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New Brighton Golf Club

Report for New Brighton Golf Club Rezoning Specialist Studies

Transport Assessment

June 2011



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1. Introduction

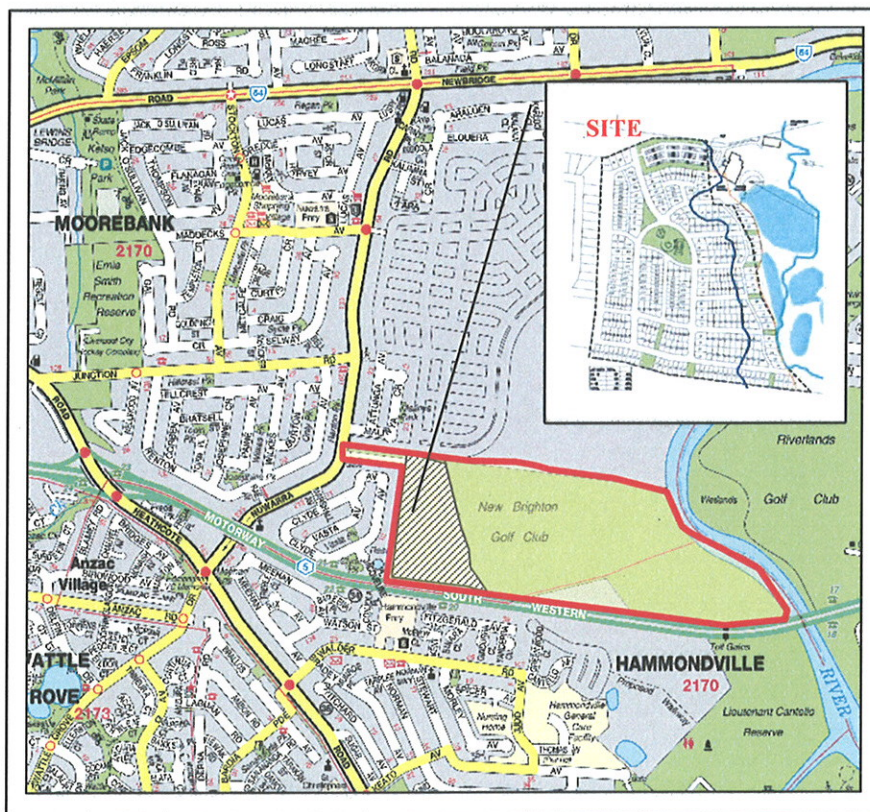
1.1 Proposed Development

The New Brighton Golf Club is proposing to lodge a Planning Proposal to develop part of the existing New Brighton Golf Club land in Moorebank, Liverpool for residential purposes and includes the redesign of the existing golf holes, and construction of a new club house. This area is proposed to accommodate approximately 313 residential lots.

The development site (herein referred to as "the Site") is located 4.5 km west of Liverpool and north of the M5 South West Motorway. The site's current vehicular access is situated along Nuwarra Road. The site forms part of the existing New Brighton Golf Club land and is located toward the west boundary of the property. It is 16 hectares in area.

The location of the Site is shown in Figure 1

Figure 1 Location of the Site



The current study is intended to determine the suitability of the site with respect to traffic and transport concerns that need to be addressed as part of a rezoning application for residential purposes. The development is currently anticipated to be developed within the next five years and should be completed and fully occupied by 2016.



1.2 Background

1.2.1 Previous Studies

GHD Pty Ltd (GHD) was initially engaged in November 2009 by New Brighton Golf Club to undertake a traffic assessment study associated with the proposed rezoning of the Site from private recreation to residential with some associated service uses. The previous development layout has been amended slightly over time and a new concept plan has been prepared by Mirvac Design for the rezoning as a residential subdivision only. A Planning Proposal is currently being prepared to be submitted to Liverpool Council to support the rezoning application.

This Transport and Traffic Assessment Report is an update of the previous presented report and should be used to support the planning application for the rezoning of the Site. The report itself presents the findings of the assessment conducted by GHD with respect to traffic, transport, access and circulation.

1.2.2 Existing Land Use

The New Brighton Golf Club land is situated north of the M5 motorway and currently consists of an 18 hole golf course, club house, pro shop, ground maintenance shed and grassed fairway and green areas, as well as vegetated areas.

1.2.3 DCP 50 – Boral Moorebank

Development Control Plan 50 was adopted by Liverpool City Council on 26th July 2006 and provides detailed controls to guide development on the Boral Moorebank Land. This Plan supplements the controls set out in Liverpool Local Environmental Plan 1997. Refer to the following figures for an understanding of the location of this land, characteristics and the proposed site structure.

Figure 2 Boral Moorebank Land Site and Structure Plan

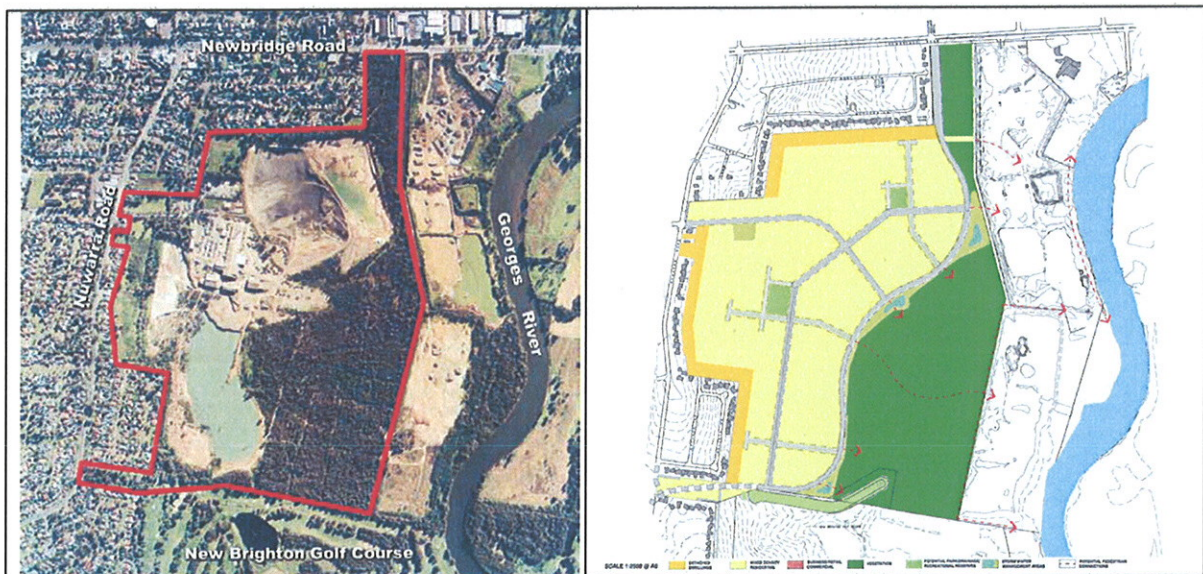


Figure 3 Key Street Network and Potential Bus Routes and Bus Stops



Refer to Section 5.2.1 for further details of the site and proposed land uses.

1.2.4 Metropolitan Transport Plan 2010

The 'our new approach to transport and land use planning' section of 'Supporting our cities and centres', which forms part of the 'Metropolitan transport plan 2010' indicates the following key objectives:

- ▮ The metropolitan strategy identifies regional cities with Liverpool being one of three planned to serve Metropolitan Sydney. These regional cities are planned to offer a full range of jobs, services and recreational opportunities.
- ▮ It also identifies that Western Sydney will be the focus of significant community and job growth and will require efficient, frequent and reliable public transport to regional centres.
- ▮ The planned growth around regional cities will help to achieve the shared vision for Sydney and will increase the number of people who live and work within 30 minutes by public transport of a city and help to increase the share of commuter trips by public transport during peak hours.
- ▮ Liverpool is the focus of a medical and education hub and will be boosted by planned commercial development around its transport interchange along with improvements to the retail experience - public transport links into Liverpool will also be improved.
- ▮ The Metropolitan Transport Plan (The Plan) indicates that it is in support of an integrated approach to transport and land use planning to ensure transport supports Sydney's role in the national economy and provides new locations for living, working, shopping, education and community and recreational facilities.
- ▮ The Plan recognises that travel demand will increase with population growth and economic activity and the maturity of the transport system.



- ▶ It also recognises that if no action is taken then urban congestion will increase significantly impacting on travel times, vehicle operating costs and the quality of air.
- ▶ The Plan highlights that more needs to be done above just accommodating for growth and a focus on a compact efficient city shape that plans work, educational and social trips around public transport opportunities and focuses on improving quality of life outcomes.
- ▶ This will be done by ensuring that housing and employment is located in the right locations and by maximising the value offered by current and planned public transport corridor investment.

1.2.5 South West Sydney Sub Regional Strategy

The strategy recognises the current deficiencies in the transport network and the planning of land use, which has influenced travel trends in the past. These include

- ▶ That the system needs to provide access to activities in different locations at different scales
- ▶ That most travel is taken at a subregional level
- ▶ 79% of trips by South West Sydney residents are made by private vehicle.
- ▶ Only 12.3% of trips are made by public transport and 12.3% by walking or cycling.
- ▶ The sub region has the lowest percentage of walking and cycling trips and the highest proportion of private vehicle based trips.
- ▶ The region is characterised by dispersed development and lack of access to a high quality public transport system, which influences travel behaviour.
- ▶ 47% of South West Subregion school children travel to school by private vehicle.
- ▶ South West residents spend an average of 44 minutes per person per day driving, which is the highest for any subregion and nearly 20% higher than the Sydney averages. The distance and time given to commuting is viewed to contribute to this trend.
- ▶ The distance travelled by South West residents per day (47.7km) is significantly higher than the Sydney average of 36.6km as is the case for average Vehicle Kilometres Travelled, which is nearly 50% higher than the Sydney average (20.3km),

1.3 Report Format

The report is set out in the following format:

- ▶ Section 2 – Existing Conditions describes the existing road network, transport conditions and the operating performance at existing key intersections;
- ▶ Section 3 – Existing Transport Context summarises current peak hour Journey-to-Work travel trends for the Liverpool Local Government Area and highlights the objectives of current Metropolitan and Subregional policies and strategies;
- ▶ Section 4 – Proposed Land Use Changes and Traffic Generation details the estimated traffic generation for the proposed development, identifies proposed vehicular access points and other known future developments;
- ▶ Section 5 – Impact Assessment reports the operational performance of the road network with the proposed development traffic and other known development scenarios; and
- ▶ Section 6 – Summarises the findings from the above investigations.



2. Existing Conditions

2.1 Existing Road Network

The road network in the immediate vicinity of the Site consists of Nuwarra Road, Newbridge Road, Heathcote Road and the M5 South Western Motorway.

The classification of roads on the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic they should appropriately carry. The Roads and Traffic Authority (RTA) have developed a set of road hierarchy classifications detailed in Table 1 indicating typical nominal volumes in terms of average annual daily traffic (AADT) serviced by various classes of roads.

Table 1 Functional Classification of Roads

Type of Road	Traffic Volume (ADT)	Peak Hour Volume (vph)
Arterial Road	>15,000	1,500 – 5,600
Sub-Arterial Road	5,000 – 20,000	500 – 2,000
Collector Road	2,000 – 10,000	200 – 1,000
Local Road	<2,000	0 - 200

2.1.1 Nuwarra Road

Nuwarra Road has a dual function both as a collector road to the north of Newbridge Road and as a sub arterial road to the south. The corridor runs in the north-south direction and connects with Alfred Road and residential areas in the Nuwarra/ Chipping Norton area in the north, and Heathcote Road to the south. It has a posted speed limit of 50 km/h and runs near to the western boundary of the Site. It has one traffic lane in each direction with provision for turn bays at key intersections situated along the road section between Newbridge Road and Heathcote Road. \

Observations indicate that this corridor acts as an alternative north south travel route between Heathcote Road and Newbridge Road for traffic travelling between Hume Highway and Governor Macquarie and the M5 Motorway, Heathcote Road and other southern arterial routes.

Traffic surveys undertaken in 2009 as part of the initial traffic assessment, indicated that there are approximately 1,400-2,000 vehicles using the route between Newbridge Road and Heathcote Road during peak hours. The afternoon peak volume tends to be higher and the main direction of flow is southbound. The RTA traffic volume count station located just north of Heathcote Road registered an AADT of 22,000 vehicles in 2005. The latest RTA Traffic Volume Data for 2008 did not include this count location. Both sets of traffic volumes indicate that Nuwarra Road is currently operating at the higher end range of the intended sub-arterial road functional classification.

Figure 4 Nuwarra Road, view looking north towards approach to Maddecks Avenue



2.1.2 Newbridge Road (MR167)

Newbridge Road (MR167) is an arterial road that provides the east-west connection linking Liverpool CBD with areas to the east to Henry Lawson Drive in the west and employment areas within Bankstown. East of Henry Lawson Drive the route is extended and becomes known as Milperra Road and Canterbury Road. The western end of Newbridge Road connects to the northern end of Heathcote Road and intersects with the northern end of Nuwarra Road further east.

The road corridor consists of divided carriageway with three travel lanes in each direction with a sign posted speed limit of 70 km/h. Intersections along the corridor are restricted and corridor allows for right turn movement at most signalised intersections.

Data from the 2008 RTA Traffic Volume Data indicated that Newbridge Road between the Georges River Bridge and Henry Lawson Drive exhibited an AADT of approximately 54,400 vehicles. The 2009 intersection turning movement counts indicated that Newbridge Road carries a peak hour volume of between 4,100 and 4,400 vehicles per hour. Both sets of traffic volumes indicate that Newbridge Road is currently operating at the higher end range of the intended arterial road functional classification.

Figure 5 Newbridge Road, west of Nuwarra Road



2.1.3 Heathcote Road

Heathcote Road (MR512) is a State Road and acts as an arterial route connecting Liverpool CBD with the M5 South Western Motorway, Holsworthy and Heathcote in the south. It intersects with Nuwarra Road southeast of the interchange with the M5 South Western Motorway.

In close proximity to the Nuwarra Road intersection, Heathcote Road has divided carriageways with two traffic lanes in each direction. At the intersection with Nuwarra Road the corridor is expanded to accommodate slip lanes and turning bays on approaches to this key intersection. The signposted speed limit along this section of the corridor is 60 km/h and acts as a key access route to the M5 Motorway via grade separated interchange situated approximately 0.5km north west of the intersection with Nuwarra Road.

It is understood from previous conversations with representatives from the RTA that the intersection of Heathcote Road and M5 Motorway forms part of Pinch Points program and has recently been upgraded. The project mainly focussed on improving network reliability with the installation of closed circuit television (CCTV) infrastructure for incident management response.

Heathcote Road has an AADT of approximately 19,000 vehicles and carries peak hour traffic volumes in both directions of approximately 3,000 vehicles per hour. This indicates that Heathcote Road in close proximity to Nuwarra Road is currently operating at the higher end range of the intended arterial road functional classification.

Figure 6 Heathcote Road, view looking east from Nuwarra Road intersection



2.1.4 M5 South Western Motorway

The M5 South Western Motorway forms the key southern leg of Sydney's orbital road network and provides links to other orbital roads linking Central Sydney, key north south transport corridors, Port Botany and Mascot to the east with Liverpool, South West Sydney, Western Sydney and beyond to the west. It runs in an east-west direction and connects with the Westlink M7, F5 freeway and the Hume Highway to the east and the M5-East motorway, Henry Lawson Drive, Fairfield Road (MetRoute 6) and King Georges Road (MetRoute 3) to the east.

The Motorway was opened in 1992 and spans a total distance of 22 km from the Cross Roads in Sydney's south west to Beverly Hills situated in the Inner Western Sydney.

The latest published AADT information from the RTA indicates that the M5 Motorway had an AADT of about 118,000 in 2006.

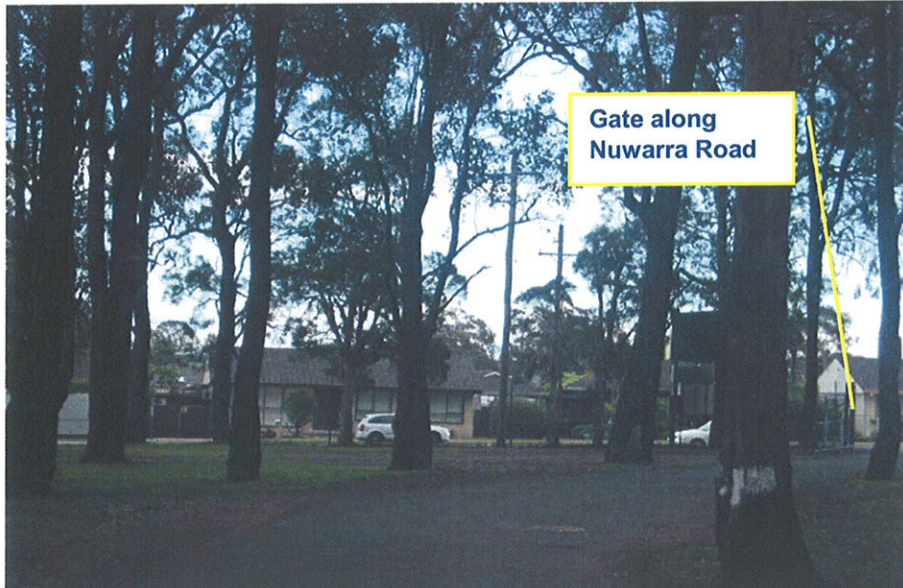
2.2 Site Access

As described in Section 1.1, the Site is currently accessible from Nuwarra Road using the existing entrance for the Golf Club.

The existing access driveway to the New Brighton Golf Club connects to Nuwarra Road at its western end. The route runs in an east-west direction and approximately 150 m east of Nuwarra Road it follows a more southerly alignment along the boundary with existing residential properties situated along Clyde Avenue. At the eastern end of the route provides access to the New Brighton Golf Club's main entrance, the main parking area and Clubhouse.

At Nuwarra Road, the road is a narrow undivided sealed road with no kerb and gutter and the alignment is currently dictated by the location of tall trees. The section of the road that runs along the boundary of Clyde Avenue property has a relatively straight alignment with kerb and gutter installed throughout the remainder of its length. It has a posted speed of 25 km/h and is gated in close proximity to Nuwarra Road.

Figure 7 Access Driveway, view looking towards Nuwarra Road access gate.



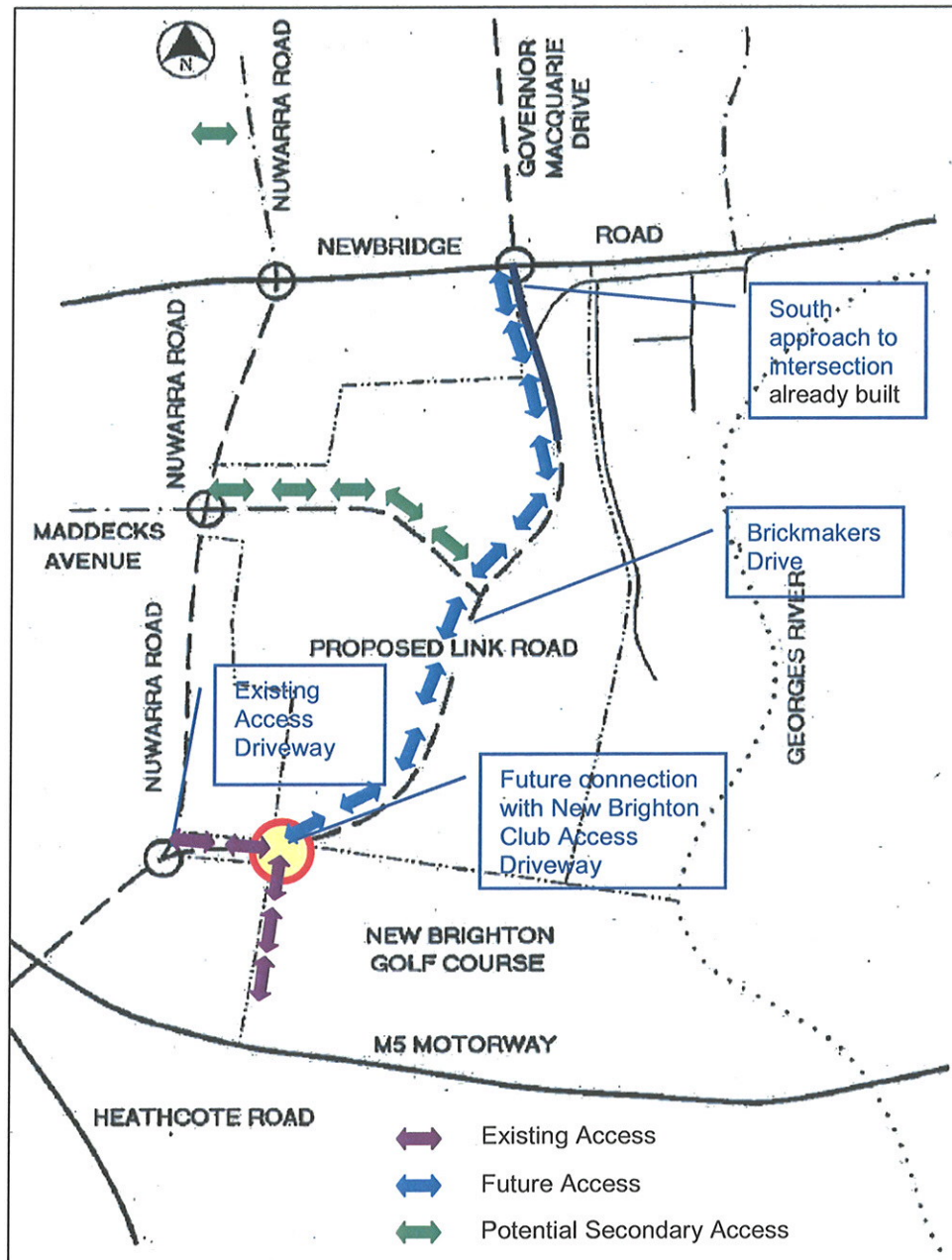
2.3 Proposed Access Improvement

It is currently proposed for the Site to be connected to a newly formed collector road, known as Brickmakers Drive. The delivery and function of Brickmakers Drive is associated with the Boral Moorebank site development project. We understand Brickmakers Drive will replace the existing Golf Club access point to Nuwarra Road and it is understood that an agreement is in place that will allow both the Golf Club and the proposed development to use Brickmakers Drive to access both Nuwarra Road and Newbridge Road. This new link will connect to Nuwarra Road via a signalised intersection and also provide an additional access route to Nuwarra Road further north via a newly formed signalised intersection with Maddecks Avenue.

Brickmakers Drive has already been partially built at its northern end where it forms the south approach to the intersection with Newbridge Road and Governor Macquarie Drive. The intersection of Newbridge Road/Governor Macquarie Drive/ Brickmakers Drive currently operates as a signalised T intersection. Brickmakers Drive will form a fourth southern leg to the intersection and will alter the current operation of the intersection. Access to Brickmakers Drive is currently curtailed with a temporary gate and it is unknown yet as to when the paving of the entire roadway will be completed and the road opened to traffic.

Refer to Figure 6 for an overview of the proposed access arrangements to the site once Brickmakers Drive is completed and open to traffic.

Figure 8 Schematic Diagram of Brickmakers Drive in connection with the New Brighton Golf Club Access Driveway



2.4 Traffic Growth

The RTA has a combination of permanent and temporary traffic counting stations along key sections of the New South Wales arterial road network. Data from permanent count stations positioned in close



proximity to the site were reviewed in order to understand the historical daily traffic trends along the surrounding arterial road network.

Table 2 shows the recorded traffic volumes at the counting stations that were reviewed as part of this study. The observed traffic volumes along Nuwarra Road indicated that traffic growth occurred at a rate of 1.67% per annum over a 12 year period between 1993 and 2005. However, the recent data taken from 2002 and 2005 indicated that the daily traffic had declined slightly.

Traffic volumes along Newbridge Road indicated that there was a general decline in daily traffic between 1996 to 2008. The data also presented a significant reduction between 2002 and 2005. This can be argued to being attributed to the provision of a grade separated interchange along the M5 South Western Motorway at Moorebank Avenue. This removed the critical bottleneck in the network, which caused major delays to traffic travelling along the M5 Motorway between the Hume Highway and Heathcote Road. As a result the M5 Motorway has become a more attractive route, which has reduced the attractiveness of other alternative routes across the region.

Recorded traffic volumes for Heathcote Road highlight that average daily traffic grew between 1996 and 2002 and 2005 volumes indicated that the average daily traffic flows declined. This decline can also be attributed to the improvements in traffic conditions on the M5 Motorway.

Table 2 Average Annual Daily Traffic (AADT) Volumes, Vehicles

Station	Location	1996	1999	2002	2005	2006	2007	2008
44.001	Newbridge Road MR167 –SL11	66113	64438	63639	56698	55114	55408	54382
62.142	Nuwarra Road, north of MR 512 Heathcote Rd	21,577	20,443	22,426	22,031	No data	No data	No data
62.141	Heathcote Road MR512, north of F5 Freeway	17436	20809	20939	18998	No data	No data	No data

Source: Roads and Traffic Authority, Traffic Volumes Data for Sydney (2005)

Based on the above table, it is evident that traffic growth is static and can be attributed to the attractiveness of recently upgrade strategic routes and the level of delay already being experienced along the arterial road network.

2.5 Existing Peak Period Traffic Volumes

This traffic assessment focuses on impacts during the AM and PM peak periods, when demand for traffic capacity in the surrounding network is perceived to be at its highest. The assessment includes the appraisal of the performance of three critical intersections along the network, which will be impacted by the site. Peak period vehicle counts have been obtained from the previous traffic assessment for 2009 traffic conditions, Intersections that will be assessed as part of this study include:

- The signalised intersection of Nuwarra Road with Heathcote Road and Wattle Grove Drive;
- The signalised intersection of Nuwarra Road with Newbridge Road; and



- The signalised intersection of Newbridge Road with Governor Macquarie Drive and in the future Brickmakers Drive.

The peak-period counts were conducted on 21 October 2009, from 7:00am to 9:00am and from 16:00 to 18:00 (4:00pm - 6:00pm). Considering no new road network improvements have been put in place since 2009 and that current trends manifested static or a decline in traffic growth along key roads near to the Site, it is assumed that the 2009 intersection volume data still remain valid for the purpose of this assessment report.

The summary results of the peak period counts are listed in Table 3.

Table 3 Existing Peak Period Traffic

Road Section	Vehicles per Hour, both directions	
	AM	PM
Nuwarra Road	1,300	2,000
Newbridge Road	4,100	4,400
Governor Macquarie Drive	1,400	1,900
Heathcote Road	3,100	3,000

2.6 Existing Intersection Turning Movements

The locations of these intersections in relation to the Site are shown in Figure 9.

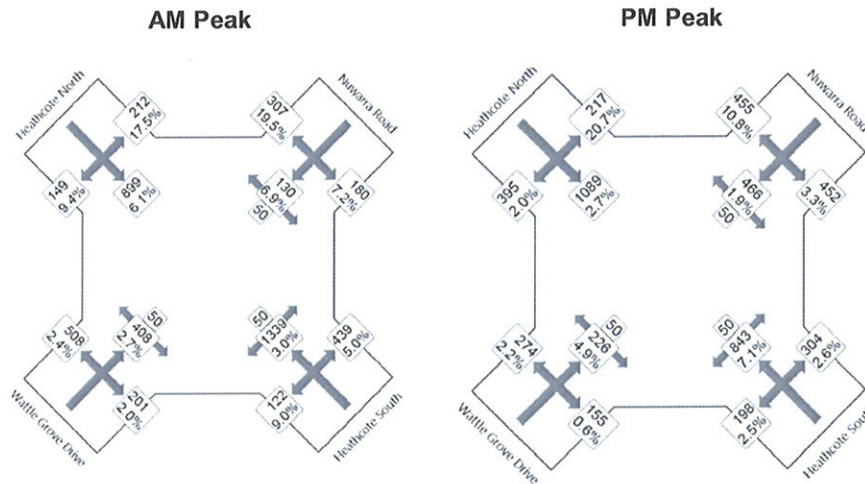
Figure 9 Location of Intersection Surveys



The volumes of the intersection vehicle flows during the morning and afternoon peak hours for the surveyed intersections are shown in Figure 10 to Figure 12 .



Figure 10 Nuwarra Road – Heathcote Road Intersection Volumes (2011)



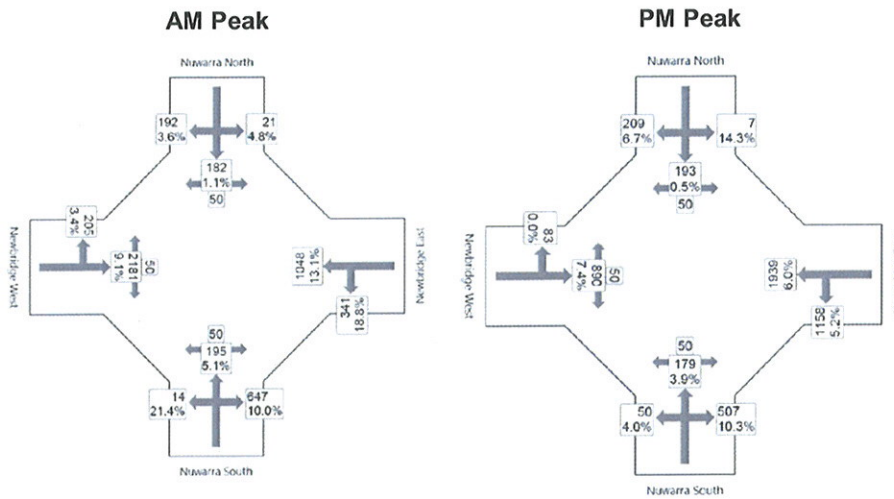
1268 - directional total volume at approach

37 - directional heavy vehicle volume at approach

765 - directional total volume at approach

59 - directional heavy vehicle volume at approach

Figure 11 Nuwarra Road – Newbridge Road Intersection Volumes



181 - directional total volume at approach

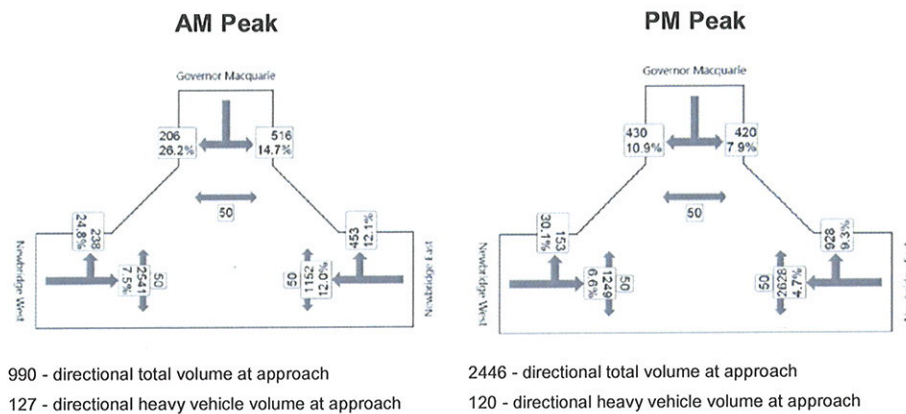
9 - directional heavy vehicle volume at approach

168 - directional total volume at approach

7 - directional heavy vehicle volume at approach



Figure 12 Newbridge Road – Governor Macquarie Drive Intersection Volumes



The results of the counts revealed that the morning peak hour occurred between 7:15am and 8:15am along the Newbridge Road corridor and between 4:00pm and 5:00pm for the afternoon peak at all three intersections.

2.7 Intersection Performance

2.7.1 Level of Service

The 'Level of Service' (or LoS) is the standard measure used to understand the operational performance of the network and intersections. This is defined as the qualitative assessment of the quantitative effect of factors such as speed, traffic volume, geometric features, delays and freedom of movement. The level of service concept is applied to intersections through measures of effectiveness, as summarised in Table 4.

Table 4 Measures of Effectiveness for Level of Service Definition for Intersections

Intersection Control	Measure of Effectiveness
Sign or merge control	Average Delay (sec/vehicle)
	Delay to critical movements
	Queue length for critical movements
Traffic Signals	Average Delay (sec/vehicle)
	Delay to critical movements
	Degree of Saturation
	Cycle Length
	Queue length for critical movements
Roundabout	Average Delay (sec/vehicle)
	Delay to critical movements
	Degree of Saturation



Intersection Control	Measure of Effectiveness
	Queue length for critical movements

The assessment of intersection operation is based on criteria outlined in Table 5, as defined by the NSW Roads and Traffic Authority (*Guide to Traffic Generating Developments*, RTA 2002).

Table 5 Level of Service Criteria for Intersections (RTA NSW)

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control modes	At capacity, requires other control mode
F	> 70	Over Capacity Unstable operation	Over Capacity Unstable operation

The average delay assessed for signalised intersections is over all movements. For roundabouts and priority control intersections (with *Stop* and *Give Way* signs or operating under the T-junction rule), the critical criterion for assessment is the movement with the highest delay per vehicle. Average delay is expressed in seconds per vehicle.

2.7.2 Existing Intersection Operation

The performance of existing intersections has been assessed using SIDRA Intersection Analysis software tool. The Level of Service criteria set by the RTA¹ is outlined in the previous section and it is **noted that Level of Service "D" is generally an accepted operating condition** along the urban arterial road network in Metropolitan Sydney.

SIDRA calculates the amount of delay experienced by vehicles using an intersection, and gives a Level of Service rating to relate this to the operating performance of that intersection. This relationship is

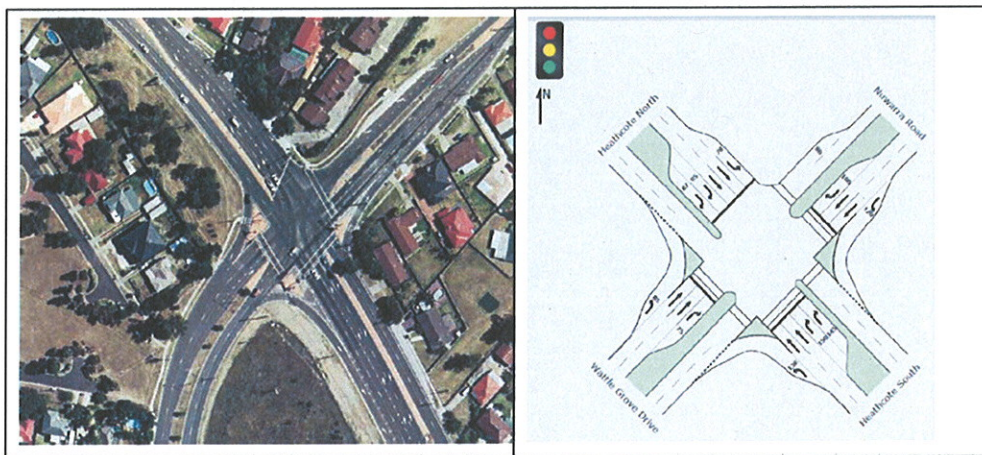
¹ *Guide to Traffic Generating Developments*, NSW- Roads and Traffic Authority, 2002

presented in Table 5 and outputs from the model provide LoS and average delay (in seconds per vehicle) recordings for the intersection as a whole and as a breakdown per movements.

2.7.3 Nuwarra Road – Heathcote Road Intersection

Located south of the Site, the intersection serves traffic travelling along Nuwarra Road wanting travel from or to Heathcote Road and the M5 Motorway. The intersection configuration is shown in Figure 13.

Figure 13 Nuwarra Road – Heathcote Road Intersection Configuration



Source of Aerial Photography: Google Earth Pro

Source: SIDRA Model Layout

A summary of the results of the analysis for the current traffic volumes is presented in Table 6 below.

Table 6 Existing Intersection Operation, Nuwarra Road – Heathcote Road

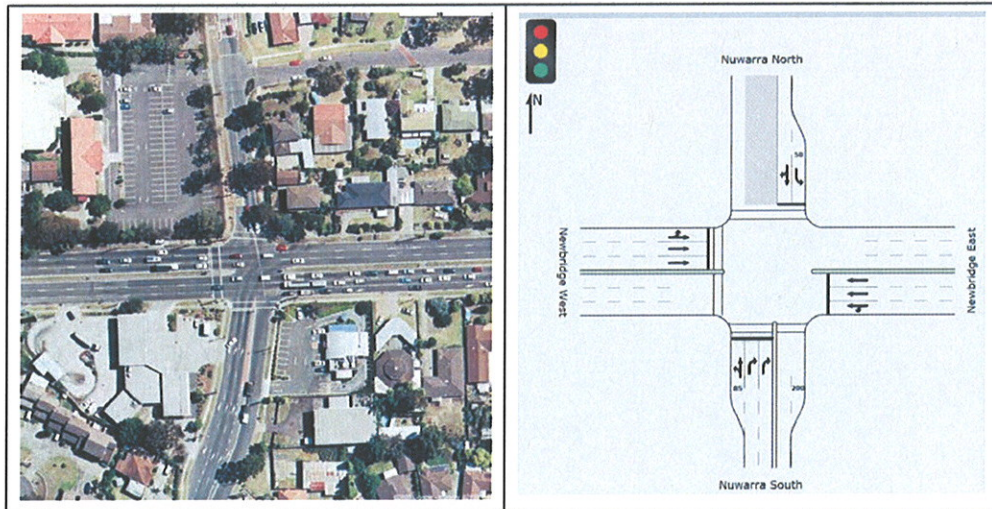
AM Peak				PM Peak			
LoS	Degree of Saturation	Average Delay (secs)	95% Back of Queue (m)	LoS	Degree of Saturation	Average Delay (secs)	95% Back of Queue (m)
D	1.038	50.3	36.2	E	1.036	70.2	>300

The intersection is operating near or at capacity with a recorded LoS “D” in the AM peak and LoS “E” in the PM peak. These measures indicate that improvements to intersection operations are required.

2.7.4 Nuwarra Road – Newbridge Road Intersection

Nuwarra Road intersects with Newbridge Road on the northern end of its corridor and currently provides access to Liverpool CBD, Governor Macquarie Drive, Moorebank town centre, the New Brighton Golf Club and the M5 Motorway. The intersection configuration is shown in Figure 14.

Figure 14 Nuwarra Road – Newbridge Road Intersection Configuration



Source of Aerial Photography: Google Earth Pro

Source: SIDRA Model Layout

Table 7 Existing Intersection Operation, Nuwarra Road – Newbridge Road

AM Peak				PM Peak			
LoS	Degree of Saturation	Average Delay (secs)	95% Back of Queue (m)	LoS	Degree of Saturation	Average Delay (secs)	95% Back of Queue (m)
E	1.041	63.9	>300	F	1.601	117.6	>200

The intersection is operating over its capacity and vehicles travelling along this route experience significant delays when traffic during peak periods. The results of the modelling were verified against actual conditions and the observations confirmed that long queues and significant delays to vehicles occurred at the intersection during both AM and PM peaks.

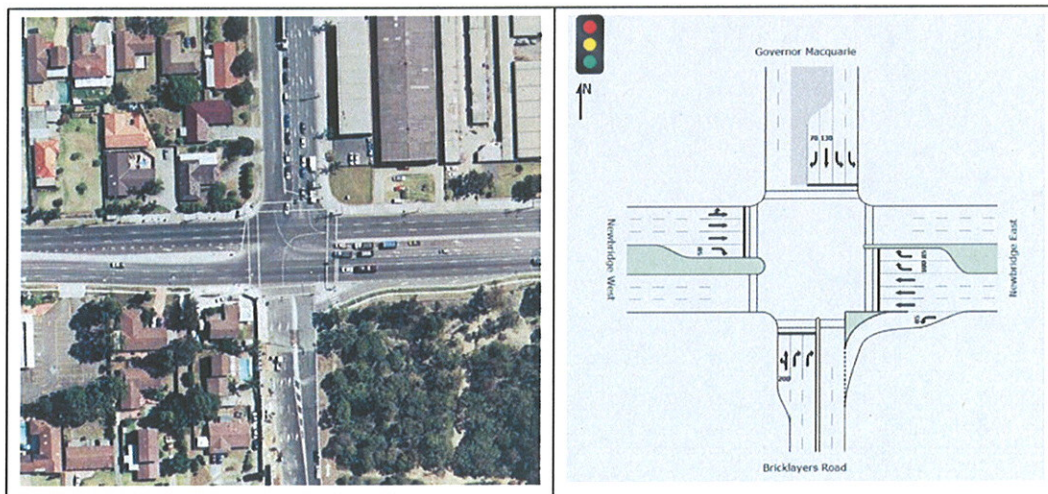
2.7.5 Newbridge Road – Governor Macquarie Drive Intersection

The Newbridge Road – Governor Macquarie Drive intersection, carries significant east-west movement between Henry Lawson Drive and Liverpool CBD and along with north-south movement between Governor Macquarie Drive and Nuwarra Road or Henry Lawson Drive. This intersection is also proposed to become an alternative access point for both the proposed Boral Moorebank and the New Brighton Golf Club sites via Brickmakers Drive. Brickmakers Drive forms the fourth southern leg to the intersection and is being built as part of the Voluntary Planning Agreement drawn up for the proposed Boral Moorebank site development. Brickmakers Drive is currently closed to traffic due to the ongoing construction works preparing the former quarry land and brickmaking facility for residential development of 950 lots. When opened to traffic, Brickmakers Drive is likely to be a main access route for both Boral Moorebank area and the Site.



The intersection configuration is shown in Figure 15. The southern approach to the intersection is currently closed to traffic.

Figure 15 Newbridge Road – Governor Macquarie Drive Intersection Location



Source of Aerial Photography: Google Earth Pro

Source: SIDRA Model Layout

A summary of the results of the analysis for the current traffic volumes is presented in Table 8 below.

Table 8 Existing Intersection Operation, Nuwarra Road – Governor Macquarie Drive

AM Peak				PM Peak			
LoS	Degree of Saturation	Average Delay (secs)	95% Back of Queue (m)	LoS	Degree of Saturation	Average Delay (secs)	95% Back of Queue (m)
D	0.957	56	614.6	C	1.0	41.2	284.2

Under its current configuration and traffic volumes, the intersection is already operating near capacity in the AM peak and satisfactorily at LoS 'C' in the PM peak.

2.8 Public Transport

Both the Site and the Boral Moorebank lands situated to the north of the Site are still undergoing planning approvals and as a result don't warrant a bus service to travel directly through the site.

In close proximity to the site there are a number of bus services that are currently in operation and serve this catchment. The two bus routes are operated by Veolia Transport NSW and it is expected that the current policy position would encourage an extension to these services to better connect with the proposed new residential catchment area. The services currently in operation consist of bus routes 902 along Nuwarra Road and the Metro Bus M90 along Newbridge Road, which could easily be diverted along Brickmakers Drive as a local service in the future.

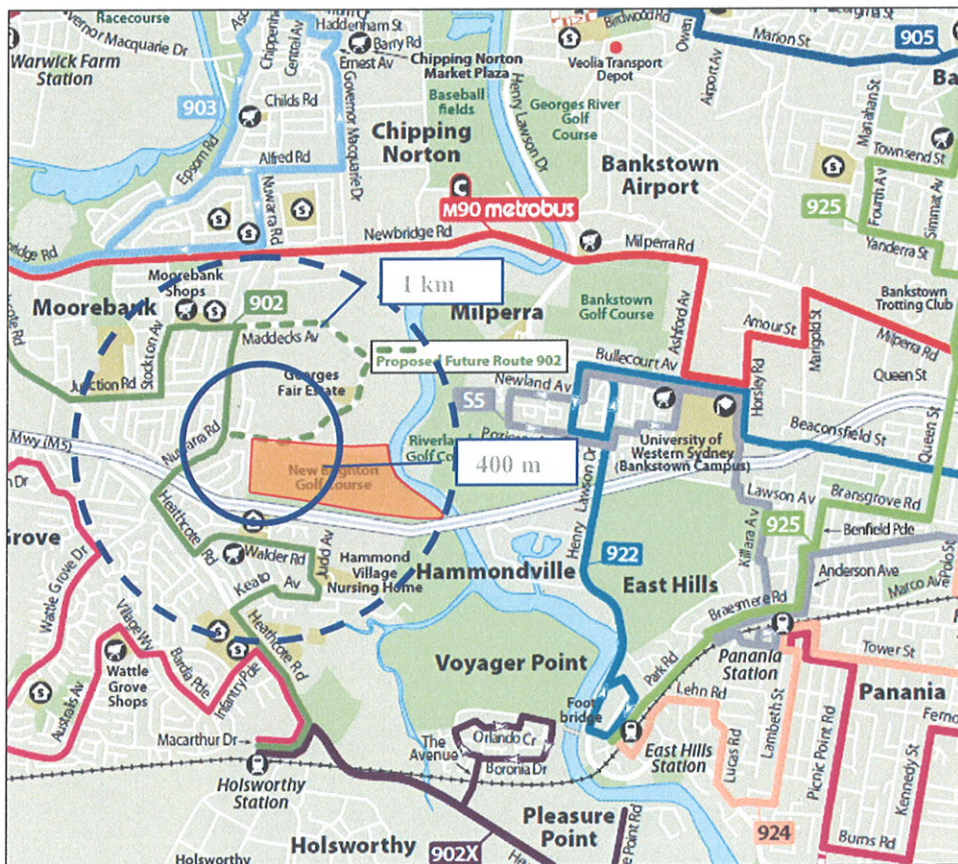


The Metro Bus route M90 runs along Newbridge Road between Liverpool and Burwood via Bankstown. It operates six days a week (Mondays to Saturdays), with the Sunday services only between Bankstown and Burwood. The current service frequency is every 10 minutes during peak hours and every 15-20 minutes at most other times.

The existing Bus Route 902 runs between Holsworthy and Liverpool via Moorebank. It operates 7 days a week, with an average of two services during the AM and PM peak hours in each direction. It is proposed to be reconfigured in the future to run via Brickmakers Drive and Maddecks Avenue to services the adjacent Boral Moorebank Land and as a result it will serve the Site.

Figure 16 shows these two bus service routes currently operating within the catchment area for both the Boral Moorebank lands and the site.

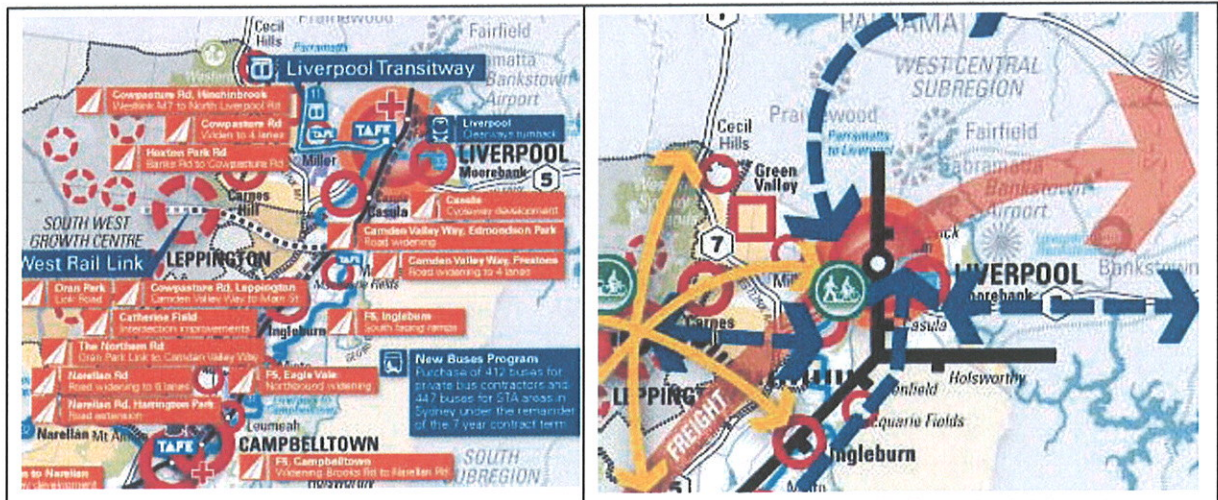
Figure 16 Bus Routes



Source: Extract from <http://www.connexnsw.com.au/services/map13.pdf>, Veolia Transport NSW 2011

It is also noted from the review of the South West Sub Regional Strategy that Newbridge Road is identified to be a strategic transport corridor and planned to accommodate strategic bus corridor number 33. This is identified to be in operation by 2014 and will offer high frequency and reliable bus services for planned increase in population and employment along the corridor and in the centres of Liverpool, Moorebank and Bankstown.

Figure 17 – Strategic Transport Corridor 33 (Liverpool to Bankstown) – Newbridge Road

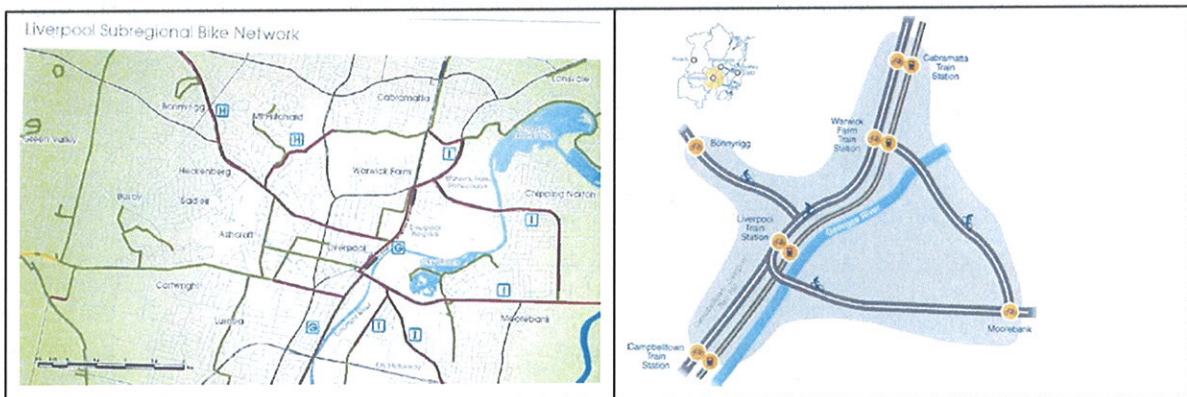


Source: Extract from <http://www.metrostrategy.nsw.gov.au/LinkClick.aspx?fileticket=s8FmewYaZYE%3d&tabid=79>

2.9 Pedestrian and Cycle Network

There are currently limited pedestrian or cycleway networks in the locality of the Site. However, both the NSW Bike Plan and the Liverpool Bike Plans (recently adopted by Council in July 2010) propose to construct a number of off and on road bicycle routes. These routes will provide designated routes that are attractive for both recreation and commuting by bike to key surrounding centres and destinations that will serve the Site.

Figure 18 – NSW and Liverpool Bike Plans



Source: Extract from <http://www.nsw.gov.au/sites/default/files/uploads/common/10324%20NSWTI%20Bike%20Flyer%20Liverpool.pdf> and http://www.nsw.gov.au/sites/default/files/uploads/common/NSWBikePlan_WEB_Chapter2.pdf

The Liverpool Bike Plan includes the provision of a proposed off-road cycle route along Brickmakers Drive between Newbridge Road and Nuwarra Road. Refer to Figure 19, which will have significant influence on the future structure and configuration of the Site's pedestrian and cycleway network. These routes offer direct and safe bicycle routes for access to Liverpool CBD along with connections to the existing off-road cycling network along Heathcote Road and the F5 Freeway, and the on-road cycleway

along the M5 South West Motorway. These planned connections will provide improved cycle access to the north, west, south and east.

Figure 19 Proposed Bike Routes



Source: <http://www.liverpool.nsw.gov.au/LCC/>

2.10 Crash Analysis

Crash data for Newbridge Road, Nuwarra Road and Heathcote Road has been analysed for a 5 year period. This information has been obtained from Roads and Traffic Authority and the period provided dates from the start of 2005 to the end of 2009.

2.10.1 Surrounding Road Corridors

Appraisal of this data indicates that a total of 200 crashes were recorded along Heathcote Road, Nuwarra Road and Newbridge Road corridors.

Table 9 Number of Crashes, 2005 - 2009

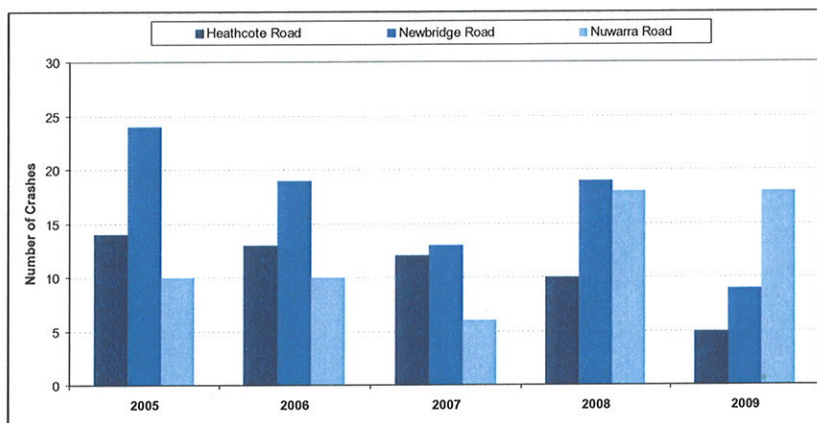
Location	Year				
	2005	2006	2007	2008	2009
Heathcote Road	14	13	12	10	5
Newbridge Road	24	19	13	19	9



Location	Year				
Nuwarra Road	10	10	6	18	18
Total	48	42	31	47	32

Figure 20 indicates two trends, one which indicates that there has steady decrease in the number of crashes from 2005 – 2009 along Heathcote Road and Newbridge Road. The other trends show that an increase in crashes per annum has occurred along Nuwarra Road.

Figure 20 Number of Crashes per Corridor (over 5 years)



A breakdown the number of crashes at various locations is shown in Table 10. This indicates that 50% of all crashes along Nuwarra Road occur midblock along sections that are undivided, Newbridge Road presents similar characteristics with approximately 50% of all crashes occurring midblock along 2-way undivided sections, and 90% of all crashes along Heathcote occur at intersections.

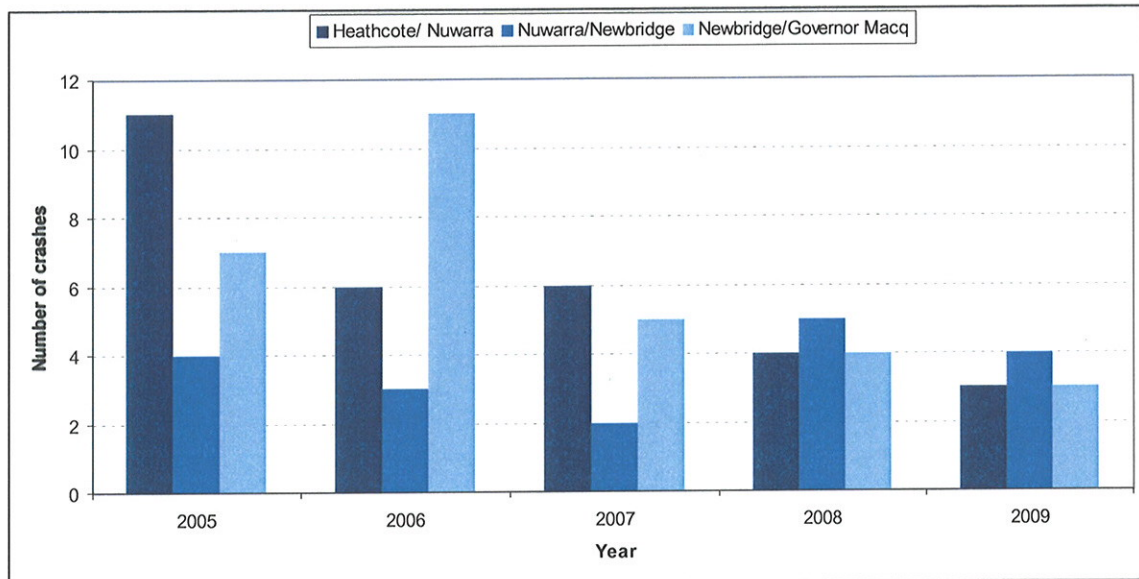
Table 10 Number of crashes per location

Type of Location	Heathcote Road	Newbridge Road	Nuwarra Road
2-way undivided	1	1	30
Divided road	3	31	3
Roundabout	6	-	-
T-junction	3	33	13
X-intersection	41	19	16
Total	54	84	62

2.11 Key Intersections

The key findings from an analysis of crash trends at the three key intersections that will serve the site indicate the following:

Figure 21 Number of crashes at 3 key intersections between 2005 and 2009



Source: Roads and Traffic Authority NSW, Crash Statistics

- The intersection of Heathcote Road/Nuwarra Road and Newbridge Road/Governor Macquarie Road recorded a similar number of crashes during the 5- year period with 30 crashes averaging over the period 6 crashes per year.
- There was a steady decline in the number of crashes at both the above intersections during this period with 4 crashes recorded in 2008 and 3 in 2009.
- The total number of crashes during the 5 year period at all 3 intersections amounted to 78 crashes with 1 fatality that occurred at the signalised intersection of Heathcote Road with Nuwarra Road.
- A total of 48 injuries were recorded at all 3 intersections during this period with Heathcote and Nuwarra identified to have the highest number of crashes resulting in an injury.



3. Existing Transport Context

3.1 Journey-to-Work (JTW)

The Transport Data Centre provides information on Local Government Area (LGA) of work trip trends including origins (place of usual residence) and destinations (work place)

For Liverpool LGA, the 2006 census indicates that approximately 28% of work trips were made by residents of Liverpool LGA (19,068 out of 67,279) and destined for work places within Liverpool LGA. A further 7.5% (4,988) will travel to Bankstown, and 8.5% (5,728) travel to Fairfield. Only 9% are trips destined for Sydney City. Other journey-to-work information from the TDC indicates the following:

- 28% of Liverpool LGA jobs are held by local residents;
- A further 12% are held by residents of Campbelltown and 5% by Camden residents; and
- Car is the main mode of travel for work: close to 87% of people who work in Liverpool LGA travel to work by private vehicle modes (car as driver, car as passenger, truck or motorcycle).

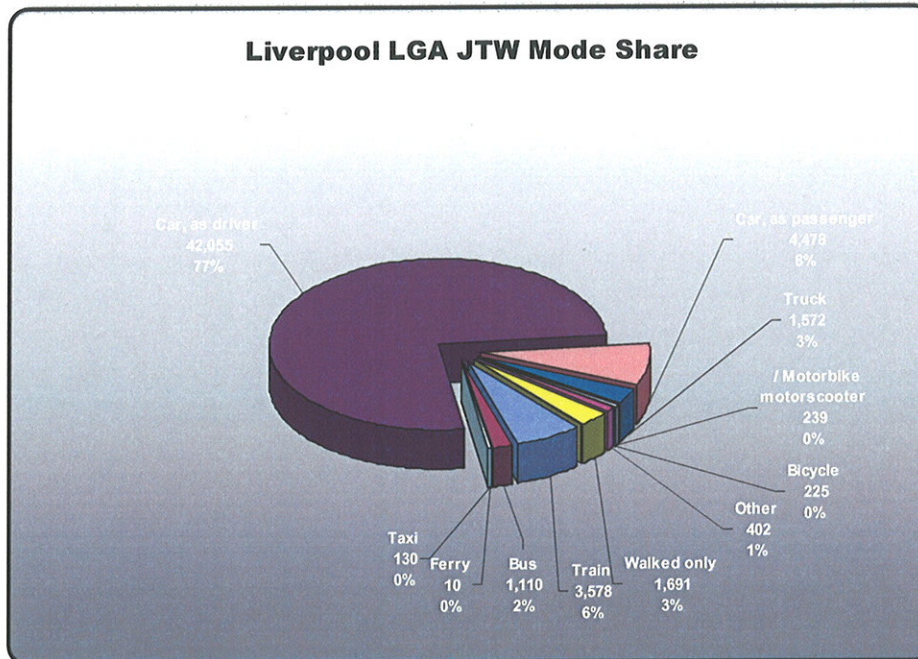
3.2 Current Mode Share

A total of 57,187 JTW trips were completed by car, either as a driver or passenger. Travel by car as a driver constituted for 77% of all JTW trips, whilst travel by car as a passenger constituted a further 8 %. This represents 85% of all JTW trips.

Train and bus travel represents only 8% of all JTW travel with 6% travelling by train and 2% by bus. Walking, cycle and other trips comprises of 4% of the JTW trip total.

The mode split for all JTW trips in the Liverpool LGA is shown in Figure 22.

Figure 22 Travel Mode in Liverpool LGA



Source: Transport Data Centre Census 2006

3.3 Car Ownership

Data from the 2006 Census indicates that in 2006, 52% of the 49,287 households within Liverpool LGA owned two or more cars. This is significantly higher than the average figure for the entire Sydney statistical sub-division, which presents an average of approximately 42%. In addition, 32% of residents owned one motor vehicle, which highlights that a total of 84% of all households or 41,400 households have access to a car.

Figure 23 Car Ownerships within LGAs

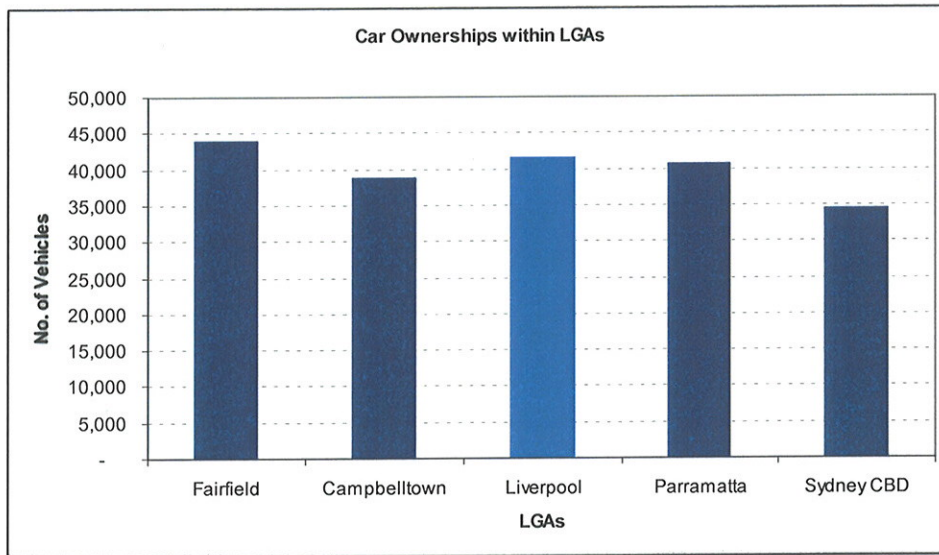


Figure 23 indicates that car ownership in Liverpool LGA is consistent with other major centres in western Sydney.

3.4 South West Subregion Strategy

The Subregional Strategy for the South West indicates that both Liverpool (Regional City) and Moorebank (town centre) are identified for growth and improvements in population, employment, transport and community infrastructure. Bankstown and Bankstown Airport are also identified centres in the Metropolitan Plan and are within close proximity of the site.

Figure 24 Metropolitan Plan

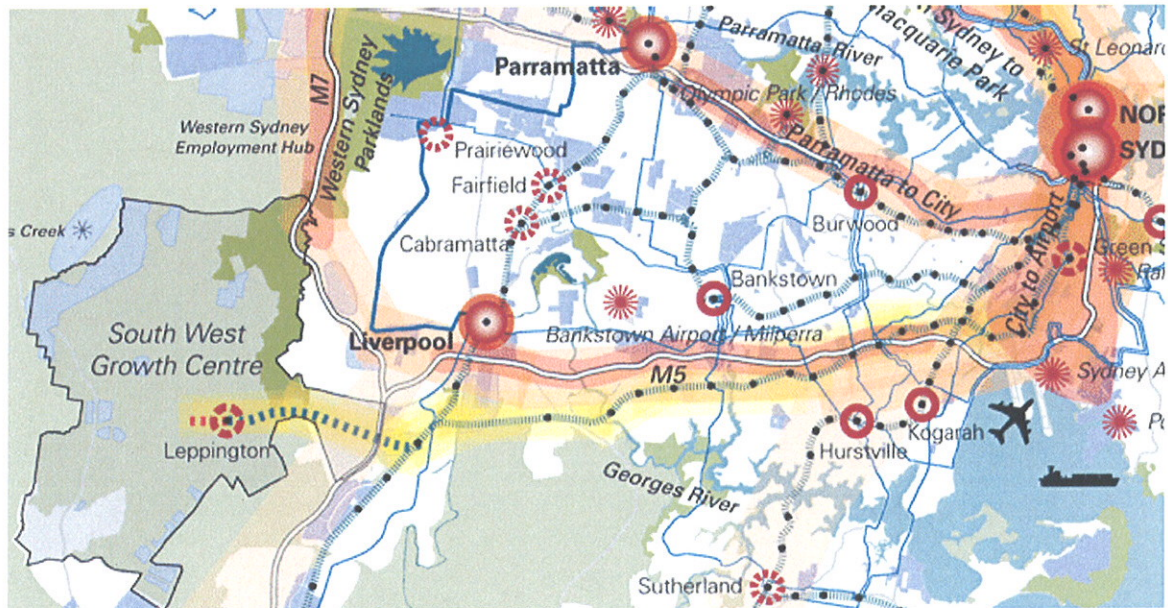


Figure 25 South West Subregional Strategy



In the transport section of the South West Subregional Strategy under key directions, it indicates that the main objectives of the South West Strategy in terms of improving transport are:

- To strengthen centres by improving public transport services
- Increase the share of peak hour journeys on safe and reliable public transport system (Priority S6)
- Improving the efficiency of the road network (Priority E7) – the strategy highlights that major radial arterial roads, such as the M5 (widening), the Hume Highway (remove of pinch points), and Newbridge Road (remove pinch points) suffer from severe traffic congestion during periods, which is getting longer as traffic demand increases and needs to be addressed to support sustainable growth of the region. The RTA Pinch Point program (State Plan priorities S7 and E7) and Federal Government funded Auslink program are expected to target improving the efficiency of the key arterial road system (D2.4-Improving Operational Management of Existing Transport Networks).
- Introduce travel demand management to get the most out of the network.



- Create more employment and services in the sub region in centres and along public transport corridors to improve travel containment.
- Create Strategic bus corridors from Liverpool to Bankstown in conjunction with integrated network plans for local services to improve access to major centres and employment areas in the region. This includes bus priority so that average bus speeds of 25km/h can be achieved.
- Increase the number of people living within a walking catchment of centres and transport nodes.
- Improve accessibility to centres and key transport nodes/ interchanges by improving cycle and walking networks (D3-Influence Travel Choices to encourage more Sustainable Travel).
- Develop a metropolitan parking policy to help guide the supply and management parking, which will support improvements in efficiency of bus services and sustainable transport to and from Strategic Centres including Liverpool.

3.5 Local Area Characteristics

The site is located approximately 3.0 to 4.0 km east of Liverpool CBD, a similar distance to the south west of the Bankstown Airport precinct, 2.5km northeast of Moorebank Business Park, 1.5km south of the Governor Macquarie Drive Industrial Precinct and approximately 1.0 km southeast of the existing Moorebank town centre. The existing area offers a wide range of facilities that can support the growth of both the Boral Moorebank lands and the proposed development. The close proximity of the above mentioned employment and activities centres has the potential to offer attractive alternatives to travel to work by private vehicle. A summary of the main facilities together with their proximity to the site are given below:

3.5.1 Retail Opportunities

■ Moorebank town centre	1.0 km NW
■ Liverpool CBD	3.5 km W
■ Boral Moorebank neighbourhood centre	0.5 km N
■ New Brighton Golf Club	0.2 km E

3.5.2 Community Facilities

■ Liverpool Library	3.5 km W
■ Moorebank Branch Library	1.0 km NW
■ Moorebank post office	1.0 km NW
■ Liverpool Hospital	3.5 km W

3.5.3 Emergency Services

■ Police Station	3.5 km W
■ Fire Station	3.5 km W



3.5.4 Educational Institutions

▮ TAFE	3.5 km W
▮ Moorebank High School	1.5 km N
▮ Wattle Grove Public School	2.5 km S
▮ University of Western Sydney Bankstown Campus	5.0 km E

3.5.5 Recreational Facilities

▮ Kelso Park	1.0 km W
▮ Milperra Sports Centre	3.0 km E
▮ Lakeside Park	1.5 km SW
▮ Malinya Park	0.5 km N
▮ New Brighton Golf Club	0.2 km E
▮ Warwick Farm Racecourse and Polo Fields	3.5 km N

3.5.6 Transportation Facilities

▮ Liverpool train station	3.5 km W
▮ Holsworthy train station	3.5 km N
▮ Newbridge Strategic Bus Corridor	1.2 km N
▮ M5 Motorway Interchange	1.5 km SW

Almost all of these facilities would be accessed via either Newbridge Road, Nuwarra Road, Governor Macquarie Drive or Heathcote Road. The majority of local and regional facilities are within easy walking or cycling distance and will be supported in the near future by designated routes and high frequency public transport services.