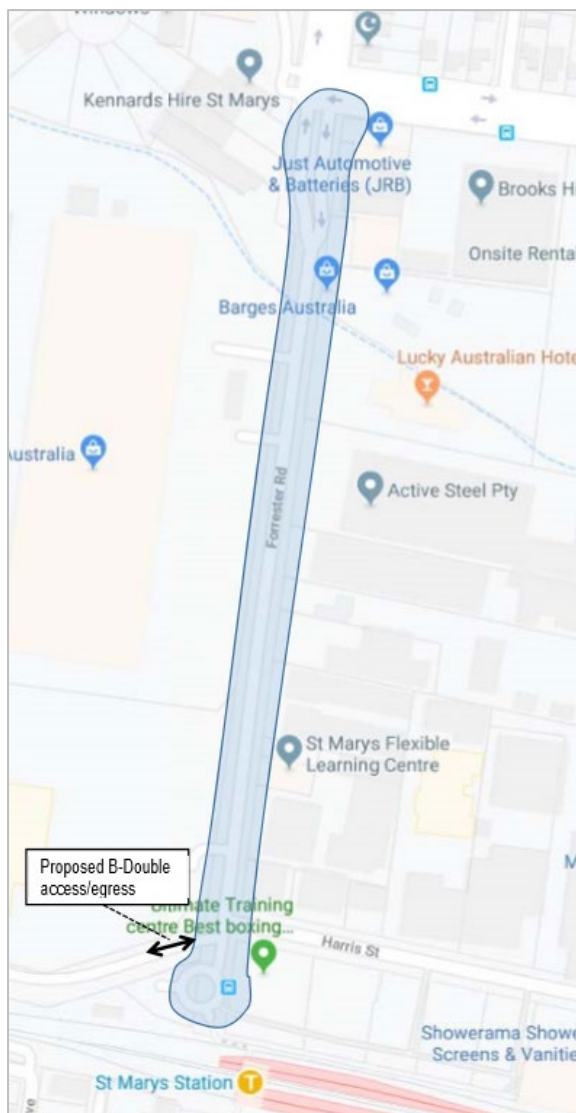


Figure 1: Section of Forrester Road subject to the Road Safety Audit (Source: Bitzios Consulting)

Utilising the *Austroads Guide to Road Safety Audit: Part 6 Road Safety Audit (2009)*, a thorough review of potential operational road safety impacts was performed.

These safety impacts included:

- Sight distances and grades;
- Signs and pavement markings;
- Roadside objects and hazards; and
- Drivers' sight distance to pedestrians and cyclists.

Site visits were undertaken during both day (1600-1800) and night periods (1945-2030) to cover afternoon peak times and early evening hours. These inspections allowed for an understanding of the route's geometry, gradient, illumination and sight lines which have potential impacts on safety concerns.

A review of the B-Double access swept path has also been undertaken to ensure potential safety impacts are minimised.

2 KEY FINDINGS

Bitzios Consulting have provided a number of key findings upon examining any potential impacts on road safety for the portion of Forrester Road subject to this audit. These key findings demonstrate minimal safety impacts to Forrester Road or pedestrians and vehicles utilising the road.

2.1 Pedestrians and Cyclists

Observations demonstrated that pedestrian and cyclist volumes were low. Pedestrians that do utilise the southern part of Forrester Road mostly use the footpath located on the eastern side of the road. As such, there would be no conflict between pedestrians and proposed B-Double vehicles utilising Forrester Road. Commuters who alight at the train station often proceed to the commuter carpark and do not utilise Forrester Road.

2.2 Public Transport

As depicted in Figure 1, there is a bus stop located at the end of Forrester Road, next to the train station. During site visit times, there were no buses observed utilising the stop. Bus timetables showed that the stop is seldomly used during early morning periods between 0620 and 0802. Given the small volume of buses, a bus turning movement and a B-Double entry or exit occurring at the same time is very unlikely.

2.3 Speed Limits

There is potential for conflict given the location of some speed limit signs along Forrester Road. There are two signs located within close proximity at the intersection of Harris Street. One speed limit sign indicates the end of the school zone and the general speed along Forrester Road being 50 km/h, whilst the other speed limit sign indicates a limit of 10 km/h as vehicles approach the end of Forrester Road where the roundabout and bus stop is located. This may pose a potential safety risk for drivers travelling at a higher speed near the train station access point.

2.4 Sight Distance

Exiting heavy vehicles from the Freight Hub have potential sight distance issues in regard to the roundabout and circulating traffic. This is due to the location of fencing between the proposed entry and exit and the roundabout. Some fencing may need to be removed to mitigate any safety risks.

2.5 B-Double Swept Path

Given the size of the B-Double vehicles proposed to utilise the Freight Hub, the access way will need to be quite wide if there were vehicles entering and exiting at the same time. A power pole located immediately north of the driveway would require relocating to allow for a wide enough driveway.

2.6 Street Lighting

There is currently above standard street lighting for the locality at the proposed entry and exit way for the St Marys Freight Hub. As required by the B-Double swept path, one (1) of the streetlights would need to be removed to provide enough space for safe entry and exit of the premise. This would still leave eight (8) streetlights which would provide sufficient lighting for the area.

3 RESPONSE TO SAFETY ISSUES

As part of the Road Safety Audit, Pacific National has responded to the identified safety issues and added their comments to the document issued by Bitzios Consulting (see Appendix 5). and have provided a response to effectively mitigate these concerns.

3.1 Speed Limit Signage

The issue of the location and proximity of the speed limit signage is easily mitigated through its removal. Removal will include consultation with Penrith City Council on the basis the 10 km/h sign is non-statutory as a stand-alone sign in New South Wales. Figure 3 illustrates the new signage proposed around the heavy vehicle entry.

3.2 Sight Distance Issues

Through careful and detailed design development, Pacific National seek to remove the fencing and replace it with a more suitable fencing option. This will result in better sight lines from the Freight Hub's access point and ensure safer entrance and exit.

3.3 B-Double Swept Path

Widening of the entry and exit way has previously been proposed in order to account for sweeping paths of B-Double vehicles. Figure 2 demonstrates the future turnpaths of B-Double vehicles when entering and exiting the Freight Hub facility via the proposed Forrester Road access point.

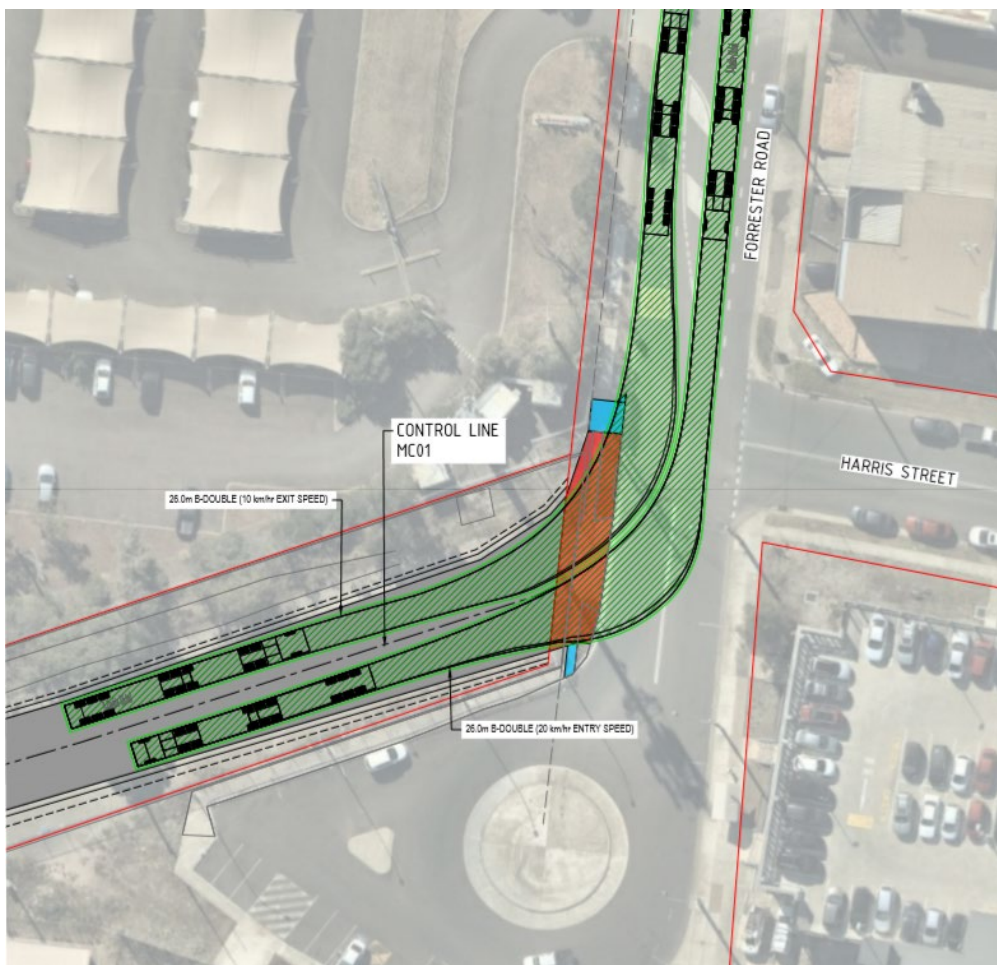


Figure 2: Access Road Driveway Paths (Source: BG&E)

A concept design has also been prepared in response to the concern for simultaneous entrance and exit of B-Doubles (see Appendix 6).

Figure 3 below is an excerpt from the concept design and illustrates the proposed new signage for the entry and exit way for the Freight Hub noting the speed limit signs as part of the access way to ensure safer access and egress.

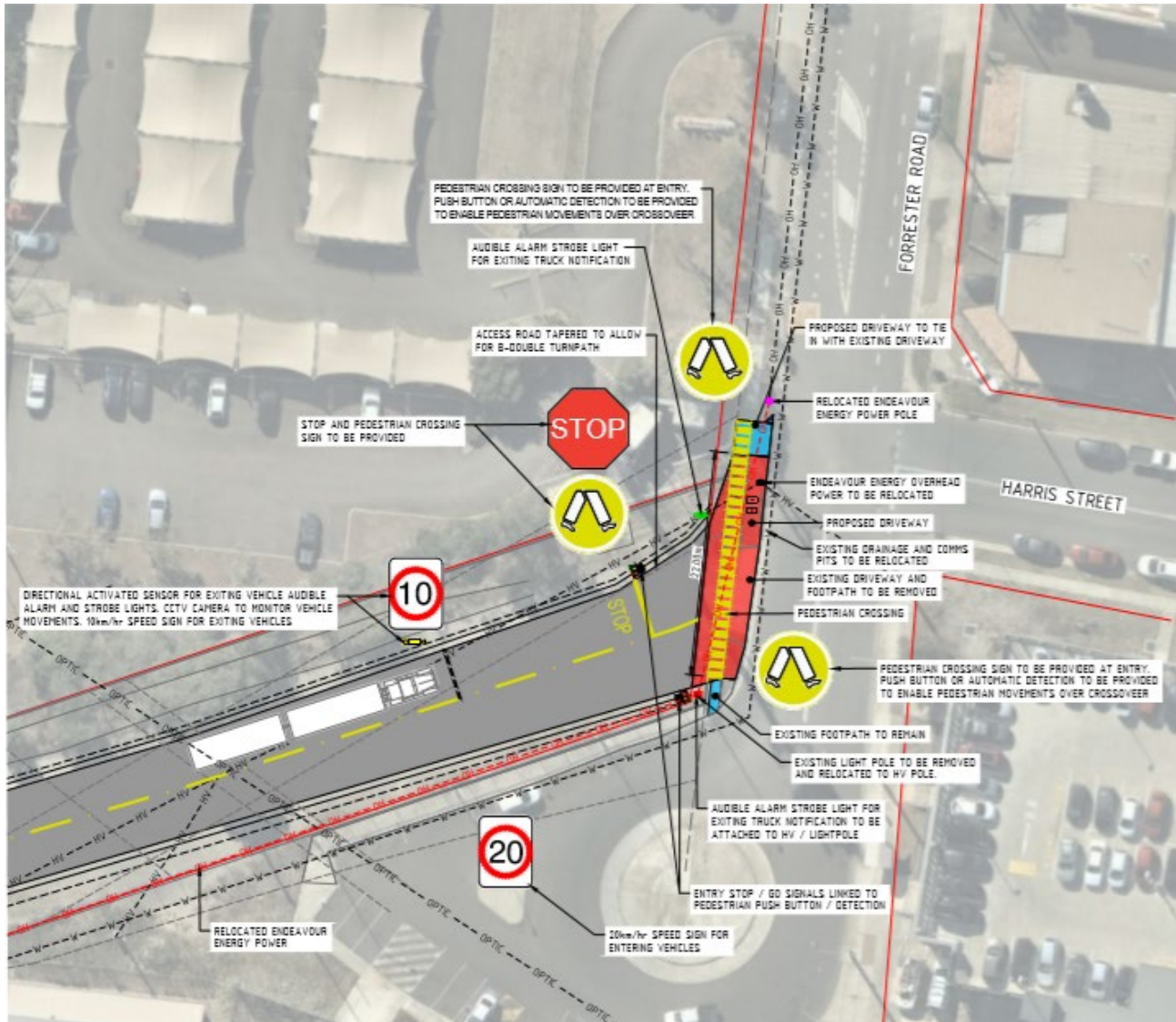


Figure 3: Proposed signage and access point widening for St Marys Freight Hub (Source: BG&E)

3.4 Street Lighting

The assessment provided by Bitzios Consulting demonstrated that the removal of one streetlight for the widening of the Forrester Road entry and exit way would not be disadvantageous to street lighting at the southern end of Forrester Road. The removal of the streetlight to widen the entrance way is deemed acceptable given it provides safer entry and exit whilst not being detrimental to lighting provided in the vicinity.

4 CONCLUSION

The Road Safety Audit has demonstrated minor impacts to any road safety factors for the proposed use of the southern portion of Forrester Road for truck movements to and from the St Marys Freight Hub.

Geometry, gradient, illumination and sight lines of Forrester Road have demonstrated a low road safety risk when considering potential impacts associated with B-Double vehicles utilising the St Marys Freight Hub.

A review of the B-Double swept paths has demonstrated the need to widen the entry and exit way for the St Marys Freight Hub. Pacific National have acted accordingly, and the concept design in Appendix 6 demonstrates necessary widening will be undertaken to ensure safety.

Preparation of the Road Safety Audit and response by Pacific National fulfils the request of the Department of Planning Industry and Environment regarding road safety and all potential safety risks have been demonstrated to be effectively mitigated.

APPENDIX 1 – DPIE RFI Letter

APPENDIX 2 – Heavy Vehicle Route Options Assessment

APPENDIX 3 – Truck Route Noise Impact Assessment

APPENDIX 4 – Air Quality Assessment

APPENDIX 5 – Road Safety Audit

APPENDIX 6 – Entry Concept Design & Turning Paths

urbanco

**Integrated urban design and
planning**