

Payce

**Proposed Development
SOPA Site,
Wentworth Point.**

Transport Impact Study

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1 Introduction

1.1 Scope of Report

Henson Consulting (HC) was commissioned by Payce in 2013 to undertake a traffic and transport assessment and advice for the proposed development of the Sydney Olympic Park Authority (SOPA) site, The Wharf Site, “Dock”, 1 Burroway Road at Wentworth Point, west of Sydney CBD.

This Transport Impact Study (TIS) and report was prepared to address the issues considered in the planning stage of the project, including the Director Generals Requirements (DGR’s) and to support a Development Application (DA) for the City of Auburn (Council), SOPA and UrbanGrowth NSW.

This TIS assessment and report was prepared with reference to traffic impact assessment as required by the RMS Guide to Traffic Generating Developments, and other relevant Australian Standards and controls.

1.2 Key Issues and Objectives

The objective of the study was to address the following key issues and provide practical transport solutions to accommodate the proposed development:

- traffic generation
- traffic demand management
- access to and from the site
- traffic movements within the site
- vehicle loading and unloading
- traffic exposure and interaction with main roads
- pedestrian and public transport access
- integration with current and future development surrounding the site
- existing and future traffic patterns and flows
- traffic and pedestrian safety in and around the site.

This TIS recognises the role of traffic within a broader transport system that includes public transport, walking and cycling:

- The accessibility of the site by a range of transport modes including car, public transport, walking and cycling;
- The ability of the public transport network to service the site in the peak and off peak and weekend periods;
- Mode share targets;
- Means of minimising travel demand by car and maximising the share of travel by other modes including public transport, cycling and walking, or car share;
- Compliance with the requirements of the planning authorities;
- A justification of car parking provision and site servicing arrangements
- The proposed allocation of parking to apartment types in residential developments;

- Access for the mobility impaired;
- Estimates of trip generation by the development and the impacts of trips generated by the development on the road network and other movement systems;
- Means of accommodating and integrating trips generated by the development including necessary improvements to public transport services, pedestrian systems, bicycle routes, and the road network;
- Means of mitigating any adverse impacts of the development on movement systems;
- Means of improving access to the site having regard to vehicular, pedestrian, cycle and public transport access;
- Impacts on and means of improving pedestrian accessibility to public transport, shops, schools, open spaces, community centres and the like,
- Impacts on and means of improving pedestrian safety;
- Availability of on street parking and potential on street parking controls to discourage commuting and all day residential parking demand generated by the development.

This TIS addresses issues contained in the Director General's Requirements (DGR's) as follows. This TIS also addresses the issues raised by TfNSW¹ in their letter of 26 February 2014 and at subsequent meeting with TfNSW officers on 13 March 2014 with notes included in the Appendix of this report.

Figure 1: Summary of DGR's and responses in this TIS

Relevant Director General Requirements	TfNSW input to DGR's	Section in this Report
7 ² . Transport and Accessibility : Existing pedestrian and cycle movements within the vicinity of the site;	Planned TfNSW duplication of ferry wharf and enhancement of interchange Proposed development does not encroach upon the interchange footprint or degrade additional capacity	3.6
The adequacy of public transport to meet the likely future demand of the proposed development;	Undertake a Transport Impact Assessment (See separate REF and CTMP for construction phase)	1-4, 4.11
Measures to promote travel choices that support the achievement of State Plan targets, such as a location-specific sustainable travel plan;	Demonstrate travel choices and State Plan targets	4.10
The daily and peak vehicle movements likely to be generated by the development, including the impact on nearby intersections and the need/associated funding for upgrading or road improvement works (if required);	Include effects of new Homebush Bay Bridge and redesigned transport interchange and services	4.6
The proposed access and parking provisions associated with the proposed development, including consideration of the availability of	Detail the proposed design and circulation	3.1

¹ Request for DGR's SSD6387, TfNSW letter dated 26/2/2014

² DGR SSD 6387 26/2/2014

public transport and the requirements of the relevant parking codes and Australian Standards, and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and cycle networks;		
The proposed service vehicle movements (including vehicle type and the likely arrival and departure times);		3
Access and car parking arrangements at all stages of construction and measures to mitigate any associated pedestrian, cycleway, public transport or traffic impacts.		3
8. Major Events: Demonstrate how the proposed development will be constructed and operated during major event periods at Sydney Olympic Park with reference to the Major Event Impact Assessment Guidelines, 2007, in particular implications of the ferry terminal operations on the development.		4.9

1.3 Existing Studies and Reports and Guidelines

Existing studies and reports include area studies by SOPA, Council and the RMS NSW on some nearby roads, and a range of NSW Government departments. The Metropolitan Strategy for Sydney also has some information regarding this area. The key transport guidelines taken into account in this study include:

- Austroads Guidelines
- Guidelines to Traffic Generating Developments, RMS NSW
- Australian Standard AS/NZS 2890.1 – 2004 Parking facilities Part 1: Off-street car parking
- Australian Standard AS 2890.2 – 2002 Off-Street Parking Part 2: Commercial vehicle facilities.
- Australian Standard AS 2890.3 – 1993 Parking Facilities Part 3: Bicycle Parking Facilities
- Sydney Regional Environmental Plan No 24 – Homebush Bay
- Auburn LEP 2010.
- Urban Activation Precinct (UAP) Wentworth Point Local Traffic Report, Traffix, 15 July 2013
- Wentworth Point TMAP, Cattell Cooper, September 2012
- ‘Planning Guidelines for Walking and Cycling’, Department of Infrastructure, Planning and Natural Resources December 2004.
- NSW Bike Plan (May 2010).
- NSW 2021;
- Residential Flat Design Code;
- Draft Metropolitan Strategy for Sydney 2031;
- Sydney Olympic Park Master Plan 2030;

- Sydney Olympic Park Wentworth Point Precinct Master Plan 2030;
- Sydney Olympic Park Access Guidelines 2011;
- Sydney Olympic Park Major Event Impact Assessment Guidelines;
- Sydney Olympic Park Urban Elements Design Manual;
- Sydney Olympic Park Environmental Guidelines;
- EIS Guidelines – Road and Related Facilities (DoPI)
- Major Project Assessment: Homebush Bay Bridge, Homebush Bay, between Wentworth Point and Rhodes (MP10_0192), Director-General's Environmental Assessment Report, Section 75I of the Environmental Planning and Assessment Act 1979, March 2013 including Appendix G Traffic Management and Access Assessment report, Arup, 2012

2 Existing Conditions

2.1 Site Location

The site is located in Wentworth Point, north of Sydney Olympic Park, on the Parramatta River between Sydney CBD and Parramatta, as shown in the following figures:

Figure 2: Regional location (A)

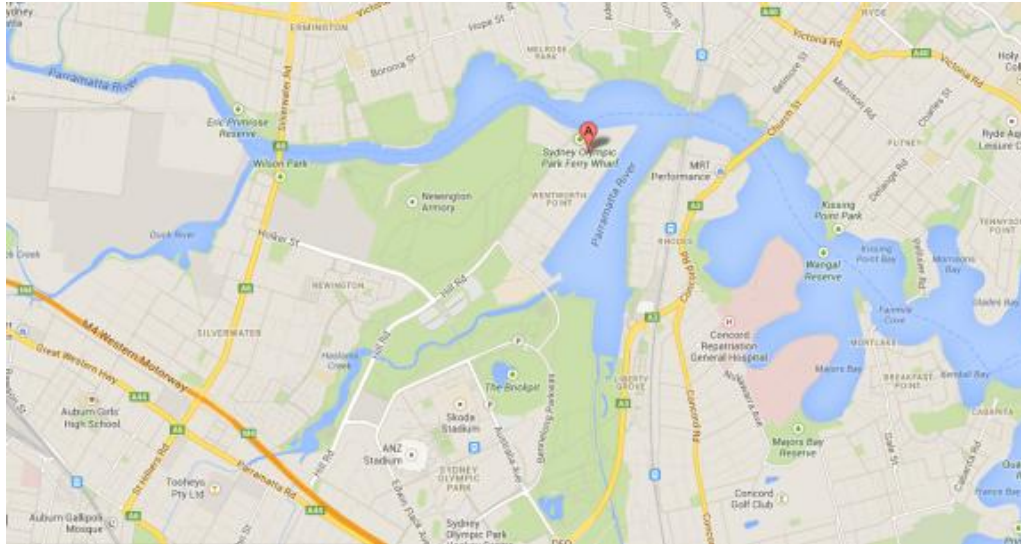


Figure 3: Site Location (A)



2.2 Description of the Site

The irregular site fronts the Hill Road extension to the Ferry Wharf to the west, Burroway Road to the south, a new road proposed to the east, and a new road to the waterfront of the Parramatta River to the north. The site is currently vacant open space and the bus turnaround serving the ferry wharf.

Figure 4: Ferry Wharf and Bus Interchange



Figure 5: STA Bus Zone for up to 4 buses, bike rack for 26 bikes, zebra crossing



Figure 6: Ferry Wharf



Figure 7: Existing intersection of Burroway Road and Hill Road, looking west



2.3 Site Surrounds

The subject site is adjoined to the east by a remnant industrial site and to the south by a warehouse buildings and current residential redevelopment on the south side

of Burroway Road, and remnant industrial and warehouse uses to the west of Hill Road.

2.4 Road Hierarchy

The road hierarchy is shown in the following descriptions and photographs:

- Hill Road (Collector road) 2+2 lanes narrowed to 1+1 lane midblock traffic and 50km/h speed limit Hill Road to/from the south is an approved route for restricted vehicles (including 26 metre B-Double articulated trucks). Hill Road is a “Special Event Clearway” tow away zone during events.
- The Western Motorway (M4): an RMS Motorway (M4) that generally runs in an east-west; carries 83,800 vpd in the vicinity; 3+3 lanes, 90 km/h speed limit
- The Great Western Highway / Parramatta Road: an RMS State Road (TCS58) carries 58,700 vpd in the vicinity of the site. 3+3 lanes, 60km/h
- Homebush Bay Drive: an RMS State Road (RR7047) 3+3 lanes, 60km/h speed limit
- Holker Street: a local road 2+2 lanes plus dedicated bus lane in each direction
- Burroway Road: a wide local road. 2+2 lanes including unrestricted kerbside parking on both sides;
- Bennelong Parkway: a local road, 1+1 lane of traffic
- Australia Avenue: a local road, 2+2 traffic lanes

Figure 8: Hill Road looking north from Bennelong Parkway



Figure 9: Burroway Road looking west towards Hill Road



2.5 Site access

Site vehicular access is currently limited, with a loop road to the bus stops serving the ferry wharf, and parking for seven cars, mostly used by disabled parking

permit holders and ferry/bus staff. There is strong local demand for car parking, including ferry travellers and construction workers. There is modest pedestrian traffic along all the frontage paths and footpaths. The busiest path is on the river frontage, but counts indicate this footpath still only carries less than twenty pedestrians per hour on weekdays.

2.6 Demographics and Mode Split

Wentworth Point currently³ has:

- A high reliance on private vehicles as the main form of Journey To Work (JTW), with a car mode share with 83 per cent by car (driver and passenger), which is 10 per cent above the Greater Sydney average.
- A higher mode share by car for JTW trips compared to the surrounding travel zones: Approximately 14 per cent of residents at Wentworth Point use public transport (train, tram, bus and ferry) to get to work, which is lower than both Newington (20 per cent) and Rhodes (29 per cent).
- A lack of good public transport options: Public transport in Wentworth Point mainly consists of train trips combined with other modes including driving. Trips by ferry and bus only represented 2 per cent and 1 per cent respectively of all JTW trips.
- Wentworth Point JTW trip destinations are spread across 35 local government areas (LGAs), but approximately half of all trips (51 per cent) are to just five LGAs. The greatest proportion of JTW trips is to Sydney LGA with 19 per cent, followed by local trips within the Auburn LGA (14 per cent), Parramatta (10 per cent) and Ryde (8 per cent).

However, the rate and extent of recent and future development in Wentworth Point suggests that these demographic and transport characteristics may evolve rapidly.

2.7 Transport and Traffic conditions

Typical daily (Annual Average Daily Traffic, AADT) and am and pm peak traffic characteristics are shown as follows. Hourly traffic flows are contained in the intersection analysis in the appendices. Traffic patterns further south on Hill Road north of Bennelong Road are shown in the following graphs: volumes exhibit a typical commuter/construction traffic peaking pattern, speeds average less than 49km/h with an 85th percentile speed of 58km/h, and 87% of traffic vehicles are light vehicles.

Figure 10: Daily Traffic Volumes⁴

Street Location/AADT Daily Traffic Volume in Year:	Year: 2013	Source:
M4 Western Motorway near Hill Road	84 000	Traffix
Great Western Highway/Parramatta Rd	59 000	Traffix
Hill Road north of Bennelong Road	10 400	HC count
Hill Road South of Burroway Road	700	HC Estimate
Burroway Road	500	HC Estimate

³ Wentworth Point TMAP based on 2006 Census data

⁴ Source: Daily Traffic, AADT, RTA NSW

Figure 11: Traffic Volumes on Hill Road north of Bennelong Parkway, Nov 2013

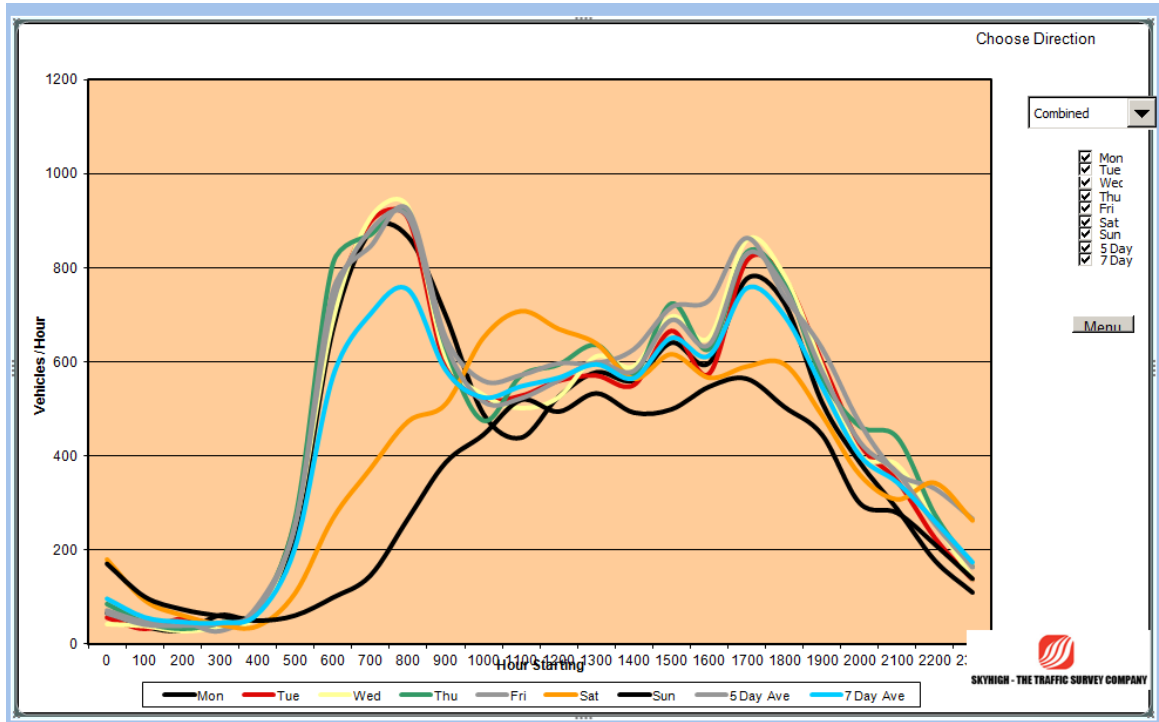


Figure 12: Vehicle Types on Hill Road north of Bennelong Parkway, Nov 2013

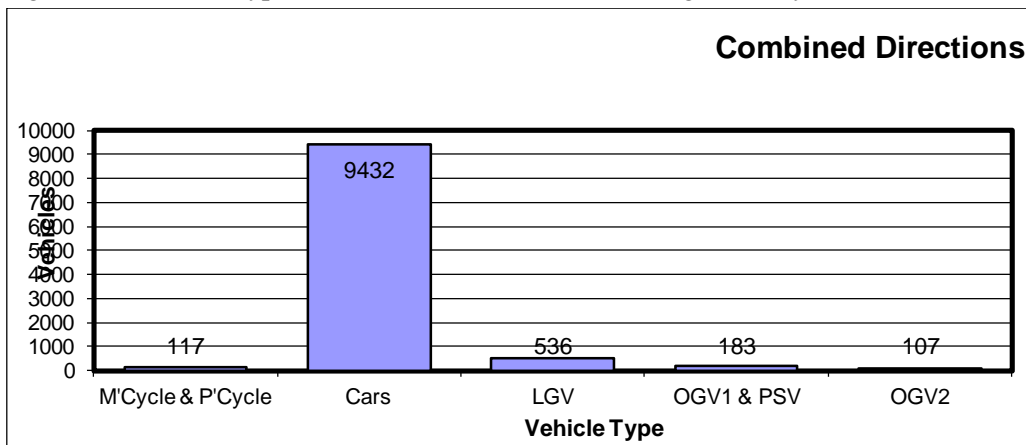
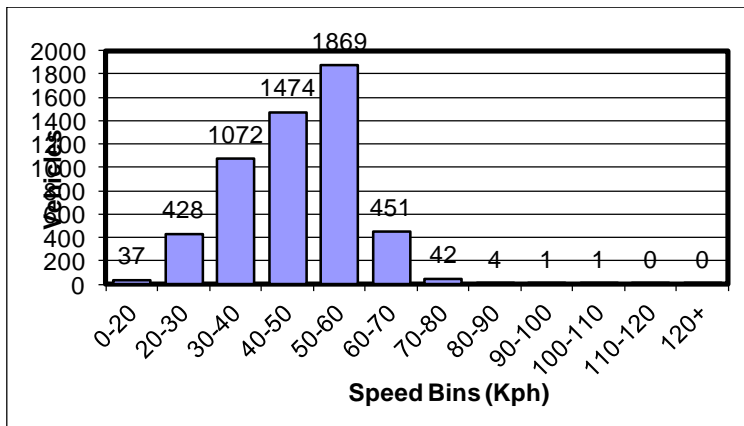


Figure 13: Traffic Speeds on Hill Road north of Bennelong Parkway, Nov 2013



Observations indicated significant but relatively modest pedestrian/jogger and bike flows of less than 20 per hour on all the footpaths and shared bike paths around the intersection and the subject site.

2.8 Existing vehicular traffic generation

The existing site uses are a bus/ferry wharf and limited short stay car parking.

Figure 14: Subject site existing vehicle traffic flows⁵ on typical weekday

Hour starting	Vehicles in	Vehicles out
07.30	11	12
13.00	5	5
17.00	23	29

2.9 Bus, Ferry and Taxi

Public bus stops are located on both sides of Hill Road and at the Ferry Wharf. Wider regional services are available at SOP Station. Sydney Buses Route 526 serves the Sydney Olympic Park Ferry Terminal adjacent to the site. The 526 service provides frequent connections to Sydney Olympic Park, where services to Lidcombe Station are available via the Olympic Park train service or Sydney Buses Route 401. The Lidcombe Station train service provides access to the Bankstown, Inner West, Southern, and Western lines, which provide access to the overall metropolitan rail network.

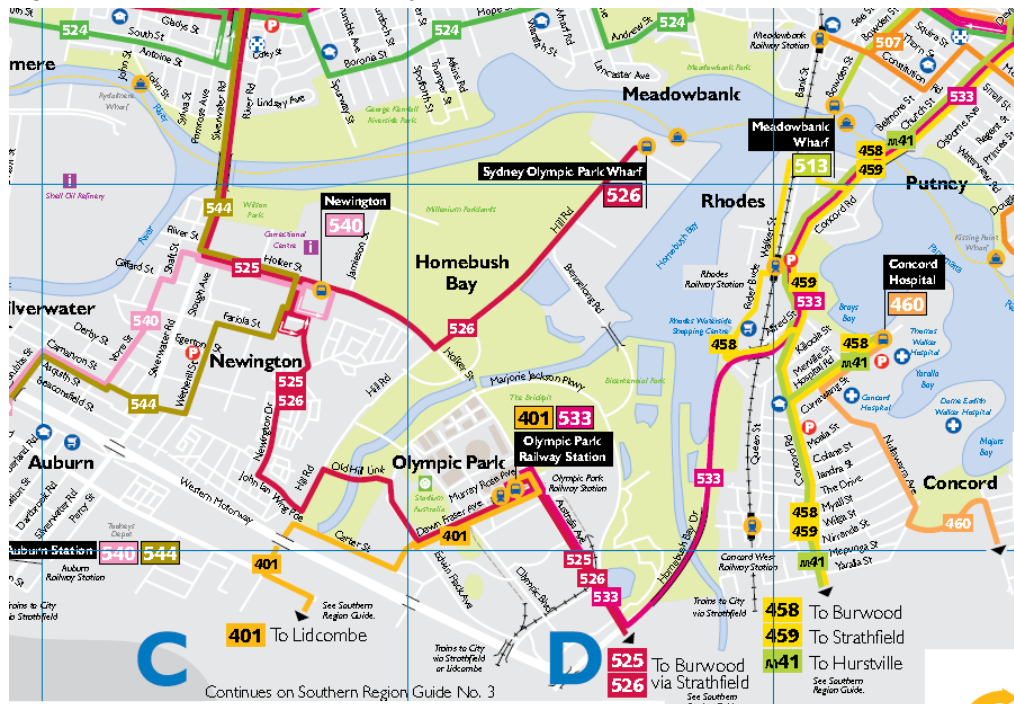
The Sydney Olympic Park Ferry Terminal also provides services between Parramatta and Circular Quay through the Sydney Ferries Parramatta River ferry service. This service departs to the King Street Ferry Wharf, en route to the Sydney CBD, every half hour during the weekday peak hour periods. Weekday peak hour bus frequency varies between 15 minutes to half an hour depending on the direction of travel. Frequency is lower during the weekends and public holidays. The Figure below illustrates the bus routes in the area.

The interchange is also used by private coach services, including tourist coaches to the Blue Mountains and other locations who transfer their passengers to the ferry service to the Sydney CBD.

Taxis are not widely available in the area, and would generally be ordered by phone.

⁵ Weekday, Traffix data and HC observations

Figure 15: Bus routes near the subject site



2.10 Train

Rail Stations are shown in the above map. Olympic Park railway station is located about four kilometres south of the site, a circuitous twenty minute bus trip, or a quarter hour by bike or three quarters of an hour walk. On-train travel time to Central Station is about half an hour. Service frequency is approximately a quarter hour in peak hours and half hourly off peak.

2.11 Pedestrian and Cyclist

There is a good network of bike routes and pedestrian paths near the subject site. Bicycle and pedestrian volumes along the roads and paths are significant but modest at present, generally observed⁶ to be less than 20 cyclists and pedestrians per hour. Walkers comprise local residents to the ferry, parked cars to the ferry, and some recreational walkers. Cyclists comprise local trips to the ferry and buses and some recreational cyclists. The area is relatively flat and well suited to walking and cycling. The routes near the subject site include:

- Westbound shared path to Newington Armoury and towards Parramatta
- Eastbound shared path from Ferry Wharf to Homebush Bay
- Southbound shared path to Woola Ra parklands, Newington and SOP
- On-road cycle routes via Hill Road and Bennelong Parkway

⁶ Henson Consulting November 2013, 22 Jan 2014.

Figure 16 Cycleway⁷'s network



Figure 17: Shared path along the west side of the subject site.



Bike parking racks to accommodate at least 24 bikes is provided at the bus/ferry interchange. Peak observed occupancy was three bikes.

⁷ SOPA Bike Safari Website

Figure 18: Bike Parking at interchange.



2.12 On-street car parking

There is on-street parallel parking with no time limits along the kerbs of the remaining industrial era streets: Hill Road (east side) and Burroway Road. Within the newer residential subdivisional areas, there is time-limited parking on both kerbs in indented parallel parking bays. There are also six car spaces at the east end of the bus road, two bays for disabled parking and four short-term car bays.

Observed occupancy of these bays was slightly higher in the morning, but ranged between 90% and 98% occupied throughout the day, indicative of a suppressed demand for car parking from employees of the remaining industrial uses, construction workforce, and ferry commuters.

2.13 Current road works and traffic management

Discussions with Council and RMS officers did not indicate any major immediate transport network works. Longer-term upgrades discussed in the following Proposed Development chapter include east-facing freeway connection ramps at Hill Road proposed as part of WestConnex upgrades, and a suite of future local intersection upgrades proposed as part of the UAP traffic study.

2.14 Road Safety

RMS records⁸ indicate that there is no unusual concentration of crashes around the subject site.

⁸ Crashstats 2010

2.15 Special Event public transport, traffic and parking

SOPA is a venue for many special events each year ranging from minor craft fairs up to “double header” football finals and the Royal Easter Show. At various threshold attendance levels special event transport and parking arrangements are implemented. For the subject development, these have several major effects. Special event clearways are implemented along Hill Road, banning kerbside parking and allowing extra buses to layover and queue on approach to the ferry wharf. Special event bus and ferry and train services are provided, increasing services to the central area and Olympic Boulevard. Special event traffic management of flows to car parks etc. and car parking restrictions are enforced with traffic management staff and tow-away operations.

Pedestrians often are willing to walk long distances to get to special events, but the ferry wharf is four kilometres from the central SOPA area and is too far to walk for most people.

The local effect of this special event mode on the subject site is not significant at present: buses and coaches in special event mode queue on Hill Road on approach to the managed ferry wharf to pick up and drop off passengers.

3 Proposed Development

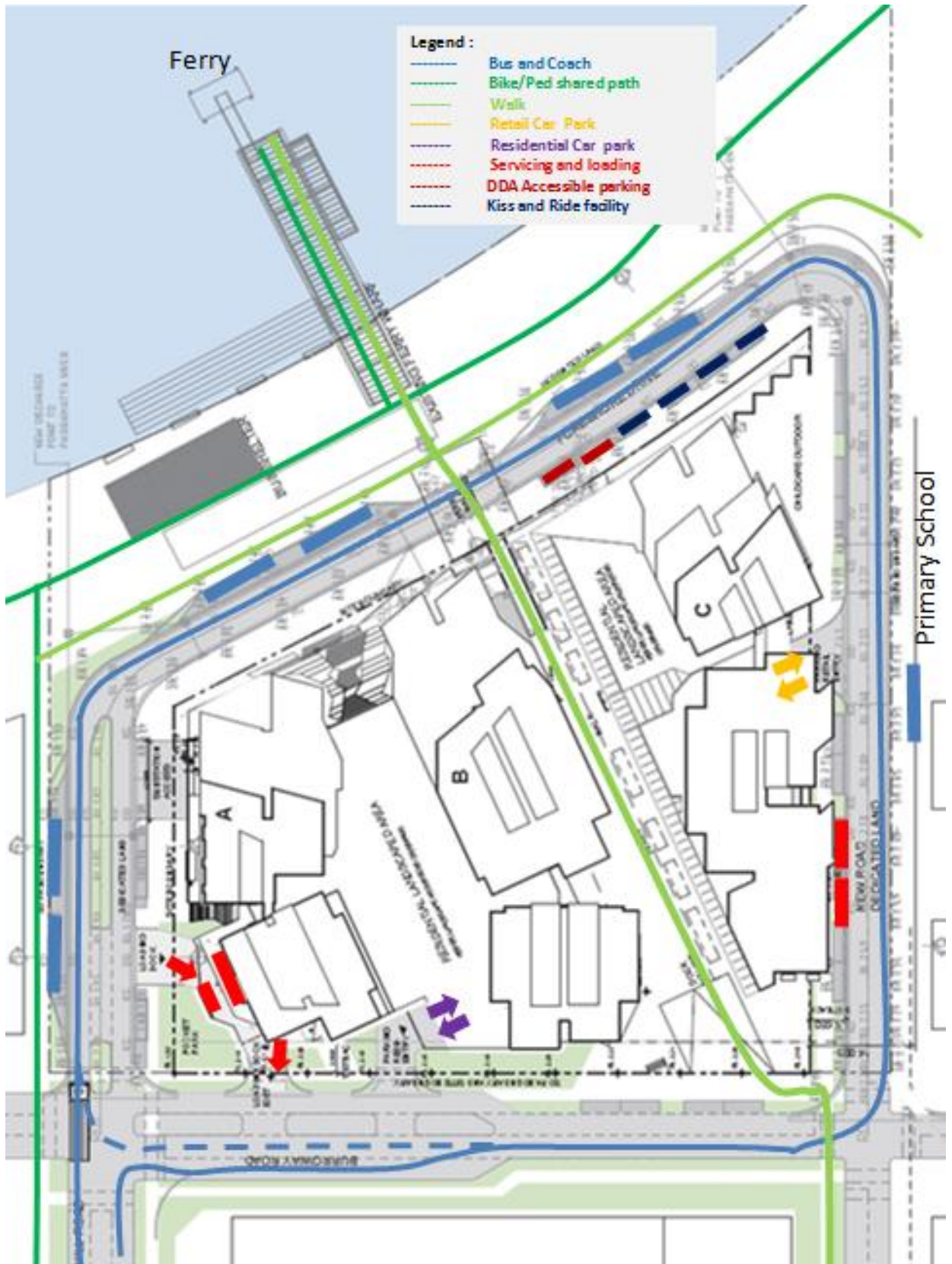
3.1 The Subject Development

The DA is seeking approval for:

- excavation and site preparation works,
- three basement and nine building levels including a retail supermarket, specialty retail and amenity areas, children's daycare, 256 residential units, and three levels of basement parking comprising 420 car parking spaces, motorcycle spaces and bicycle parking spaces.
- loading dock
- frontage footpaths and pedestrian accesses
- appropriate signage to direct delivery and service and visitor vehicles to the appropriate entrance and parking locations.
- associated landscaping and open space.

The subject proposal is described in Rice Daubney Drawings DA-0000 to 80003 series of May 2014. The transport and access diagram is shown in the following figure.

Figure 19: Transport and Access Diagram



Residential parking is accessed via ramps off a driveway onto Burroway Road. Retail and commercial parking is accessed off via ramps off a driveway onto the new north-south proposed road fronting the east of the subject site.

All parking for persons with a disability is conveniently located with no need to circulate through the main parking.

The site frontage is gently graded and the sight distances of the driveways will provide sufficient views along the road and across the footpath.

Retail delivery and service vehicle access is to the loading dock at the south western corner of the site. The medium sized supermarket and other developments will be served mostly by small and medium trucks up to the size of a heavy rigid truck (HRV) up to 12.5m long.

The Waste Management consultant has advised that the garbage truck will collect from the new road to the east of the subject site, accessing by foot the waste holding room at level 1, which is the ground floor. In Basement level 1, there are five garbage rooms under each garbage chute with an associated compactor.

Pedestrian access to the building is via the perimeter public footpath and crossings to lift lobbies at ground level, or via the lifts and stairs and doors from the parking areas. A through-site pedestrian link connects with the pedestrian axis of the ferry wharf and bus interchange and through to the footpath network to the south, and the proposed pedestrian bridge across Homebush Bay to Rhodes.

The existing bike paths and bike parking are preserved. Additional bike parking will be provided in the subject development.

The existing bus stop and ferry wharf capacity is preserved. Regular buses will circulate north up Hill Road, serve stops on the northern kerb of the foreshore road and return south via the new eastern road, Burroway Road westbound, and Hill Road southbound. Special Event bus services will use this same route under special event clearway management conditions.

3.2 Hours of operation

Hours and days of operation of the car park are 24 hours per day seven days per week. The loading dock will be used primarily during business hours.

3.3 Design vehicles

The design vehicle for the car park is the Australian Standards AS2890.1 Off Street Car Parking B99 vehicle (99th percentile vehicle represented by a very large car or Ford Transit Van medium wheelbase van) to public parking. The design vehicle to service waste using a private contractor is also likely to be the AS2890.2 Medium Rigid Vehicle (MRV garbage truck 8.8 m long) and for the retail loading dock the Heavy Rigid Vehicle (HRV single unit truck/bus 12.5m long). The design vehicles for the bus/ferry interchange are a HRV 12.5m bus for most services and a 14.5m long non-rear-steer rigid tourist coach for occasional services.

3.4 Analysis of projected queuing at entrances

Sufficient parking and traffic management elements are provided on site to avoid queuing at the entrance. There will be keycard/intercom access controlled roller shutters and no expected delay to vehicles including bicycles entering the site. Visitor vehicles will gain access via an intercom system.

All parking spaces and circulation aisles generally comply with AS 2890.1 – 2004 off street car parking, bike parking, and other standards.

3.5 Other local development

Cumulative traffic impact assessment addressed in Section 4 considered nearby proposed developments including the following.

3.6 Sydney Olympic Park Ferry and Bus Interchange

The direct ferry and public bus and charter bus interchange opportunities have recently been improved and could potentially be further improved in the short and medium term by with ferry and bus service enhancements offered by the new Homebush Bay Bridge transit bridge connecting Wentworth Point and Rhodes peninsulas. The wharf is to be enhanced by a committed NSW Government project to duplicate the ferry wharf space on the existing pedestrian axis, and upgrades of the cycling facilities, pick up and drop off zones, and footpaths. TfNSW further advised that ferries may in future be moored overnight at the wharf, but not including ferry maintenance services. TfNSW noted⁹ this might result in increased noise and vehicle movements.

3.7 Wentworth Point Urban Activation Precinct

In 2013, the NSW Department of Planning and Infrastructure released a proposal for the transformation of over 18 hectares of prime waterfront land at Wentworth Point into Sydney's newest residential community. The proposal was open for public comment and aimed to help tackle one of Sydney's most pressing challenges - housing supply and affordability – by rezoning vacant and underutilised industrial land for residential uses close to infrastructure, transport and jobs near the geographic heart of the metropolitan region. In addition to rezoning the land, the proposal also included controls for height and floor space ratios. To be developed over 20 years, key features of the proposal include:

- 2,300 new dwellings in a range of low, mid and high-rise residential buildings
- one third of the precinct as public open space, including a new 3.9 ha peninsula park along with three new pocket parks
- linked foreshore cycling and walking paths along the Parramatta River and Homebush bay foreshores
- an 18-classroom school with playing fields by 2017
- new maritime uses adjacent to Homebush Bay for rowing/kayaking facility, dry boat storage and supporting retail and businesses
- recent approvals including the Fairmead consortium's residential precinct and a new pedestrian, cyclist and public transport bridge linking the area to Rhodes across Homebush Bay.

3.8 Wentworth Point TMAP.

The Transport Management and Accessibility Plan (TMAP) related to the Wentworth Point Planning Proposal on 24.9 hectares of land at Wentworth Point

⁹ TfNSW DGR's 26 Feb 2014.

(formerly known as Homebush Bay West) in the western suburbs of Sydney. The concept of a pedestrian, cycle and public transport bridge linking Wentworth Point with Rhodes, the next peninsula to the east, has been developed, and construction of the bridge is the subject of a development approval process. The bridge has the potential to improve access between Wentworth Point and the railway station (and other services) at Rhodes. Owners of undeveloped land that are not included in this proposal are the NSW Government agencies of Sydney Olympic Park Authority (SOPA) and NSW Maritime. The Proposal is for additional floor space of permissible development, based on the increased accessibility and amenity offered by the proposed Homebush Bay Bridge. In particular, the proposed changes are to: increase residential floor space by approximately 105,000 m², increase building heights in a number of areas to 16 to 25 storeys, and to make changes to streets and local land use to improve the integration of the bridge landing.

The following targets were adopted in the TMAP to support an average JTW mode-share target of 40 per cent non-car modes for Wentworth Point:

- Journey to work (JTW) trips originating in Wentworth Point and with a destination in the Sydney CBD will have an 80 per cent public transport mode share.
- JTW trips originating in Wentworth Point and with a destination in the Parramatta CBD will have a 50 per cent public transport mode share.
- JTW trips originating in Wentworth Point regardless of destination will have an average 30 per cent public transport mode share.
- JTW originating in Wentworth Point and 3km or less will have a 50 per cent walk/cycle mode share.
- JTW trips originating in Wentworth Point regardless of trip length will have an average 10 per cent walk/cycle mode share.

3.9 UAP Local Traffic Report

The UAP report¹⁰ was commissioned by the Department of Planning and Infrastructure (DP&I) to undertake a traffic impact assessment in support of the Wentworth Point 'Urban Activation Precinct' (UAP) primarily for residential purposes, but also with a primary school, maritime facilities, ancillary retail area and extensive open space also provided to serve the emerging community and locality generally.

The report methodology focused on local traffic impacts, in acknowledgement of the fact that the arterial road network in the locality would be the subject of separate and ongoing strategic assessment, with a view to identifying the full range of infrastructure provision that is needed to accommodate not just traffic associated with the subject site, but with development within the wider Wentworth Point area more generally. This strategic study would also include consideration of background traffic growth on the arterial road network, probably to 2031. These investigations were expected to take up to a year to complete, with stakeholder participation including representatives from Auburn Council, DP&I, Roads and Maritime Services (RMS) and Transport for NSW (TfNSW). WestConnex motorway proposals will further affect regional transport.

¹⁰ UAP Local Traffic Report , Traffix, July 2013

The study includes a ‘cumulative test’ scenario that considers the potential impacts on the local road network associated with the development of all residential zoned land within the Wentworth Point area, such as the Fairmead Consortium development site, in addition to the ‘base plus development’ scenario (but excluding the subject SOPA site).

Traffic surveys of the road network within the subject study area were undertaken to determine the existing traffic conditions. Accordingly, peak period traffic surveys (morning and evening) were undertaken at the following key intersections, which comprise the extent of the local study network:

- Intersection of Hill Road with Burroway Road;
- Intersection of Hill Road with Bennelong Parkway;
- Intersection of Hill Road with Holker Street;
- Intersection of Bennelong Parkway with Marjorie Jackson Parkway; and
- Intersection of Australia Avenue with Bennelong Parkway and Sarah Durack Avenue.

Analysis of the survey shows that the maximum volumes over these peak periods occurred during the following time periods and these have been used for the subsequent assessment:

- Morning Peak Hour: 7.30 – 8.30am; and
- Evening Peak Hour: 5.00 – 6.00pm.

3.10 Wentworth Point Urban Design Masterplan

The Wentworth Point Urban Design Masterplan 2030 was prepared for SOPA in 2010. The Masterplan provides design guidance for individual developments within the precinct, including the following graphical extracts.

Figure 20: Extract from Masterplan, showing the subject site.



Figure 21: Masterplan Foreshore road

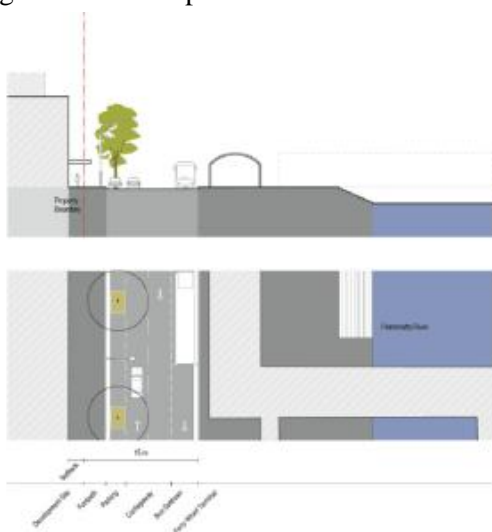


Figure 22: Masterplan Pedestrian and Cycle Routes



3.11 Homebush Bay Bridge

The bridge over Homebush Bay connecting the suburbs of Wentworth Point and Rhodes was designed to accommodate public buses, maintenance and emergency vehicles, and pedestrians and cyclists. Private motor vehicles (including taxis, hire cars and motor bikes) would be prohibited from using the bridge. The future proposed and approved bridge will bring the subject area within a reasonable walking and cycling distance from Rhodes shopping centre and Rhodes railway station. Modelling has been conducted using a worst-case scenario of future peak hour bus operation (AM weekday) at full development of 20 buses per hour.

3.12 Western Sydney Light Rail Network

Recent feasibility studies¹¹ by Parramatta City Council identified potential light rail route options including Parramatta – SOP –Strathfield -Burwood, and Parramatta-Wentworth Point- Rhodes – Breakfast Point. The study recommended the First Stage priority to routes linking Castle Hill-Parramatta-Westmead-Macquarie Park. However, light rail branch services to SOP and Wentworth Point were shown to remain as Next Stage longer-term possibilities. This local light rail

¹¹ Unlocking Western Sydney's Potential with Light Rail , part 1&2 Feasibility Report, Parramatta City Council, August 2013.

would be a major benefit to the longer-term travel choices for the subject development.

3.13 Other studies

The SKM Homebush Bay Area Traffic Study undertaken in 2009 on behalf of Auburn Council was a Paramics micro-simulation model study, which documents traffic conditions in 2009 during weekday peak periods; and the SKM Parramatta Road Retail Study undertaken in 2011 on behalf of Auburn Council. This report was a Transport Management and Accessibility Plan (TMAP) Study and was essentially an update of the 2009 study, although it assessed different future land use scenarios. The report assessed the performance of the road network in 2019 and 2029 with full development of the land parcels considered in these reports. The reports identify a menu of local improvements.

3.14 Parking

A place that has a high level of access to public transport and services will need less car parking than a place that has a low level of access to transport and services. Parking in Wentworth Point is currently required to be provided in accordance with the Homebush Bay West DCP (2004). This currently has a cap on the provision of residential parking in new buildings as follows:

- Studio Maximum of 0 spaces/unit
- 1 bedroom Maximum 1.0 spaces/unit
- 2 bedroom Maximum 1.5 spaces/unit
- 3 bedroom Maximum 2.0 spaces/unit
- Visitors Maximum 0.2 spaces/unit

Parking for non-residential uses is proposed to be established on the basis of Auburn Council's Parking DCP where applicable. The UAP traffic study concluded residential parking rates are recommended for adoption as minimum parking rates:

- Studio 1.0 spaces/ unit
- 1 bedroom 1.0 spaces/unit
- 2 bedroom 1.1 spaces/unit
- 3 bedroom 2.0 spaces/unit
- Visitors 0.1 spaces/unit

The parking provision for the subject site complies with the requirements of the Sydney Olympic Park Masterplan 2030 (Part 4, p100) maximum rates as follows, and summarised as shown by the following table.

- 1 bedroom 1.0 spaces/unit
- 2 bedroom 1.2 spaces/unit
- 3 bedroom 1.5 spaces/unit
- Visitors 0.25 spaces/unit
- Supermarkets 4 spaces per 100m²
- Retail 1 space per 50m²

- Childcare: 1 space per 4 children and suitable drop-off, 1 space per two staff ,
- Minimum bike parking at same rate as residential , commercial 1 space per 50m² & 1space per 75m² visitors

Figure 23: Parking Space Requirements and Provision for Subject Site

Floor space type	Units	Car Parking maximum spaces required	Car parking provided spaces	Bike parking required spaces	Bike parking provided spaces
1 bed	46	46			
2 bed	190	228			
3 bed	20	30			
Total residents	256	304	278	304	66
Residential Visitor		64	32	64	at-grade
Child care		8	8		
Supermarket	1789m ²	72			
Retail	1155m ²	23			
Total Retail		95	102	68	80
Retail and Other visitors				45	at-grade
Total	256	471	420	481	146 plus at-grade

The rate of visitor car parking provision is in excess of the UAP minimum, and allows for some shared visitor parking with the retail parking. This situation is common in mixed-use developments such as East Village at Zetland, where short-term visitors can share the retail car park without the problems of the residents controlling mis-use of spare visitor car parking.

The UAP traffic report also stated that in relation to the visitor-parking rate, it is recognised that with the extensive kerbside parking that is available within the UAP area (in the order of 200 spaces), some reliance on on-street parking for visitors could be considered. This would also activate the street frontages and make full use of what is an available parking resource (i.e. on-street parking). This is a matter that could be considered for individual development applications, depending on their circumstances. This would include a consideration of car sharing schemes and reserved car parking spaces for car-sharing vehicles.

The total bike parking provided is considered to be sufficient: a core of 146 secure bike spaces within the building exclusive to bikes, plus additional secure bike parking available in basement storage areas, plus lower security visitor bike parking racks located conveniently at-grade around the perimeter of the site close to the residential, retail, and other entrances.

4 Assessment of Proposed Development

4.1 Managing Transport Demand

The Masterplan and TMAP emphasise managing the transport demand that is generated by a development to encourage more sustainable transport options. 'Managing Transport Demand' refers to the measures taken which minimise the need to travel and the length of trips, particularly by cars, and also encourages travel by more sustainable modes of transport (DIPNR, Integrating Land Use and Transport, 2001).

The proposed development is appropriately located close to convenient pedestrian paths, crossings, bus stops, railway stations, and bike routes that link conveniently to local and regional shopping and dining, employment, schools and open space and recreation. The subject building provides shopping and other services locally. This convenience will encourage maximum use of transport other than private cars. Many residents are likely to often use these modes in preference their private cars, and therefore reduce the peak hour traffic generation.

4.2 Traffic generation during design periods

A traffic generation study¹² of similar developments in the vicinity of South Sydney established the traffic generation rates of denser residential developments, in particular 'village' style developments which consist of a number of high rise blocks with facilities such as convenience stores, childcare and recreation centres for residents.

The 'Guide to Traffic Generating Developments' published by RTA has the traffic generation rates for selected types of developments. These rates range from 0.2trips/dwelling/h and are commonly adopted in traffic impact studies in NSW. However, the guide does not provide any traffic generation rate for 'village' style high-density development with more than one high-rise block with some internal facilities and located close to bus services but reasonably away from train stations. In 1998, Arup conducted traffic surveys in the three developments in Rosebery, Waterloo and Moore Park area to establish a traffic generation characteristics in those developments. Since the data is more than 10 years old, Arup conducted similar repeat surveys on these developments in 2008 to determine any change of traffic generation rate i.e. the existing traffic generation by these developments. The three sites surveyed are Moore Park Gardens, Waterloo; Kimberley Estate, Rosebery; and Raleigh Park, Moore Park.

Traffic generation rates in the am peak hour for the 1998 and 2008 survey remain similar but in the pm peak hour the rate has increased by 0.1trip/unit/h. The trip characteristics shows that while the morning peak period mainly consists of journey to work trips, the afternoon peak period often comprises of journey from work and recreational trips, such as dining and other entertainment. The three surveyed sites had an average traffic generation rate of 0.42 trips/unit/h in the am peak hour and 0.50 trips/unit/h in the pm peak hour.

The UAP traffic report found: *With regard to development impacts, the assessment adopted for this report is based on an adjusted high-density residential trip rate of 0.35 vehicle trips per hour per unit during peak periods, as*

¹² Arup, Zetland Mixed Use Development – Northern Precinct Victoria Park, Arup Transport Assessment, August 2006

adopted in the study terms of reference. This reflects a 'worst case' scenario that does not fully take into account the benefits that will flow from a number of public transport initiatives, in particular, the introduction of additional bus services, ferry enhancements and construction of the proposed Homebush Bay Bridge – which have all been disregarded from this study. The trip rate of 0.35 is significantly higher than other renewal areas, such as Rhodes for instance which, being closer to rail, adopts a trip rate of 0.29 trips per unit.

The full potential of these alternative transport improvements (the benefit of which being reduced trip rates) has not been assessed in this study, in order to consider a worst-case traffic planning scenario. This therefore provides a 'safety margin' in terms of the conclusions in this report relating to road improvement works.

Recent surveys published by RMS¹³ confirm lower traffic generation rates. However, this TIS report has applied the worst-case UAP rates as follows, including the above safety margin, as follows.

Figure 24: Subject site traffic generation (on-street peak hour)

Movement in peak hour (passenger car equivalents, PCE)	Existing (mainly from bus/ferry interchange)	Subject development ^{14, 15}
AM in	11	69
AM out	11	122
PM in	23	230
PM out	29	177

Truck and service vehicle traffic generation is included in the above traffic generation. There is a wide range of estimates for the demand or recommended provision of loading docks in existing and new developments. For the proposed mix of supermarket and retail uses one bay per 2000m² floorspace is recommended¹⁶. One HRV bay and one MRV bay are provided in the loading dock and standing area within the south west corner of the subject site. A kerbside loading zone is also proposed on the eastern frontage.

Proposed service vehicle movements including vehicle types and likely arrival and departure times were estimated based on research undertaken for other developments including East Village in Zetland. The estimated service traffic is shown in the following table.

¹³ RMS Updated Traffic Surveys to Guide to Traffic Generating Developments TDT2013/04a, August 2013

¹⁴ Based on UAP traffic generation rates, AM in/out: 255 residences @0.35/unit 80% out=18/71; 1253m²GFA supermarket @0.2*15.5/100m² 50% out=19/19trips; 1600m² specialty retail @0.2*4.6/100m²GFA 50% out=8/8trips; 540m² daycare @1/20m² ,50% in =24/24trips; total 69/122 trips.

¹⁵ Based on UAP traffic generation rates, PM in/out: 255 residences @0.35/unit 20% out=71/18; 1253m²GFA supermarket @15.5/100m² 50% out=95/95trips; 1600m² specialty retail @4.6/100m²GFA 50% out=40/40trips; 540m² daycare @1/20m² ,50% in =24/24trips; total 230/177 trips.

¹⁶ Traffic Engineering and Management, Monash University, Prof KW Ogden, Table 4.1.6

Figure 25: Estimated Service Traffic¹⁷.

Site:		SOPA subject site					
Land Use/Vehicle type	hours:	SOPA area (m2)	Courier vans LRV	Light trucks LRV	Medium and Heavy Rigid Trucks, HRV and MRV	Articulated Vehicles, AV (AV to HV for SOPA IGA)	Total Vehicles
Supermarket		1253	6	0	6	0	12
Specialty Retail;		1600	3	7	13	0	23
total		2853	9	7	19	0	35
ratio Sopa/East Village		0.246					
Time periods within weekday:							
Early	0600-08.00		1	1	6	0	8
AM peak	08.00-09.00		1	0	3	0	4
Day between peak hours	09.00-17.00		5	5	2	0	12
PM peak hour	17.00-18.00		1	0	3	0	4
Evening	18.00-22.00		1	1	5	0	7
Overnight	22.00-06.00		0	0	0	0	0
total			9	8	18	0	35

As observed at other centres, goods from growers, manufacturers and distribution centres are routed to stores in a cost effective manner to meet customer demands. Large deliveries are scheduled by the store and IGL logistics to fit within delivery time windows, local traffic conditions, school peak hours etc. Smaller delivery vehicles do not have specific delivery schedules but are directed to deliver outside the major truck delivery times. On this basis¹⁸, one loading dock is appropriate at the subject site, supported by deliveries by smaller trucks and vans within the loading dock and loading zone and the car park for other couriers, vans and cars.

4.3 Pedestrian and Cyclist generation and movements

Pedestrian and bike generation from the development will be able to circulate via the public pathways that exist to the site. These flows will be substantial, but are estimated to be of an order that can be accommodated at acceptable levels of service on the existing and planned shared path and pedestrian footpath network without detailed capacity analysis. For example, the maximum pedestrian demand peaking flow might reasonably be associated with the school or the simultaneous arrival and unloading of two full 200 passenger ferries and two full 60 passenger buses, a total of 520 persons in a five minute period. This is less than the capacity of a 3m wide footpath at a good Fruin Level of Service C of 50 persons per metre width per minute of 750 persons per five minutes.

4.4 Traffic Distribution and Assignment

The distribution of traffic to and from the site to surrounding areas of Sydney was estimated from a range of sources. The future trips were assigned onto the study road network in accordance with destination patterns for the Wentworth Point area based on information extracted from the NSW Government's Bureau of Transport Statistics, 2006 Journey to Work (JTW) data, which is summarised below:

- Westbound, Northbound and Southbound on Holker Street: 25%

¹⁷ East Village Loading Dock Report, Zetland, Henson Consulting, June 2012. Data rounded based on ratio of SOPA/East Village floor area.

¹⁸ 10 200m2 GLFA Retail, 5400m2 GFA commercial, 1000 m2 GFA Auto Service

- Southbound and Westbound on Hill Road: 45%
- Eastbound, Northbound and Southbound on Australia Avenue: 30%

4.5 Background Traffic Growth

The surface transport task in Sydney is projected to grow passenger kilometres at a compound annual growth rate of 0.9 per cent per year from 2010 to 2056. Combined with local site developments outlined above, a background growth of 2% factor was added to all existing background traffic flows as a basis for analysing the future traffic flows with the subject development. This has been included in the UAP traffic analysis.

4.6 Impact of Generated Traffic

The vehicular trips generated by the development during the peak hours will distribute across the access network. The peak hour levels of traffic generated, and the inter-peak arrival and departure of vehicles to the site will be well provided for by the grid network and its connections to the main road access system, supplemented by good walking cycling and public transport facilities. The subject site traffic was added to the UAP Scenario 2023 Cumulative Traffic scenario. Traffic was assigned to the subject site 50% via the foreshore road and 50% via Burroway Road, with an additional six buses per hour assigned to recirculate via the bus interchange i.e. six buses per hour recirculate from dropping off passengers at the ferry interchange then recirculate via a right turn from Burroway Road into Hill Road to then pick up passengers at the ferry interchange before departing.

Intersections were recently analysed by the Sidra intersection modelling program as part of the UAP studies, including the upgrade and signalisation of the intersection of Hill Road and Burroway Road. The intersection of Hill Road with the road to the new Homebush Bay Bridge based on estimates of traffic from recent studies¹⁹.

Figure 26: Proposed Hill Road/Burroway Road intersection upgrade (UAP report)

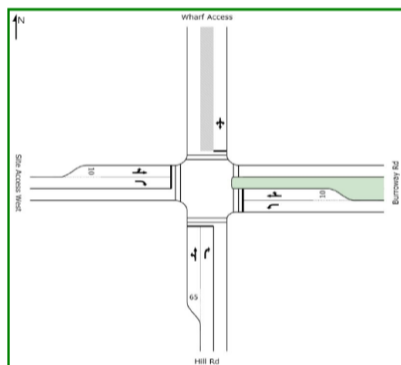


Figure 16: Interim improvement - Hill Rd x Burroway Rd - Proposed Signals

¹⁹ Homebush Bay Bridge DGR Appendix G Arup traffic study showed seven main east-west streets (Fig 12) in DCP the Wentworth Point network serving a total of 7100 dwellings, suggests 1014 dwellings or equivalent land use might be accessed via Bridge Boulevard. Based on UAP traffic generation rates, AM in/out: 1014 residences @0.35/unit 80%out=71/284. Based on UAP traffic generation rates, PM in/out: 1014 residences @0.35/unit 20%out=284/71; 20 buses per weekday peak hour, 10 in each direction, 50% circulating via Wentworth Point ferry interchange.

The results of the intersection modelling was repeated in this TIS for the key local junction of Hill Road and Burroway Road and found similar to the UAP analysis as tabulated below. Summary SIDRA outputs and Explanatory Notes are attached in the Appendices.

Figure 27: Summary of Intersection Analysis – Vehicles – weekday peaks

Intersection Scenario	Period: Weekday Peak hour	Level of Service Existing ²⁰	Level of Service with background growth ²¹	Level of Service with background growth plus UAP development plus proposed road upgrades ²²	Level of Service with background growth plus UAP development plus subject development plus proposed road upgrades
Hill Road – Burroway Road	AM	A	A	B	B
“	PM	A	A	B	B
Hill Road – Bennelong Parkway	AM	C	E	C	
“	PM	F	F	C	
Hill Road - Holker Street	AM	C	D	C	
“	PM	C	C	C	
Bennelong Parkway - Marjorie Jackson Parkway	AM	B	B	B	
“	PM	C	C	B	
Bennelong Parkway - Australia Avenue	AM	C	E	C	
“	PM	D	F	D	
Burroway Road/New Road next to School	AM	-			A
“	PM	-			A
Bridge Boulevard/Hill Road	AM	-			C
“	PM	-			B

It can be seen from Table 4 that the intersection performance of all the study intersections, with the proposed improvement schemes identified above and in the UAP report, would operate satisfactorily under the ‘base plus development’ scenario with forecasted levels of service of D or better. The detailed SIDRA results attached show that all forecasted 95th-percentile queuing would be accommodated within the existing and/or proposed lane storage.

When the Homebush Bay Bridge reaches the maximum estimated bus flows of 10 buses per hour in each direction in the peak hours, there will be some delay to the assumed 50% of buses that recirculate via the ferry wharf by a right turn out of Bridge Boulevard into Hill Road towards the wharf. Some form of priority for buses making that right turn may be required at that time by the total traffic on Hill Road, not triggered by the subject development.

²⁰ Existing Scenarios (2013) from UAP report by Traffix , Table 2

²¹ Base Case Scenario (2023) from UAP report by Traffix including SKM study 2% pa growth factor over 10 years, Table 3

²² Base plus Development Scenario (2023) from UAP report by Traffix, Table 4

4.7 Effects on Public Transport, walking and cycling

The subject site and locality is well served by public transport with many direct and frequent bus services. The foreshore road layout is in accordance with the SOP Master Plan. The existing bus-turning loop is replaced with a larger turning loop around the perimeter roads of the subject development. Buses will circulate clockwise from Hill Road northbound through the bus interchange on the foreshore road as currently, and then make a right turn into the new road past the school, then a right turn into Burroway Road, then a left turn into Hill Road southbound.

The proposed four bus stops, four park and ride bays, two disabled parking bays and two bus layover bays maintains the existing capacity. Intersection analysis confirms that buses can make these turns at acceptable levels of service, including up to six buses per hour recirculating around the block via the layover bays to drop off passengers on the first circuit and pick up passengers later on the second circuit. Turning paths of public buses and charter buses up to 14.5m long non-rear-steer models were plotted as part of the construction and long term roadway design and found to be satisfactory (see civil engineering drawings) The proposal will have no adverse impact on the ferry wharf, bus stops and operation of buses in the area.

The subject site and locality is accessible by a ubiquitous footpath network that provides safe walking conditions. The Sidra intersection analysis in the Appendix indicates a good Level of Service (LOS B) for pedestrians.

Bike parking will be available at the subject site and at nearby destinations such as the park and ferry wharf. Streets in the adjacent street network are suited to cycling, although some cyclists may be deterred from using some other major roads that carry heavy traffic volumes.

4.8 Safety

The design provides adequate sight distances and circulation for the safe access and movement of residents and visitors, and passing pedestrians, cyclists, and vehicular traffic. School Zone speed limits pick up and set-down facilities for cars and buses, and bike and pedestrian improvements are likely to be associated with the future opening of the adjacent primary school.

4.9 Construction and operation during Major Events.

SOP and Wentworth Point are subject to the effects of crowds and associated transport during major events. These events range from regular sports activities through special retail and cultural shows to major events every year such as the Royal Easter Show, Rugby League “Double Header” finals matches, and future potential international events contemplated in bids such as for the FIFA World Cup.

The interchange area around the subject site will at all times provide at least 4 bus stands and 2 bus layovers on the Hill Road approach (more bus queuing and layover is available down Hill Road to accommodate at least 10 more buses).

Special Event and Clearway conditions can apply on Hill Road, New Road, and Burroway Road and the interchange during special events. On-street parking and loading zones may also be restricted on Burroway Road and the New Road in order to improve bus and traffic circulation during Major Events.

In accordance with the SOPA guidelines²³ in favour of Developer proponent's rights:

- a) Access for owners and occupiers to the property, including vehicular and pedestrian access to the premises, must be preserved.
- b) SOPA as precinct manager will make best endeavours to minimise the impact of Major Event activities on the business of building owners and tenants in so far as it is reasonable to do so within a Major Event precinct.

The contribution of the site developer will be to use its internal communications to encourage a minimum of deliveries and other site traffic during Special Events. This applies during construction and operation phases. Development construction activity will be staged over a suitable timeframe and in a suitable sequence to avoid clashes with the largest Major Events;

New building and car park access points and infrastructure access nodes are located in suitable places and developed to suitable standards to minimise impacts.

Development activities will not overly impact effective Major Event related site connectivity into, within and around the precinct. The bus/ferry interchange area will be available at all times.

4.10 NSW Government State Plan

Users of the subject development and transport interchange will be able to make transport choices that support the achievement of State Plan²⁴ goals and targets including goals:

Figure 28: NSW 2021 State Plan extracts

<u>Goal</u>	<u>Target</u>	<u>Proposals that support achievement</u>
7 Reduce travel times	The road network during peak times on Sydney's road corridors	The proposed development mode split will minimise external commuter cars generation onto the regional main roads
	Minimise public transport waiting times for customers <ul style="list-style-type: none"> • Increase the frequency of services on key corridors during peak and off-peak • Reduce the difference between scheduled and actual public transport travel times 	Proposed road and path and interchange allows for more frequent and reliable bus and ferry services, and easy walking and cycling direct to the services.
8. Grow patronage on public transport by making it a more attractive choice	Transport reliability targets: <ul style="list-style-type: none"> • Trains: 92% of CityRail trains run on time across the network • Buses: 95% of Sydney buses run on time across the network • Ferries: 98.5% of Sydney Ferries run on time 	Proposed network allows reliability and priority for buses, and supports a larger and better ferry wharf. Bike travel and walking to ferries is supported.
	Increase the share of commuter trips made by public transport <ul style="list-style-type: none"> • To and from Sydney CBD during 	Supports increased ferry travel to Sydney CBD and Parramatta CBD

²³ Major Event Impact Assessment Guidelines, 2007, SOPA

²⁴ NSW 2021, 32 Goals, NSW 2021, A plan to make NSW number one, September 2011, NSW government website

	<p>peak hours to 80% by 2016</p> <ul style="list-style-type: none"> • To and from Parramatta CBD during peak hours to 50% by 2016 	
	<p>Increase the proportion of total journeys to work by public transport in the Sydney Metropolitan Region to 28% by 2016</p>	<p>A location-specific sustainable travel plan will be prepared, and a Transport Access Guide</p>
	<p>Increase walking and cycling</p> <ul style="list-style-type: none"> • More than double the mode share of bicycle trips made in the Greater Sydney region, at a local and district level, by 2016 • Increase the mode share of walking trips made in the Greater Sydney region, at a local and district level, to 25% by 2016 	<p>Wentworth Point with the proposed development and Homebush Bay Bridge and SOP paths offers an exemplar opportunity, including pedestrian and bicycle linkages across the site. The example of Manly Ferry wharf with hundreds of bikes parked per day indicates the potential.</p>
10. Improve road Safety	<p>Reduce fatalities to 4.3 per 100,000 population by 2016</p>	<p>Design to best practice and Australian standards will maximise safety</p>
11. Keep people healthy and out of hospital		<p>The development encourages and supports walking and cycling and active living</p>
16. Prevent and reduce the level of crime		<p>The subject development increases the local activity and security through over-sighting of the transport interchange and bike paths.</p>
14. Increase opportunities for people with a disability by providing support that meet their individual needs and realise their potential		<p>The proposed development and surrounds are fully DDA accessible.</p>
20. Build liveable centres	<ul style="list-style-type: none"> • Increase the percentage of the population living within 30 minutes by public transport of a city or major centre in metropolitan Sydney 	<p>The development supports a mix of uses and excellent public transport</p>

4.11 Construction Phase Transport Impacts

This TIS addresses the proposed completed development. Transport impact during construction including bus, pedestrian, and bicycle, and car access to the interchange will be addressed in a separate REF and Construction Traffic Management Plan for the various stages of construction.

5 Conclusions

The key conclusions of this Transport Impact Study are:

- The proposed development is ideally suited to the subject site and surrounds. Appropriate land use mixes and inherent proximity is the best transport plan. Occupants and visitors can walk to shop, childcare, school, recreation, bus and ferry. They can walk or cycle via well-designed paths and bridges to regional shopping, employment or sport or regional rail at Sydney Olympic Park or at Rhodes.
- The site is suited to the proposed use from a transport perspective.
- The project design will support NSW Government targets to increase the transport mode share to the sustainable modes of public transport, walking, and cycling.
- Parking layout, circulation and accesses are designed in accordance with the relevant Australian Standards.
- Vehicle traffic generation in this analysis was based on UAP rates, but is expected in practice to be even lower.
- Traffic generated by the proposed development can be accommodated at acceptable levels of service without adversely affecting transport efficiency on the proposed network.
- Access points for pedestrians, cyclists, and vehicles are suitable and in accordance with road hierarchy considerations. The proposed operation can be appropriately managed and has no significant impact on amenity.
- There will be no adverse effects on the safety of any road users including public transport, pedestrians and cyclists.
- The proposed development does not encroach on the bus and ferry interchange footprint or degrade the additional capacity planned by TfNSW.
- It is recommended that a Transport Access Guide be prepared and displayed in all appropriate common areas throughout the site for residents as well as online for visitors. The guide would include community information to encourage non-car transport such as Local bus network maps and timetables, Ferry network maps and timetables, Rail network maps and timetables; Cycle route maps, Location of critical services within walking distances, Taxi contact numbers; and Location and contact details for car share operators.

6 Appendix A: Traffic Count

Job No	N1250		
Client	Henson Consulting		
Road	Hill Rd - north of Bernalong Pkwy	Average Weekday	5,362
Location	Homebush	7 Day Average	4,994
Site No.	1		
Start Date	6-Nov-13		
Description	Volume Summary		
Direction	NB		

Time	Day of Week							Ave W'day	7 Day Ave
	Mon 11-Nov	Tue 12-Nov	Wed 6-Nov	Thu 7-Nov	Fri 8-Nov	Sat 9-Nov	Sun 10-Nov		
AM Peak	371	383	369	433	396	319	208		
PM Peak	454	481	493	444	437	320	319		
0:00	44	37	24	45	46	106	106	39	58
1:00	22	21	21	24	30	63	54	24	34
2:00	14	36	14	15	19	38	43	20	26
3:00	37	22	15	18	13	22	35	21	23
4:00	35	36	25	36	44	23	31	35	33
5:00	122	129	143	143	123	46	21	132	104
6:00	371	383	369	433	396	108	39	390	300
7:00	241	248	261	235	255	179	42	248	209
8:00	246	258	302	286	295	154	87	277	233
9:00	291	263	274	273	273	178	115	275	238
10:00	217	211	239	194	247	252	144	222	215
11:00	203	219	223	257	270	319	208	234	243
12:00	264	269	273	303	313	268	195	284	269
13:00	261	266	279	284	281	279	259	274	273
14:00	244	241	269	264	258	288	252	255	259
15:00	283	278	242	263	322	284	268	278	277
16:00	326	319	322	338	359	303	319	333	327
17:00	439	449	467	417	437	320	296	442	404
18:00	454	481	493	444	429	308	266	460	411
19:00	338	344	358	309	362	258	250	342	317
20:00	238	288	239	294	272	197	191	266	246
21:00	180	220	250	309	219	169	169	236	217
22:00	114	150	169	188	193	207	125	163	164
23:00	76	95	89	112	186	170	93	112	117
Total	5060	5263	5360	5484	5642	4539	3608	5362	4994

7-19	3469	3502	3644	3558	3739	3132	2451	3582	3356
6-22	4596	4737	4860	4903	4988	3864	3100	4817	4435
6-24	4786	4982	5118	5203	5367	4241	3318	5091	4716
0-24	5060	5263	5360	5484	5642	4539	3608	5362	4994

Job No	N1250		
Client	Henson Consulting		
Road	Hill Rd - north of Bernalong Pkwy		
Location	Homebush		
Site No.	1		
Start Date	6-Nov-13		
Description	Volume Summary		
Direction	SB		
	Average Weekday	5,783	
	7 Day Average	5,381	

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	11-Nov	12-Nov	6-Nov	7-Nov	8-Nov	9-Nov	10-Nov		
AM Peak	637	650	646	635	628	400	311		
PM Peak	359	388	455	461	426	403	299		
0:00	23	20	18	40	27	74	65	26	38
1:00	17	12	17	22	19	30	47	17	23
2:00	16	19	13	17	30	23	31	19	21
3:00	26	22	21	26	16	19	25	22	22
4:00	33	35	37	38	39	15	19	36	31
5:00	111	132	112	123	130	62	40	122	101
6:00	298	316	319	375	354	159	60	332	269
7:00	637	650	646	635	590	194	104	632	494
8:00	621	647	628	629	628	320	180	631	522
9:00	409	328	336	358	379	333	271	362	345
10:00	274	311	291	281	313	400	301	294	310
11:00	237	309	279	313	302	390	311	288	306
12:00	263	291	252	291	284	403	299	276	298
13:00	318	305	333	352	316	361	274	325	323
14:00	318	310	322	309	369	277	240	326	306
15:00	359	388	455	461	394	333	231	411	374
16:00	273	256	330	289	372	264	228	304	287
17:00	339	366	393	416	426	271	268	388	354
18:00	272	297	291	321	310	288	238	298	288
19:00	177	256	233	257	267	229	195	238	231
20:00	150	138	164	169	199	164	109	164	156
21:00	108	127	131	130	145	139	110	128	127
22:00	65	76	93	87	138	136	87	92	97
23:00	35	42	48	52	81	93	46	52	57
Total	5379	5653	5762	5991	6128	4977	3779	5783	5381

7-19	4320	4458	4556	4655	4683	3834	2945	4534	4207
6-22	5053	5295	5403	5586	5648	4525	3419	5397	4990
6-24	5153	5413	5544	5725	5867	4754	3552	5540	5144
0-24	5379	5653	5762	5991	6128	4977	3779	5783	5381

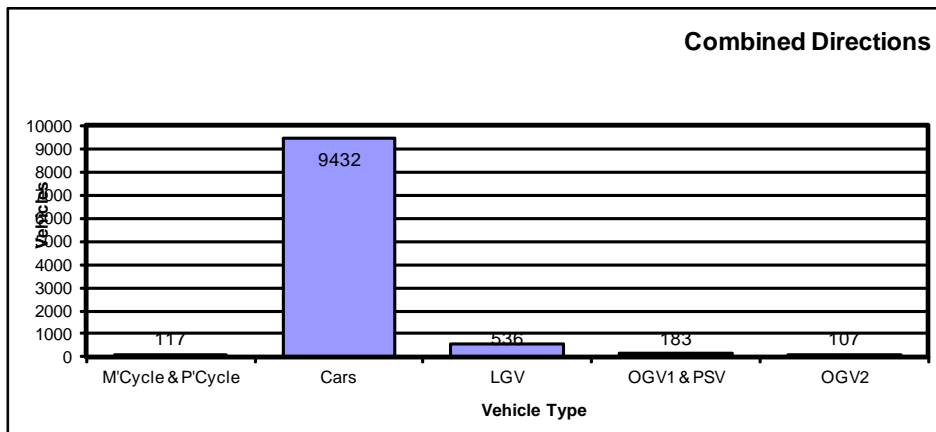
Road	Hill Rd - north of Bernalong Pkwy	M'Cycle & P'Cycle	1%
Location	Homebush	Cars	91%
Site No.	1	LGV	5%
Start Date	6-Nov-13	OGV1 & PSV	2%
Day	7 Day Ave.	OGV2	1%
Description Class Summary			

Menu

7 Day Av

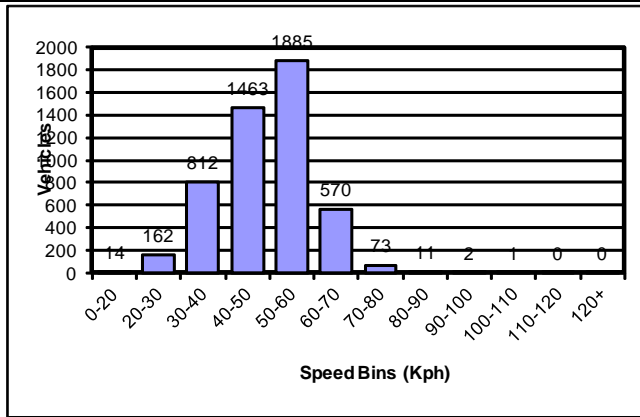
1. Hill Rd

	NB						SB						Combined					
	M'Cycle & P'Cycle	Cars	LGV	OGV1 & PSV	OGV2	Total	M'Cycle & P'Cycle	Cars	LGV	OGV1 & PSV	OGV2	Total	M'Cycle & P'Cycle	Cars	LGV	OGV1 & PSV	OGV2	Total
0:00	1	55	1	0	2	58	0	36	1	0	1	38	1	91	1	1	3	96
1:00	0	30	1	0	2	34	1	20	1	0	2	23	1	51	1	0	4	57
2:00	0	21	0	1	3	26	0	17	1	0	3	21	0	38	2	1	6	47
3:00	0	19	1	1	2	23	2	16	0	1	3	22	2	35	1	2	5	45
4:00	0	24	3	2	3	33	0	24	2	2	3	31	1	49	5	4	5	64
5:00	0	82	18	2	2	104	3	84	8	4	3	101	3	166	26	6	4	205
6:00	3	272	20	3	2	300	7	230	18	8	4	269	11	503	38	11	6	569
7:00	2	182	19	4	2	209	10	452	23	6	3	494	12	633	42	10	5	702
8:00	1	210	15	4	3	233	8	483	20	7	3	522	10	693	34	11	6	754
9:00	1	208	21	6	3	238	6	309	20	7	4	345	7	516	41	13	6	583
10:00	1	182	19	8	4	215	4	276	17	8	4	310	5	459	37	16	8	525
11:00	2	209	20	8	4	243	3	270	21	9	4	306	5	478	40	17	8	549
12:00	2	234	22	8	4	269	3	262	20	8	5	298	5	496	42	15	9	567
13:00	1	239	21	7	4	273	4	283	24	7	5	323	5	522	45	14	9	595
14:00	0	232	18	6	3	259	3	277	17	6	4	306	3	509	35	12	6	566
15:00	1	251	18	5	2	277	4	341	20	6	3	374	5	592	38	11	5	652
16:00	3	293	22	6	3	327	5	267	10	4	2	287	8	560	32	10	4	614
17:00	4	377	17	5	1	404	7	321	20	5	1	354	11	698	36	10	2	758
18:00	4	392	10	3	2	411	4	272	8	4	0	288	8	664	17	7	2	699
19:00	2	307	5	2	0	317	4	220	4	2	0	231	6	527	9	4	1	548
20:00	2	239	3	1	0	246	2	151	2	1	0	156	4	390	6	2	1	402
21:00	1	213	2	1	0	217	2	123	1	1	0	127	3	336	3	2	1	344
22:00	1	160	2	1	0	164	0	95	1	1	0	97	1	255	3	2	0	261
23:00	1	115	1	0	0	117	0	56	0	1	0	57	1	171	1	1	1	174
Total	35	4547	277	84	50	4994	82	4885	259	99	57	5381	117	9432	536	183	107	10375



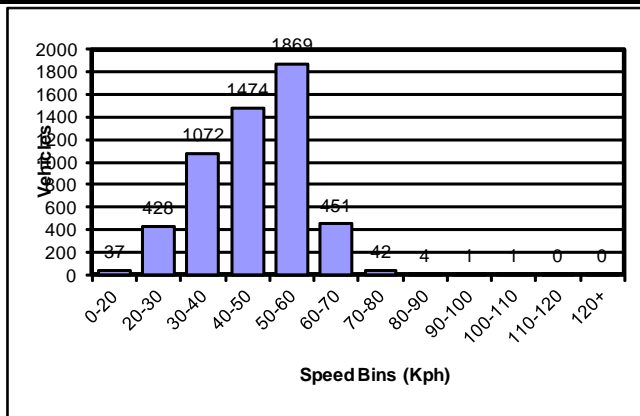
Road Hill Rd - north of Bernalong Pkwy Location Homebush Site No. 1 Start Date 6-Nov-13 Day 7 Day Ave. Direction NB Description Speed Summary	0-20	0.3%	Speed		Choose Day	
	20-30	3.2%	Ave	85%ile		
	30-40	16.3%	49.2	58.9	7 Day Ave. ▼	
	40-50	29.3%				
	50-60	37.8%				
	60-70	11.4%				
	70-80	1.5%				
	80-90	0.2%				
	90-100	0.0%				
	100-110	0.0%				
	110-120	0.0%				
	120+	0.0%				

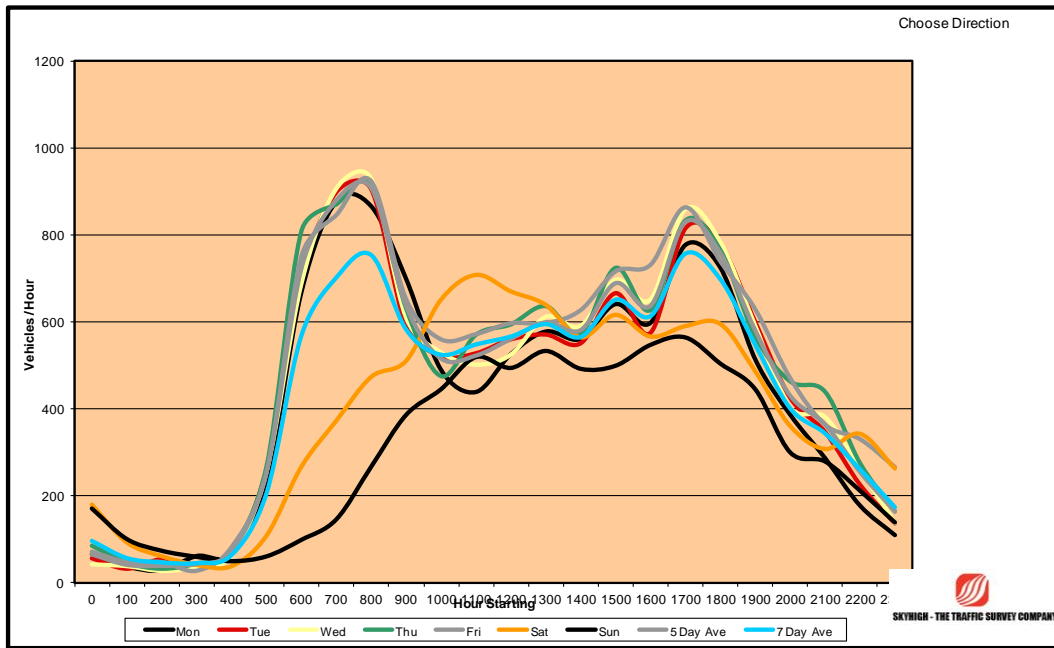
	Vehicle Speed Bins (kph)													Speed	
	0-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120+	Ave	85%ile	
0:00	0	1	10	16	20	9	1	0	0	0	0	0	49.6	59.6	
1:00	0	3	5	8	12	5	1	0	0	0	0	0	49.3	60.1	
2:00	0	1	4	7	9	3	1	0	0	0	0	0	50.5	60.0	
3:00	0	0	2	4	10	5	1	1	0	0	0	0	56.4	66.3	
4:00	0	0	3	7	12	8	2	1	0	0	0	0	55.1	65.0	
5:00	0	1	3	15	48	30	7	1	0	0	0	0	56.7	65.0	
6:00	0	3	16	75	146	53	6	1	0	0	0	0	53.2	61.7	
7:00	0	5	24	57	93	26	3	0	0	0	0	0	50.5	59.1	
8:00	0	3	20	77	108	22	2	0	0	0	0	0	50.7	58.4	
9:00	1	8	34	67	94	32	3	0	0	0	0	0	49.6	59.7	
10:00	1	8	31	68	81	22	3	1	0	0	0	0	49.2	58.6	
11:00	1	6	34	74	93	28	5	1	0	0	0	0	50.1	59.3	
12:00	1	7	39	78	103	36	4	0	0	0	0	0	49.8	59.5	
13:00	0	8	38	83	103	36	4	0	0	0	0	0	50.0	59.7	
14:00	1	8	40	83	94	29	4	0	0	0	0	0	49.2	59.1	
15:00	0	7	48	74	110	32	4	1	0	0	0	0	49.6	59.2	
16:00	2	12	55	96	121	36	4	1	0	0	0	0	48.7	58.6	
17:00	1	15	82	114	151	37	4	1	0	0	0	0	48.1	58.0	
18:00	1	15	82	125	147	37	4	0	0	0	0	0	47.8	58.1	
19:00	1	16	71	101	101	24	3	1	0	0	0	0	46.8	57.3	
20:00	1	12	54	80	77	19	2	0	0	0	0	0	46.9	57.0	
21:00	0	11	48	70	70	15	2	0	0	0	0	0	47.0	56.9	
22:00	1	8	42	50	47	14	2	0	0	0	0	0	46.3	56.5	
23:00	0	2	27	34	40	12	1	0	0	0	0	0	48.1	58.7	
Total	14	162	812	1463	1885	570	73	11	2	1	0	0	49.2	58.9	



Road Hill Rd - north of Bernalong Pkwy Location Homebush Site No. 1 Start Date 6-Nov-13 Day 7 Day Ave. Direction SB Description Speed Summary	0-20	0.7%	Speed		Choose Day	
	20-30	8.0%	Ave	85%ile		
	30-40	19.9%	46.5	57.2	7 Day Ave. ▼	
	40-50	27.4%				
	50-60	34.7%				
	60-70	8.4%				
	70-80	0.8%				
	80-90	0.1%				
	90-100	0.0%				
	100-110	0.0%				
	110-120	0.0%				
	120+	0.0%				

	Vehicle Speed Bins (kph)													Speed	
	0-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120+	Ave	85%ile	
0:00	0	3	7	12	13	3	0	0	0	0	0	0	47.9	57.7	
1:00	0	1	4	8	8	2	0	0	0	0	0	0	47.0	57.6	
2:00	0	1	4	7	6	1	0	0	0	0	0	0	46.5	55.8	
3:00	0	2	3	6	5	4	2	0	0	0	0	0	50.0	65.3	
4:00	0	3	3	8	10	4	1	0	0	0	0	0	48.9	60.5	
5:00	1	10	20	22	33	13	2	0	0	0	0	0	47.0	59.4	
6:00	2	22	57	65	92	29	3	0	0	0	0	0	46.6	58.8	
7:00	2	45	132	131	151	30	2	0	0	1	0	0	44.5	55.9	
8:00	3	50	126	140	170	31	1	0	0	0	0	0	45.0	56.7	
9:00	2	30	68	101	115	26	2	0	0	0	0	0	46.1	56.9	
10:00	2	27	65	82	107	25	2	0	0	0	0	0	46.2	57.0	
11:00	2	28	62	84	105	23	2	0	0	0	0	0	46.2	56.8	
12:00	2	24	51	81	108	28	2	0	0	0	0	0	47.3	57.8	
13:00	2	21	53	86	123	35	2	0	0	0	0	0	48.0	58.4	
14:00	2	20	51	80	118	32	4	0	0	0	0	0	48.1	58.1	
15:00	1	20	53	101	154	41	5	0	0	0	0	0	48.6	58.3	
16:00	2	21	51	69	110	32	3	1	0	0	0	0	48.0	58.6	
17:00	4	18	60	100	140	30	2	0	0	0	0	0	47.5	57.3	
18:00	2	20	59	82	102	22	1	0	0	0	0	0	46.4	56.7	
19:00	2	20	49	62	77	18	2	0	0	0	0	0	45.9	57.1	
20:00	2	17	34	47	47	8	1	0	0	0	0	0	44.5	55.2	
21:00	1	12	26	47	33	7	1	0	0	0	0	0	45.0	55.0	
22:00	1	10	22	37	22	4	0	0	0	0	0	0	43.5	53.0	
23:00	0	5	10	17	19	4	1	0	0	0	0	0	47.0	57.6	
Total	37	428	1072	1474	1869	451	42	4	1	1	0	0	46.5	57.2	



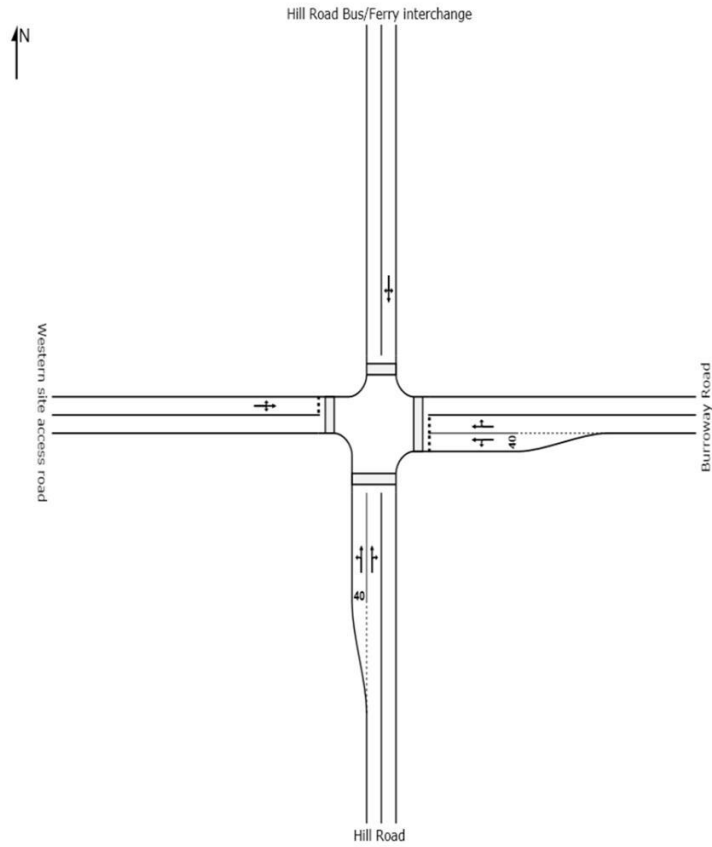


7 Appendix B: Traffic Analysis

SITE LAYOUT

▽ Site: Hill Road/Burroway Road Exist AM

Scenario: 2013 Existing
Period: AM weekday peak hour



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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

▽ Site: Hill Road/Burroway Road Exist AM

Scenario: 2013 Existing
Period: AM weekday peak hour
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: Hill Road												
1	L2	13	8.0	0.009	8.2	LOS A	0.0	0.0	0.00	0.56	50.4	
2	T1	9	22.0	0.045	0.0	LOS A	0.2	1.7	0.04	0.55	49.6	
3	R2	67	19.0	0.045	8.3	LOS A	0.2	1.7	0.06	0.54	49.3	
Approach		89	17.7	0.045	7.5	NA	0.2	1.7	0.05	0.54	49.5	
East: Burroway Road												
4	L2	33	39.0	0.024	8.2	LOS A	0.1	0.9	0.05	0.50	48.7	
5	T1	1	0.0	0.002	7.5	LOS A	0.0	0.1	0.23	0.58	48.4	
6	R2	1	0.0	0.002	9.0	LOS A	0.0	0.1	0.23	0.58	48.4	
Approach		35	36.8	0.024	8.2	LOS A	0.1	0.9	0.06	0.50	48.7	
North: Hill Road Bus/Ferry interchange												
7	L2	1	0.0	0.006	8.2	LOS A	0.0	0.2	0.08	0.17	55.9	
8	T1	9	22.0	0.006	0.1	LOS A	0.0	0.2	0.08	0.17	55.9	
9	R2	1	0.0	0.006	8.5	LOS A	0.0	0.2	0.08	0.17	55.9	
Approach		11	18.0	0.006	1.6	NA	0.0	0.2	0.08	0.17	55.9	
West: Western site access road												
10	L2	1	0.0	0.019	9.1	LOS A	0.1	0.6	0.17	0.59	47.9	
11	T1	1	0.0	0.019	7.9	LOS A	0.1	0.6	0.17	0.59	47.9	
12	R2	14	15.0	0.019	9.3	LOS A	0.1	0.6	0.17	0.59	47.9	
Approach		16	13.1	0.019	9.2	LOS A	0.1	0.6	0.17	0.59	47.9	
All Vehicles		151	21.7	0.045	7.4	NA	0.2	1.7	0.07	0.51	49.5	

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

▽ Site: Hill Road/Burroway Road - Exist PM

Scenario: 2013 Existing
Period: PM weekday peak hour
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: Hill Road												
1	L2	7	57.0	0.006	8.2	LOS A	0.0	0.0	0.00	0.42	50.9	
2	T1	21	45.0	0.031	0.1	LOS A	0.1	1.3	0.11	0.37	51.4	
3	R2	28	30.0	0.031	8.3	LOS A	0.1	1.3	0.11	0.37	51.4	
Approach		56	39.0	0.031	5.2	NA	0.1	1.3	0.10	0.38	51.4	
East: Burroway Road												
4	L2	57	4.0	0.036	8.3	LOS A	0.1	1.1	0.10	0.61	48.5	
5	T1	1	0.0	0.002	7.4	LOS A	0.0	0.1	0.22	0.57	48.5	
6	R2	1	0.0	0.002	8.8	LOS A	0.0	0.1	0.22	0.57	48.5	
Approach		59	3.9	0.036	8.3	LOS A	0.1	1.1	0.10	0.61	48.5	
North: Hill Road Bus/Ferry interchange												
7	L2	1	0.0	0.018	8.3	LOS A	0.1	0.7	0.11	0.07	56.8	
8	T1	27	35.0	0.018	0.1	LOS A	0.1	0.7	0.11	0.07	56.8	
9	R2	1	0.0	0.018	8.5	LOS A	0.1	0.7	0.11	0.07	56.8	
Approach		29	32.6	0.018	0.7	NA	0.1	0.7	0.11	0.07	56.8	
West: Western site access road												
10	L2	1	0.0	0.019	9.1	LOS A	0.1	0.5	0.23	0.63	47.9	
11	T1	1	0.0	0.019	7.8	LOS A	0.1	0.5	0.23	0.63	47.9	
12	R2	15	0.0	0.019	9.2	LOS A	0.1	0.5	0.23	0.63	47.9	
Approach		17	0.0	0.019	9.1	LOS A	0.1	0.5	0.23	0.63	47.9	
All Vehicles		161	20.9	0.036	5.9	NA	0.1	1.3	0.11	0.43	50.8	

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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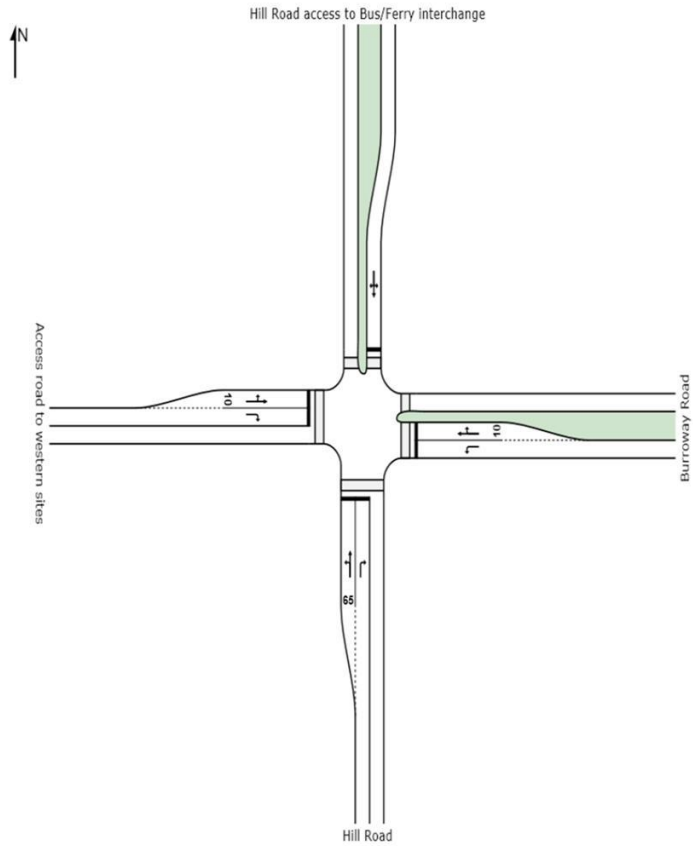
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**SIDRA
INTERSECTION 6**

SITE LAYOUT

Site: Hill Road/Burroway Road (signals) Future PM

Scenario: 2023 Cumulative Traffic (UAP plus subject SOPA site plus 6 extra buses per hour)
Period: PM peak hour, weekday



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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

Site: Hill Road/Burroway Road (signals) Future AM

Scenario: 2023 Cumulative Traffic (UAP plus subject SOPA site plus 6 extra buses per hour)
 Period: AM peak hour, weekday
 Signals - Fixed Time Cycle Time = 60 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hill Road											
1	L2	121	4.0	0.373	28.9	LOS C	4.3	31.0	0.87	0.77	34.1
2	T1	50	4.0	0.373	20.7	LOS B	4.3	31.0	0.87	0.77	34.1
3	R2	210	8.4	0.626	32.3	LOS C	5.9	44.6	0.95	0.84	31.7
Approach		381	6.4	0.626	29.7	LOS C	5.9	44.6	0.91	0.81	32.7
East: Burroway Road											
4	L2	456	5.0	0.472	17.0	LOS B	8.1	59.3	0.65	0.79	40.8
5	T1	1	0.0	0.013	6.6	LOS A	0.1	1.2	0.47	0.53	45.0
6	R2	7	90.0	0.013	15.0	LOS B	0.1	1.2	0.47	0.53	45.0
Approach		464	6.3	0.472	17.0	LOS B	8.1	59.3	0.64	0.79	40.9
North: Hill Road access to Bus/Ferry interchange											
7	L2	1	0.0	0.167	27.7	LOS B	1.7	13.7	0.82	0.64	37.0
8	T1	70	18.0	0.167	19.5	LOS B	1.7	13.7	0.82	0.64	37.0
9	R2	1	0.0	0.167	27.8	LOS B	1.7	13.7	0.82	0.64	37.0
Approach		72	17.5	0.167	19.7	LOS B	1.7	13.7	0.82	0.64	37.0
West: Access road to western sites											
10	L2	1	0.0	0.002	14.6	LOS B	0.0	0.2	0.46	0.51	45.7
11	T1	1	0.0	0.002	6.4	LOS A	0.0	0.2	0.46	0.51	45.7
12	R2	371	3.0	0.900	48.0	LOS D	15.7	112.9	1.00	1.13	25.8
Approach		373	3.0	0.900	47.8	LOS D	15.7	112.9	1.00	1.13	25.8
All Vehicles		1290	6.0	0.900	29.8	LOS C	15.7	112.9	0.84	0.89	32.8

Level of Service (LOS) Method: Delay (RTA NSW).
 Vehicle movement LOS values are based on average delay per movement
 Intersection and Approach LOS values are based on average delay for all vehicle movements.
 SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	9.7	LOS A	0.0	0.0	0.57	0.57
P2	East Full Crossing	50	24.4	LOS C	0.1	0.1	0.90	0.90
P3	North Full Crossing	50	9.1	LOS A	0.0	0.0	0.55	0.55
P4	West Full Crossing	50	22.6	LOS C	0.1	0.1	0.87	0.87
All Pedestrians		200	16.4	LOS B			0.72	0.72

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
 Pedestrian movement LOS values are based on average delay per pedestrian movement.
 Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

Site: Hill Road/Burroway Road (signals) Future PM

Scenario: 2023 Cumulative Traffic (UAP plus subject SOPA site plus 6 extra buses per hour)
Period: PM peak hour, weekday
Signals - Fixed Time Cycle Time = 60 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hill Road											
1	L2	397	5.0	0.539	17.6	LOS B	10.2	74.4	0.69	0.77	41.5
2	T1	142	5.0	0.539	9.4	LOS A	10.2	74.4	0.69	0.77	41.5
3	R2	533	4.0	0.779	25.5	LOS B	14.8	107.5	0.87	0.92	35.2
Approach		1072	4.5	0.779	20.4	LOS B	14.8	107.5	0.78	0.84	38.1
East: Burroway Road											
4	L2	254	3.0	0.575	30.1	LOS C	6.7	48.4	0.92	0.82	32.8
5	T1	1	0.0	0.026	18.8	LOS B	0.2	2.1	0.78	0.62	35.1
6	R2	7	90.0	0.026	27.3	LOS B	0.2	2.1	0.78	0.62	35.1
Approach		262	5.3	0.575	30.0	LOS C	6.7	48.4	0.92	0.81	32.8
North: Hill Road access to Bus/Ferry interchange											
7	L2	1	0.0	0.135	15.3	LOS B	1.7	15.0	0.51	0.43	48.0
8	T1	116	32.0	0.135	7.1	LOS A	1.7	15.0	0.51	0.43	48.0
9	R2	1	0.0	0.135	15.4	LOS B	1.7	15.0	0.51	0.43	48.0
Approach		118	31.5	0.135	7.2	LOS A	1.7	15.0	0.51	0.43	48.0
West: Access road to western sites											
10	L2	1	0.0	0.004	26.3	LOS B	0.0	0.3	0.77	0.57	36.3
11	T1	1	0.0	0.004	18.1	LOS B	0.0	0.3	0.77	0.57	36.3
12	R2	154	2.0	0.723	39.1	LOS C	4.9	34.8	1.00	0.89	28.8
Approach		156	2.0	0.723	38.9	LOS C	4.9	34.8	1.00	0.89	28.9
All Vehicles		1608	6.4	0.779	22.8	LOS B	14.8	107.5	0.80	0.81	36.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	50	22.6	LOS C	0.1	0.1	0.87	0.87
P2	East Full Crossing	50	10.8	LOS B	0.1	0.1	0.60	0.60
P3	North Full Crossing	50	21.7	LOS C	0.1	0.1	0.85	0.85
P4	West Full Crossing	50	9.7	LOS A	0.0	0.0	0.57	0.57
All Pedestrians		200	16.2	LOS B			0.72	0.72

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

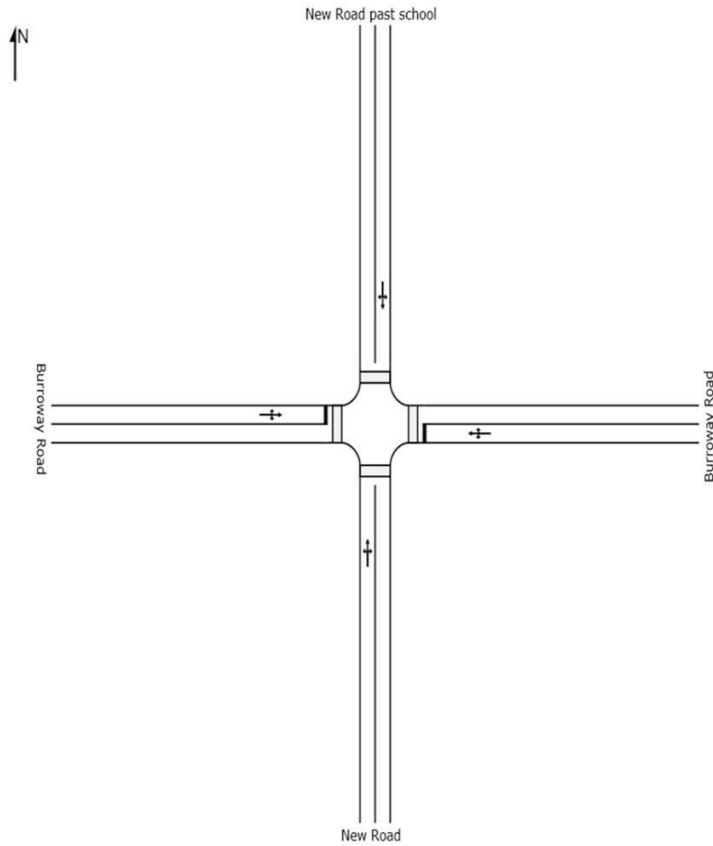
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**SIDRA
INTERSECTION 6**

SITE LAYOUT

▽ Site: New Road school/Burroway Road Future AM

Scenario: 2023 Cumulative plus SOPA plus 6 buses
Period: AM weekday peak hour



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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

▽ Site: New Road school/Burroway Road Future AM

Scenario: 2023 Cummulative plus SOPA plus 6 buses
Period: AM weekday peak hour
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: New Road												
1	L2	98	8.0	0.067	6.5	LOS A	0.3	2.5	0.08	0.51	30.9	
2	T1	10	8.0	0.067	0.1	LOS A	0.3	2.5	0.08	0.51	30.9	
3	R2	10	8.0	0.067	6.8	LOS A	0.3	2.5	0.08	0.51	30.9	
Approach		118	8.0	0.067	6.0	NA	0.3	2.5	0.08	0.51	30.9	
East: Burroway Road												
4	L2	10	8.0	0.253	11.2	LOS A	1.1	7.9	0.24	0.90	27.3	
5	T1	196	8.0	0.253	10.8	LOS A	1.1	7.9	0.24	0.90	27.3	
6	R2	10	8.0	0.253	11.0	LOS A	1.1	7.9	0.24	0.90	27.3	
Approach		216	8.0	0.253	10.8	LOS A	1.1	7.9	0.24	0.90	27.3	
North: New Road past school												
7	L2	10	8.0	0.098	6.8	LOS A	0.5	3.5	0.23	0.55	28.9	
8	T1	10	8.0	0.098	0.4	LOS A	0.5	3.5	0.23	0.55	28.9	
9	R2	135	8.0	0.098	7.1	LOS A	0.5	3.5	0.23	0.55	28.9	
Approach		155	8.0	0.098	6.7	NA	0.5	3.5	0.23	0.55	28.9	
West: Burroway Road												
10	L2	61	8.0	0.221	10.9	LOS A	0.9	6.7	0.07	0.92	24.1	
11	T1	89	8.0	0.221	10.5	LOS A	0.9	6.7	0.07	0.92	24.1	
12	R2	45	8.0	0.221	10.8	LOS A	0.9	6.7	0.07	0.92	24.1	
Approach		195	8.0	0.221	10.7	LOS A	0.9	6.7	0.07	0.92	24.1	
All Vehicles		684	8.0	0.253	9.0	NA	1.1	7.9	0.16	0.76	27.2	

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: New Road school/Burroway Road Future AM

Scenario: 2023 Cummulative plus SOPA plus 6 buses
Period: AM weekday peak hour
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: New Road												
1	L2	98	8.0	0.067	6.5	LOS A	0.3	2.5	0.08	0.51	30.9	
2	T1	10	8.0	0.067	0.1	LOS A	0.3	2.5	0.08	0.51	30.9	
3	R2	10	8.0	0.067	6.8	LOS A	0.3	2.5	0.08	0.51	30.9	
Approach		118	8.0	0.067	6.0	NA	0.3	2.5	0.08	0.51	30.9	
East: Burroway Road												
4	L2	10	8.0	0.253	11.2	LOS A	1.1	7.9	0.24	0.90	27.3	
5	T1	196	8.0	0.253	10.8	LOS A	1.1	7.9	0.24	0.90	27.3	
6	R2	10	8.0	0.253	11.0	LOS A	1.1	7.9	0.24	0.90	27.3	
Approach		216	8.0	0.253	10.8	LOS A	1.1	7.9	0.24	0.90	27.3	
North: New Road past school												
7	L2	10	8.0	0.098	6.8	LOS A	0.5	3.5	0.23	0.55	28.9	
8	T1	10	8.0	0.098	0.4	LOS A	0.5	3.5	0.23	0.55	28.9	
9	R2	135	8.0	0.098	7.1	LOS A	0.5	3.5	0.23	0.55	28.9	
Approach		155	8.0	0.098	6.7	NA	0.5	3.5	0.23	0.55	28.9	
West: Burroway Road												
10	L2	61	8.0	0.221	10.9	LOS A	0.9	6.7	0.07	0.92	24.1	
11	T1	89	8.0	0.221	10.5	LOS A	0.9	6.7	0.07	0.92	24.1	
12	R2	45	8.0	0.221	10.8	LOS A	0.9	6.7	0.07	0.92	24.1	
Approach		195	8.0	0.221	10.7	LOS A	0.9	6.7	0.07	0.92	24.1	
All Vehicles		684	8.0	0.253	9.0	NA	1.1	7.9	0.16	0.76	27.2	

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

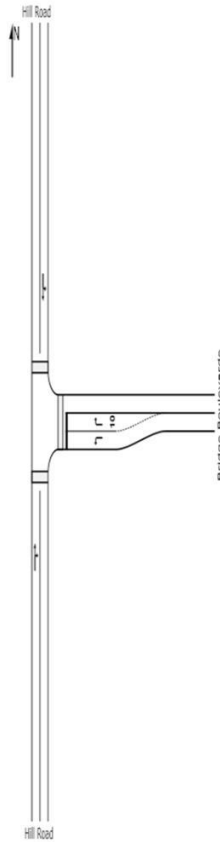
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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INTERSECTION 6**

SITE LAYOUT

▽ Site: Bridge Boulevard/Hill Road Future AM

Scenario: 2023 Cumulative plus SOPA plus 6 buses plus Bridge Bvde traffic
Period: AM weekday peak hour



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INTERSECTION 6**

MOVEMENT SUMMARY

▽ Site: Bridge Boulevard/Hill Road Future AM

Scenario: 2023 Cumulative plus SOPA plus 6 buses plus Bridge Bvde traffic
 Period: AM weekday peak hour
 Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hill Road											
2	T1	386	8.0	0.365	10.7	LOS A	5.2	38.7	0.98	0.18	20.5
3	R2	76	8.0	0.365	17.2	LOS B	5.2	38.7	0.98	0.18	20.5
Approach		462	8.0	0.365	11.7	NA	5.2	38.7	0.98	0.18	20.5
East: Bridge Boulevard											
4	L2	289	8.0	0.837	36.9	LOS C	6.4	47.7	0.95	1.52	11.1
6	R2	5	100.0	0.190	138.6	LOS F	0.5	6.2	0.97	1.00	3.3
Approach		294	9.6	0.837	38.6	LOS C	6.4	47.7	0.95	1.52	10.7
North: Hill Road											
7	L2	5	100.0	0.489	6.4	LOS A	0.0	0.0	0.00	0.01	49.7
8	T1	897	8.0	0.489	0.0	LOS A	0.0	0.0	0.00	0.01	49.7
Approach		902	8.5	0.489	0.1	NA	0.0	0.0	0.00	0.01	49.7
All Vehicles		1658	8.6	0.837	10.2	NA	6.4	47.7	0.44	0.32	24.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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MOVEMENT SUMMARY

▽ Site: Bridge Boulevard/Hill Road Future PM

Scenario: 2023 Cumulative plus SOPA plus 6 buses plus Bridge Bvde traffic
Period: PM weekday peak hour
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hill Road											
2	T1	1077	8.0	0.663	9.7	LOS A	14.5	108.5	1.00	0.09	21.5
3	R2	76	8.0	0.663	16.3	LOS B	14.5	108.5	1.00	0.09	21.5
Approach		1153	8.0	0.663	10.2	NA	14.5	108.5	1.00	0.09	21.5
East: Bridge Boulevard											
4	L2	76	8.0	0.105	12.6	LOS A	0.4	2.9	0.54	0.93	23.2
6	R2	5	100.0	0.944	1103.0	LOS F	2.4	31.8	1.00	1.08	0.4
Approach		81	13.7	0.944	79.9	LOS F	2.4	31.8	0.57	0.94	5.6
North: Hill Road											
7	L2	5	100.0	0.287	6.4	LOS A	0.0	0.0	0.00	0.02	49.6
8	T1	524	8.0	0.287	0.0	LOS A	0.0	0.0	0.00	0.02	49.6
Approach		529	8.9	0.287	0.1	NA	0.0	0.0	0.00	0.02	49.6
All Vehicles		1763	8.5	0.944	10.3	NA	14.5	108.5	0.68	0.11	22.4

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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INTERSECTION 6**

8 Appendix: Consultation with TfNSW

Memo

Henson Consulting

To: Mark Ozinga, TfNSW; Robert Rutledge, TfNSW, Louis Goulimis, Ionic/Payce
From: Colin Henson, Henson Consulting Date: 24 March 2014
CC: Meeting attendants
Subject: DGR's for Mixed Use Development (SSD 6387), Wentworth Point
Notes of Meeting 10am 13 March 2014 at TfNSW office, Lee Street

Attendees:

Mark Ozinga, TfNSW
Nerida Morgan, TfNSW
George Mobayed, TfNSW
Stacy O'Brien, TfNSW
Daniel Cavallo, TfNSW
Doma Darab, TfNSW
(Apology - Robert Rutledge, TfNSW)
Chris Ryan, Applicant - Ionic/Payce
Louis Goulimis, Ionic/Payce
Mathew Richards, Northrop, Civil Engineer
Colin Henson, Henson Consulting, Transport Planner

Agenda was formed by issues in DGR letter from TfNSW dated 26 February 2014.
Response will be in DA report, and construction DA and CTMP, but these are preliminary notes (not formal minutes).

Payce was informed by Planning that RMS will not be submitting a separate response on DGRs.

Upgrade of the wharf is a committed TAP project for physical and interchange works, likely to be under construction within a year. Understood to be additional berth(s) on existing wharf, infrastructure upgrades of peds and bike facilities and the pick up and drop off zones. Pedestrian axis maintained. Construction access and works area will be required, but details unknown at this stage.

The proposed project site was not part of UAP Traffic considerations. The traffic impact assessment will include as background traffic, the whole of Wentworth Point and new ped/bus bridge over Homebush Bay and resulting uplift in floor space in Fairmead etc. Confirmed in Traffix report.

Noted that bridge is approved and under construction soon, providing an opportunity for increased bus services. Ferry services increased to half hourly from October 2013. Future bus services may increase even though some express services may bypass the ferry wharf. Bus studies currently being considered with SOPA.

Northrop presented 12.5m bus layout during construction. Demonstrated the ability to individually stop and turnaround buses within 30 m diameter turning circle. TfNSW

Page 1 of 3

Memo

Henson Consulting

requested check with 14.5m non-rear steer bus, to allow for Sydney Buses and tourist coaches stopping at wharf as part of linked tours from CBD to the Blue Mountains etc. No articulated buses required normally, but maybe in special event mode.

Applicant team outlined circulation for construction, everyday, and special event scenarios.

TfNSW noted need for buses to recirculate via an easy turn from New Road into Burroway Road and via a right turn from Burroway Road into Hill Road northbound. Should the traffic modelling reveal delays to buses turning from New Road into Burroway Road, the intersection should be designed to allow the bus right turn movement to have the priority. Existing public toilets will serve bus drivers, plus public toilets in subject development and food. Drivers mostly use Burwood and Strathfield.

Applicant explained ped and bike links. Link across subject site when completed will be open 24/7, with secure lighting and CCTV. The proposal will include safe and adequate pedestrian crossing facilities at the intersection of New Road and Burroway Road to allow pedestrians to access the development site and the interchange approaching from the south of Burroway Road and also the school site to the east of New Road.

A TAG and sustainable travel Plan will be provided in due course.

Service vehicle and car park access points are according to SOP guidelines.

TfNSW has experienced problems for bus ranks within/near major pedestrian crossings. NEW INFORMATION – TfNSW does not support any raised pedestrian platform across the foreshore road on the wharf axis between two drop off bus bays to the west and two pick up bays to the east, and recommends that either a signalised pedestrian crossing or a non-raised zebra crossing is provided at this location. A raised crossing at this location would severely contravene the operation and safety of the interchange. In addition to the bus drop off and pick up bays, adequate bus layover is to be provided on Hill Road immediately adjoining the interchange and should be of sufficient capacity to accommodate both regular public buses and special event buses.

Extra lane and indents are desirable on the east side of the New Road to two provide bus stop and parking in front of the new school without blocking passing busses and traffic.

The proposal is to provide two DDA compliant parking spaces and a kiss and ride zone on the south kerb of the foreshore road. Their location will require cars to circulate anticlockwise - signage at a Hill road desirable. Bus Entry Only is a feasible long-term option if required when the area becomes busier.

Noted the TMAP and UAP Census evidence that local use of a public transport is increasing, and should be encouraged. Bikes/walks may also link to Rhodes and improved bus and rail connectivity.

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Memo

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TFNSW noted that ferries might need in future to be moored overnight at the wharf. Some noise issues. Not regular ferry maintenance activities.

Subject Proposal responds to SOPA special event guidelines and will be operated with special event clearways etc.

This meeting satisfied attachment 1 para 2: TFNSW advises that the applicant should liaise with TFNSW on the design of the interchanges and mixed use development ..

Applicant noted SOP perimeter traffic congestion, especially DFO junction. Public transport and local facilities such as supermarket will assist to reduce external traffic generation in future. West Cornex studies including east facing ramps at Hill Road will improve the overall capacity of the arterial road network.

Applicant thanked TFNSW for the opportunity to meet. Meeting Closed at 11am.

9 Appendix: Explanatory notes

Description and Classification Methods

Glossary and descriptions are generally in accordance with the recommendations of Australian Standards AS 1348-1986.

Term	Definition
access control control of access	<ol style="list-style-type: none"> 1. Preventing vehicles and people crossing property lines by means of barriers or regulations. 2. Arranging matters so that vehicles and people have access at predetermined locations.
amenity	That element in the layout and operation of town and country which makes for a comfortable and pleasant life rather than a mere existence. It relates also to the preservation of such characteristics of a neighbourhood as make it pleasing in appearance to both the passer-by as well as to the resident and those across the road.
assignment traffic assignment	Process of allocating trips onto existing or planned routes available on the road or public transport network. Assignment may be based on one or more factors known to influence route selection, e.g. Travel time, distance, cost.
at-grade crossing level crossing	Crossing at the same level, such as a railway crossing which is at the same level as a road, or a normal road intersection.
base case	System that would exist without the introduction of the changes proposed in the project being analysed.
calibration	Process of determining the parameters of the mathematical travel models so that these models simulate observed travel patterns as accurately as possible.
capacity	Maximum flow of trains, vehicles, passengers or goods that can be accommodated in a transport system in a specified period.
road capacity	Maximum number of vehicles or pedestrians that can pass over a given section of a lane, road or footpath in one direction (or in both directions for a two-lane or three-lane road) during a given time period under prevailing road and traffic conditions. It is the maximum rate of flow that has a reasonable expectation of occurring. In the absence of a time modifier, capacity is an hourly volume. The capacity would not normally be exceeded without changing one or more of the conditions that prevail. In expressing capacity, it is essential to state the prevailing road and traffic conditions under which the capacity is applicable.
census collector's district (abbreviation CCD)	Unit of area for which each census collector is responsible for collecting information. CCDs are the smallest individual areas for which basic land use and population data are available in Australia.
central business district (abbreviation CBD)	Dominant area of business and commercial activity within a given area. CBDs are characterised by high density office and retail development, large numbers of pedestrians and vehicles, and a heavy demand for parking. Also known as central activities district (CAD).
centroid	Assumed point in a traffic zone that represents the origin or destination of all trips to or from the zone. Generally, the weighted centre of trip ends rather than a geometric centre of the zonal area.
commercial vehicle	Road vehicle constructed specifically to convey goods, passengers or burden in the course of trade or business.
cordon	Imaginary line drawn around a given study area at which traffic counts and interviews may be taken.
desire line	Straight line joining two centroids and showing the desired direction of travel.
distribution	Process by which the number of trips between zones is estimated. The distribution may be measured or be estimated by a growth factor process or by a synthetic model such as a gravity model.
85th Percentile	Value of variable characteristic of individuals in a population, possessed by at or below 85 per cent of that population.
elasticity	Ratio of the change in demand for a commodity to the change in price of that commodity. In transport, a high ratio is termed elastic while a low ratio is termed inelastic.
grade separation	The separation of road, rail or other traffic so that crossing movements which would otherwise conflict are effected at different elevations.
journey	<p>Movement involving one or more trips, e.g.:</p> <ol style="list-style-type: none"> (a) a 'journey-to-work', which could involve a direct trip to work or an intermediate stop for some other but secondary purpose; (b) an 'origin-to-origin' journey, which could involve several trips, each for a particular purpose. Home-to-home journeys have also been termed 'tours'.
model	Mathematical description of a situation which uses data on past and present conditions to make predictions about the effects of changes.
passenger car unit equivalent car unit	Measure involving the conversion of different types of vehicles into their equivalent passenger cars in terms of operating characteristics.
public transport	Service by bus, rail, taxi or other means which provides transport to the public on a regular basis for payment of a prescribed fare.
road hierarchy	Grading of roads according to increasing or decreasing importance of their traffic carrying or other function.
screenline	Imaginary line which splits a study area into two parts. Usually located along railway lines or rivers to minimise the number of crossing points.

Term	Definition
sight distance	The distance measured along the carriageway over which objects of defined height are visible to a driver.
traffic	movement between locations of persons, goods and information by means of mechanical, electrical or personal methods.
base traffic	That traffic already present on a facility, or that traffic unlikely to be affected by design changes.
by-passable traffic	That traffic which can be diverted from a particular road or area because drivers do not wish to stop on that road or in that area.
local by-passable traffic	Term normally used to refer to short distance traffic that can be diverted, usually at the expense of increased distance, not increased time.
through by-passable traffic	Term normally used to refer to longer distance traffic that can be diverted without significant time or distance penalties.
converted traffic	Component of traffic which has changed its mode of travel, e.g. from train to car.
diverted traffic	Component of traffic which has changed its route but not its origin, destination, or mode of travel.
generated traffic	<ol style="list-style-type: none"> 1. Traffic created by a new or improved facility as distinct from traffic which is diverted to a facility and normal traffic increase. 2. Traffic created by changes in land use.
induced traffic	Additional traffic resulting from some improvement in a road or in traffic arrangements.
potential traffic	Total volume which would move between two terminals assuming ideal travelling conditions.
shifted traffic	Component of traffic whose desire lines have been shifted because of change of origin or destination.
suppressed traffic	Reduction in traffic volume resulting from a change in traffic arrangements.
trip	<ol style="list-style-type: none"> 1. One-way movement from one place to another for a particular purpose (<i>see also journey</i>). Note: Care is required in applying this general definition. In particular, the definition of 'purpose' will affect the way in which person, vehicle or commodity movements are classified into trips. In travel surveys, the 'purpose' set often includes 'change mode' and 'serve passenger', thus making a trip correspond to a movement by only one mode. Movements for these purposes have been variously called 'legs', 'segments', or 'unlinked trips', in transport planning practice. For analyses, trips are often 'linked', thus making a trip embrace more than one mode and/or lower order purpose. 2. In public vehicle operations: the movement by one vehicle or unit in one direction from the start of a route to the end of it.
external trip	Trip which starts or ends outside the study area.
through trip	Trip which starts and ends outside the study area, but which passes through the study area.
internal trip	Trip which starts and ends in the study area.
linked trip	One-way movement from one place to another for a specific purpose, involving more than one mode of travel.
trip distribution	<ol style="list-style-type: none"> 1. The geographical distribution of trips. 2. Process by which the total number of trips is converted to individual zone-to-zone movements.
vehicle hours of travel (abbreviation VHT)	Total vehicle hours of travel over a road segment or number of road segments for a certain period, usually a specified year.
vehicle kilometres of travel (abbreviation VKT)	Total vehicle kilometres of travel over a road segment or number of road segments for a certain period, usually a specified year.
volume	Number of persons, vehicles or pedestrians passing a given point in a specified period of time.

Field surveys have been used to assess conditions. Unless specifically stated otherwise, these assessments have been transferred directly to the record sheets and not modified. Field descriptions may therefore be used as an independent estimate of conditions which can be correlated with other data.

AUSTROADS Design Vehicle Classification (AUSTROADS/SAA, 1995)

Bicycles	see Austroads Part 13	
Motorcycles	see Austroads Part 13	
Car/van - 85th percentile car, 99th percentile car	5.0 metres long	2 axles
Service vehicle	8.8 metres long	2 axles
Single unit truck/bus	12.5 metres long	3 axles
Long rigid bus	14.5 metres long	3 axles
Articulated bus	19.0 metres long	4 axles
Prime mover and semi-trailer	19.0 metres long	6 axles
Prime mover and long semi-trailer	25.0 metres long	6 axles
B-Double	25.0 metres long	9 axles
Road train	36.0 – 53.0 metres long	11-16 axles

Levels of Service

- **Level of Service A** is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
- **Level of Service B** is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is a little less than with level of service A.
- **Level of Service C** is also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
- **Level of Service D** is close to the limit of stable flow and is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.
- **Level of Service E** occurs when traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause break-down.
- **Level of Service F** is the zone of forced flow. With it, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow break-down occurs, and queuing and delays result.

Degree of Saturation: The DS is another measure of the operational performance of individual intersections. As both queue length and delay increase rapidly as DS approaches 1.0, it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 residual queues can be anticipated.

Road Classification

Broad Classification

Arterial Roads	Freeways	Those roads with full access control and grade separated intersections, whose primary function is to service large traffic movements.
	Primary Arterial Roads	Those arterial roads whose main function is to form the principal avenue of communication for metropolitan traffic movement not catered for by freeways.
	Secondary Arterial Roads	Those roads which supplement the Primary Arterial Roads in providing for through traffic movement, to an individually determined limit that is sensitive to both roadway characteristics and abutting land users.
Local Roads	Collector Roads	Those non arterial or 'intermediate' roads which distribute traffic between the arterial roads and the local street system, which provide local connection between arterial roads and which provide access to abutting property. It is the collector road, which mixes the basic functions of carrying traffic – often at excessive speed – and serving as a local residential street, that is the generator of many of the problems encountered in traffic management in Local Traffic Areas.
	Local Access Streets	Those streets, not being arterials or collectors, whose main (traffic) function is to provide access to abutting property.

Source: Austroads Part 10, 1988

Classification of Residential Streets

Access Street	Access Place	The lowest order of street providing access to sites without any traffic generated by sites in other streets. Target maximum speed 15 km/h. Indicative traffic volume 300 vpd.
	Local Street	Access streets are generally streets where the residential environment is dominant, traffic is subservient, speed and volume are low and pedestrians and cycle movements are facilitated. Target maximum speed 40 km/h. Indicative traffic volume <200 vpd.
Collector Streets	Minor Collector	The collector street collects traffic from access streets and carries higher volumes of traffic. A reasonable level of residential amenity and safety is maintained by restricting traffic volumes and vehicle speeds. Vehicle speeds are controlled by street alignment, intersection design and, in some cases, by speed control measures. Target maximum speed 50 km/h. Indicative traffic volume <3000 vpd.
	Major Collector	The major collector is generally short and connects the collector street with the road corridor network. Fronting development should still be encouraged, but with siting conditions which ensure acceptable amenity and safety. Target maximum speed 60 km/h. Indicative traffic volume <6000 vpd.

Source: AMCORD 1995, Element 1.3 Street Networks

Road management between Roads and Maritime Services (replacing Roads and Traffic Authority) and councils in NSW provides for three categories of road: State, Regional and Local. Refer to NSW Road Management Arrangements for more details. **Legal Class** The Roads Act 1993 provides for roads to be classified as Freeways, Controlled Access Roads, Tollways, State Highways, Main Roads, Secondary Roads, Tourist Roads, Transitways and State Works. The classification of a road empowers Roads and Maritime Services (replacing Roads and Traffic Authority) to exercise broad authority over some, or all, aspects of legally classified roads and to provide financial assistance to councils. **Administrative Class** To simplify administration of the various legal road classes, the roads in which Roads and Maritime Services (replacing Roads and Traffic Authority) has an interest and council roads are grouped into a three tier administrative classification system of State, Regional and Local Roads. The schedule of roads classified under the Roads Act 1993 and of State and Regional Roads is on the RMS website.