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Dear Jeremy

Bungaribbee Parklands Precinct - Traffic Access

In response to a request from APP Corporation, Maunsell have undertaken analysis necessary to assess the performance of proposed accesses to the Bungarribee Precinct of the Western Sydney Parklands. This letter summarises the results of the review.

Proposed Structure Plan

The Structure Plan for the Bungarribee Precinct proposes three signalised accesses, at:

- Eastern Road/ Blacktown Olympic Park;
- Doonside Road/ Holbeche Road; and
- Great Western Highway/ Huntingwood West Access.

In addition, two existing left in left out accesses to the parklands will be retained for access to and from the Great Western Highway.

It is understood that the following land uses may be developed on the Bungarribee Precinct of the Parklands:

- Zone 1: potentially including sports courts (netball, basketball, tennis), football fields and a potential indoor sport, cultural and/or recreational facility.
- Zone 2: air strip for model planes.
- Zone 3: institutional precinct (potentially a zoo and children's museum).
- Zone 4: open space, event space, playground, barbeque facilities.
- Zone 5: agricultural uses, potentially a community garden, market garden and/ or horse agistment.
- Zone 6: open space, fitness track.
- Zone 7: open space, potential recreation uses.

The purpose of the assessment is to:

- test proposed accesses to ascertain if these will accommodate traffic generated by suggested parkland developments;
- review the internal road network developed for the Parklands Concept Plan; and
- if necessary, suggest additional or alternative access locations.

Traffic generation estimates

Traffic generation is considered for each area in turn, according the differing uses within each area. Since there is no connection through the park for motorised vehicles it is assumed that:

- all vehicles travelling to the Sports zone (Area 1) use the Eastern Road/Olympic Park access,
- all vehicles travelling to Area 5 use the Great Western Highway/Huntingwood West access or the Doonside Road/Holbeche Road access;
- all vehicles travelling to the airstrip (Area 2) use the Doonside Road/Holbeche Road access;
- all vehicles travelling to the productive land use areas (Area 5) use the existing left in/ left out accesses from the Great Western Highway; and
- visitors travelling to the general open space within the Parklands are distributed between all three accesses.

It is noted that Blacktown Council are currently undertaking a constraints assessment of the Aqua Luna reserve site to the east of the Blacktown Olympic Park. Following the assessment and once the developable area is known, access facilities will be investigated. It is likely that an additional access will be required on Eastern Road; if the new intersection can be linked to the Sports Precinct site it may be possible to spread the demand between two intersections.

The RTA Guide to Traffic Generating Developments (RTA, 2002) includes traffic generation rates for land uses, which are based on surveys of existing developments. For land uses not included in the Guide, Maunsell estimated a trip rates on a first principles approach, considering the number of users of a site and when they are likely to travel.

A typical car occupancy for weekend trips was applied to the overall trip rate to estimate the number of vehicle trips. The car occupancy rate applied in this analysis is 1.78, an average weekend car occupancy rate in Sydney (Source: Transport and Population Data Centre, 2004 Household Travel Survey, 2006 Release).

Zone 1- Sports zone

Sports uses that have been suggested for the sports precinct area are:

- nine soccer courts;
- 48 dual use netball/ basketball/ tennis courts; and
- A potential indoor sport, cultural and/or recreational facility.

The trip rates for netball and basketball courts and the soccer fields are estimated according to the number of players and coaches on each field and the total number of fields. The RTA guide includes evening peak hour trip rates for tennis courts of four vehicles per court. Since the number of players in a netball team is higher than basketball or tennis, the rate for netball uses is included in the access intersection analysis.

Approximately 75 per cent of the courts are considered to be occupied at the same time at the development peak hour. The estimated trip rates for the sports precinct area can be seen in **Table 1** below.

Table 1: Trip rates for other sports uses

Land Use	Development Peak Trip Rate	Number of facilities	Development Peak Hour Vehicle Trips
Soccer fields	15 veh/ field	9	105
Netball/ basketball courts	9 veh/ court	48	420
Total	-	57	325

Source: Maunsell, 2007

The potential indoor sport, cultural and/or recreational facility is not included in the total trip generation for Section 1, since it is assumed that the facility will be used during special events only and not every weekend. Therefore, a separate trip rate analysis and intersection analysis were estimated for a Saturday peak hour. For traffic modelling purposes, an indicative seating capacity of 7,500 people and approximately 1,200 car spaces have been assumed. If it is assumed that three people would travel in each car to the venue and coaches will transport a small proportion of the spectators and the teams, then approximately 2,000-2,500 vehicle trips could be made to a sell-out event.

It is assumed that arrivals to the event will be spread over two hours, but spectators leaving the event will travel for up to an hour after the game ended.

Zone 2 - Airstrip

The traffic generation for the model plane airstrip is considered to be approximately 10 vehicles per hour for the Saturday peak hour.

Zone 3 - Institutional zone

Prior to this piece of work, Maunsell had previously undertaken broad estimates of traffic generation for indicative uses including zoo and children's museum. For this stage, the estimates were refined so that peak flow rates are established for a Saturday. It is expected that there will be as many people visiting a zoo and museum during weekdays (over 5 days) as during weekends (over 2 days). Based on experience at Taronga Zoo, the peak hour for a zoo and museum is considered to be between 10.00am and 11.00am.

Estimated vehicle trips for a zoo/museum are described in **Table 2** below.

Table 2: Trip Rates for Other Land Uses

Land Use	Vehicle Trips	
	Development Peak Hour (10.00am – 11am)	External Peak Hour (11.45am – 12.45pm)
Zoo/Museum	280 vph	270 vph

Source: Maunsell, 2007

Zones 4 and 7- Event space, open space, barbeque facilities

Trip generation for this area of the precinct is included within the general allowance for trips to the parklands open space. It is assumed that the event space will be used on rare occasions only and outside peak hours and that visitor trips would be split over the three Parklands accesses according to the ratio of parking spaces provided.

Zone 5 - Production based landscape

The Australian Community Foods Organisation website was reviewed for details of market garden uses, size and participants in order to understand potential trip generation. Some gardens have allotments tended by individuals or families and some are shared resources and worked communally. The communal gardens tend to have open days when they are worked. These are generally for few hours on one weekend day and perhaps one weekday. However, in some cases, the gardens are not worked every weekend but once a fortnight or once a month. Therefore a resource of this nature at the Bungarribee Precinct site is unlikely to generate large volumes of traffic.

Market gardens are labour intensive commercial farming enterprises. Small farms of between 0.5 and 5 hectares are typically run by one farmer or farmer family, with perhaps a small number of employees. At this rate of labour intensiveness, market gardening uses of the site at Zone 5 Bungarribee Precinct (31.5ha) would be farmed by between 10 and 60 farmers. Other agricultural uses such as flower production or forestry would be expected to employ similar or fewer workers to maintain the site.

Farm shops or produce booths are not expected to generate a large number of new trips by visitors. Some trips will be pass by trips, that is, made by a visitor who passing by the site and called in or will be diverted from other food retail sites in the area.

The number of trips to a site used for horse agistment will vary according to:

- the quality of the soil and so how many horses may be accommodated;
- type of agistment - whether there are community paddocks or single paddocks; and
- the extent of the agistment service - whether the horse owner tends to the horse themselves (two trips a day) or whether full livery is required.

As little as one horse per hectare may be accommodated on poor soils where the pasture is low quality. This may increase to four or five horses as the pasture quality improves. At a site size of 31.5 hectares, between 30 and 150 horses could be accommodated and so there may be between 30 and 150 trips by horse owners.

Riding lessons typically involve four to six students per lesson plus one or two instructors.

It is expected therefore that a range of between 10 (market gardens) and 155 trips (high quality horse agistment) could be made to the site at peak times, depending on the uses selected for the site.

General Open Space

The open space of the Parklands Precinct, including a network cycle and pedestrian paths, and picnic and barbeque areas, will be attractive for general users who were not attracted to the park for specific other uses.

Assumptions for the open space trip rate were made by comparing the proposed open space to the area and number of visitors attracted to the Sydney Harbour National Park, situated in northeast Sydney. Sydney Harbour National Park was used as a proxy to estimate trip rates as it offers tracks through areas of natural vegetation which was considered to be similar to the Bungarribee Parklands Precinct.

It was assumed that the number of people visiting the park during weekends was equal to the number of people visiting the park between Monday and Friday. The trip rate was modified prior to application to the Western Sydney Parklands by comparing the density of residential areas close to Sydney Harbour National Park to those in the vicinity of proposed Parkland precinct. Estimated trip rates for the open space area is described in **Table 3** below.

Table 3: Trip Rates for Other Land Uses

Land Use	Peak Hour Trip Rate	Peak Hour Vehicle Trips
Open Space	0.01 veh/ 100 m^2	430 vph

Source: Maunsell, 2007

Trip distribution

The trips to and from the site were distributed according to the existing traffic load on the network. Journey to work data (used for residential and commercial site trip distribution) collected during the 2001 Census could not be used during this study since it considers employment trips only.

A summary of the trip distribution is illustrated by **Table 4**.

Table 4: Trip Distribution

Street	Percentage of trips
Eastern Road	10%
Rooty Hill	2%
Great Western Highway West	17%
Great Western Highway East	13%
Brabham Dr	10%
Holbeche Road	5%
Douglas Road	2%
Bungarribee Road	10%
Knox Road	16%
Wallgrove Road	15%

Source: Maunsell, 2007

2007 Saturday models

Saturday peak traffic flows were established by conducting intersection counts at the following locations:

- Eastern Road/ Parklands access; and
- Holbeche Road/ Doonside Road.

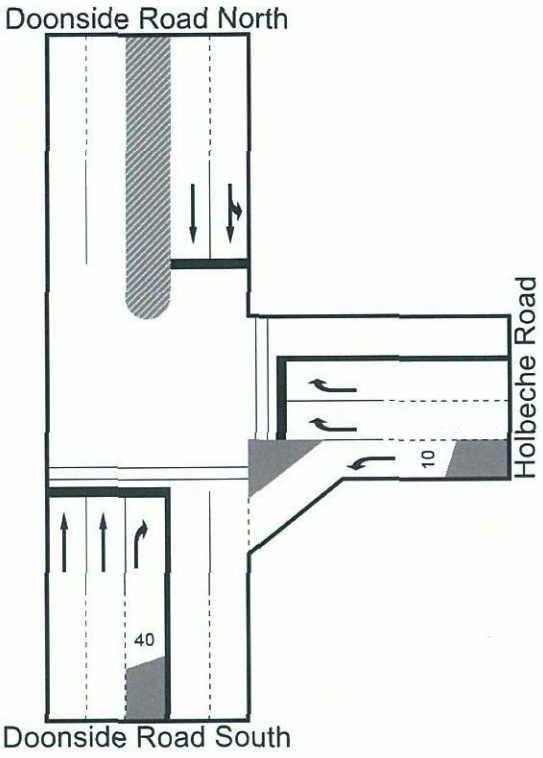
A two way traffic count was conducted at a mid block location on Great Western Highway to establish through flow past the left in left out accesses and to enable a Saturday model to be run of the proposed Great Western Highway/ Huntingwood West Access.

The counts determined that the external peak hour occurs between 11.45am and 12.45pm. Traffic analysis has been conducted for this hour so that a worst case is considered.

The performance of the intersections without parklands traffic was assessed using surveyed traffic flows and the modelling package SIDRA 2.1 to establish a base case against which the 'with development' scenario can be compared. The layouts for the BASE models are shown below.

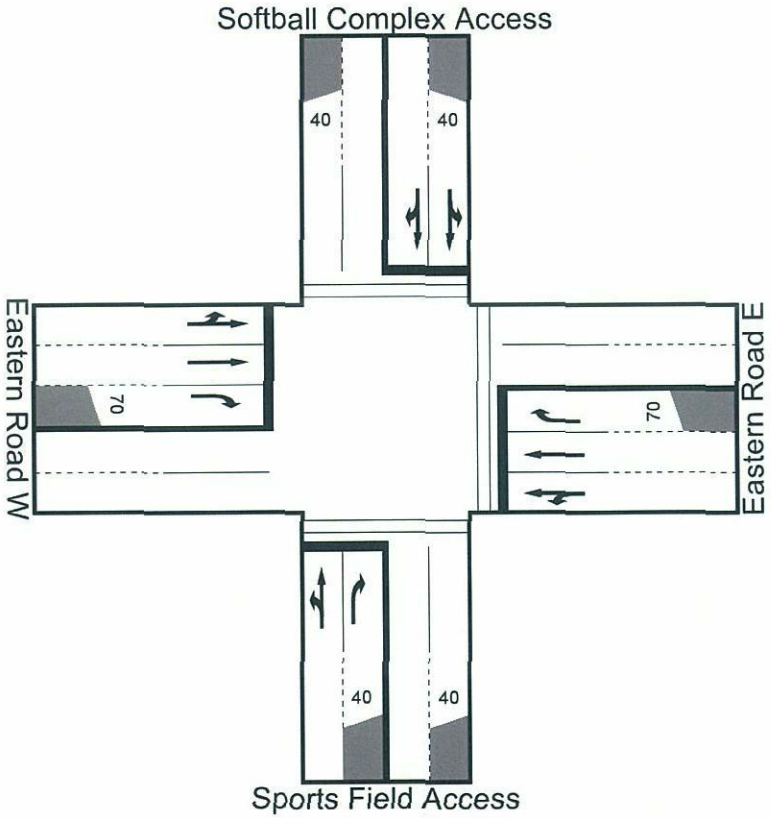
It was not considered necessary to construct models of the existing left in/ left out intersections with the Great Western Highway as traffic flows estimated at these intersections are expected to be extremely low (less than 100 vehicles).

Figure 1: Existing Intersection at Doonside Road/Holbeche Road



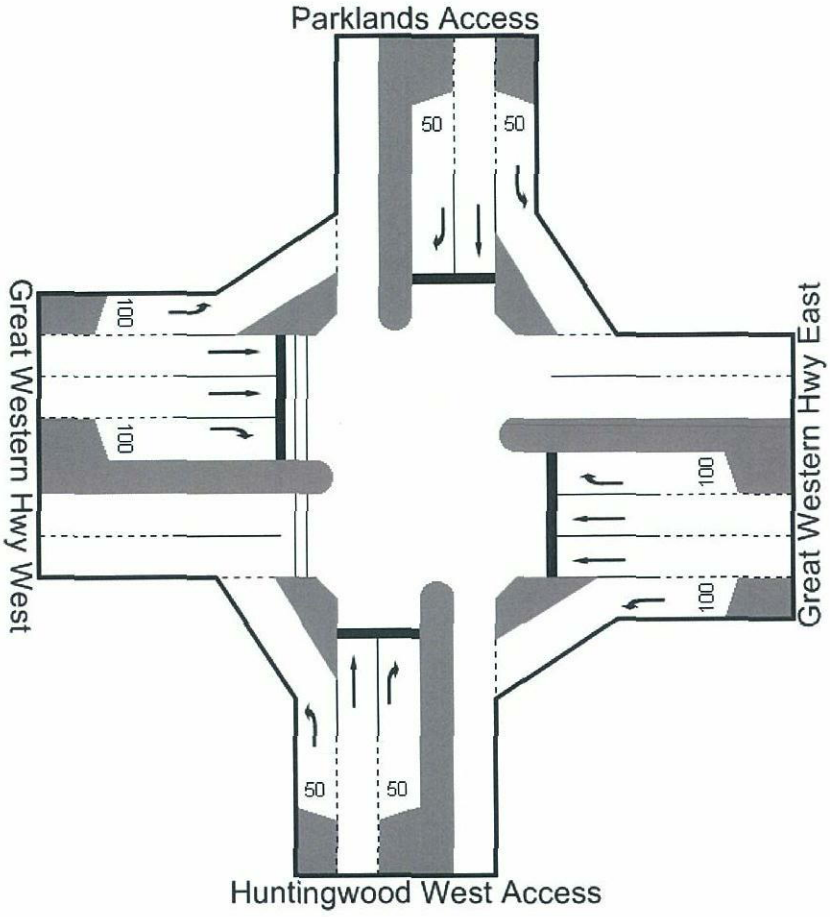
Source: Maunsell 2007

Figure 2: Existing intersection at Eastern Road/Parkland Access



Source: Maunsell 2007

Figure 3: Proposed intersection at Great Western Highway/ Huntingwood West Access



Source: Maunsell 2007

Table 5: Base intersection model results

Intersection	Degree of Saturation	Average Delay (sec/veh)	Level of Service
1: Eastern Road/Olympic Park Access	0.62	27.0	B
2: Doonside Road/Holbeche Road	0.26	16.0	B
3: Great Western Highway/Huntingwood West	0.78	25.2	B

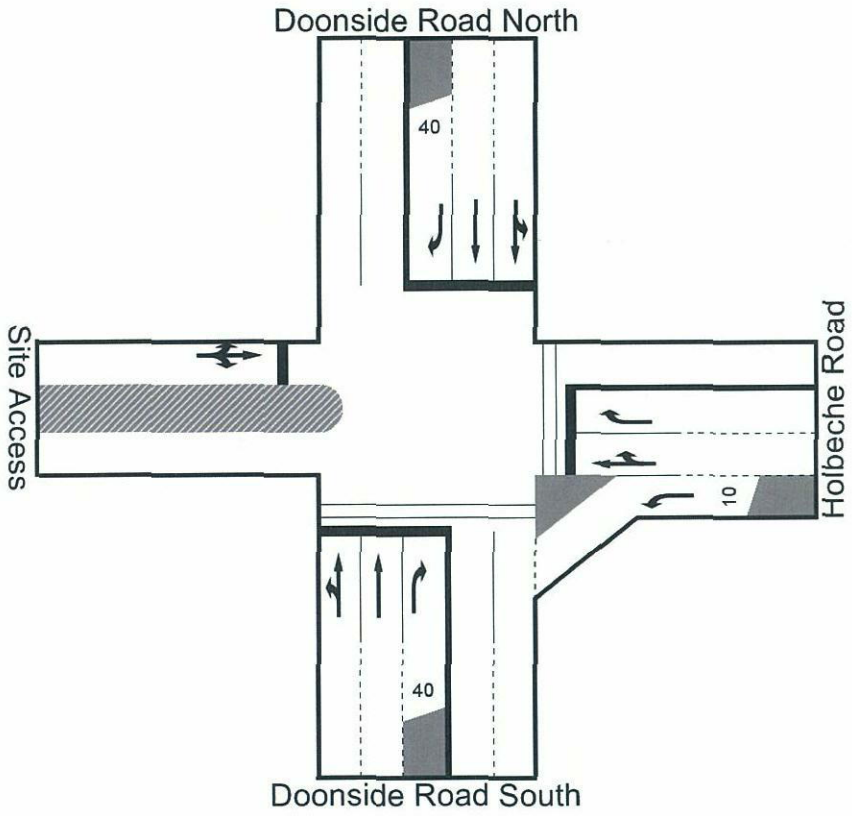
Source: Maunsell, 2007

Table 5 *indicates that the three access intersections currently operate efficiently and with spare capacity during the Saturday peak period.*

'With Development' models

Intersection models were tested with the Parklands traffic to establish the impact on performance. The layout for the with development model at Holbeche Road is shown below; it includes a short right turn lane for waiting traffic on Doonside Road for safety.

Figure 4: Doonside Road/Holbeche Road: With development



Source: Maunsell, 2007

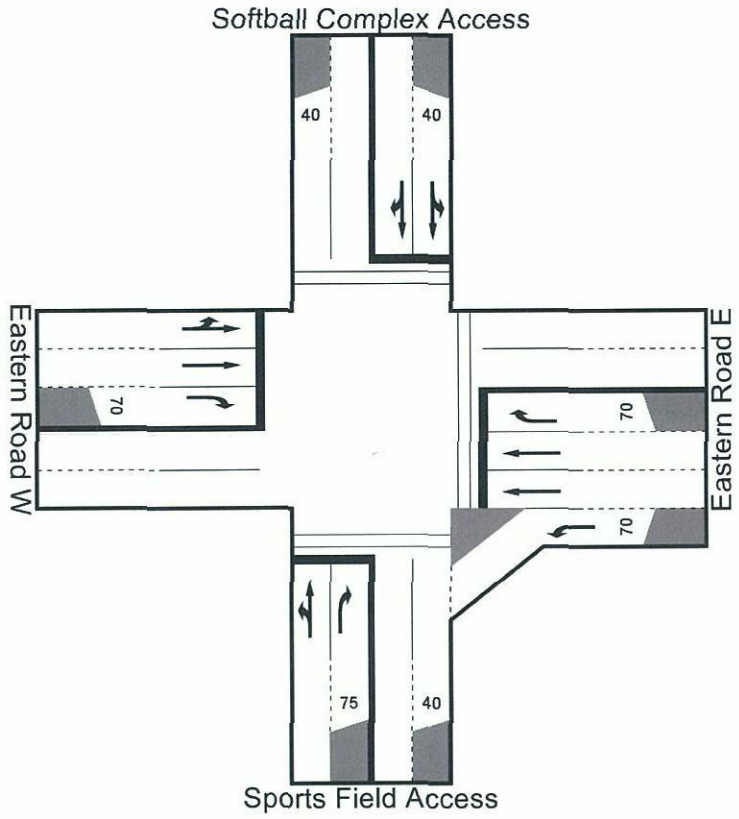
Table 6: 'With development' intersection model results

Intersection	Degree of Saturation	Average Delay (sec/veh)	Level of Service
1: Eastern Road/Olympic Park Access	1.0	78.8	F
2: Doonside Road/Holbeche Road	0.7	24.6	B
3: Great Western Highway/Huntingwood West	0.8	22.2	B

Source: Maunsell, 2007

Table 6 indicates that with following the proposed Parklands developments, the intersection at the Eastern Road/Olympic Park access is over capacity. Works are required to increase the capacity of the intersection in order to accommodate peak flows, as illustrated by **Figure 5**. The improvements tested include a left turn lane on Eastern Road East and an extension of the right turn lane on the Sports Precinct approach. These measures improved the intersection operation to a level of service D.

Figure 5: Intersection at Eastern Road/Parkland Access with Improvements



Source: Maunsell, 2007

A sensitivity test was conducted by increasing flows by 20 per cent over the original estimates. The intersections continued to operate satisfactorily.

Table 7: Sensitivity test model results

Intersection	Degree of Saturation	Average Delay (sec/veh)	Level of Service
1: Eastern Road/Olympic Park Access	1.0	61.5	E
2: Doonside Road/Holbeche Road	0.5	30.5	C
3: Great Western Highway/Huntingwood West	0.8	22.1	B

Source: Maunsell, 2007

Tables 6 and **7** report the results for the Eastern Road access under a usual Saturday peak time scenario. However, the intersection will also provide access to the potential indoor sport, cultural and/or recreational facility which will be used for infrequent events. It is not necessary to design the intersection to operate at a Level of Service C for infrequent circumstances but if the facility is planned for use most weekends, then it may be necessary to carry out works to increase the capacity of the intersection.

The extent of such works would be determined during a traffic impact assessment. Alternatively, if an additional intersection is provided for the Blacktown Council development to the east of the Olympic Park and this can be linked to the Sports Precinct, demand may be spread across the two intersections and works may not be necessary.

It is recommended that the approach road connecting the car park to the access is widened to two lanes. This is discussed in more detail in the consideration of the internal road network that follows.

Review of internal road network

Vehicular Access
The internal road network for vehicles does not provide connectivity between the three signalised site accesses, except a short connection between Holbeche Road access road and the museum/ zoo car park and on to the Great Western Highway access. Car parking is provided for trip ends at the periphery of the park, from where users will walk or cycle into the parklands.

The market/ community garden uses will be accessed by two left in/ left out arrangements from the Great Western Highway. This could lead to increased vehicle kilometres travelled as cars drive, on an inbound trip from the east (or on an outbound trip to the west) around the precinct so that it can be approached from the correct direction. However, trip volumes for these land uses are expected to be low, in the region of 30 to 80 at peak times, so this is not expected to create a significant transport impact.

Discussions with EDAW have established that the absence of connectivity between the accesses is intentional to maintain the integrity of the green space. A circular road network is not offered so that vehicles are excluded from the main body of the Parklands precinct and restricted to the access roads and car parks.

In preserving the integrity of the green space, this concept is successful. However, the waymarking to the precinct would need to be well signed so that visitors select the correct access point for their journey purpose. It would be prudent to reserve flat areas adjacent to planned parking sites as potential future parking sites (could be required if land uses change or additional development is proposed) or overflow sites for events.

Based on the traffic generation assumptions stated above, traffic volumes expected to be between 240 and 715 at each access at peak times, which is within the capacity of a two lane road (one lane in each direction).

Table 8: Access Road Volumes

	Vehicle Flow in Land Use Peak Period	
Access Point	**In**	**Out**
1: Eastern Road/Olympic Park	400	280
2: Doonside Road/Holbeche Road	70	50
3: Great Western Highway/Huntingwood West	430	310

Source: Maunsell, 2007

Events at the potential indoor sport, cultural and/or recreational facility may fully utilise the 1,200 car spaces assumed within the Zone 1 Sports zone. If it is assumed that all car park users leave the site in the first hour after the end of a game, then the exit road must accommodate 1,200 vehicles. This indicates that two lanes should be provided on the approach to the access intersection. One lane (5.5m wide to allow for breakdowns) will be sufficient for the inbound direction, as it is expected that the trips to the potential indoor facility will be spread over a longer period.

Pedestrian/ Cycle Access
The Western Sydney Parklands recreational trail is included as part of the pedestrian/ cycle network. Pedestrian and cycle accessibility within the site is appropriate with good access for both short and longer rides and walk loops from the car parks.

Trips to the park by public transport, by bicycle and on foot should be encouraged but some users may be deterred by the absence of footpaths on some external roads including:

- Doonside Road
- Great Western Highway
- Holbeche Road

Some external connectivity will be resolved by implementation of a shared path on the eastern boundary of the precinct connecting Doonside rail station to the Huntingwood commercial areas south of the Great Western Highway, which is being considered by Council and was included within the package of measures for the Huntingwood West TMAP.

Maintenance, ranger and emergency vehicles
Maintenance, ranger or emergency vehicles may need to access to parts of the site without public vehicular access but this may be achieved via the shared paths, given that these trips would be rare. It is noted that the creek crossing may be designed to allow internal movement of small maintenance vehicles, however emergency vehicles may be required to use the external road network to travel from the eastern side of the park to the western side. Given that these trips will be occasional and in low volumes, it is not expected that they will create a traffic impact.

Summary

This analysis indicates that three access points will be sufficient to cater for the usual parklands land uses. The absence of vehicular connections across the park does not appear to create problems for access.

It is recommended that the access road from the Sports zone main car park to the Eastern Road intersection should be two lanes in the outbound direction to accommodate event traffic.

A transport impact assessment should be completed once the land uses are known to refine the trip generation and distribution assumptions.

If you have any queries about the content of this letter, please do not hesitate to contact me.

Yours sincerely

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