



Hornsby Junction Remodelling and Commuter Car Park

Transport for NSW

Traffic and Transport Assessment

Final

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Hornsby Junction Remodelling and Commuter Car Park

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1. Introduction

This Traffic and Transport Technical Paper has been prepared by Jacobs (Australia) Pty Ltd on behalf of Transport for New South Wales (Transport for NSW) to accompany the Review of Environmental Factors (REF) for the Hornsby junction remodelling and multi-storey commuter car park (the Proposal).

Transport for NSW is the lead agency for integrated delivery of public transport services across all modes of transport in New South Wales (NSW). The Proposal encompasses two components; track work and a multi-storey commuter car park. The track works are being delivered to increase the capacity and reliability of the T1 North Shore Line while the car park is being delivered as part of the Transport Access Program (TAP) – an initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure where it is needed most.

Transport for NSW is the proponent for the Proposal which will be delivered by the Infrastructure and Services Division.

The purpose of this Technical Paper is to assess the likely traffic and transport impacts of the construction and operation of the Proposal and to identify mitigation measures to reduce the likely impacts of the Proposal.

Following this introduction, this Technical Paper is structured as follows:

- Chapter 2 details the existing conditions including the site location, road network, public transport and active transport networks;
- Chapter 3 outlines the proposed works;
- Chapter 4 outlines the anticipated construction traffic impacts of the proposal;
- Chapter 5 presents the likely operational traffic impacts; and
- Chapter 6 summarises and concludes the assessment.

2. Existing Conditions

2.1 Site location

Hornsby Station is located to the west of the main Hornsby retail area and is bounded by an existing commuter car park and George Street to the east and the Hornsby bus interchange and Station Street to the west. The site location is shown in **Figure 2.1**.



Figure 2.1 Site location

The junction remodelling works would primarily occur within the rail corridor to the north of Hornsby Station, as shown in **Figure 2.2** with some work proposed south of the Station, contained within the rail corridor. The commuter car park would be located on part of the site of the current commuter car park to the east of the station, as shown in **Figure 2.3**.



Figure 2.2 Junction remodelling works location



Figure 2.3 Existing commuter car park

2.2 Hornsby rail services

Hornsby Station is equipped with five platforms accessible by a pedestrian concourse located at the southern end of the station. A northern overbridge also provides access between platforms only. The station is a major transport interchange servicing three train lines, namely:

- T1 North Shore Line (express and all stations services to City via Gordon)
- T1 Northern Line (all stations service to City via Macquarie Park)
- Central Coast and Newcastle Line (express services to City via Strathfield)

The average stopping frequency on each line during weekday and Saturday peak periods are summarised in **Table 2.1**.

Table 2.1 : Average Hornsby Station Train frequencies

Direction	Line	Service Frequency (min)		
		Weekday AM peak (6-9.30am)	Weekday PM peak (3-6.30pm)	Saturday peak (11am-1pm)
Southbound	Northern Line	15 min	15 min	15 min
	North Shore Line	5 min	7 min	15 min
	Central Coast and Newcastle Line	15 min	30 min	30 min
Northbound	Northern Line	15 min	15 min	15 min
	North Shore Line	7 min	6 min	15 min
	Central Coast and Newcastle Line	30 min	15 min	30 min

It can be seen from **Table 2.1** that Hornsby Station provides frequent services with trains operating at least every five minutes in the weekday AM peak and every six minutes in the PM peak.

2.3 Existing rail demand

Hornsby Station is the 15th busiest station¹ on the Sydney Trains network (of 176 stations). Station barrier counts (undertaken in 2013) for the AM peak period (6:00 – 9:30 AM) and PM peak period (3:00 – 6:30 PM) are presented in **Table 2.2**.

Table 2.2 Hornsby Station barrier counts, 2013

	In	Out
6:00 – 9:30 AM	5,230	2,200
3:00 – 6:30 PM	3,120	4,680

Source: Train Statistics, Bureau of Transport Statistics, December 2014

On a Saturday, Hornsby Station experiences 43% of the weekday barrier exits and on a Sunday experiences 34% of weekday barrier exits².

The above patronage numbers do not account for train to train interchanging passengers, therefore the total number of passengers using Hornsby Station would be in excess of the above.

2.4 Active travel

2.4.1 Pedestrian access

Hornsby Station is located in a highly developed retail and commercial area, with numerous pedestrian facilities and crossing opportunities on either side of the station.

On the eastern side of the station, there is stair access from the main concourse to the western side of George Street and the two commuter car parks. A pedestrian bridge is also located across George Street, which can be

¹ Train Statistics, Bureau of Transport Statistics, December 2014

² Train Statistics, Bureau of Transport Statistics, December 2014

seen in **Figure 2.4**, providing direct connections between the station concourse, Florence Street and the retail area. The pedestrian bridge forms a key pedestrian desire line providing pedestrian access to / from Hornsby's retail, educational and hospital facilities, as well as residential areas to the east of the station.



Figure 2.4 Pedestrian bridge over George Street

Furthermore, there are signalised pedestrian crossing facilities on George Street at the Pacific Highway (south of the station) and Burdett Street (north of the station). A fence is located along the central reservation to prevent pedestrians crossing George Street between the intersections.

On the western side of the station, the main concourse is easily accessed at ground level via Station Street. In the immediate vicinity there is a two-stage zebra crossing facility at Station Street, shown in **Figure 2.5**, and a signalised pedestrian crossing is located at the Pacific Highway / Station Street intersection.



Figure 2.5 Pedestrian crossing facilities at Station Street

It can therefore be seen that safe and convenient pedestrian facilities are located on both the eastern and western frontages of the station providing good pedestrian access options to / from the station.

2.4.2 Cycling access

There are several bicycle parking facilities in the vicinity of Hornsby Station. These include two secure cycle storage facilities, each containing 12 individual bicycle lockers, on the corner of Jersey Street and Station

Street. These facilities are operated by Transport for NSW and may be hired for three, six, nine or 12 month periods.

The closest bicycle racks are located on Station Street to the west of the station, with combined capacity for 18 bicycles. There are also cycle racks to the east of the station at Burdett Street and in the precinct surrounding Westfield Hornsby.

The location of designated bicycle storage is shown in **Figure 2.6**.

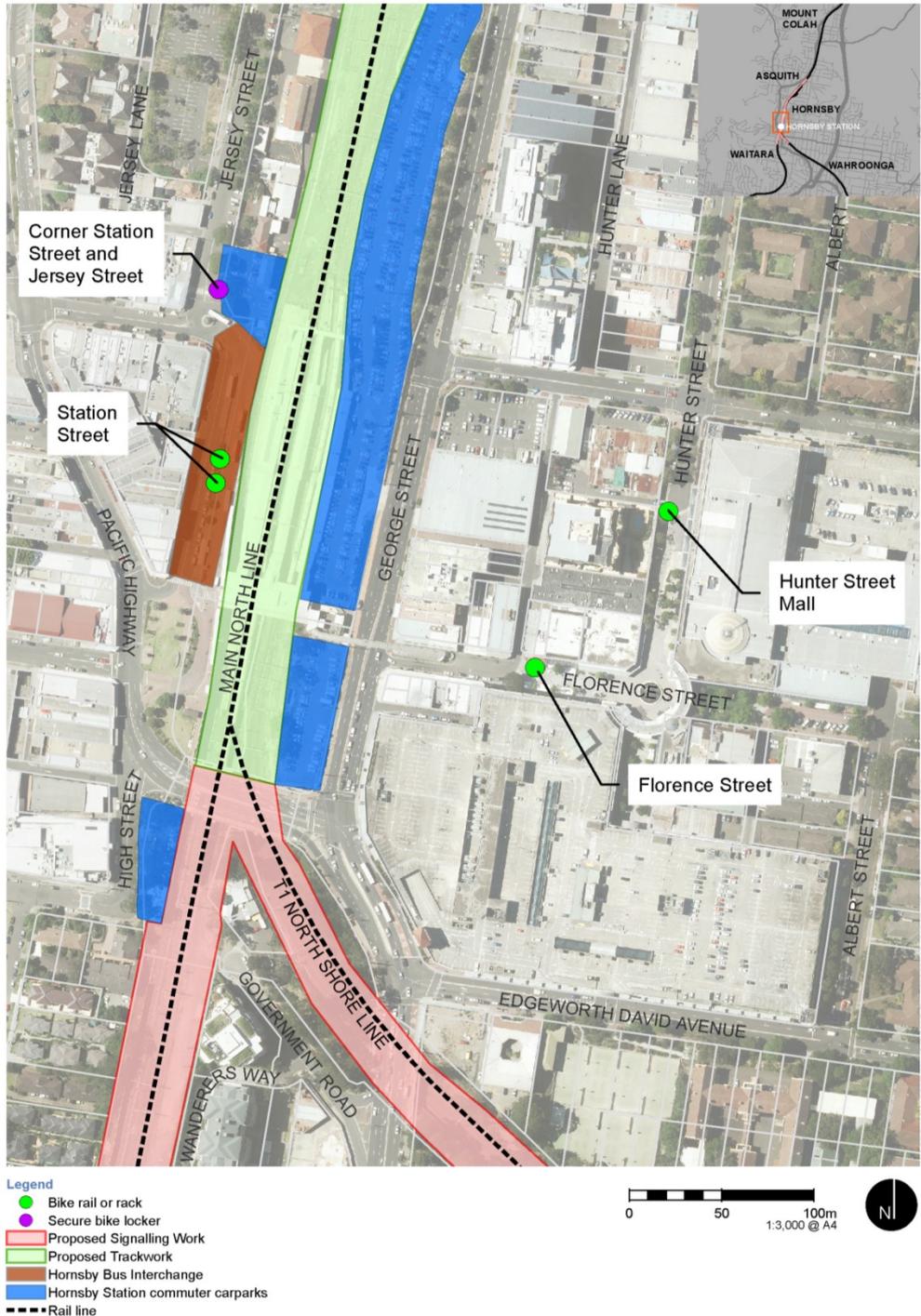


Figure 2.6 Location of cycle parking facilities in the vicinity of Hornsby Station

2.5 Public Transport

2.5.1 Bus access

The Hornsby bus interchange is located on the western side of the station and can be seen below in **Figure 2.7**. Six bus stands are located on Station Street and there is additional space for terminating or waiting buses.



Figure 2.7 Hornsby bus interchange

Major routes include the high-frequency M60 service between Hornsby and Parramatta via Castle Hill and route 575 between Hornsby and Macquarie University. The location of the bus interchange and bus stops in the local area are shown in **Figure 2.8**.

A summary of the bus routes and frequencies that serve the Hornsby bus interchange is provided in **Table 2.3** and **Table 2.4**.

Table 2.3 : Bus services and frequencies at Hornsby bus interchange

Route No.	Route Name	Operator	Direction	Service Frequency			
				AM peak (7am to 9am)	PM peak (5pm to 7pm)	Off-peak (9am to 5pm)	Saturday (11am to 1pm)
M60	Hornsby to Parramatta	Hillsbus	From Hornsby	10 min	15 min	10 min	20 min
			To Hornsby	10 min	15 min	10 min	20 min
575	Macquarie University to Hornsby	Transdev NSW	From Hornsby	20 min	30 min	25 min	30 min
			To Hornsby	20min	30 min	20 min	30 min
587	Hornsby to Westleigh Loop	Transdev NSW	From Hornsby	25 min (no services from 8am to 9am)	60 min	30 min	60 min
			To Hornsby	30 min	60 min	30 min	60 min
588	Hornsby to Normanhurst West Loop	Transdev NSW	From Hornsby	25 min	60 min	25 min	60 min
			To Hornsby	20 min	60 min	25 min	60 min
589	Hornsby to Sydney Adventist Hospital	Transdev NSW	From Hornsby	60 min	60 min	60 min	90 min
			To Hornsby	30 min (av.)	60 min	60 min	90 min

Route No.	Route Name	Operator	Direction	Service Frequency			
				AM peak (7am to 9am)	PM peak (5pm to 7pm)	Off-peak (9am to 5pm)	Saturday (11am to 1pm)
592	Brooklyn to Mooney Mooney	Transdev NSW	From Hornsby	None	One departure at 2:05pm	None	One departure at 3:14pm
			To Hornsby	None	One arrival at 9:57am	None	One arrival at 10:34am
594H	Hornsby to City	Transdev NSW	From Hornsby	28 min (6:30am to 7:30am only)	Departures at 3:39pm and 16:13pm only	30 min (5-6pm only)	None
			To Hornsby	30 min (8:30am to 10am)	None	45 min (6-8pm only)	None
595	Hornsby to Mt Colah Loop	Transdev NSW	From Hornsby	30 min	60 min	30 min	60 min
			To Hornsby	30 min	60 min	30 min	60 min
596	Hornsby to Hornsby Heights Loop	Transdev NSW	From Hornsby	20 min	30 min	20 min	45 min
			To Hornsby	20 min	30 min	20 min	45 min
597	Hornsby to Berowra	Transdev NSW	From Hornsby	Departures at 7:51am and 8:15am	110 min	Departures at 4:25pm and 17:48pm	120 min
			To Hornsby	Arrivals at 7:23am and 7:35am	120min	Departure at 16:12pm only	120 min
598	Hornsby to Asquith Loop	Transdev NSW	From Hornsby	15 min	60 min	30 min	60 min
			To Hornsby	15 min	60 min	30 min	60 min

Table 2.4 : NightRide bus routes and frequencies at Hornsby Station

Route No.	Route Name	Operator	Direction	Service Frequency (12am to 4:30am)	
				Friday to Saturday	Sunday to Thursday
N80	Town Hall to Hornsby (via Strathfield)	NightRide	From Hornsby	60 min	60 min
			To Hornsby	60 min	60 min
N90	Town Hall to Hornsby (via Chatswood)	NightRide	From Hornsby	60 min	60 min
			To Hornsby	30 min	60 min

It can be seen from the above that many bus services operate to / from the interchange, including over 50 services per hour during the AM peak period. The interchange therefore provides excellent interchange options with Hornsby Station.

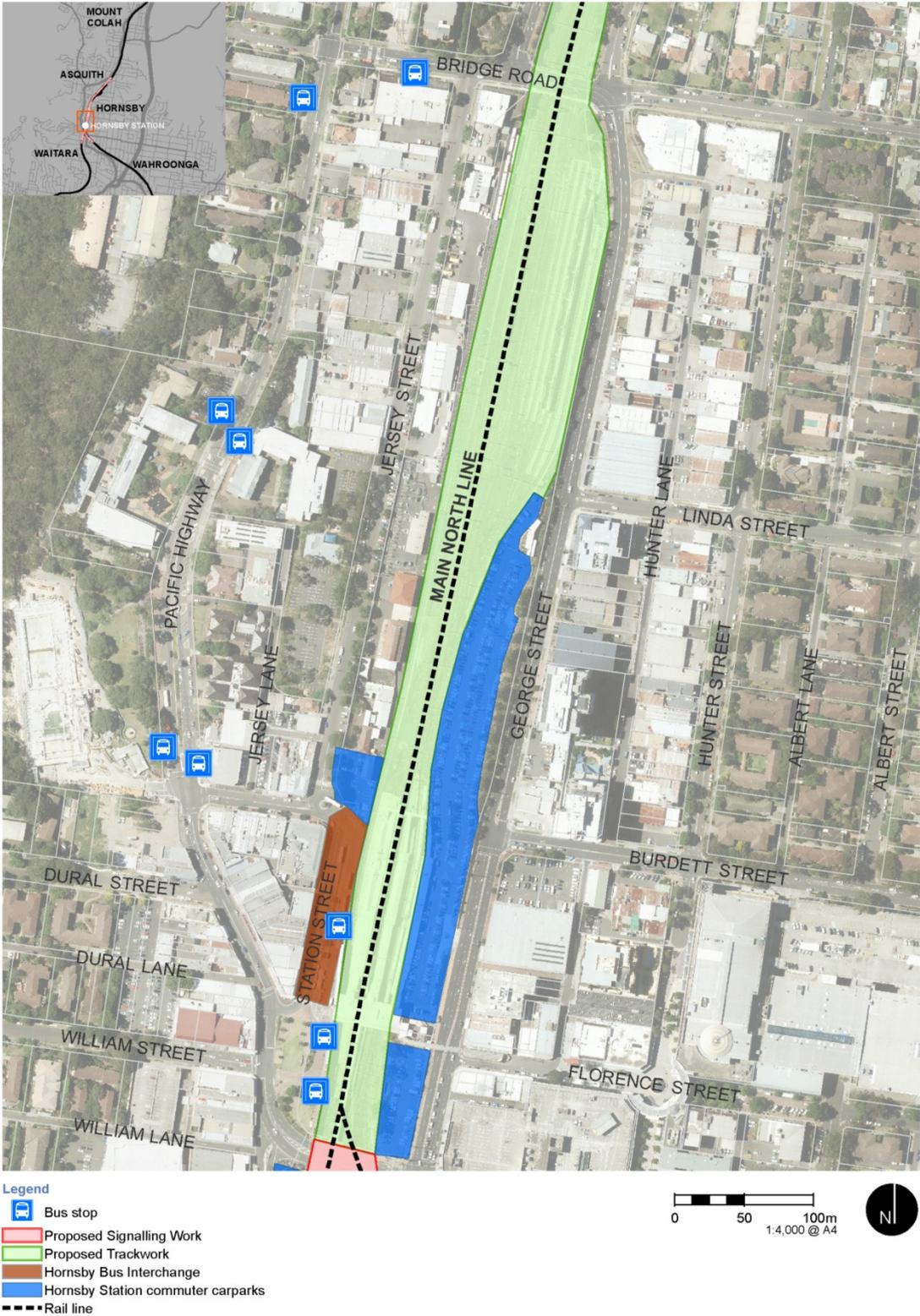


Figure 2.8 Location of bus services in the vicinity of Hornsby Station

2.5.2 Taxi access

A taxi rank is located on Station Street on the western side of the station, approximately 50m north of the station entrance. The rank operates as a secure taxi rank between the hours of 11:00 PM and 5:00 AM on Friday and Saturday. During these times, security guards are stationed at the rank.

An additional taxi zone is provided within a layby on George Street outside the station entrance, with taxis permitted between 9am and 12am every day, as can be seen in **Figure 2.9**.



Figure 2.9 Taxi / Kiss and Ride layby on George Street

2.6 Road Network

George Street is an arterial road running north-south between the Pacific Highway and Bridge Road as can be seen in **Figure 2.10**. It is generally two lanes in each direction with a speed limit of 60 kilometres per hour. George Street / Pacific Highway, George Street / Edgeworth David Ave, George Street / Burdett Street and George Street / Bridge Street / Railway Parade are signalised intersections on the eastern side of the railway line.



Figure 2.10 George Street (looking southbound from Bridge Road)

Burdett Street is a local road running east-west with a speed limit of 50 kilometres per hour. Between George Street and Hunter Street, Burdett Street has two westbound lanes and one eastbound lane that widens to two

lanes at the intersection of Burdett Street and Hunter Street. No Stopping Zones are implemented throughout this section of Burdett Street. Burdett Street provides entry and exit points to the Westfield shopping centre.

The Pacific Highway is a major north-south arterial route. The road has a speed limit of 60 kilometres per hour in the vicinity of Hornsby Station and is largely two lanes in each direction, narrowing to one traffic lane and one parking lane in each direction north of Station Street.

Edgeworth David Avenue is a collector route running east-west between the Pacific Highway and Junction Road in Waitara. It provides access to the Westfield car park and the road is primarily residential with local amenities such as Hornsby Girls High School at its western end near the Pacific Highway. The road has two lanes in each direction and a speed limit of 50 kilometres per hour, with a 40 kilometre per hour school zone in place between the Pacific Highway and Romsey Street.

2.7 Car parking

2.7.1 Commuter car park

There are currently four commuter car parks of which two are located to the east of Hornsby Station along George Street. The locations are shown in **Figure 2.12**.

The main car parking is accessed via George Street between its intersections with Florence Street and Burdett Street. It provides 374 commuter car parking spaces and 11 Sydney Trains car parking spaces at the northern end. Parking is free and unrestricted.

A smaller commuter car park providing 53 car parking spaces, including six accessible parking spaces, is also located off George Street with access between the Pacific Highway and Florence Street intersections. Parking is free and unrestricted. The car park can be seen below in **Figure 2.11**. From site observations, both car parks were at full capacity on a weekday.



Figure 2.11 Southern commuter car park

Two small commuter car parks are located on the western side of the station:

- One car park off Jersey Road, north of the roundabout with Coronation Street and Station Street. The car park has 22 parking spaces including one accessible parking space.
- One car park off High Street, south of the Pacific Highway overbridge. The car park provides 21 parking spaces.

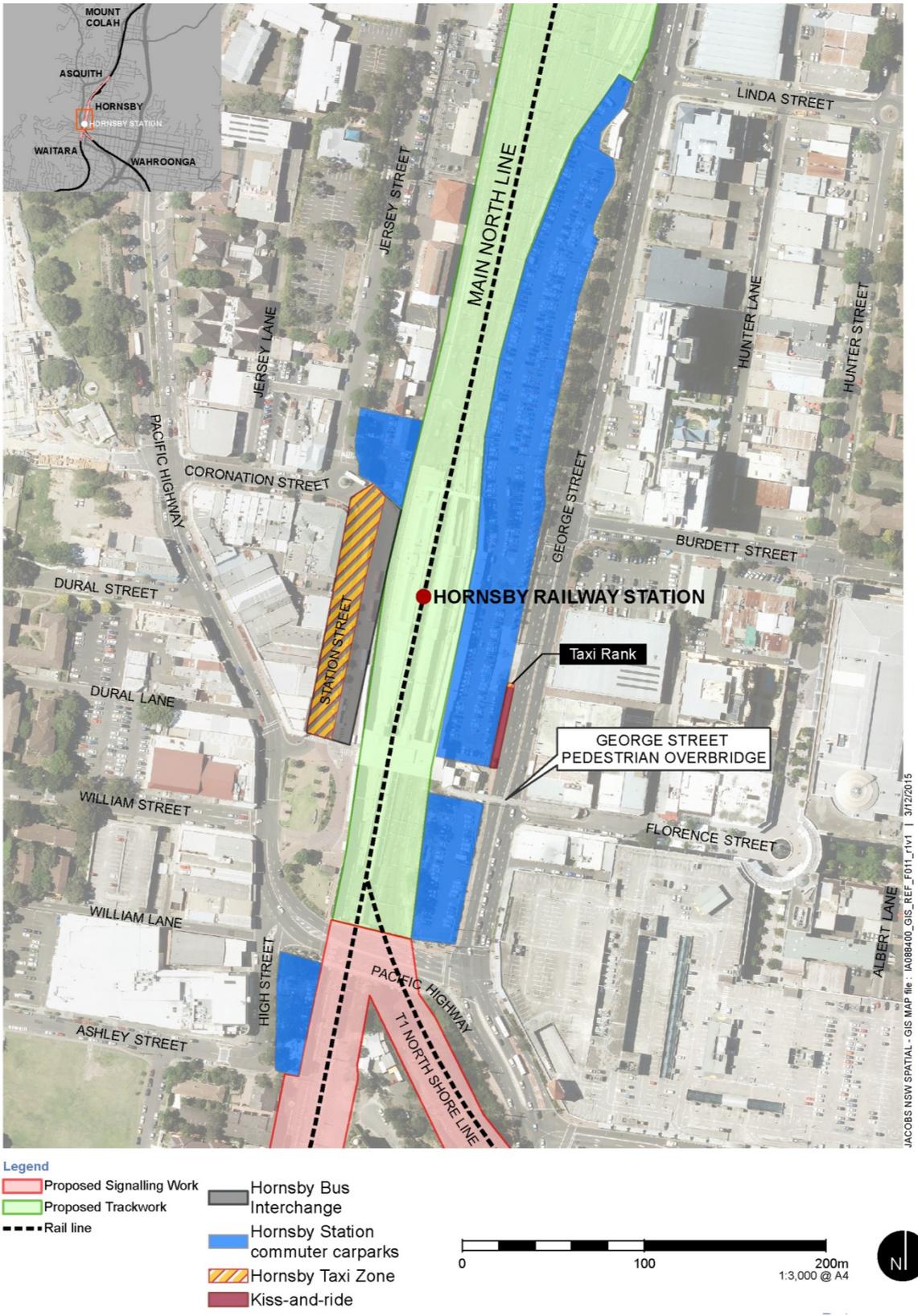


Figure 2.12 Key features of the existing traffic and transport environment

2.7.2 On-street parking

A Temporary Commuter Car Parking Options Report (Peopletrans, October 2015) identified the unrestricted on-street car parking spaces and occupancy within a ten minute walk, or approximately 800 metres from Hornsby Station. The on-street parking area is shown below in **Figure 2.13**.

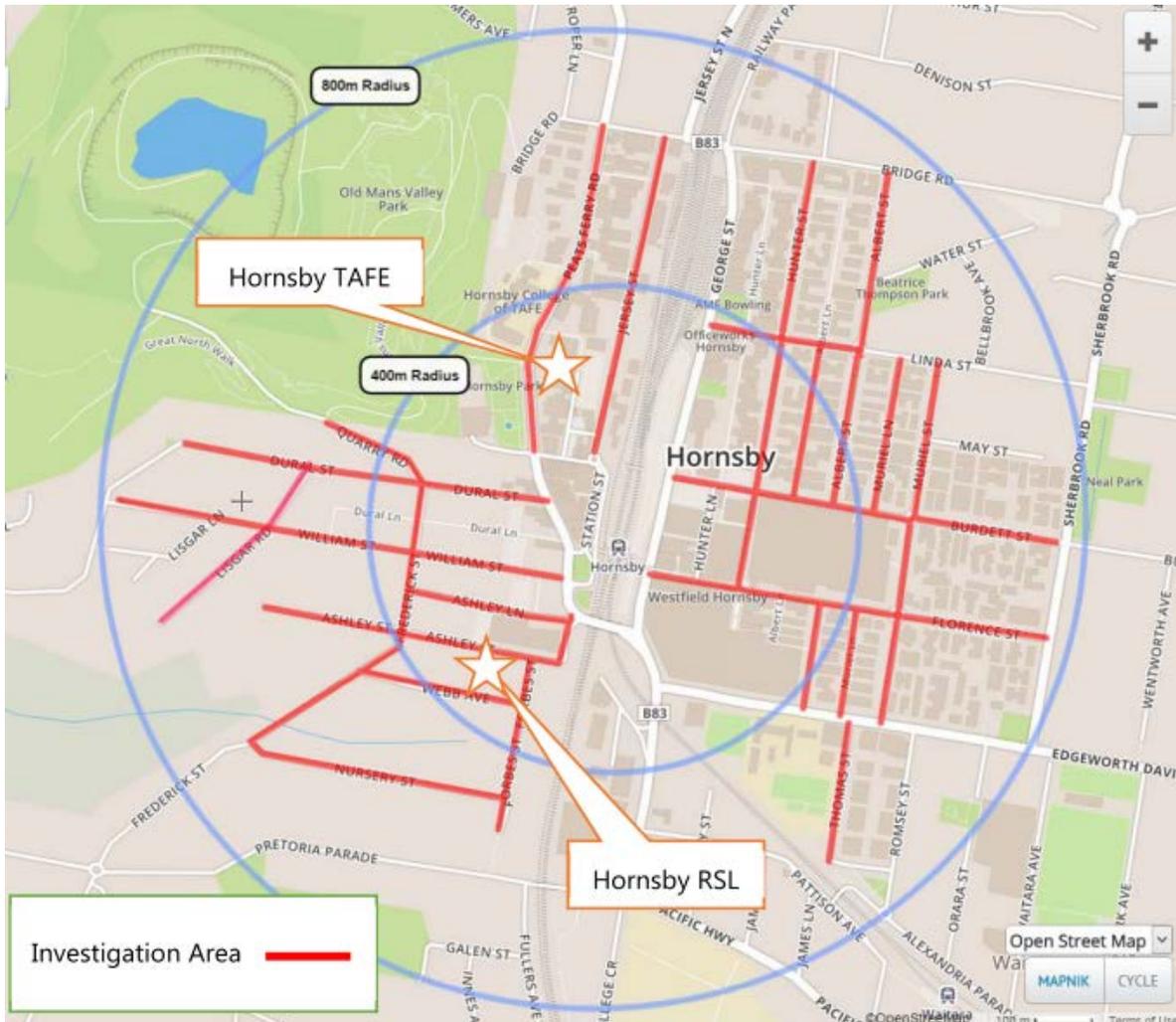


Figure 2.13 Parking survey investigation area (Source: Temporary Commuter Car Parking Options Report, Peopletrans 2015)

Parking occupancy surveys were undertaken on Thursday 17 September 2015 at two-hourly intervals between 7:00 AM and 7:00 PM. The results of the survey are summarised below in **Table 2.5**.

Table 2.5 : Unrestricted on-street parking survey results

	7am	9am	11am	1pm	3pm	5pm	7pm
On-street unrestricted supply	1,374	1,374	1,374	1,374	1,374	1,374	1,374
On-street unrestricted demand	883	1,095	1,138	1,134	1,038	965	801
Occupancy (%)	64%	80%	83%	83%	76%	70%	58%
Unrestricted vacancies	491	279	236	240	336	409	573

Source: Temporary Commuter Car Parking Options Report, Peopletrans 2015

It can be seen from **Table 2.5** that during the day the unrestricted on-street parking spaces within 800 metres of the station are over 80% occupied.

Figure 2.14 below shows the streets with unrestricted parking closest and their occupancy at 11am on Thursday 17th September 2015. It can be seen that the streets closest to the station, namely Forbes Street, Ashley Street, Webb Avenue and Frederick Street to the west of the station and Albert Street, Muriel Street and Linda Street to the east of the station were over 85% occupied at the time of the survey. It can therefore be concluded that there is currently little available unrestricted on-street parking in the immediate vicinity of the station.



Figure 2.14 Existing unrestricted on-street car parking occupancy – 11am Thursday 17/9/15 (Source: Temporary Commuter Car Parking Options Report, Peopletrans 2015)

2.7.3 Kiss and Ride

Kiss and ride facilities are currently located in a layby on George Street adjacent to the taxi facility on the east of the station, as shown in **Figure 2.9**. On the west of the station, kiss and ride facilities are also located on Station Street outside the shops and Railway Hotel.

3. Proposed works

This chapter outlines the key features, associated infrastructure and activities of the proposal. This description is based on the design details available at the time of writing and is subject to refinement during the detailed design phase.

The proposal comprises of two parts which are described further below:

- Hornsby junction remodelling, comprising the reconfiguration of track work, signalling and overhead wiring within the existing rail corridor between Waitara and Asquith.
- Hornsby Station multi-storey commuter car park, comprising the construction and operation of a two-level car park on part of the site of the existing commuter car park.

3.1 Hornsby junction remodelling

The key features of the Hornsby junction remodelling include:

- Installation, removal and reconditioning of track work between Hornsby Station and approximately 400 metres north of Bridge Road, Hornsby
- Relocation of overhead wires and support structures
- Installation, removal and modifications of signalling infrastructure to enable the operation of up to 16 city-bound trains per hour on the T1 North Shore line.
- Modification of track drainage, combined services routes and other rail infrastructure (such as local cable routes)
- Provision of a new train driver's walkway and a train turnback facility located approximately 30 metres south of Bridge Road, Hornsby

3.2 Multi-storey commuter car park

The design of the multi-storey commuter car park is yet to be finalised, however at the time of writing the key features of the Hornsby Station multi-storey commuter car park would include:

- Partial demolition of the existing at-grade commuter car park, including the decommissioning and replacement of an existing on-site stormwater detention storage tank
- Construction of a multi-storey commuter car park structure
- Provision of approximately 230 additional commuter parking spaces
- Provision of vehicular entry and exit from the George Street/Burdett Street intersection (via reconfigured traffic signals); the existing vehicle entry and exit off George Street (south of Burdett Street) would also be retained as some of the existing commuter car parking spaces would remain. The proposed George Street / Burdett Street intersection upgrade is shown below in **Figure 3.1 Upgraded George Street / Burdett Street / car park access intersection (Source: Traffic and Transport Assessment, Arup 2015)**
- Provision of a new retaining wall along the eastern boundary of the commuter car park
- Provision of a new retaining wall and planter along the western side of George Street (to replace the existing retaining wall structure that would be demolished to facilitate construction)
- Ancillary works including stairs, a lift, perimeter fencing, power and lighting, communications, CCTV camera surveillance, drainage, utilities, line-marking and signage, urban design works and landscaping
- Maintaining access to the Sydney Trains maintenance facility via the car park.

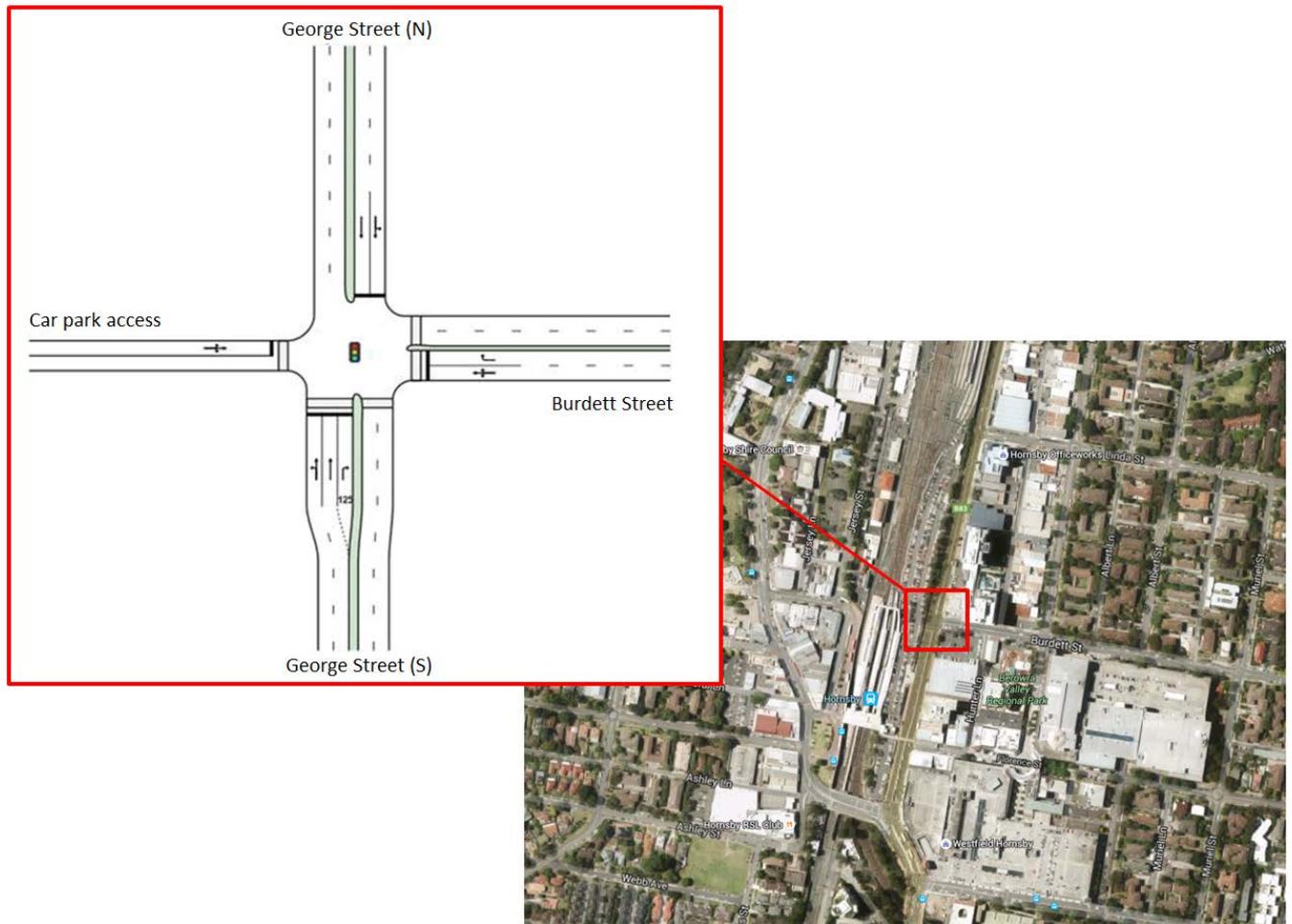


Figure 3.1 Upgraded George Street / Burdett Street / car park access intersection (Source: Traffic and Transport Assessment, Arup 2015)

A number of other associated works would also be required as part of the proposed commuter car park, including:

- Relocation of high voltage overhead power lines from the site of the existing commuter car park
- Provision of approximately six accessible parking spaces adjacent to the eastern station entrance (to be created from existing unrestricted commuter parking at this location)
- Extension of the footpath on the western side of George Street from the George Street/Burdett Street intersection, where it currently terminates, to the northern boundary of the proposed commuter car park to provide pedestrian access between Hornsby Station and the proposed lifts in the commuter car park
- Utility protection works
- Vegetation removal from the existing car park site

4. Construction traffic impact

4.1 Construction methodology

The Proposal is likely to be constructed in four stages, with construction anticipated to be completed by March 2018. Transport for NSW has indicated the following construction program:

- Stage 1: Construction of the Hornsby Junction Remodelling works and high voltage overhead wiring relocation including some car park enabling works.
- Stage 2: Construction of the majority of the new commuter car park including some minor works associated with the Hornsby Junction Remodelling.
- Stage 3: Construction of the majority of the track work for the Hornsby Junction Remodelling.
- Stage 4: Demobilisation.

An overview of the indicative construction activities anticipated to occur during each of the above four stages of work is provided in **Table 4.1**. This staging is based on the current preliminary design and may change once the detailed design methodology is finalised. The construction methodology would be further developed during the detailed design of the Proposal by the nominated Contractor in consultation with Transport for NSW.

Table 4.1 Key construction activities

Stage	Main activities	Approx. duration
Construction start		Mid-2016
1	<p>Hornsby Junction Remodelling, HV relocation, Car Park enabling works</p> <ul style="list-style-type: none"> • Establish offset car parking. • Establish site compound, including the closure of approximately 90 car parking spaces. • Undertake preliminary Hornsby Junction remodelling works during possession weekends. • Relocate existing HV located within the car park in accordance with detailed design. • Undertake minor alterations on Ausgrid power lines on George Street if required. • Undertake car park enabling works. 	8 months
2	<p>Commuter car park construction, minor Hornsby Junction Remodelling works</p> <ul style="list-style-type: none"> • Full car park closure (affecting approximately 370 spaces) - establish further temporary commuter car park. • Establish site compound/hoarding. • Ground works and site clearance, including removal of existing pavements, selected trees, lighting and services. • Drive contiguous piled retaining structure. • Excavate commuter car park footprint. • Substructure preparation (e.g. preparation for services, drainage and foundations) and construction of car park structure. • Car park fit out, including installation of building services (e.g. electrical, communications, CCTV, hydraulics). • Construct internal footpaths, ramps, kerbs, islands and fences. • Install street lighting, fencing, signage and line marking. • Reconfigure George Street/Burdett Street intersection, including new pavement, kerbs, turning lanes and reconfigured traffic signals. • Extend footpath on western side of George Street. • Landscaping. • Establish new accessible parking spaces adjacent eastern entrance of Hornsby Station. 	10 months

Stage	Main activities	Approx. duration
3	Main Hornsby Junction Remodelling works <ul style="list-style-type: none"> Ongoing full car park closure (affecting approximately 370 spaces). Establish site compound/hoarding. Relocate, divert and/or protect rail and public utilities. Construct signalling infrastructure bases. Track work, including installation, removal and reconditioning of track. Install signalling and overhead wiring systems. Testing and commissioning of railway systems and signals. 	3 months
4	Finalisation works, demobilisation, Car Park opening <ul style="list-style-type: none"> Post construction demobilising, including removal of temporary construction facilities. 	2 months
Construction finish		March 2018

4.1.1 Work hours

Hornsby Junction Remodelling

The majority of works would be undertaken outside of standard construction hours to coincide with scheduled weekend track possessions (planned periods when Sydney Trains suspend rail services on a segment of the network to enable track maintenance).

Scheduled track possessions normally occur during weekends or holiday periods when patronage demand is traditionally lower and, therefore, expected to result in the least disruption to rail customers.

Construction hours during a scheduled weekend track possession typically extend over a consecutive 48-hour period from 2.00 am Saturday to 2.00 am the following Monday. The proposed track work would be staged to occur over approximately 18 scheduled track possessions.

In addition to the scheduled track possessions, construction of the Proposal would also require a two week shutdown of the Hornsby Junction (a closure of the rail corridor that is specifically required to construct the Proposal). This shutdown is scheduled to coincide with the December 2017-January 2018 holiday period (during Stage 3) to minimise disruptions to rail customers.

Commuter car park

The majority of construction of the commuter car park would be undertaken during the standard (NSW) Environment Protection Authority (EPA) construction hours of:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm on Saturdays
- No work on Sundays or public holidays.

Exemptions and approval for works outside the above standard construction hours may be required during the following circumstances to minimise disruptions to traffic, rail customers and pedestrians:

- Relocation of the high voltage overhead power lines from the Hornsby Station commuter car park
- Works required by utility service providers or where impacts to services cannot be reasonably managed
- Emergency works (e.g. due to a damaged utility)

4.1.2 Earthworks

Approximately 33,000 cubic metres of material is anticipated to require excavation during construction of the Proposal. The bulk of the excavated material would be generated during construction of the commuter car park. This would be due to the need to remove a large volume of fill to enable an at-grade car park entry from the George Street/Burdett Street intersection. Approximately 6,000 cubic metres of material would be required for backfilling.

Where feasible, the excavated material would be reworked (if necessary) and used to meet fill material needs. However, this may be impractical if the excavated material is contaminated or unsuitable for the purposes of structural fill. In this case, fill material would need to be imported, and excavated material exported for re-use on other sites or for treatment or disposal.

4.1.3 Intersection upgrade

The upgrade of the George Street / Burdett Street intersection is anticipated to occur over a three week period. The works would include the addition of the car park access arm to the intersection, the existing northbound kerbside lane on George Street would become straight ahead and left turn into the car park, kerb upgrades on the western frontage of George Street, upgraded line markings on George Street and Burdett Street and upgraded signalling. It is anticipated that all construction works to upgrade the intersection would be undertaken overnight, therefore minimising disruption to road users.

4.1.4 Site access

Construction access would primarily be via the existing commuter car park access off George Street. The existing traffic island at the car park access would be removed and four existing car parking spaces would be removed directly north of the access to allow heavy vehicles to access and exit the car park. The access location and Stage 1 construction compound can be seen below in **Figure 4.1**.

In addition to the main site access point, vehicles would use existing Sydney Trains' maintenance access gates to enter the rail corridor for track remodelling and signalling works. They would be used less frequently and with a much lower volume of vehicles than the main access at the existing commuter car park. The locations of the access gates are shown in **Figure 4.2**.

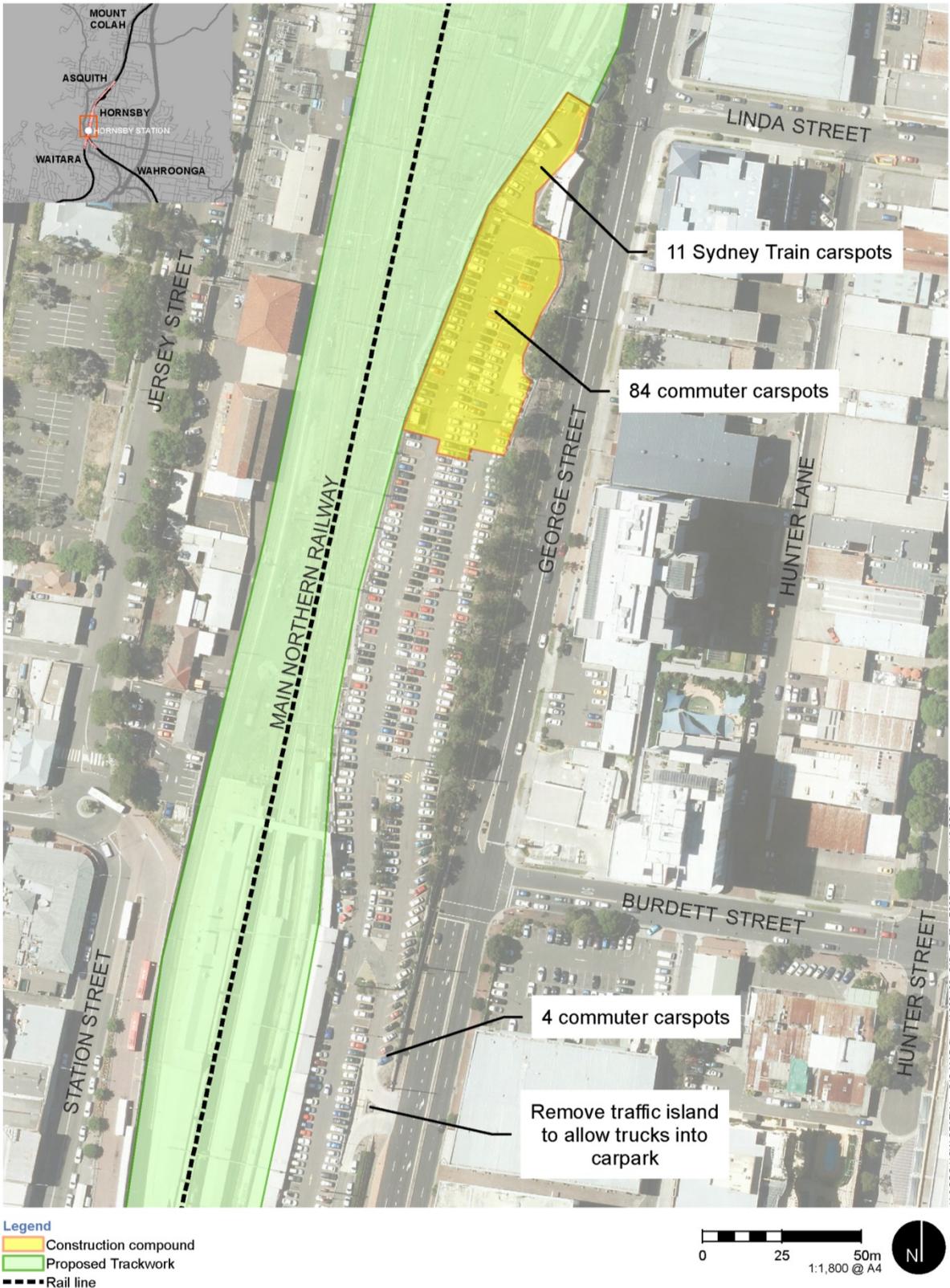


Figure 4.1 Main construction access and Stage 1 construction compound

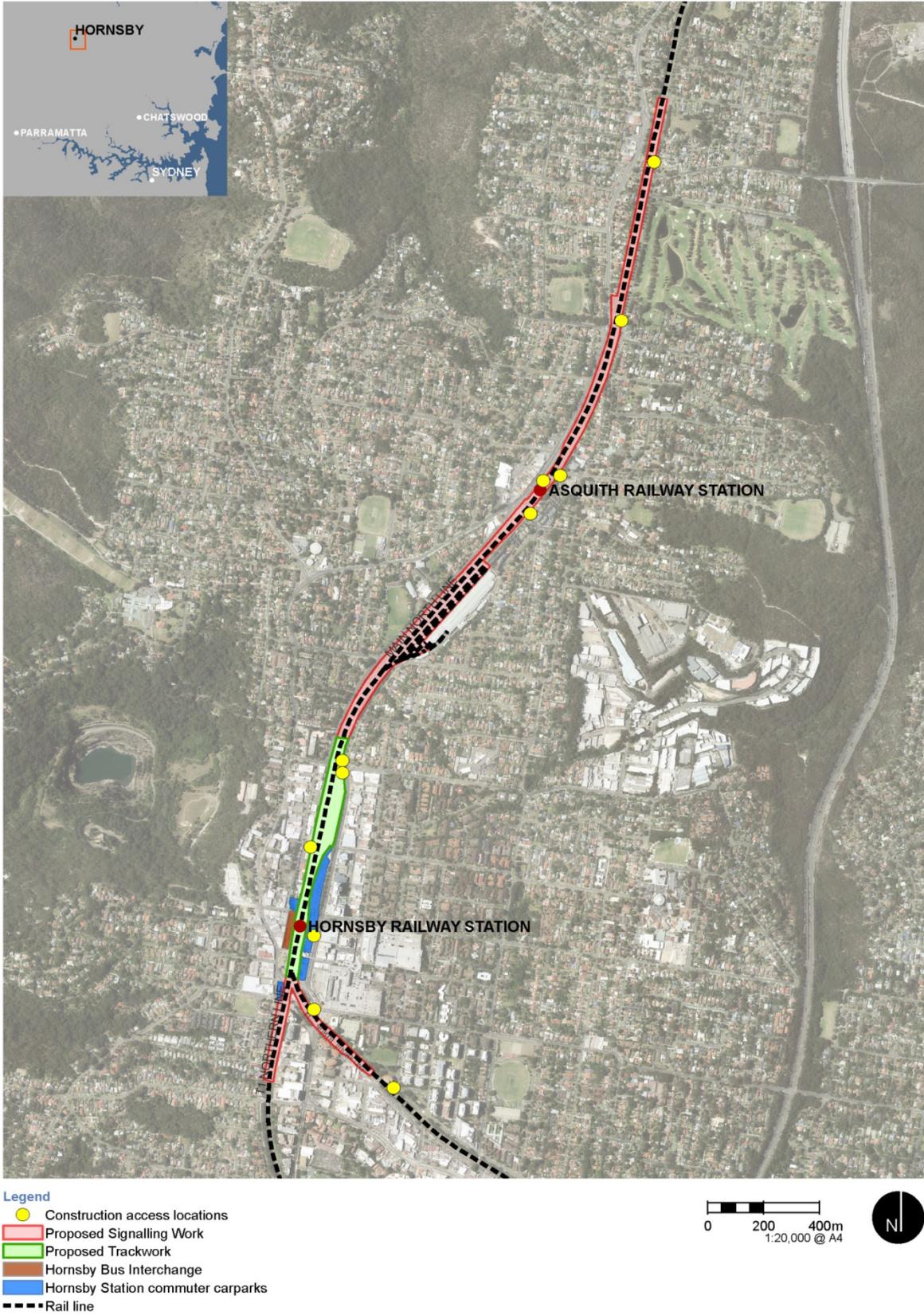


Figure 4.2 Additional site access locations (Hornsby Junction Remodelling)

4.2 Construction assessment methodology

A qualitative assessment of the traffic impacts of construction vehicles has been undertaken.

Existing traffic data has been extracted from the Hornsby West Side Traffic Study (Bitzios Consulting, May 2013) to use as a baseline to assess the anticipated construction vehicle movements during the network peak hour. The construction vehicle numbers have been provided by Transport for NSW.

It is estimated that the maximum construction vehicle numbers would be:

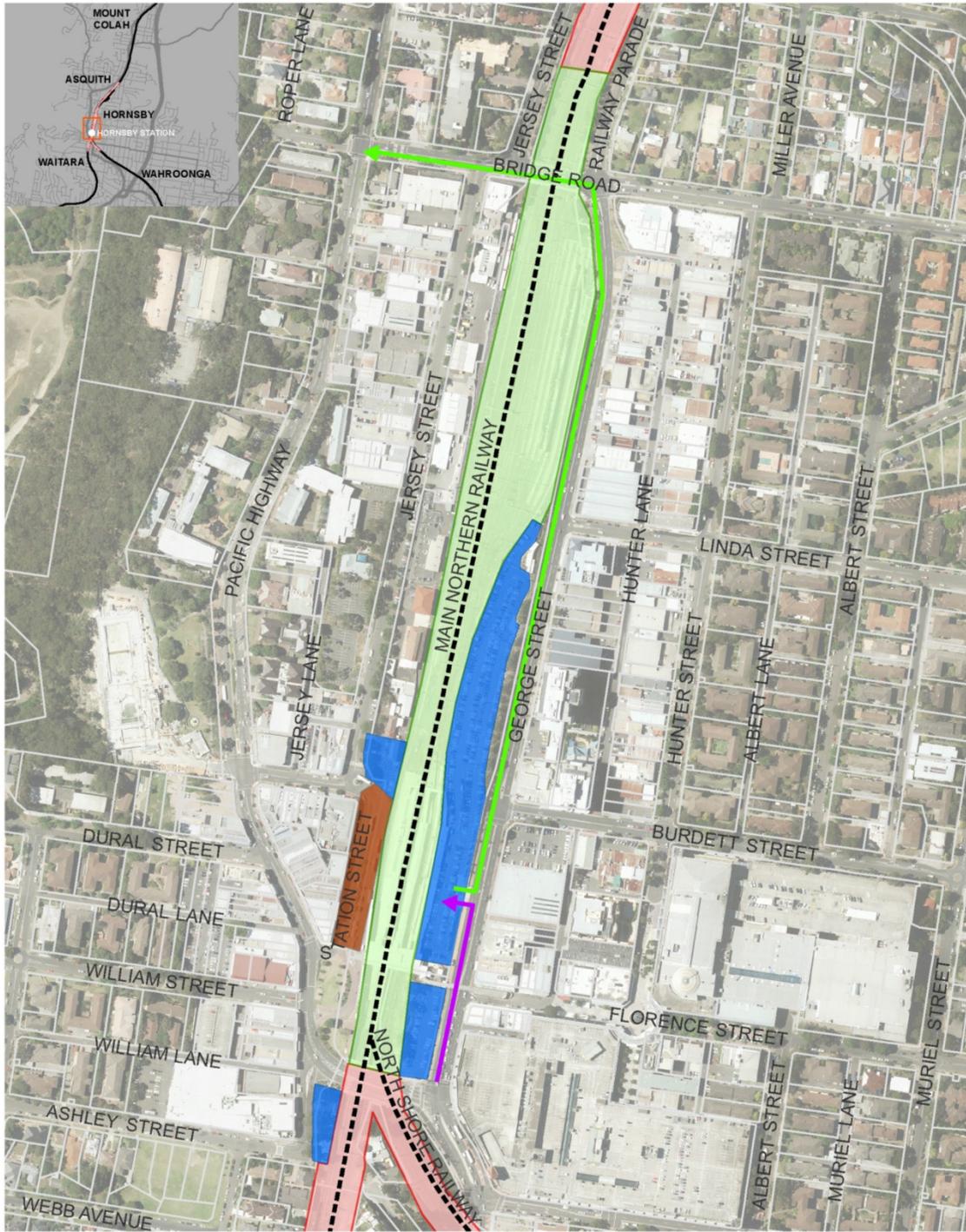
- 32 truck movements a day (distributed evenly across an eight hour work day)
- 20 light vehicle movements a day (with a worst case scenario of 10 movements in the am peak hour)

This equates to a maximum of 14 vehicle movements in the am peak hour (seven vehicles arriving and seven vehicles departing the construction site).

During the peak of construction there would be up to 80-100 construction staff on site. Staff would be encouraged to travel by public transport, however if they drive they would be required to park outside a 600 metre radius of the construction site. Therefore construction staff would not impact the operation of the road network in the immediate vicinity of the construction site or commuter car parking.

It has been assumed that haulage routes would be via the shortest route possible to / from the nearest arterial road as shown in **Figure 4.3**.

To provide a worst case assessment of the construction vehicle impacts on the local road network, it has been assumed that all construction vehicles access and exit via the existing commuter car park.



- Legend**
- Entry haulage route
 - Exit haulage route
 - Proposed Signalling Work
 - Proposed Trackwork
 - Hornsby Bus Interchange
 - Hornsby Station commuter carparks
 - Rail line



JACOBS NSW SPATIAL - GIS MAP file : I:\088400_GIS_Traffic_F007_11v2 | 4/12/2015

Figure 4.3 Assumed haulage routes

4.3 Traffic impacts

As the construction site access assessed is the entry and exit point for the existing commuter car park, and would continue to operate as a left-in / left-out access point, there are not anticipated to be any visibility concerns for construction vehicles entering or exiting the site. The existing traffic island and four car parking spaces to the north of the access would be removed to ensure construction vehicles can access and exit the site safely.

The impact of construction vehicles using the additional access gates on the local road network is considered to be negligible given their infrequent use and low numbers of expected construction vehicles. As they are existing Sydney Train's maintenance gates, there is also no anticipated visibility or safety concerns for the small number of construction vehicles accessing and exiting these locations.

Table 4.2 presents the existing traffic volumes during the AM peak hour (7:00 AM to 8:00 AM) at key intersections along the assumed haulage routes and the anticipated construction vehicles.

Table 4.2 Construction vehicle impacts – AM peak hour

Intersection	Existing traffic conditions ³		Maximum estimated construction traffic volumes	Percentage
	Existing traffic volumes	Level of Service (LoS)		
Pacific Highway / George Street	2,652	LoS B	14	0.53%
George Street / Burdett Street	2,034	LoS A	14	0.69%
George Street / Bridge Road / Railway Parade	1,924	LoS D	14	0.73%
Bridge Road / Pacific Highway	2,094	LoS B	14	0.67%

It can be seen from **Table 4.2** that the hourly construction vehicles would be less than 1% of the total existing traffic at each of the assessed intersections. It can therefore be concluded that the impact of the anticipated construction traffic of the Proposal is unlikely to have a material impact on the local road network.

The George Street / Bridge Road / Railway Parade intersection currently operates at a LoS D, meaning it is approaching an unstable flow of traffic and that the construction traffic would therefore more likely have a material impact at this intersection than the others assessed.

It should be noted that as the existing commuter car park would be closed for the majority of construction and the commuter car parking spaces relocated elsewhere, to a location still to be determined, this would result in a redistribution of traffic on the local road network. Therefore, once the temporary commuter car parking has been confirmed, the above is subject to change.

4.3.1 Hornsby junction shutdown period

As previously discussed, the rail operations at Hornsby Station would be required to close for a two week period around Christmas 2017. During this period, the anticipated train passenger journey numbers are expected to be approximately 50% or less of the standard peak weekday passenger numbers. This is due to the Christmas period where the number of customers travelling to and from work decreases.

³ Hornsby West Side Traffic Study, Bitzios Consulting, May 2013

During this time replacement bus services would be provided by Sydney Trains. Buses would be provided to meet the anticipated demand during the shutdown period and would align with the current train timetable times.

As the replacement bus services would be provided over a two week period around Christmas, the morning peak hour traffic on the local road network in the vicinity of the station would be expected to be lower than normal. Therefore the replacement buses would not be expected to cause a material impact on the operation of the above intersections.

4.4 Parking impacts

4.4.1 Construction areas

During the first 8 months of construction (Stage 1) commuter car parking spaces would be removed at the northern end of the car park for the construction site area. Approximately 90 spaces in total would be unavailable during this stage, as shown in Figure 4.1.

For approximately 15 months (Stages 2 to 4), approximately 370 spaces would be removed (as the whole of the existing commuter car park would be closed for construction activities) until the multistorey car park is opened.

The three smaller commuter car parks (with a combined capacity of 96 parking spaces) would not be affected by the works.

Transport for NSW are currently investigating temporary alternate commuter car parking options to accommodate the displaced parking spaces throughout the construction of the Proposal. Subject to further analysis, the location of the temporary commuter car parking could result in traffic impacts on the local road network and would therefore be subject to further environmental assessment as required.

4.5 Pedestrian and cycle impacts

Impacts on pedestrians, including along the pedestrian desire line to the east of the station, are anticipated to be minimal. Pedestrians would continue to use the footbridge over George Street or the crossing facilities on Station Street on the western side of the station. Therefore pedestrians are not anticipated to be directly impacted by the construction vehicles and their anticipated haulage routes.

Cyclists would continue to primarily use the cycle parking facilities on the western side of the station and therefore the construction traffic, using the eastern side of the station, would cause minimal impacts to cyclists accessing the station.

4.6 Cumulative impacts

Hornsby Shire Council is partially filling Hornsby Quarry with clean excavated material from the Northconnex tunnel. It has been identified that this would occur over a two year period from 2015 and would result in 380 truck movements per day along George Street. It has been assumed these would occur 24 hours a day and therefore result in 16 trucks per hour that would use the same haulage route as the junction remodelling works to access the quarry via Bridge Road.

Hornsby Shire Council plan to upgrade the pedestrian footbridge between the station and Florence Street. Construction is anticipated to occur in 2015 and the new bridge would be open in early 2016 (<http://www.hornsby.nsw.gov.au/council/noticeboard/latest-news/hornsby-footbridge-soon-to-be-replaced>). It is therefore anticipated that the bulk of the footbridge construction would be completed prior to the Proposal construction and therefore there would be minimal cumulative impacts.

Table 4.3 below presents the cumulative impact that would occur during the construction of the Proposal.

Table 4.3 Anticipated AM peak hour cumulative impact – junction remodelling

Intersection	Existing traffic conditions ⁴		Total construction vehicles		Total construction vehicle percentage
	Existing traffic volumes	Level of Service (LoS)	Junction remodelling	Hornsby Quarry	
Pacific Highway / George Street	2,652	LoS B	14	16	1.1%
George Street / Burdett Street	2,034	LoS A	14	16	1.5%
George Street / Bridge Road / Railway Parade	1,924	LoS D	14	16	1.6%
Bridge Road / Pacific Highway	2,094	LoS B	14	16	1.4%

It can be seen from **Table 4.3** that the cumulative impact of construction vehicles on the assessed intersections would be less than 2% of the existing traffic volumes. This is unlikely to result in a material impact on the operation of these intersections, however the results would vary once the temporary commuter car parking location is known.

As above, the George Street / Bridge Road / Railway Parade intersection currently operates at a LoS D, meaning the cumulative impact of the construction vehicles is more likely to have a material impact at this intersection than the other intersections assessed.

4.7 Mitigation measures

In order to minimise impacts on the traffic and transport networks in the vicinity of the site, the following mitigation measures are proposed.

Construction worker parking would not be permitted within 600 metres of the construction site.

The following objectives would need to be met by the contractor during the construction of the Proposal:

- Maintain pedestrian access to and from Hornsby Station at all times.
- Where practicable, minimise the use of local and town centre roads for construction vehicle access to and from the site, with major regional roads being used for construction haulage.
- Where practicable, avoid the delivery of construction materials during peak commuter travel periods.
- Minimise the total number of deliveries required during construction by providing enough storage within the construction compounds for stockpiling materials.
- Avoid a net loss in accessible parking spaces at the eastern Hornsby Station entrance by relocating existing commuter parking spaces.

A detailed Construction Traffic Management Plan (CTMP) would be prepared for the junction remodelling to manage and minimise construction impacts. The CTMP would be produced in consultation with Transport for NSW, the Roads and Maritime Services and Hornsby Shire Council prior to commencement.

The CTMP would include but not be limited to the following:

- Timing of proposed works.
- Hours of construction activities.

⁴ Hornsby West Side Traffic Study, Bitzios Consulting, May 2013

- Number of construction vehicles to be used.
- Designation of construction routes.
- Mitigation and management measures including use of traffic control signals, construction vehicle access and traffic circulation arrangements.
- Designation of temporary commuter parking during construction works.
- Contact details for key onsite construction personnel.

Site-specific traffic management issues would also be addressed through the implementation of appropriate Traffic Control Plans (TCPs) developed in consultation with Transport for NSW, the Roads and Maritime Services and Hornsby Shire Council. The TCPs would outline key details such as advanced warning signage, traffic flow management and pedestrian management measures.

5. Operational traffic impact

This chapter outlines the anticipated impacts during the operational phase of the Proposal.

5.1 Hornsby junction remodelling

Once the remodelling and track work has been completed, expected to be at the start of 2018, the operational phase is anticipated to generate a similar level of traffic, relative to the existing scenario, to the Sydney Trains site located at the northern end of the car park.

It is therefore considered that the operational implications on the local road network for Sydney Trains operations following the junction remodelling would be negligible.

It is assumed that the additional train patronage associated with the Hornsby junction remodelling would be aligned generally to the predicted patronage increase (32% increase in year 2036 + 15%) at Hornsby Station. Additional car journeys would therefore be included in the additional car parking numbers provided below.

5.2 Commuter car park

As part of the TAP: Commuter Car Parks Project, a Traffic and Transport Assessment (TTA) (Arup, February 2015) was produced to identify the likely key operational impacts of the proposed facility on the existing traffic and transport network. The commuter car park design is yet to be finalised, however the below assessment is based on the Concept Design Report – Hornsby Station, July 2015⁵.

As part of this Technical Paper, a review of the TTA has been undertaken and the following has been concluded from the review:

- The TTA was written in February 2015, therefore it is considered that the data used and trip distribution assumed represents current information
- The assessment methodology is acceptable
- The report assesses a car park with 234 additional spaces to the existing commuter car park. The current car park design includes approximately 230 additional parking spaces to the existing commuter car park. Therefore the TTA assessment presents a representative scenario
- As with the existing commuter car park, most vehicles accessing the car park arrive before the network peak hour (7 am - 8 am). The additional vehicles resulting from the new commuter car park would be expected to follow the same arrival pattern, i.e. mainly arrive before 7 am, and therefore the residual impact of the additional vehicles during the network am peak would be low.

The below assessment and numbers have been extracted from the TTA.

5.2.1 Trip generation

The TTA is based on the commuter car park providing an additional 234 car parking spaces relative to the existing commuter car park. It was assumed that each space would generate one trip in both the morning and afternoon peak periods.

The report identified that the additional spaces would be expected to have a similar arrival and departure profile to the existing spaces and survey data from a traffic study done on Sutherland Commuter Car Park (prepared by GHD 2013). The traffic study was used to estimate an arrival and departure profile given its comparable size and proximity from the Sydney CBD. The Sutherland commuter car park has a capacity of 389 parking spaces. The predicted arrival profile is presented below in **Table 5.1**, which indicates that the car park is fully occupied by 7:15 AM.

⁵ TAP Commuter Car Parking Concept Planning – Tranche 1, Arup July 2015

Table 5.1 Predicated arrival profile

Time period	In	Out	Parking accumulation	% occupancy
6:15-6:30 AM	60	1	$228 + 60 - 1 = 287$	74%
6:30-6:45 AM	38	0	$287 + 38 - 0 = 325$	84%
6:45-7:00 AM	44	0	$325 + 44 - 0 = 369$	95%
7:00-7:15 AM	24	5	$369 + 24 - 5 = 388$	100%
7:15-7:30 AM	11	10	$388 + 11 - 10 = 389$	100%
7:30-7:45 AM	6	7	$389 + 6 - 7 = 388$	100%
7:45-8:00 AM	5	6	$388 + 5 - 6 = 387$	99%
8:00-8:15 AM	11	11	$387 + 11 - 11 = 387$	99%
8:15-8:30 AM	3	5	$387 + 3 - 5 = 385$	99%
8:30-8:45 AM	2	2	$385 + 2 - 2 = 385$	99%

Source: Hornsby Station Traffic and Transport Assessment, Arup February 2015 (prepared as part of the TAP Commuter Car Park Project)

The network peak hour was identified as 7:00 AM – 8:00 AM and a trip generation rate was calculated to assess the above vehicle movements during this peak hour. The trip generation rate was calculated by dividing the number of cars entering and exiting the car parking during the peak hour by the total number of car parking spaces in the Sutherland commuter car park to determine an 'In' and 'Out' trip generation rate respectively. The peak hour trip generation rates are as follows:

- In: $46 / 389 = 0.12$
- Out: $28 / 389 = 0.07$

The PM peak hour trips have been anticipated to occur 10 hours after the AM trips, therefore between 5:00 PM and 6:00 PM, and would be opposite and directly proportionate to the AM trips. Therefore the PM peak hour trip generation rates were as follows:

- In: 0.07
- Out: 0.12

The above trip generation rates were then applied to the additional car parking spaces that would be available within the Hornsby multi-storey commuter car park, relative to the existing Hornsby commuter car park, to determine the anticipated number of additional cars that would enter and exit the car park during the peak hours.

Based on the above trip rates, the trips generated by the additional car parking spaces provided within the new commuter car park are presented in **Table 5.2**.

Table 5.2 Trip generation during the AM and PM peak hours

Peak period	In	Out
7:00 AM – 8:00 AM	$234 \times 0.12 = 28$	$234 \times 0.07 = 16$
5:00 PM – 6:00 PM	$234 \times 0.07 = 16$	$234 \times 0.12 = 28$

Source: Hornsby Station Traffic and Transport Assessment, Arup February 2015

5.2.2 Traffic distribution

The assumed traffic distribution is presented below in **Figure 5.1**.

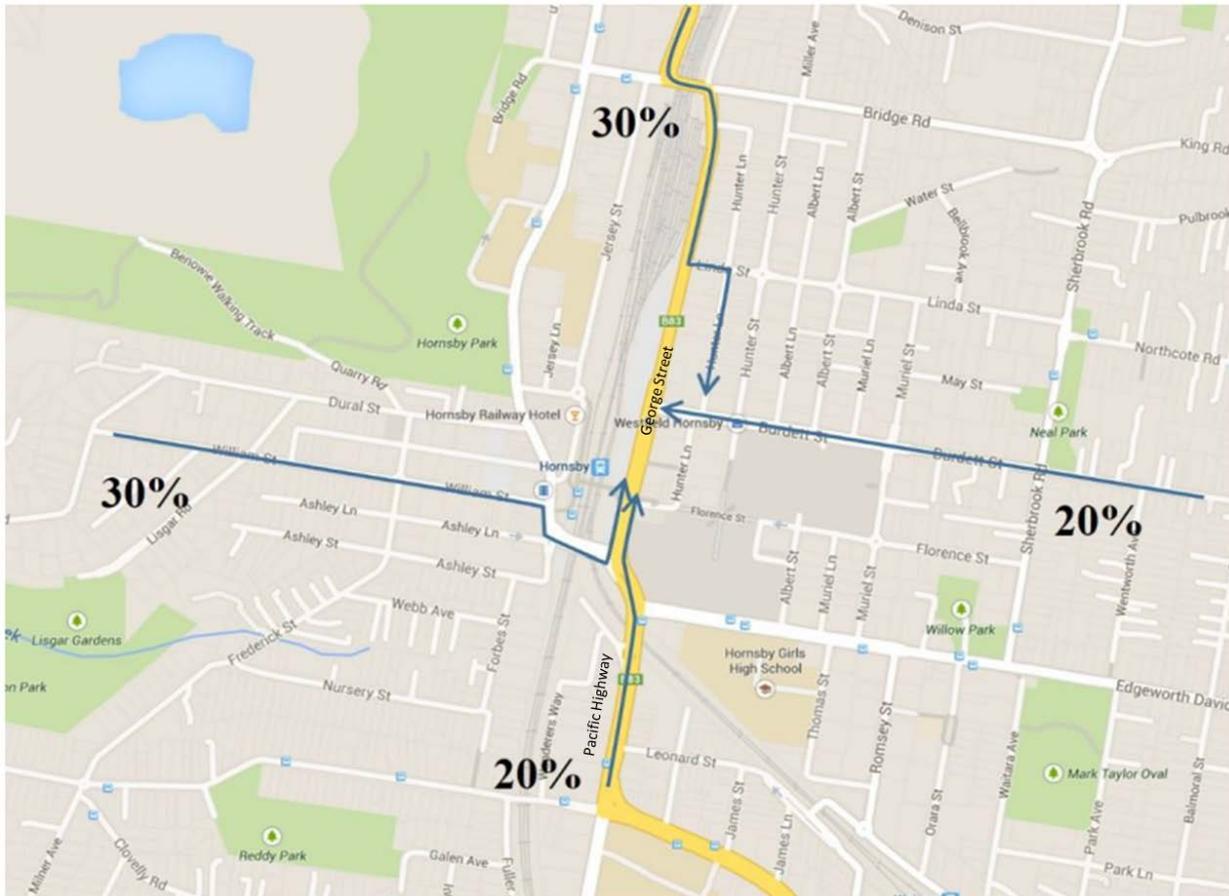


Figure 5.1 Traffic distribution (Source: *Traffic and Transport Assessment, Arup February 2015*)

5.2.3 Road network impacts

The TTA refers to the Hornsby Westside Traffic and Parking Study (Bitzios 2013) to identify critical intersections during peak traffic periods. The Pacific Highway / George Street and Bridge Road / George Street intersections were identified as critical intersections during the peak traffic periods and the traffic volumes at these intersections were compared with the additional trips generated by the car park during the AM peak hour to assess the impact of the additional trips generated by the proposed car park on these key intersections, as shown in **Table 5.3**.

Table 5.3 Development traffic compared with existing AM peak hour traffic volumes

Intersection	Existing traffic volumes	Development traffic volumes	Percentage
Pacific Highway / George Street	2,652	22	0.8%
Bridge Street / George Street	1,924	13	0.6%

Source: *Traffic and Transport Assessment, Arup February 2015*

The assessment concludes that as the development traffic is less than 1% of the existing traffic volume at both intersections, therefore the impact on the operation of each intersection is negligible.

The proposed upgraded intersection of George Street / Burdett Street was modelled using SIDRA to analyse the performance during the operation of the car park. The results of the SIDRA analysis are presented in **Table 5.4**.

Table 5.4 Operational performance of George Street / Burdett Street intersection

Scenario	Level of Service	Average delay (secs)	Degree of Saturation	95th %ile queue (m)
AM existing	B	21	0.85	158
PM existing	B	24	0.71	90
AM future	B	21	0.81	158
PM future	C	29	0.76	101

Source: Traffic and Transport Assessment, Arup February 2015

It can be seen from **Table 5.4** that with the upgraded intersection design, the traffic generated by the proposed car park during the AM peak hour would have a negligible impact relative to the existing operation. The degree of saturation is a ratio of the arrival flow (demand) to the capacity of the approach at a signalised intersection during the same period and it can be seen that during the AM peak hour, the degree of saturation would improve from 0.85 to 0.81. The PM peak hour would experience slightly worse conditions during the future scenario however the TTA concludes the additional trips would have a minimal impact on the intersection performance.

The signal phasing at the intersection could be assessed and possibly optimised in order to mitigate the slightly worse conditions experienced during the PM peak hour.

6. Summary and conclusion

This Traffic and Transport Technical Paper has been prepared by Jacobs (Australia) Pty Ltd on behalf of Transport for NSW to accompany the REF for the Hornsby junction remodelling and provision of approximately 230 additional parking spaces.

The junction remodelling is being delivered to increase the capacity and reliability of the T1 North Shore Line while the car park is being delivered as part of the TAP.

Hornsby Station is a major transport interchange servicing three train lines; the T1 North Shore Line, the T1 Northern Line and the Central Coast and Newcastle Line. A main commuter car park is currently located immediately east of the station, accessed via George Street and providing 374 commuter car parking spaces.

The construction of the proposal is anticipated to commence in the middle of 2016 and conclude early 2018.

During construction, a maximum total of 14 construction vehicle movements are anticipated at the main construction site during the morning peak hour. Access would be via a number of existing Sydney Trains maintenance access points into the rail corridor however the main construction access would be via the existing commuter car park access off George Street.

Approximately 90 commuter car parking spaces would be removed during Stage 1 of construction and for the remainder of the construction period approximately 370 commuter car parking spaces would be displaced. Transport for NSW are currently investigating temporary alternate commuter car parking options during this time.

A peak of 80-100 construction staff are anticipated and staff would be required to park at least 600 metres from the construction site.

The impact of the construction vehicles during both phases of construction is considered to not result in a material impact on the operation of the local road network during the morning peak hour. However the George Street / Bridge Road / Railway Parade intersection currently operates at a LoS D in the morning peak hour therefore is more likely to have a material impact at this intersection than the other intersections assessed. The results of the traffic and transport impacts during construction may vary once the location of the temporary alternate commuter car parking has been confirmed.

A TTA was undertaken by Arup in February 2015 to assess the operational impacts of the commuter car park. The report concludes that the proposed design and impact of the additional vehicles generated by the commuter car park would have minimal impacts on the local road network.

From the assessment undertaken, it can be concluded that the construction and operation of the Proposal would have a minimal environmental impact with regard to traffic and transport.