4 PROJECT ASSESSMENT

Cardno Eppell Olsen has worked closely with Cochlear Limited design team to provide input to the design of the car park access and internal layout.

4.1 CAR PARKING PROVISION

The project proposes to provide a total of 544 off-street parking spaces. Of the 544 spaces, 146 right-angle off-street car parking spaces are provided at-grade and 398 will be provided over two levels of basement parking within the project.

Stage 1 of the proposed Cochlear Headquarters facility is to comprise the following:

- Car parking provision for 544 cars;
- 17,081m^2 GFA of office area;
- 5,192m^2 GFA of manufacturing/research area; and
- 2,070m^2 GFA warehouse space.

20 at-grade car parking spaces are proposed to be provided within the service area. Access to these spaces will be restricted to service vehicles and manufacturing/research/warehouse employees.

The majority of at-grade parking spaces (126) are provided at the western end of the project site. Access into and out of this car park is proposed via a two-way driveway located at University Avenue approximately 75 metres west of the existing roundabout.

The basement car park and the service area will share the same access from a proposed driveway located on University Avenue, 85 metres east of the existing roundabout. The basement car park will have restricted access. A boom gate and roller shutter system is proposed at both the entry and exit points to the car park.

The boom gates operate within the car park entry area. During the day, the roller shutters will remain open and staff will need to utilise a card reader system to operate the boom gate to enter. An intercom will be provided for visitor access through the boom gates. At night, both roller shutters and boom gates will be closed. A secondary card reader will be installed on the median island at western end of driveway. Staff will need to utilise the secondary card reader to open the roller shutter before accessing the boom gate system.

A second set of boom gates operate to restrict access to the service area. Service vehicles will need to pass through this boom gate system to enter the service area. The system will consist of a card reader and an intercom.

The western at-grade car park proposes the following parking types:

- 119 spaces x 2.4m by 5.4m unrestricted 90 degree parking bays (26 of which are widened to 2.7m as they are adjacent to obstructions);
- 7 x 3.2m by 5.4m disabled parking bays; and
- 31 Outdoor spiral bike storage spaces.

The lower ground floor basement car park proposes:

- 142 x 2.4m by 5.4m unrestricted parking bays;
- 18 x 2.3m by 5.0m unrestricted 'small car' parking bays;
- 4 x 2.4m by 5.4m disabled parking spaces with 2.4m by 5.4m shared area on one side of each space; and
- 22 x 1.2m by 2.5m motorcycle parking spaces.

The basement level B1 car park consists of:

- 172 x 2.4m by 5.4m unrestricted parking bays;
- 62 x 2.3m by 5.0m unrestricted 'small car' parking bays;
- 20 x 1.2m by 2.5m motorcycle parking spaces; and
- 152 Bike storage spaces in a secure undercover bicycle store area.

The service area car park consists of:

- 2 loading docks at the south western end of the car park; and
- 20 x 2.4m by 5.4m unrestricted parking bays.

A summary of the total parking provision is provided in Table 4.1.

Table 4.1 Car Parking Provision

Car Park Area	Car Parking						Bike Parking		Loading Dock
	Small	Regular		Disabled		Total			
	2.3 x 5.1m	2.4 x 5.4m	2.7 x 5.4m	2.4 x 5.4m*	3.2 x 5.4m		Motorbike (1.2 x 2.5m)	Bicycle	
Service Area		20				20			2
Western At-grade		93	26		7	126		31	
Lower Ground Basement	18	142		4		164	22		
Basement Level B1	62	172				234	20	152	
TOTAL	**80**	**427**	**26**	**4**	**7**	**544**	**42**	**183**	**2**

* Disabled spaces designed with 2.4 x x 5.4m shared area (as per draft AS2890.6)

4.2 PROJECT PARKING REQUIREMENTS

Under normal circumstances the parking rates for a project site would be calculated using the rates specified in the relevant LEP or DCP. The relevant planning documents for the site have been identified as:

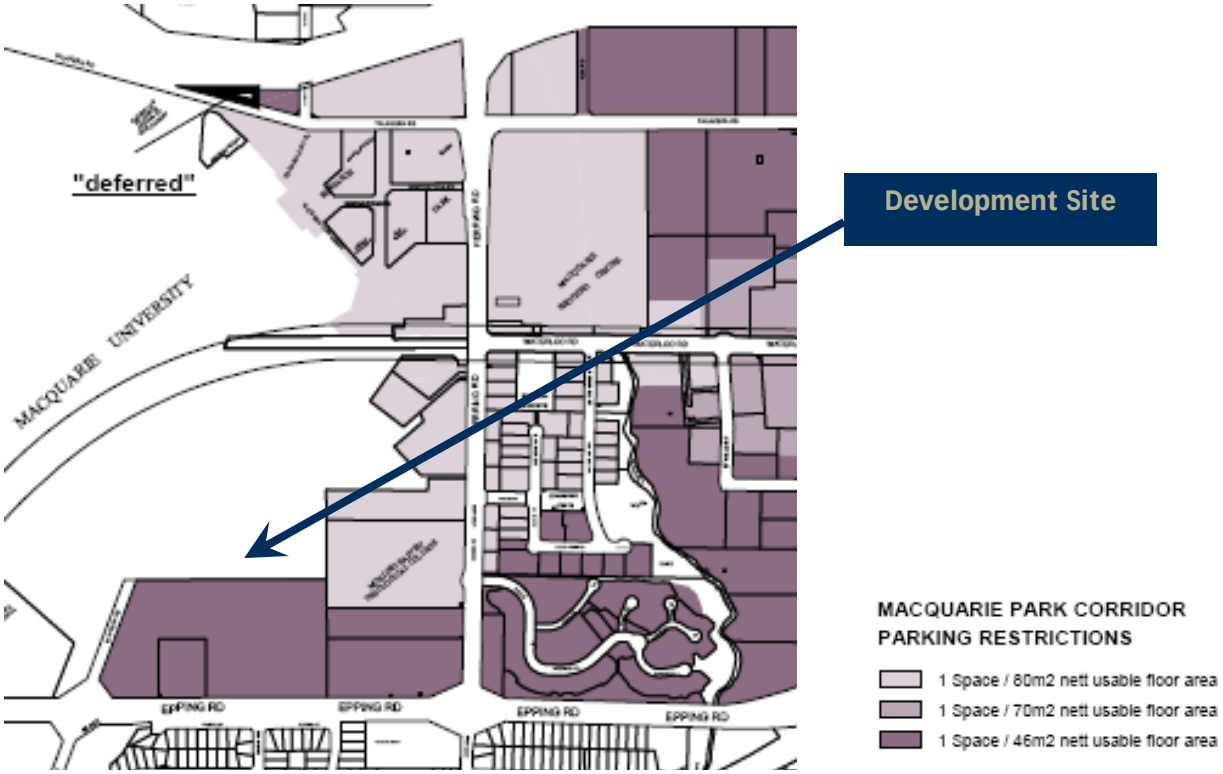
- The Ryde Local Environmental Plan No 137 – Macquarie Park Corridor;
- City of Ryde Development Control Plan 2006;
- Ryde Planning Scheme Ordinance 2006;
- Draft City of Ryde Development Control Plan 2006, Part 4.5, Macquarie Park Corridor; and
- RTA Guide to Traffic Generating Developments.

However, the proposed project site currently lies un-zoned in all of the relevant planning documentation. This poses a number of possible scenarios when calculating required parking supply for the project site.

4.2.1 Ryde LEP No 137

The Ryde Local Environmental Plan No 137 (LEP 137) – Macquarie Park Corridor was adopted by Council on 20th January 2006. Clause 98 of LEP 137 contains the Off-Street parking requirements for commercial & industrial development on land within Macquarie Park Corridor, stating that parking must not exceed the rate shown for the land on the plan marked "Ryde Local Environmental Plan No 137 – Macquarie Park Corridor – Parking Restriction", excerpt reproduced in Figure 4.1.

Figure 4.1 Ryde Local Environmental Plan No 137 – MPC Parking Restriction



Source:
www.ryde.nsw.gov.au/WEB/SITE/RESOURCES/DOCUMENTS/Planning/lep137_parking_restrictions.pdf

As the proposed project site is not included in the plan, it is considered that applying the parking rate applicable to the area immediately to the south of the site (1/46m^2), as indicated in LEP 137, would be applicable to this site and therefore appropriate for use in calculating maximum parking provision. Table 4.2 details the total amount of parking required for this assumption.

This is further reinforced by the fact that the majority of the site is beyond the 400 metres radius from the nearest Station entrance (see drawing in Appendix C), that the pedestrian entrance to the site is located outside the 400m radius of the station, and that the site is not part of the Station Precinct, but part of the 'Station South Precinct'.

Table 4.2 Parking Provision based on Ryde LEP

Type of development	1 space per 46m^2 GFA
Office	371
Industry	113
Warehouse	45
Maximum Required	**529**
Provided	*544*
Difference	*15*

4.2.2 Ryde DCP 2006

The City of Ryde Council adopted the City of Ryde Development Control Plan 2006 (DCP 2006) on the 4th July 2006. The Plan came into effect on the 26th July 2006. Section 9.3 – Parking of DCP 2006 contains the parking requirements for business and industrial development, as summarised in Table 4.3.

Table 4.3 Parking Rates in DCP 2006 – 9.3 Parking

Section	Land Use	Rate
4.2 Business	Offices	1 space/30m^2
4.3 Industrial	(i) Industry	whichever is the greater of: 1 space/46m^2 of net usable floor area or 1 space/ 2 employees
	(ii) Macquarie Park Employment Area (formerly known as North Ryde Industrial Area)	Not more than 1 space/46m^2 of net useable floor area*
	(iii) Warehousing	whichever is the greater of: 1 space/100m^2 of net usable floor area or 1 space/ 2 employees

* Council may consider a variation to that standard subject to a traffic management plan for the site being submitted to Council with a development application.

Table 4.4 summarises the parking rates using the assumptions contained in Ryde DCP 2006.

Table 4.4 Parking Requirements in DCP 2006 – 9.3 Parking

Type of development	Based on GFA		Based on Employees		Spaces
	Rate (GFA)	*Spaces*	*Rate*	*Spaces*	
Office	*1 space per 30m^2*	569			
Industry	*1 space per 46 m^2*	113			
Warehouse	*1 space per 100 m^2*	21			
Minimum Required		**703**	*1 space per 2 employees*	**625**	**703**
Provided		*544*			*544*
Difference		*-159*			*-159*

4.2.3 Draft Macquarie Park Corridor DCP

The Draft City of Ryde Development Control Plan 2006, Part 4.5 - Macquarie Park Corridor was recently exhibited for comment between 15th February and 25th March 2008. The purpose of this Draft DCP is to:

- Amend the City of Ryde DCP 2006;
- Is broadly based on the objectives and development principles contained in the Macquarie Park Corridor, North Ryde Master Plan, adopted by City of Ryde Council in 2004; and
- Supplements the Ryde Local Environmental Plan (LEP) 2008 Amendment 1 and the Ryde Planning Scheme Ordinance by providing detailed development principles, controls and guidelines.

The proposed project site lies within the in the Draft MPC DCP, see Figure 4.2.

Figure 4.2 Draft Macquarie Park DCP Zoning

Source: http://www.ryde.nsw.gov.au/WEB/SITE/RESOURCES/DOCUMENTS/Planning/lep137_parking_restrictions.pdf

The Draft DCP advises that parking rates within the Corridor will vary according to distance from the railway stations and the type of activities, with the amount of parking required related to the size of the development.

Specific rates for parking are not contained within the Draft DCP stating that 'Car parking for commercial and industrial activities is to be provided for in accordance with the rates contained in the Ryde Planning Scheme'.

The Ryde Planning Scheme Ordinance however states that 'The off-street parking requirements for commercial and industrial development on land within Macquarie Park Corridor must not exceed the rate shown for the land on the map marked "Ryde Local Environmental Plan No 137-Macquarie Park Corridor-Parking Restrictions" deposited in the office of the Council'. Therefore the rates contained within the LEP should be used.

In addition to this advice, a series of transitional parking arrangements will be available to help avoid an unintended incentive for property owners to retain redundant building stock simply because of its parking provision and allow time for mechanisms to be introduced to reduce existing parking supply. These rates will apply until 2015, applying to commercial and industrial activities, and are outlined in Table 4.5.

Table 4.5 Draft MPC DCP Transitional Parking Rates*

	FSR 2:1 and 3:1	FSR 1.5:1	FSR 1:1
Permanent Spaces (maximum)	1 space/80m^2	1 space/70m^2	1 space/46m^2
Temporary Spaces (maximum)	1 space/240m^2 different to rate of 1 space/60m^2	1 space/420m^2 different to rate of 1 space/60m^2	Nil

* Development Applications lodged between 01/01/08 - 01/01/2015

Council will only consider use of the transitional parking rates on the basis of the lodgement of an objection under State Environmental Planning Policy No.1 (SEPP 1) to the parking rates in LEP 137. The document states that *"a traffic and parking impact assessment report and parking management strategy, prepared by a suitably qualified traffic engineer/planner, should accompany such an objection."*

Industrial and commercial developments may seek to apply the transitional parking rates detailed in the table below that provide for a progressive reduction in parking rates as a result of a planned decrease in dependence on motor vehicles. Applications seeking to apply these transitional rates must be accompanied by:

- an objection under SEPP 1 to the parking rates in LEP 137;
- a traffic and parking impact assessment report;
- a parking management strategy; and
- a Work Place Travel Plan.

The transitional parking rates provide for permanent parking to the maximum rate specified in Ryde Planning Scheme plus additional temporary parking that is capable of removal at a future specified date. Any temporary parking spaces would need to be identified in a phasing out scheme as part of the parking management strategy. The strategy would include details of how the spaces would be converted to another use in time.

4.2.4 The Ryde Planning Scheme Ordinance

The Ryde Planning Scheme Ordinance was published in Government Gazette No. 73 of 1st June, 1979. This Ordinance has been retyped from the original copy of the Ordinance and incorporates the provisions of local environmental plans gazetted up to 4 August 2006.
The off-street parking requirements are stated as follows:

- The off-street parking requirements for commercial and industrial development on land within Macquarie Park Corridor must not exceed the rate shown for the land on the map marked "Ryde Local Environmental Plan No 137-Macquarie Park Corridor-Parking Restrictions" deposited in the office of the Council.

This therefore concludes that the parking rates in the Ryde Local Environmental Plan No 137-Macquarie Park Corridor should be used.

4.2.5 Macquarie University Concept Plan

The Macquarie University Concept Plan will guide the development of the University precinct for the next 20-25 years. When adopted, the Plan will act as the DCP for Macquarie University lands, currently not covered by existing City of Ryde planning instruments. The Concept Plan proposes that parking spaces at 'Station South Precinct' are provided at a ratio of 1 space per 46m^2. The car parking requirements in the Concept Plan are listed in Table 4.6.

Table 4.6: Macquarie University Concept Plan Parking Requirement

Type of development	Macquarie University Concept Plan requirements 1 space per 46sqm GFA
Office	371
Industry	113
Warehouse	45
Minimum Required	**529**
Provided	*544*
Difference	*15*

4.2.6 RTA Guide to Traffic Generating Developments

To compare rates contained within the DCP and LEP, the RTA parking rates for office, commercial, factories and warehouses contained in Section 5 Parking Requirements for Specific Land Uses has been included in this summary.

Office and Commercial

The car parking requirements for office and commercial developments vary with the parking policies of local government areas. As discussed in the RTA's publication Metropolitan Parking Policy and Guidelines, it is the responsibility of local government to determine parking policy in commercial centres.

Distinction needs to be drawn between whether the parking demand is to be met on-site (unrestrained situation) or whether car parking supply is to be used as a policy tool to restrict commuter movement by private vehicles into a commercial centre (restrained situation). On this basis, the following car parking provision is recommended:

- unrestrained situation - 1 space per 40m^2 gross floor area.
- restrained situation - refer to council parking code and applicable local plans.

The unrestrained situation assumes a peak hour mode split for cars of 0.62, car occupancy of 1.19 and a mean employee density of 4.75 employees per 100m^2 gross floor area. The unrestrained figure is based on 1979 surveys and has not been updated. For this reason other references, such as specific town centre studies, should preferably be used to establish an appropriate figure.

Factories

All new factories on undeveloped sites must provide on-site parking for all vehicles used by employees of the firm. Wholly redeveloped sites must be treated individually. Provision of 1.3 spaces per 100m^2 gross floor area is recommended. Variations to the recommended rate of parking provision must be considered in the context of both current and potential users.

Parking provision rate is increased when:

- retailing is permitted on-site (refer to Shopping centres for parking requirements).
- office space component is in excess of 20% of the floor area (refer to Commercial premises for parking requirements)

Parking provision is reduced when:

- a high proportion of the labour force utilises public transport.
- employee parking demand is substantially less than the recommended rate.

The number of on-site truck parking spaces provided must be on the basis of one space for each vehicle present at any one time (excluding those vehicles in loading docks). Under no circumstances is the parking of trucks on contiguous public streets acceptable.

Warehouses

All new warehouses on undeveloped sites must provide on-site parking for all vehicles used by employees. In the case of wholly redeveloped sites each site is treated on its merit. Provision of one car space per 300m^2 gross floor area is recommended.

The recommended rate of parking provision is in the middle range parking rate observed in the RTA's survey. The rates vary from one space per 80m^2 to one space per 960m^2, the mean and sample standard deviation figures being 338m^2 and 280m^2 respectively based on a sample of 10 sites.

Based on this information, Table 4.7 summarises the rates that could be applied to this development if the RTA parking advice was to be used.

Table 4.7 RTA Parking Rates

Type of development	Rate	Spaces required
Office	1 space per 40m^2 GFA	426
Industry	1 space per 77m^2 GFA	67
Warehouse	1 space per 300m^2 GFA	7
Minimum Required		**501**
Provided		**544**
Difference		*43*

4.2.7 Summary of Parking Rates

Table 4.8 summarises the rates contained in the LEP, DCP and the RTA Guide that could be applied to the proposed project.

Table 4.8 Summary of Parking Rates for Proposed Project

Type of Development	LEP 137[3]		MUCP		DCP 2006					RTA Guide	
	GFA		GFA		GFA		EMP		Max	GFA	
	1 space per sqm GFA	Spaces required	1 space per sqm GFA	Spaces required	1 space per sqm GFA	Spaces required	1 space per employees	Spaces required	Spaces required	1 space per sqm GFA	Spaces required
Office	46	371	46	371	30	569	-	-	-	40	427
Industry	46	113	46	113	46	113	-	-	-	76.92	67
Warehouse/ Research	46	45	46	45	100	21	-	-	-	300	7
Required	**-**	**529[1]**	**-**	**529[1]**	**-**	**703[2]**	**2**	**625[2]**	**703[2]**	**-**	**501[2]**
Provided	*-*	*544*	*-*	*544*	*-*	*-*	*-*	*-*	*544*	*-*	*544*
Difference	*-*	*15*	*-*	*15*	*-*	*-*	*-*	*-*	*-159*	*-*	*43*
Comment	*2.8% surplus*		*2.8% surplus*		*22.6% deficit*					*8.5% surplus*	

[1] Maximum Requirement
[2] Minimum Requirements
[3] The Draft City of Ryde Development Control Plan 2006, Part 4.5 and Ryde Planning Scheme Ordinance refer to rates in LEP 137

4.2.8 Conclusion

The proposal for 544 parking spaces is considered to generally comply with the relevant parking rates in:

- LEP 137 – less than 3% surplus;
- Draft City of Ryde Development Control Plan 2006, Part 4.5 - Macquarie Park Corridor (as per LEP 137);
- Ryde Planning Scheme Ordinance (as per LEP 137);
- Macquarie University Concept Plan – less than 3% surplus; and
- RTA Guide to Traffic Generating Developments – 8.5% surplus.

The proposal does not comply with the current Ryde DCP 2006 Section 9.3 – Parking, as the parking proposed is less than the requirement within DCP 2006. However, the subject site falls within the area identified to be included in the Draft DCP and the Macquarie University Concept Plan. The Draft DCP states that car parking for commercial and industrial activities is to be provided for in accordance with the rates contained in the Ryde Planning Scheme. The Ryde Planning Scheme Ordinance indicates that off-street parking requirements should be in accordance with LEP 137.

Given this, and the fact that the parking rates included in the LEP are consistent with the Macquarie University Concept Plan, it is considered that the parking provisions should be provided at a maximum of rate 1 space per 46m^2 GFA, which equates to 529 spaces. The proposed provision exceeds this by less than 3%.

It should be noted that Cochlear are committed to sustainable transport and are considering the development of a Workplace Travel Plan, prior to occupying the new site to assist as many employees as possible in shifting from their current car driving mode of travel to public and active transport modes and to increase car sharing opportunities.

Furthermore Cochlear's research, production and distribution staff (totalling 350 at Stage 1) work over 2 shifts. The shifts are 6am to 2 pm and 150 (12%) from 2pm to 10pm, as such public and active transport options are much less viable for these employees. Parking demand from these staff is therefore high.

4.3 CAR PARKING LAYOUT

4.3.1 Ryde DCP 2006

According to the City of Ryde DCP, all parking areas shall be designed in accordance with Australian Standards 2890.1 and AS 2890.2.

4.3.2 Australian Standards

Parking within the site is categorised as Class 1 according to Australian Standards 2890.1:2004 Table 1.1. The Australian Standards 2890.1:2004 states that:

- For 90 degrees bays, the minimum bay dimensions shall be 2.4m x 5.4m with an aisle width of 6.2m (Figure 2.2).

The majority of parking spaces (464 of 544) provided exceed these minimum size dimensions. Of these 464 spaces, 26 spaces are widened by 300mm to account for side obstructions and 11 spaces are provided as disabled parking spaces. The balance of 80 spaces, are provided as small car spaces (2.3m x 5.0m) in accordance with the buildings green star rating.

4.3.3 Green Star Rating Parking

According to the V2 Green Star office design matrix, ratings are given to the following criteria to encourage developments that facilitate the use of alternative modes of transportation and also the use of more fuel efficient vehicles. The requirement states:

- One point is awarded where it can be demonstrated that 25% of the total parking spaces on the site are designed and labelled for small cars and/or mopeds/motorbikes.
- A minimum of 10% of the total parking spaces (i.e. 10 out of every 100 parking spaces provided) must be for small cars.

According to the V2 Green Star office design matrix, small car bays are deemed to have dimensions of 2.3m x 5.0m. The small car spaces proposed for the subject project comply.

4.4 DISABLED PARKING

The subject project proposes to provide 11 disabled parking spaces in two different formats:

- 7 spaces at 3.2m wide by 5.4m in the western at-grade car park;
- 4 spaces at 2.4m wide by 5.4m provided in pairs with a 2.4m wide by 5.4m shared area.

11 Spaces represents 2% of the total car parking provision.

4.4.1 Ryde DCP 2006

Ryde DCP 2006 (adopted July 2006):

- Part 9.2 Access for people with disabilities Section C: Item 16.1 states:
  - "Parking spaces are to be a minimum of 3660mm wide to allow a wheelchair user to fully open the car door and then transfer from the car to the wheelchair"; and
  - Table 1 - requires that for a building class 5 (commercial) "with parking areas of more than 10 spaces, 3% of spaces are wide bay."
- Part 9.3 Car Parking Section 6 Design of Parking Areas states:
  - "all parking areas shall be designed in accordance with Australian Standards AS2890.2 and AS 2890.2"

The proposed parking spaces do not comply with Part 9.2 of Ryde DCP 2006 in terms of bay dimensions and minimum number of spaces.

4.4.2 Australian Standards

AS1428.1-2001 Design for Access & Mobility Part 1 states:

- "Car parking facilities shall comply with the requirements for parking for persons with disabilities set out in AS 2890.1".

AS2890.1 – Parking Facilities – Part 1: Off Street Parking:

- 2.4.1 (iii) states "parking spaces for people with disabilities See AS/NZS 2890.6"
- The footnote to this notes that pending the adoption of the draft AS2890.6 requirements for parking for people with disabilities should be referred to in the superseded version of A2890.1-1993 which states in 2.4.5 (c) "the parking space width shall not be less than 3.2m" and Table C1 recommends 1-2% of spaces be allocated as disabled parking spaces; and
- AS2890.1 (2004) makes no recommendation as to number of disabled parking spaces.

The proposed number of parking spaces meets the requirements of the Australian Standards for the minimum number of parking spaces allocated as disabled spaces. The seven proposed 3.2m by 5.4m spaces meet the current applicable Australian Standards requirements for bay dimensions.

Draft AS2890.6 Parking Facilities - Part 6: Off-street parking for people with disabilities states:

- Draft AS2890.6 makes no recommendation as to number of disabled parking spaces; and
- "An angle parking space shall comprise a combination of areas as illustrated in Figure 6.1 (refer to Appendix F) as follows:
  - A dedicated (non-shared) space 2400 mm wide by 5400 mm long.
  - A shared area 2400 mm wide by 5400 mm long on one side of the dedicated space. It may be entirely on the left or entirely on the right side of the dedicated space.
  - A shared area 2400 mm long by 2400 mm wide at one end of the dedicated space. It may be entirely at the front or entirely at the rear of the dedicated space.
  - The dedicated space and the shared area shall be at the same level.
  - Bollards shall be provided in the positions shown in Figures 6.2 and 6.3[1].
  - The angle-parking angle shall be between 45 degrees and 90 degrees. It is not required that all spaces within a car park be at the same parking angle

The four proposed 2.4m by 5.4m spaces with shared areas meet the draft applicable Australian Standards requirements for bay dimensions.

Austroads Guide to Traffic Engineering Practice (AGTEP) Part 11 Parking:

- provides only general guidelines used in the USA.

Building Code of Australia (BCA): Part D3 - Access for people with Disabilities, Section D3.5:

- indicates that 1 space for every 100 carparking spaces should be provided for people with disabilities.

4.4.3 Summary

To summarise issues in relation to disabled parking bay widths:

- Ryde DCP 9.2 the requirement is for 3.66m wide spaces;
- Ryde DCP 9.3 requires compliance with AS2890.1;
- AS2890.1 the current requirement is for 3.2m wide spaces; and
- AS2890.6 the draft requirement is for 2.4m wide spaces with a shared area.

With regards to the number of disabled parking spaces:

- The proposed 11 disabled parking spaces represents 2% of total spaces (544). Hence the proposal exceeds the recommendation in the AS, BCA & AGTEP;
- However, Ryde DCP 2006 (adopted July 2006) - Part 9.2 Access for people with disabilities Section C: Item 16.1 states: Table 1 - requires that for a building class 5 (commercial) "with parking areas of more than 10 spaces, 3% of spaces are wide bay." hence the proposed number of spaces does not comply with this requirement.

[1] Examples of angle parking spaces referred to as Figures 6.1 to 6.3 of AS2890.6 are provided in Appendix F

4.5 BICYCLE PARKING

The provision of bicycle parking in new development approvals is regulated by Ryde Council's Parking Development Control Plan and determines the rate of provision by bicycle parking spaces per square metres of floor space. The Draft City of Ryde Development Control Plan 2006, Part 4.5 - Macquarie Park Corridor (Draft DCP) provides the following rates for bicycle parking at commercial developments as a minimum of 1 space per 200m^2 GFA for employees and a minimum of 1 space per 750m^2 GFA for visitors. Although technically the rates in the Draft DCP do not apply they provide good guidance as to what the City of Ryde would like to see in terms of cycle parking provision.

Based on the above rates the Draft DCP, the following bicycle parking provisions would be preferable:

- 122 for staff;
- 32 for visitors.

The Draft DCP also provides the following guidance for bicycle facilities:

- Bicycle parking is to be secure and located with safe and easy access from the street;
- Bicycle parking is to be provided in all public car parks and at train stations; and
- End of trip facilities are to be provided in all commercial developments.

Bike provisions currently being aimed for (based on 3 points from the V2 Green Star Office Design matrix) include:-

- A total of 152 secure bicycle spaces (for staff), 16 showers and a change room area;
- No specific laundry facilities have been allocated at present;
- A total of 31 visitor bicycle spots (on grade at the front entry area).

Refer to Appendix G for an example of a typical staff bicycle parking arrangement and Appendix H for an example of a typical visitor bicycle parking arrangement.

4.6 MOTORCYCLE PARKING

48 motorcycles parking spaces with minimum dimensions of 1.2m by 2.5m are proposed on the project site, with 22 on the lower ground floor and 20 on basement level B1. The City of Ryde DCP does not specify minimum dimensions for motorcycle parking. The Australian Standards AS2890.1:2004 requires minimum bay dimensions of 1.2m by 2.5m for motorcycle bays. The proposed parking bays comply with this requirement

4.7 SERVICE VEHICLE PARKING

According to AS2890.2-2002 Table 4.1, the minimum service bay dimension for a heavy rigid vehicle is 3.5m x 12.5m and 3.5m x 19.0m for an articulated vehicle. In general, the service bay has to allow provision for the largest design vehicle likely to use the facility and also be separated, as far as practicable, from areas of car parking, pedestrian activity, entrances and exits. The ability of the service area to cater for the largest design vehicle is detailed in Section 4.9.

4.8 PROJECT ACCESS

The project proposal includes two driveway accesses. The first provides access to the basement car park and the service vehicle area. It is located where a current driveway exists, on the eastern boundary of the site, approximately 85 metres from the existing roundabout. This driveway provides 2 entry lanes and 2 exit lanes.

A second driveway access is proposed at the western end of the site, approximately 75 metres from the roundabout, allowing a single lane each for entry and exit to the at-grade off-street parking facility.

It is proposed to close off the existing access to the site located at the roundabout intersection of University Avenue and Central Avenue.

Real-time information for each car parking facility will be provided at or near the car park accesses. Electric signboards will be installed informing drivers of the number of available car parking spaces, for the basement car park as well as the at-grade car park.

4.8.1 Truck Access

Australian Standard 2890.2-2002, "Off Street Commercial Vehicle Facilities", states that the minimum width of a two-way access driveway on a minor road catering for articulated vehicles be 12.5metres wide. The proposed width of the two-way commercial vehicle access at the eastern car park driveway access is 13.0 metres and is therefore sufficient. At Stage 1, it is proposed for the eastern access to allow entry and exit of rigid vehicles. Only rigid trucks will be used on the site until Stage 2 is complete at such time articulated vehicles will enter via the eastern driveway and exit out the western driveway.

4.8.2 Car Access

According to the Australian Standard 2890.1:2004, "Off Street Car Parking", the parking facilities for this project fall into the category of User Class 1. The Access Road is considered a local road. The western parking facility caters for around 150 cars while the eastern car park caters for over 400 vehicles. According to AS2890.1 Table 3.1, the eastern car park would require a 6.0m wide entry and a 4.0-6.0 metre wide exit. The proposed access point meets these requirements being 13.0 metres wide. For the western car park a 6.0-9.0 metres wide combined entry and exit driveway is required. The proposed access point meets these requirements being 8.0 metres wide.

4.9 SIGHT DISTANCE

An important aspect to consider is the sight distance provided to vehicles entering and exiting the site. In calculating driver sight distance requirements, the following values of driver eye heights have been used in design as detailed in Austroads Part 5 Intersections at Grade (2005):

- Cars – a height of 1.05m;and
- Trucks – a height of 2.40m.

Approach Sight Distance (ASD) – ASD is the minimum level of sight distance which should be available at all intersections to allow drivers to identify the changing road conditions and react appropriately.

Entering Sight Distance (ESD) – Entering sight distance is the sight distance required for minor road drivers to enter a major road via a left or right turn, such that traffic on the major road is unimpeded. Because of the large distances required ESD is rarely achieved, but should be provided where possible.

Australian Standard 2890.1:2004 Off Street Car Parking states that unsignalised access driveways shall be located so that the intersection sight distance along the frontage road available to drivers leaving the car park or domestic driveway with a frontage road speed of 50 km/hr is a minimum of 45 metres and desirable distance of 69 metres.

Australian Standard 2890.2:2002 Off Street Commercial Vehicle Facilities states that unsignalised access driveways shall be located so that the intersection sight distance along the frontage road available to drivers leaving the car park or domestic driveway with a frontage road speed of 50 km/hr is a minimum of 69 metres (5 seconds gap) and desirable distance of 111 metres (8 seconds gap).

Austroads Part 5 Intersections at Grade (2005) states that the ASD for a design road speed of 50km/hr is 47 metres (for an absolute minimum 2 seconds reaction time) and 54 metres (for a desirable 2.5 seconds reaction time).

Cardno Engineers have visited the site to determine the adequacy of sight distance for vehicles entering and exiting the proposed accesses from University Avenue. The project was found to be in a generally flat area of land with a gradual increase in grades towards the west just before the roundabout at University Avenue/Western Road. Existing vegetation causes some obstructions to sight distances along University Avenue, especially at bends near the pedestrian crossings at the western and eastern ends of the road section.

The sight distance for the proposed driveway accesses has been reviewed:

- The sight distance at the proposed eastern driveway looking in the western and eastern direction is approximately 200 and 130 metres respectively;
- The sight distance at the western driveway looking in the western and eastern direction is approximately 75 and 170 metres respectively.

The general sight distances to and from all driveway accesses provide ample sight distances in excess of minimum requirements set out in the Australian Standards and Austroads Guide.

However, it should be noted that the proximity of the existing pedestrian crossing on University Avenue to the proposed western car park entrance is not desirable. Consideration should be given to re-locating this crossing to a more appropriate location.

4.10 INTERNAL ROAD LAYOUT

4.10.1 Western at-grade Car Park

At the western at-grade car park, two way circulating aisles are provided for vehicles travelling north south at the western boundary of the site with a minimum width of 6.2 metres. All other circulating aisles within the surface car park are provided as one-way circulating aisles with a minimum width of 6.2 metres. There is only one blind aisle located at the southern end of the car park, which provides access for around 26 car park spaces. A turning bay is provided at the end of this aisle. The car park layout provides good circulation and access to all parking spaces.

4.10.2 Service Area Car Park

Give-way signage is proposed just after the median island at the access driveway to give priority to vehicles turning right into the basement car park.

4.10.3 Basement Car Park

The majority of parking aisles within the basement car park are provided as two-way aisles with a minimum width of 6.0 metres which is considered acceptable. The north-south aisle in basement level 2 at the bottom of the access ramp has been designated as one-way to minimise potential vehicle conflict at the priority junction.

4.10.4 Truck Routes & Access to Loading

Trucks accessing the site are provided entry at the proposed eastern driveway. At this stage, it is proposed for only rigid trucks to enter and exit through the eastern driveway. Semi-articulated trucks are proposed via the eastern access and exit out the western driveway in Stage 2. Rigid or semi-articulated vehicles are proposed to perform 3-point turns and reverse into the loading docks located at the south-west of the project site. Once the loading activities are completed, they will proceed to leave the site in a forward manner via the exit driveway access.

It is recommended that the following be implemented in the detailed design and line-marking plans for the truck access:

- 'Beware Trucks Reversing' signage to be located around dock area; and
- No Parking/No Stopping signage to be positioned at sections where trucks perform reverse movement.

4.11 SWEPT PATH

A swept path analysis for the eastern service area has been undertaken using AutoTurn 5 for AUTOCAD. The manoeuvring movements for the 12.5 metres rigid and 19 metres semi-articulated trucks were analysed for this study. The analyses have demonstrated that articulated vehicles have no major issues entering and leaving the site through the eastern access. Results also revealed that articulated trucks are able to do 3 point turns and reverse into the loading dock. Swept path analyses for articulated vehicles exiting via the western driveway will be undertaken for Stage 2 studies. Please refer to Appendix I for swept path figures.

4.12 PUBLIC TRANSPORT ACCESS

Information on available public transport options will be provided to Cochlear Staff.

4.12.1 Bus

An internal network of bus stops exists within the University campus on Macquarie Drive and University Avenue, a short walk from the proposed project. These can be accessed along the well lit, pedestrian friendly footpaths and offer a range of bus services to the surrounding area and beyond. External to the University site, the bus stops on Epping Road offer the widest frequency and range of services and are supported by bus shelters and timetable information – see Figure 3.8. These bus stops are also located within close proximity of the proposed project. Bus stops serving southbound bus routes can be easily accessed via the pedestrian crossings located on Epping Road.

4.12.2 Rail

The proposed project is within walking distance of the proposed Macquarie University Rail Station. An enhanced pedestrian network proposed throughout the University and around the station will provide easy access for Cochlear staff and visitors to the railway station.

4.13 PEDESTRIAN AND CYCLING ACCESS

4.13.1 Pedestrian

The proposed project is located along University Avenue, which is a key pedestrian route within the University pedestrian network. The project proposes a footpath along the frontage of the site along University Avenue, which connects to the existing pedestrian network within the University. The University pedestrian network is generally comprehensive and well-lit.

Further improvements to the pedestrian network are proposed as part of the MUCP. This includes improvements to quality of facilities, new links and improved way-finding signage. This will provide excellent pedestrian access to the proposed project from public transport, local attraction such as Macquarie Shopping Centre and local residential areas.

4.13.2 Cycling

The proposed project has a strong emphasis on providing cycling facilities for staff and visitors. Highlighted through the proposed provision of 16 showers and a change room area, 152 secure bicycle spaces (for staff) and 31 visitor bike parking spaces.

With regard to the 'Short Term Cycle Access Plan' contained within the Macquarie University Bicycle Network Masterplan, access to the site by bicycle will be extremely convenient for cyclists. The emphasis is to provide maximum circulation and minimal conflict for cyclists within a 0-5 year timescale. A proposed off-road segregated bicycle path along University Avenue will provide direct and convenient access into the site from all sides of the campus; this in turn links into the following existing and proposed cycle links creating a safe network for those arriving at the site by bicycle:

- A proposed shared path from Epping Road/Balaclava Road;
- An existing bicycle route on Western Road/Macquarie Drive/Eastern Road;
- A proposed share path to Gymnasium Road; and
- A future bicycle road on Waterloo Road.

In the longer term, the internal cycle network will be maintained and cycling to the proposed project site will be further enhanced with the proposed inclusion of 'Cycle Centres' at the railway station and other locations as part of the Macquarie University Bicycle Network Masterplan.

4.14 WORKPLACE TRAVEL PLAN

Section 3.8 of the Draft DCP recommends that a Work Place Travel Plan (WPTP) is required for all developments that exceed 15,000m^2 floor space. A WPTP promotes the development, implementation and monitoring of a coordinated transport strategy for an individual company or site to influence the travel behaviour of employers, employees and occasional visitors to an organisation, away from single-occupancy car use towards more sustainable forms of transport.

The objectives of work place travel planning within the Macquarie Park Corridor are to:

- Provide incentives for employers to encourage staff to utilise improved accessibility (by public transport, cycling and walking) to, from, and within the Corridor;
- Minimise rates of private vehicle use for commuters and business trips as a contribution to the regional goal of 20% transport modal shift;
- More effectively manage the use of private vehicles within the area;
- Encourage the use of alternative modes of transport within the region; and
- Reduce congestion and the cumulative impacts of vehicle emissions upon air quality.

Cochlear will be developing a Building User Guide which will include information on the cycling facilities, conditions of access and appropriate use, local transport information, maps and timetables and information on alternative methods of transport to the workplace. This will be provided to staff and visitors. Cochlear are committed to sustainable transport and will be considering the development of a Workplace Travel Plan, prior to occupying the new site.

4.15 UNIVERSITY RULES AND GUIDELINES

All Cochlear staff and regular visitors will be informed of the University Traffic and Parking Rules and Guidelines. Similarly all construction staff will also be informed of the University requirements.

5 PROJECT TRAFFIC GENERATION

5.1 PROJECT TRAFFIC

The RTA's Guide to Traffic Generating Developments (2002) was used to determine the potential traffic generation of the proposed project. The traffic generation rates for the various land uses utilised for this study are detailed below:

- Daily Vehicle trips:
  - Office: 10 vehicle trips per 100m^2 GFA; and
  - Manufacturing/Research: 5 vehicle trips per 100m^2 GFA; and
  - Warehouse: 4 vehicle trips per 100m^2 GFA; and
- Peak Hourly Vehicle trips:
  - Office: 2 vehicle trips per 100m^2 GFA (evening peak); and
  - Manufacturing/Research: 1 vehicle trip per 100m^2 GFA (evening peak); and
  - Warehouse: 0.5 vehicle trips per 100m^2 GFA (morning peak).

Table 5.1: Site Traffic Generation

Land Use	Size (m^2 GFA)	Traffic Generation Rates		Traffic Generation	
		Peak Hour (veh/hr)	Daily (veh/day)	Peak Hour (veh/hr)	Daily (veh/day)
Office	17,081	2/100m^2 GFA	10/100 m^2 GFA	342	1,708
Manufacturing/Research	5,192	1/100m^2 GFA	5/100 m^2 GFA	52	260
Warehouse	2,070	0.5/100 m^2 GFA	4/100 m^2 GFA	10	83
Sub-Total	**24,343**			**404**	**2,051**

It is expected that this project will generate approximately 404 peak hour vehicle trips and 2,051 daily vehicle trips.

The manufacturing/research and warehouse land uses are proposed to operate 2 shifts over a 16 hour period (6am to 2 pm and 2pm to 10pm. As such these land uses may not generate trips during the traditional peak hours.

Furthermore Cochlear are minimising car parking in accordance with Ryde LEP 137 and looking at ways to promote and encourage staff to travel to work in non-single occupant private vehicles.

The assessment above assumes that all land uses generate trips during the traditional peak hours at the conservative rates assume din the RTA guide. To perform the analyses for the worst-case scenario, it is assumed that all trips will be generated from this project during the peak hours for the purposes of this study.

5.2 MODELLING APPROACH

The basis for the traffic impact assessment is the use of the Macquarie University Simulation Transport Model (MUSTM) that was developed for the Macquarie University Concept Plan TMAP. MUSTM is comprised of AM and PM peak hour models for the 2006 base year and a 2031 forecast year model. The 2006 base year model is used to provide predicted background traffic volumes for Stage 1 of the proposed project.

The 2006 Base Year Calibration year, as its name suggests, is a calibrated model of the 2006 traffic conditions and the respective landuses. The calibration of the MUSTM for 2006 was better than industry standards and provides a very good basis to assess the traffic impacts of the proposed project taking into account the background traffic. The background traffic affects routing of the proposed project generated traffic (and vice versa) since both traffic streams compete for the same road capacity.

Within Macquarie University each car park is represented by a zone for the purposes of trip generation and destination. The proposed project site is represented by a unique zone (zone 524) and the location mirrors the car park location in the internal Macquarie University road network.

For the purposes of the traffic assessment, the trip generation is based on gross floor area using RTA trip generation rates as presented in Section 5.1.

The proposed project zone is added to the base year calibration matrix. We have assumed that all trips either originate to or from outside the Macquarie University area.

The distribution of the proposed project trips for both inbound and outbound is based on the trip ends for the major roads entering the study area namely:

- Epping Road;
- M2 Motorway;
- Lane Cove Road;
- Ryde Road;
- Pittwater Road; and
- Wicks Road.

The distribution is in proportion to the traffic volumes and hence follows major traffic routes. The proportions differ from the AM to the PM peak hour, and the road direction for the inbound and outbound trips. These assumptions are based on calibrated and observed traffic and are reasonable taking into account that the MUSTM is a sub area model.

The background and project trips are combined in a single trip matrix and assigned to the road network. Since the project trips travel to or from a unique zone, the routes used by the project trips to enter or leave the study can be viewed through select link extraction. This route assessment is used to check that the road usage is reasonable, and to assess the proportion of project versus background trips at any road section or turn movement at an intersection. In this way the traffic effects can be separated into two sources.

5.3 TRUCK MOVEMENTS

Cochlear have advised the following in relation to truck movements to the site:

- The warehouse dock will open at 8:00am;
- 10-12 Truck/Vans per day are anticipated (a mixture of Pantechs, 20ft table tops and small courier vans);
- Trucks not received between 1:30pm – 2:30pm; and
- Cochlear's Asia Pacific (APAC) office, which is currently located away from the Main Cochlear Facility at Lane Cove will generate the following service vehicle activity:
  - Pick up and Delivery in the morning and afternoon; and
  - At least two Courier vans per day.

5.4 TRAFFIC IMPACTS

The critical intersections surrounding the site were assessed using the SIDRA software package to determine the Degree of Saturation, Average Delay (in seconds) and Level of Service (LoS) at each intersection. Traffic volumes from the MUTSM were used as input to the more detailed SIDRA modelling.

The following intersections were assessed:

- Epping Road/Balaclava Road;
- Epping Road/Herring Road;
- Waterloo Road/Herring Road;
- Waterloo Road/Culloden Road;
- Talavera Road/Culloden Road;
- Talavera Road/Christie Road;
- Talavera Road/Herring Road;
- Epping Road/Culloden Road;
- University Avenue/Western Road;
- University Avenue/Central Avenue;
- University Avenue/Eastern Road;
- University Avenue/Research Park Drive;
- Research Park Drive/Innovation Road
- Research Park Drive/Science Road
- Herring Road/Innovation Road; and
- Culloden Road/Gymnasium Road.

All intersections were evaluated for the weekday AM and PM peak periods for each of the following scenarios:

- 2007 Existing Traffic Volumes (no project traffic); and
- 2007 Traffic Volumes with additional project traffic.

5.4.1 Existing Traffic with Project

The traffic on the surrounding road network with additional traffic generated by the project has been determined by adding the project traffic to the base background traffic in the MUTSM. The detailed results of this analysis are provided in Appendix J and a comparison between the operation with and without the project is presented in Table 5.2 and Table 5.3.

Table 5.2 Intersection Analysis Summary – Comparisons for AM peak

Intersection	Intersection Control	2007 AM Base			2007 AM Base with Project		
		Degree of Saturation	Delay (sec)	LoS	Degree of Saturation	Delay (sec)	LoS
Epping Rd/ Balaclava Rd	Traffic Signals	0.898	57.6	E	0.923	60.4	E
Epping Rd/ Herring Rd	Traffic Signals	1.109	> 124	F	1.063	123.0	F
Waterloo Rd/ Herring Rd	Traffic Signals	0.640	40.1	C	0.632	39.0	C
Waterloo Rd/ Culloden Rd	Roundabout	0.556	11.6	A	0.556	11.6	A
Talavera Rd/ Culloden Rd	Roundabout	0.239	17.4	B	0.240	17.5	B
Talavera Rd/ Christie Rd	Traffic Signals	0.699	16.1	B	0.695	16.2	B
Talavera Rd/ Herring Rd	Traffic Signals	0.607	21.8	B	0.618	22.0	B
Epping Rd/ Culloden Rd	Give Way (E-W)	0.019	9.2	A	0.017	9.2	A
Uni Ave/Western Rd	Roundabout	0.047	12.2	A	0.050	12.5	A
Uni Ave/Car Park	Roundabout	0.016	13.0	A	0.057	13.1	A
Uni Ave/Eastern Rd	Give Way (E-W)	0.011	14.3	A	0.018	19.4	B
Uni Av/Research Park Dr	Give Way (E-W)	0.309	15.6	B	0.637	22	B
Research Park Dr/Innovation Rd	Give Way (E-W)	0.037	9.4	A	0.043	10.2	A
Research Park Dr/Science Rd	Roundabout	0.114	11.5	A	0.200	11.6	A
Herring Rd/Innovation Rd	Give Way (N-S)	0.057	10.7	A	0.071	10.8	A
Culloden Rd/Gymnasium Rd	Give Way (N-S)	0.010	11.3	A	0.010	11.3	A

* Average Delay is provided for whole intersection for signalised intersection, for all other intersections the average delay for the worst approach is provided.

Table 5.3 Intersection Analysis Summary – Comparisons for PM peak

Intersection	Intersection Control	2007 PM Base			2007 PM Base with Project		
		Degree of Saturation	Delay (sec)	LoS	Degree of Saturation	Delay (sec)	LoS
Epping Rd/ Balaclava Rd	Traffic Signals	1.001	56.3	D	0.999	58.9	E
Epping Rd/ Herring Rd	Traffic Signals	1.107	142.3	F	1.136	154.0	F
Waterloo Rd/ Herring Rd	Traffic Signals	1.000	68.7	E	1.001	80.1	F
Waterloo Rd/ Culloden Rd	Roundabout	0.272	14.5	B	0.269	14.6	B
Talavera Rd/ Culloden Rd	Roundabout	0.056	12.4	A	0.056	12.4	A
Talavera Rd/ Christie Rd	Traffic Signals	0.745	15.0	B	0.767	15.2	B
Talavera Rd/ Herring Rd	Traffic Signals	1.001	24.0	B	1.001	24.1	B
Epping Rd/ Culloden Rd	Give Way (E-W)	0.161	8.4	A	0.161	8.4	A
Uni Ave/Western Rd	Roundabout	0.340	12.8	A	0.413	12.9	A
Uni Ave/Car Park	Roundabout	0.039	13.5	A	0.448	14.3	A
Uni Ave/Eastern Rd	Give Way (E-W)	0.008	11.7	A	0.011	14.2	A
Uni Av/Research Park Dr	Give Way (E-W)	0.156	12.9	A	0.149	14.8	B
Research Park Dr/Innovation Rd	Give Way (E-W)	0.201	9.5	A	0.193	9.2	A
Research Park Dr/Science Rd	Roundabout	0.015	11.8	A	0.015	11.8	A
Herring Rd/Innovation Rd	Give Way (N-S)	0.054	12.6	A	0.155	13.0	A
Culloden Rd/Gymnasium Rd	Give Way (N-S)	0.013	12.7	A	0.013	12.7	A

* Average Delay is provided for whole intersection for signalised intersection, for all other intersections the average delay for the worst approach is provided.

The signalised intersection of Epping Road and Balaclava Road continues to show delays and LoS E during both weekday peak periods. The intersection will experience only very minor increases in delay during the PM peak period with the project.

The signalised intersection of Epping Road and Herring Road is operating with high degrees of saturation and delays with LoS F. With the project traffic minor increases in delay and queue lengths were observed, the changes are consistent with the unstable nature of an intersection already over capacity.

The signalised intersection of Waterloo Road and Herring Road will experience small increases in delay. The intersection operates with LoS C during the AM peak period and LoS F during the PM peak period with the project.

The intersection of Waterloo Road and Culloden Road will continue to operate with good performance characteristics during both peak periods. The observed changes in operating characteristics are marginal.

The results showed that the intersections along Talavera Road continue to operate with good performance characteristics and well within their capacities with LoS A or B. The changes in delay and degree of saturation are insignificant.

The intersection of Epping Road and Culloden Road continues to operate with good performance characteristics and well within their capacities with LoS A for both peak periods.

The intersections along University Avenue will operate with good performance characteristics and well within their capacities. No significant changes in delay and degree of saturation were observed.

The following intersections will continue to operate with good performance characteristics and well within their capacities with LoS A:

- Research Park Dr/Innovation Rd;
- Research Park Dr/Science Rd;
- Herring Rd/Innovation Rd; and
- Culloden Rd/Gymnasium Rd.

Overall the impact of the subject project on key surrounding intersections is minimal except for the following intersections where remedial works are recommended in Section 5.5.2:

- Epping Road/Balaclava Road; and
- Waterloo Road/Herring Road.

5.4.2 Future Scenarios

The Macquarie University Concept Plan strategic model included the Station South Precinct where the proposed project site is located. The model was analysed based on a 25-year scenario and an impact assessment was carried out following results achieved from the 2031 model.

A comparison of the data assumptions for the Macquarie University Concept Plan and the proposed project application are presented in Table 5.4.

Table 5.4 Data Assumptions

Study	GFA (m^2)	Parking Provisions	Employment Numbers
Cochlear Headquarters Stage 1 Project Application	24,343	544	1,250
Cochlear Headquarters Estimated Full Development	54,543	1,206	3,000
Macquarie University Concept Plan	56,765	1,235	2,271

It is considered that given the future assessment is for a 25 projection scenario that the assumptions within the Macquarie University Concept Plan strategic model are reasonable for the current planning for the proposed project. The assessment of the future impact of the University development (including the proposed project) has been adequately assessed in the MUCP TMAP.

It should be noted that the underlying transport objective of the MUCP TMAP is to increase the use of public transport, walking and cycling to/from and within the Macquarie University area. In that context, and given the substantial investment in Epping-Chatswood Rail Link, it is considered appropriate to minimise the range of road upgrades.

This approach is consistent with the demand management focus of current transport planning, and also frees up funds for measures more likely to increase public transport use, cycling and walking. It is also consistent with the recommendations of the Macquarie Park TMAP.

Many intersections within the greater MPC are already operating at or near capacity and over time will worsen considerably as a result of not only development within the corridor but external pressures on the road network. Furthermore, the road network surrounding the Macquarie Park Corridor area is already largely fully developed, with somewhat limited scope for any significant upgrading measures. Key intersections such as M2 / Epping Road and Epping Road / Lane Cove Road are already grade-separated. While a number of other intersections experience congestion during peak periods, it is considered that there is either insufficient space or insufficient justification from a broader policy point of view to warrant further grade separation.

However, the existing constraints of the surrounding road network and key intersections mean that to accommodate the additional development on the University and the Macquarie Park in general, a number of road and intersection improvements will need to be implemented over the next 25 years and commensurate with the expansion of the University. The results of the modeling process and options testing were used as a basis for recommendations made in the MUCP TMAP. The MUCP TMAP focused on measures that could be implemented on:

- Internal roads within the University;
- Accesses to the University; and
- Roads immediately surrounding the University.

The MUCP TMAP recommended implementing a range of measures to improve the performance of key intersections at or surrounding the University. Given the wide-ranging and complex nature of the road management issues within the Macquarie Park Corridor and their overall budgets, the approach was taken that it was necessary to identify further issues (major intersections a greater distance away from the University that require improvements) to be considered as part of the City of Ryde study for the Macquarie Park corridor (Macquarie Park Traffic Study). Furthermore it was recommended that the University should continue to work with the City of Ryde to identify recommended treatments with a corresponding contributions plan.

The City of Ryde (CoR) is currently in the process of amending and translating its Local Environment Plan (LEP), DCP and Public Domain Plan (PDP) for Macquarie Park, in recognition of the significant growth potential of the area. As a result of this the CoR has initiated both a traffic study and a pedestrian movement study for Macquarie Park to consider the needs and effects of the proposed LEP, defined as LEP2008. The Macquarie Park Traffic Study was undertaken under the direction of a steering committee comprising:

- City of Ryde;
- TransUrban (for the M2 Motorway interface);
- RailCorp (for the Epping-Chatswood Rail Line);
- AMP (as owners of the Macquarie Park Shopping Centre);
- Macquarie University; and
- Goodman International (as a major property owner in the area).

The RTA was also involved in the study as a key stakeholder attending steering committee meetings and through involvement at each stage of the option development and assessment process.

A draft of the CoR Macquarie Park Traffic Study has since been released. This study modelled the Macquarie Park road network in 2031. Major road network improvements surrounding Macquarie Park required to provide sufficient capacity in the study area in 2031, assuming a 40% public transport mode split is achieved, were recommended. These draft recommendations were made considering road capacity, accessibility, road function and safety considerations.

Some key recommendations from the Draft CoR Macquarie Park Traffic Study to provide sufficient capacity at key intersections in the study area in 2031 included:

- Waterloo Road/Herring Road - double right turn from Waterloo Road into Herring Road;
- Epping Road/Herring Road - Epping Road overpass over Herring Road and change lane markings at existing signalised intersection;
- Epping Road/Balaclava Road - Double right turn from the eastern approach, extension of the four "stand-up" lanes on the southern approach and additional turn lanes from side streets and in Epping Road.

It should be noted that the CoR Macquarie Park Traffic Study is still in draft and resolution as to a preferred set of recommended improvements to the road network has yet to be resolved.

The MUCP TMAP recommended implementing the following range of measures (2031) to improve the performance of the intersections identified as requiring remedial works in Section 5.4.1.

Intersection of Waterloo Road/Herring Road

- Provide a short left turn slip lane in Waterloo Road (east);
- Provide additional through lane in Waterloo Road (east) with additional through shared lanes;
- Favourable movement Herring Road (south) approach during the AM peak only via changes to phasing arrangements.

Intersection of Epping Road/Balaclava Road

- Provide an additional exit lane on Epping Road (east);
- Provide additional through lane in Balaclava Road (south) to 2 through and 3 right turn lanes;
- Provide additional through lane in Epping Road (west);
- Provide an additional exit lane on Epping Road (west);
- Provide an additional exit lane on Balaclava Road (north);
- Favourable movement – through movements on Epping Road via changes to phasing arrangements.

5.5 ROAD NETWORK IMPROVEMENTS

5.5.1 Introduction

The MUCP TMAP recommended a range of measures to improve the performance of the two intersections identified as requiring remedial works in Section 5.4.1 and are part of a package of measures aimed at improving performance of the road network surrounding the Macquarie University when the MUCP is at full development (approximately 25 years). The recommendations are subject for review as part of the Public Exhibition of the MUCP, currently underway.

The CoR Macquarie Park Traffic Study is still in draft form and is also subject for review.

Funding for Road Network Improvements

When the agreed range of road network improvement measures for the Macquarie Park Corridor is finalised it is expected that a method for apportioning funding will need to be developed. This funding apportionment method may include a combination of the following:

- Contributions Plans (CP);
- Voluntary Planning Agreements (VPA);
- Works in kind.

The funding apportionment will need to consider all relevant parties such as:

- City of Ryde;
- Roads and Traffic Authority;
- TransUrban; and
- Developers in the Macquarie Park area such as AMP, Macquarie University and Goodman International.

Once in place it would be typical for a developer to contribute an equitable proportion of funding towards the agreed road network improvements or to undertake works in kind via a VPA based on some quantifiable measure such as floorspace, car parking or traffic generation.

As the recommended package of road network improvement measures for the Macquarie Park Corridor as a whole has not yet been finalised it is recommended that specific works be identified as part of this study to potentially maintain the current intersection performance at the noted intersections.

5.5.2 Proposed Project Potential Intersection Improvements

An analysis was undertaken of the following intersections as part of this study to determine specific works that could be undertaken to mitigate the particular impacts of the proposed project:

- Waterloo Road/Herring Road; and
- Balaclava Road/Epping Road.

The following recommended intersection treatment works have been developed to achieve the above:

Intersection of Epping Road/Balaclava Road

- Provide an additional short (50m) right turn lane in the Balaclava Road (north) approach; and
- Reduce the Balaclava Road (north) departure to one lane.

The proposed works are shown schematically in Figure 5.1.

Intersection of Waterloo Road/Herring Road

- Provide an additional short (50m) right turn lane in the Waterloo Road (west) approach;
- Reduce the Waterloo Road (west) departure to one lane.

The proposed works are shown schematically in Figure 5.2.

5.5.3 Intersection Performance with Intersection Improvements

The performance of the above two intersections has been assessed with the proposed improvements detailed in Section 5.5.2. The detailed results of this analysis are provided in Appendix K and a comparison between the operation with and without the project is presented in Table 5.5 and Table 5.6.

Cardno Eppell Olsen

Drawing Title:
Intersection of Epping Rd/Balaclava Rd with proposed improvements

Figure No: 5.1

Date: 30.05.2008

Project No: Ce001063

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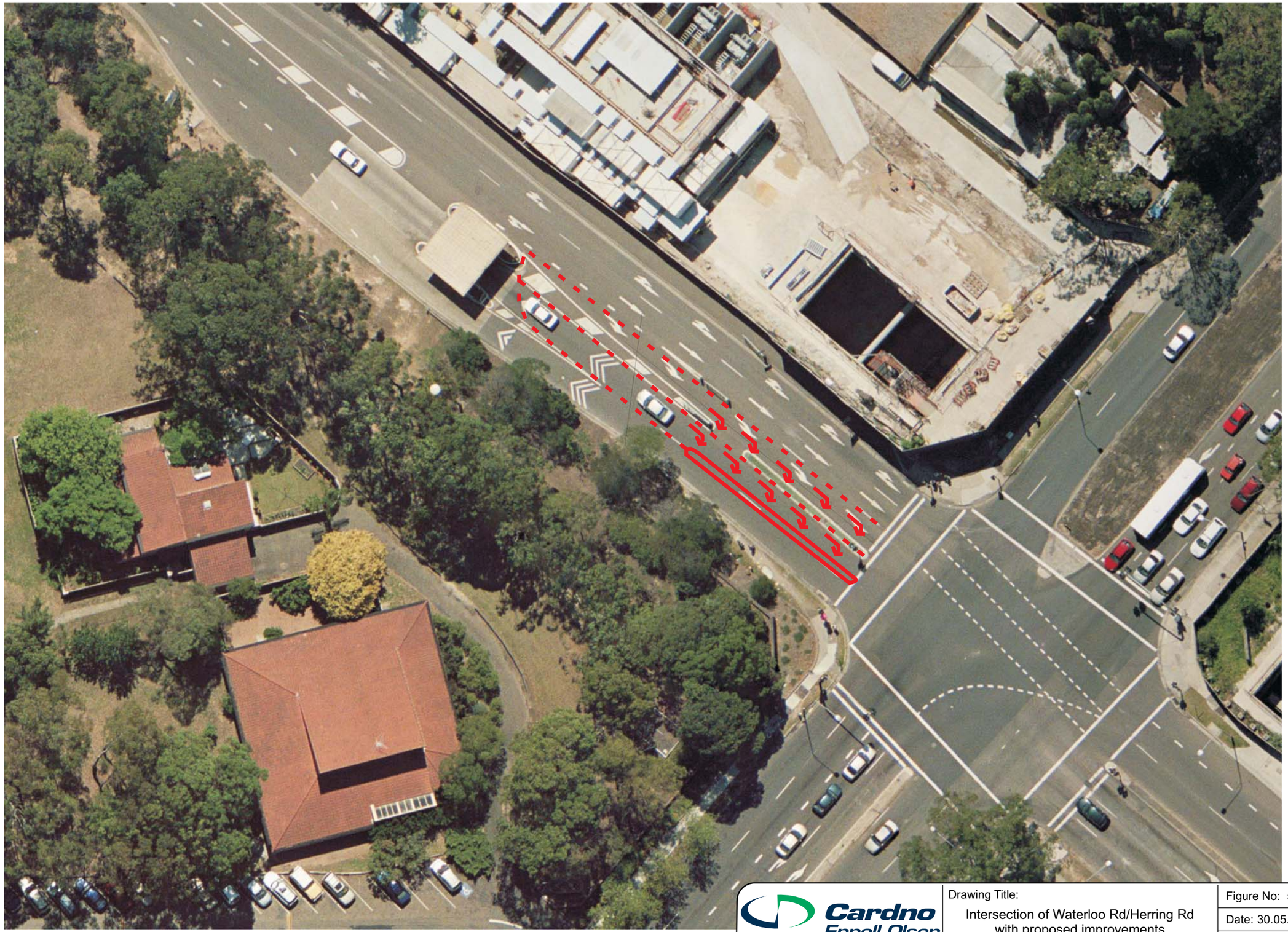

Cardno Eppell Olsen

Drawing Title:
Intersection of Waterloo Rd/Herring Rd with proposed improvements

Figure No: 5.2

Date: 30.05.2008

Project No: Ce001063

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Table 5.5 Intersection Analysis Results With Improvements – 2007 AM peak

Intersection/ Approach	Turn	Base				Base with Project				Base with Project & Improvements			
		Deg Sat'n	Delay (sec)	LoS	Queue	Deg Sat'n	Delay (sec)	LoS	Queue	Deg Sat'n	Delay (sec)	LoS	Queue
Epping Rd/ Balaclava Rd													
Epping Rd (E)	L	0.034	7.9	A	2	0.034	7.9	A	2	0.034	7.9	A	2
	T	0.338	34.8	C	101	0.342	35.5	C	102	0.342	35.5	C	102
	R	0.867	91.6	F	85	0.923	99.7	F	100	0.923	99.6	F	100
	All	**0.867**	**41.4**	**C**	**101**	**0.923**	**44.5**	**D**	**102**	**0.923**	**44.5**	**D**	**102**
Balaclava Rd (N)	L	0.074	53.2	D	20	0.098	57.5	E	23	0.07	57.8	E	16
	T	0.074	45.3	D	20	0.098	49.6	D	23	0.07	49.9	D	16
	R	0.074	61.1	E	20	0.098	64.2	E	23	0.07	66	E	16
	All	**0.074**	**58.3**	**E**	**20**	**0.098**	**60.7**	**E**	**23**	**0.07**	**62.1**	**E**	**16**
Epping Rd (W)	L	0.175	8	A	10	0.209	8.1	A	12	0.209	8.1	A	12
	T	0.898	57.9	E	351	0.915	63.4	E	369	0.915	63.4	E	369
	R	0.111	77.5	F	12	0.053	75.6	F	6	0.053	75.6	F	6
	All	**0.898**	**52.4**	**D**	**351**	**0.915**	**56.1**	**D**	**369**	**0.915**	**56.1**	**D**	**369**
Balaclava Rd (S)	L	0.097	29.8	C	5	0.096	29.3	C	5	0.096	29.3	C	5
	T	0.897	74.3	F	215	0.9	75.2	F	217	0.9	75.2	F	217
	R	0.897	82.4	F	215	0.901	83.3	F	217	0.901	83.3	F	217
	All	**0.897**	**80.8**	**F**	**215**	**0.901**	**81.6**	**F**	**217**	**0.901**	**81.6**	**F**	**217**
Average	**All**	**0.898**	**57.6**	**E**	**351**	**0.923**	**60.4**	**E**	**369**	**0.923**	**60.4**	**E**	**369**
Waterloo Rd/ Herring Rd													
Waterloo Rd (E)	L	0.016	20.4	B	4	0.017	21.7	B	4	0.034	21.7	B	4
	T	0.63	54.9	D	105	0.63	54.9	D	105	0.63	54.9	D	105
	R	0.634	78.7	F	52	0.626	78.6	F	51	0.626	78.6	F	51
	All	**0.634**	**58.9**	**E**	**105**	**0.63**	**58.9**	**E**	**105**	**0.63**	**58.9**	**E**	**105**
Herring Rd (N)	L	0.589	49.6	D	134	0.548	46.6	D	129	0.548	46.6	D	129
	T	0.589	42.3	C	144	0.548	39.4	C	140	0.548	39.4	C	140
	R	0.588	74.8	F	54	0.588	74.8	F	54	0.588	74.6	F	54
	All	**0.589**	**48.1**	**D**	**144**	**0.588**	**45.5**	**D**	**140**	**0.588**	**45.5**	**D**	**140**
Waterloo Rd (W)	L	0.199	33.4	C	33	0.199	32.8	C	32	0.199	32.8	C	32
	T	0.199	48.5	D	37	0.199	48.5	D	37	0.199	48.5	D	37
	R	0.247	75.5	F	21	0.367	76.4	F	31	0.184	75.1	F	16
	All	**0.247**	**46.7**	**D**	**37**	**0.367**	**48.7**	**D**	**37**	**0.199**	**48.4**	**D**	**37**
Herring Rd (S)	L	0.56	24.9	B	121	0.632	24.6	B	135	0.632	24.6	B	135
	T	0.559	17	B	123	0.631	17.4	B	140	0.631	17.4	B	140
	R	0.64	53.6	D	138	0.618	55.4	D	126	0.618	55.4	D	126
	All	**0.64**	**32.5**	**C**	**138**	**0.631**	**31.8**	**C**	**140**	**0.631**	**31.8**	**C**	**140**
Average	**All**	**0.64**	**40.1**	**C**	**144**	**0.632**	**39**	**C**	**140**	**0.632**	**39**	**C**	**140**

Table 5.6 Intersection Analysis Results With Improvements – PM peak

Intersection/ Approach	Turn	Base				Base with Project				Base with Project & Improvements			
		Deg Sat'n	Delay (sec)	LoS	Queue	Deg Sat'n	Delay (sec)	LoS	Queue	Deg Sat'n	Delay (sec)	LoS	Queue
Epping Rd/ Balaclava Rd													
Epping Rd (E)	L	0.521	8.1	A	38	0.521	8.1	A	38	0.034	8.1	LOS A	38
	T	0.958	94	F	304	0.963	96.4	F	319	0.938	82.7	LOS F	295
	R	0.211	62.5	E	37	0.219	63.6	E	38	0.225	67.5	LOS E	40
	All	**0.958**	**63.2**	**E**	**304**	**0.963**	**65.4**	**E**	**319**	**0.938**	**56.9**	**LOS E**	**295**
Balaclava Rd (N)	L	0.554	25	B	64	0.692	58.6	E	117	0.285	45.2	LOS D	71
	T	0.56	17.2	B	64	0.674	50.8	D	117	0.284	37.4	LOS C	71
	R	0.56	46.6	D	89	0.674	66	E	117	0.284	52	LOS D	71
	All	**0.56**	**45.7**	**D**	**89**	**0.674**	**64.3**	**E**	**117**	**0.284**	**50.4**	**LOS D**	**71**
Epping Rd (W)	L	0.075	8.5	A	4	0.078	8.5	A	4	0.078	8.5	LOS A	4
	T	0.626	53	D	142	0.61	52	D	141	0.595	51.1	LOS D	140
	R	0.617	65.4	E	82	0.626	66.5	E	83	0.647	71	LOS F	86
	All	**0.626**	**51**	**D**	**142**	**0.626**	**50.3**	**D**	**141**	**0.647**	**50.1**	**LOS D**	**140**
Balaclava Rd (S)	L	1.001#	26.9	B	44	0.999#	27	B	44	1.001#	33.9	LOS C	44
	T	0.348	42.9	D	79	0.355	40.9	C	81	0.561	48.1	LOS D	90
	R	0.348	57.7	E	79	0.354	57.8	E	81	0.561	71.2	LOS F	90
	All	**1**	**47.8**	**D**	**79**	**1**	**47.8**	**D**	**81**	**1**	**58.9**	**LOS E**	**90**
Average	**All**	**1.001**	**56.3**	**D**	**304**	**0.999**	**58.9**	**E**	**319**	**1.001**	**54.8**	**LOS D**	**295**
Waterloo Rd/ Herring Rd													
Waterloo Rd (E)	L	0.912	69.7	E	220	0.98	106	F	307	0.034	67.4	LOS E	217
	T	0.912	74.8	F	216	0.98	110.1	F	274	0.904	72.5	LOS F	216
	R	0.939	104.6	F	199	0.724	70.3	E	156	0.975	125.1	LOS F	220
	All	**0.939**	**78.2**	**F**	**220**	**0.98**	**98.2**	**F**	**307**	**0.975**	**81**	**LOS F**	**220**
Herring Rd (N)	L	0.519	51.1	D	150	0.643	57.5	E	181	0.583	53.1	LOS D	172
	T	0.519	43	D	155	0.643	49.1	D	185	0.583	44.5	LOS D	176
	R	1.000#	72.1	F	88	1.001#	74.6	F	88	1.001#	73.4	LOS F	88
	All	**1**	**48.7**	**D**	**155**	**1**	**53.6**	**D**	**185**	**1**	**49.6**	**LOS D**	**176**
Waterloo Rd (W)	L	0.014	37.4	C	3	0.136	62.7	E	30	0.062	43	LOS D	12
	T	0.014	48.9	D	4	0.199	56.2	D	42	0.062	44.8	LOS D	16
	R	0.711	73.1	F	59	0.999#	69.5	E	77	0.651	72.3	LOS F	64
	All	**0.711**	**70**	**E**	**59**	**1**	**63.6**	**E**	**77**	**0.652**	**67.1**	**LOS E**	**64**
Herring Rd (S)	L	0.855	75.2	F	110	0.877	76.6	F	115	0.782	67.5	LOS E	107
	T	0.855	50.5	D	151	0.878	56.2	D	163	0.781	41	LOS C	140
	R	0.907	97.8	F	137	0.966	119.9	F	155	0.918	100.3	LOS F	140
	All	**0.907**	**72.4**	**F**	**151**	**0.966**	**84.5**	**F**	**163**	**0.918**	**68.1**	**LOS E**	**140**
Average	**All**	**1**	**68.7**	**E**	**220**	**1.001**	**80.1**	**F**	**307**	**1.001**	**68**	**LOS E**	**220**

Intersection of Epping Road/Balaclava Road

As a result of the increased traffic from the proposed project the average delays and queue lengths at the Balaclava Road (north) approach to the intersection during the PM peak were noted to significantly increase:

- average delays increased from 46 to 64 seconds; and
- queue lengths increased from 89m to 117m.

As a result of the introduction of the additional short right tune lane on Balaclava Road (north), resulting in a reduction of the departure lanes to one lane, these impacts are mitigated:

- average delays are reduced to 50 seconds; and
- queue lengths are reduced to 71 metres (improvement on existing situation).

Intersection of Waterloo Road/Herring Road

As a result of the increased traffic from the proposed project the average delays and queue lengths during the PM peak were noted to increase at the following approaches to the intersection

- Herring Road (north):
  - average delays increased from 49 to 54 seconds; and
  - queue lengths increased from 155m to 185m.
- Waterloo Road (west):
  - queue lengths increased from 59m to 77m.

As a result of the introduction of the additional short right tune lane on Waterloo Road (west) these impacts are somewhat mitigated:

- Herring Road (north):
  - average delays are reduced to 50 seconds; and
  - queue lengths are reduced to 176 metres.
- Waterloo Road (west):
  - queue lengths are reduced to 64 metres.

The above improvements are considered reasonable to mitigate the impact of the proposed project traffic at these intersections.

5.6 TRAVEL DEMAND MANAGEMENT

Cochlear will review and consider best practises adopted by other organisations that promote non-single occupant private motor vehicle use, such as:

- Running initial phase promotions of to increase awareness of public and active transport modes such as competitions to win public transport passes and bikes for those who did not drive to work;
- Car Sharing – facilitating a car share culture with an online car sharing database and promotional activities such as:
  - Car-mates Bingo competition - car sharers who display a valid sticker can be entered into a regular competition to win fuel vouchers;
- Company executives leading by example; and
- Promotional activities like 'No-parking days'.

Cochlear is committed to developing the most appropriate travel demand management strategies for the current and future workforce.

6 RECOMMENDATIONS & CONCLUSIONS

6.1 SUMMARY OF PROPOSAL

The proposed project, comprising 24,343m^2 GFA of floor space, a combination of office, manufacturing/research and warehouse facility, is located on the 'Station South Precinct' of Macquarie University as stated in the Macquarie University Concept Plan. The FSR for this project is approximately 1.9.

6.2 OVERVIEW OF PARKING ISSUES

Total parking provided for this project is 544 spaces. There will be 146 at grade car parking spaces and 398 basement car parking spaces. This amount of parking is considered reasonable for the project and its location and consistent with the relevant planning controls.

The parking bay lengths and widths and, parking aisle widths meet the criteria set out in the Australian Standard AS2890.2-1989. The car park layout provides two-way circulation aisles with a minimum width of 6-6.2m for circulation and access to all parking spaces.

2% of total parking spaces are provided for disabled parking with appropriate bay dimensions in relation to Australian Standards. Ryde DCP 2006 requires 3% of parking spaces be provided for disabled parking.

The project caters for bicycle parking in the form of 31 bike racks at the entrances to the project and bike storage for 152 staff bicycle spaces with end of trip facilities within the building. A further 42 motorcycle parking spaces are proposed in the basement car parks.

The project proposes two access driveways. The proposed accesses to the project will operate well and all have satisfactory sight distance in both directions.

Adequate space for trucks to circulate and manoeuvre within the site has been provided. The Swept Path Analysis of the access driveway and the movements in and out of the loading docks indicated that delivery vehicle access is satisfactory. This analysis indicated that articulated vehicles are able to enter the site satisfactorily. Access to and from each of the loading docks has been assessed and it was found that vehicles can enter and exit satisfactorily.

Overall the design provides for good access and internal circulation with adequate provisions for car parking and loading facilities.

Consideration should be given to re-locating the existing pedestrian crossing on University Avenue (west of proposed western car park entrance) to a more appropriate location.

6.3 OVERVIEW OF ACTIVE AND PUBLIC TRANSPORT ISSUES

Bus services for this site are currently operated by State Transit Authority, Shorelink and Hillsbus with more than 890 bus services operating on weekdays across 25 bus routes in the Macquarie Park Corridor. The site is well served by bus services.

At present, the closest railway stations are located at Epping (Northern Line), Eastwood (Northern Line) and Chatswood (North Shore Line). Bus services link Macquarie University with these railway stations. The Epping-Chatswood Railway line is currently under construction and is scheduled for completion in mid 2008. With the opening of the station, and combined with the current bus services, this will provide a good level of pubic transport accessibility for the site.

The site is well connected to the existing and proposed pedestrian and cycle networks both within the University and on the surrounding external network.

6.4 OVERVIEW OF TRAFFIC IMPACTS

The proposed project is expected to generate approximately 2,051 vehicle trips per day, with 404 vehicle trips during the peak periods on a typical weekday. These estimates were considered to be conservative (worst case) for the following reasons;

- 28% of staff would be working shifts that would generate traffic outside of traditional peak periods; and
- Cochlear are minimising car parking and looking at ways to provide incentives for staff to travel to work in non-single occupant private vehicles.

An analysis of 16 critical intersections was undertaken using the SIDRA software to determine operating performance for the intersections. The analysis and review of the existing and base case background traffic volumes showed that even without the subject project problems do exist at the following intersections:

- The signalised intersection of Epping Road and Herring Road operates with high degree of saturation and delays with level of service F during both peak periods;
- Intersection of Epping Road and Balaclava Road is operating at or near capacity during both peak periods; and
- The signalised intersection of Waterloo Road and Herring Road is operating with high delays during the PM peak period only.

All other intersections are shown to operate well.

When the intersections were analysed with additional traffic from the proposed project, increases in delay or other operating performance characteristics were noted at the following intersections:

- Intersection of Waterloo Road/Herring Road; and
- Intersection of Epping Road/Balaclava Road.

It is considered that based on our assessment, the majority of the other surrounding intersections will perform at satisfactory levels with the subject project, including the proposed access to the main car park at the site. The exception to this are the intersections of Epping Road/Herring Road, Epping Road/Balaclava Road and Waterloo Road/Herring Road which are already performing poorly under existing conditions.

6.5 RECOMMENDATIONS

Until the Macquarie Park Traffic Study is finalised and a list of recommended road network improvements are agreed a definitive contributions plan or VPA cannot be developed. In the absence of these final recommendations and funding arrangements with regards to recommended upgrades to the road network in the Macquarie Park Corridor it is recommended that remedial measure be undertaken to generally maintain the current operating characteristics of the following impacted intersections as a result of the proposed project:

- Intersection of Waterloo Road/Herring Road; and
- Intersection of Epping Road/Balaclava Road.

The recommended works are detailed in Section 5.5.2 but generally consist of providing additional right turning lane capacity at the University approaches to the above intersections.

Cochlear as a major employer in the MPC should consider implementing travel demand management initiatives to reduce demand for car parking and reduce car traffic generation.

TERMS

Australian Bureau of Statistics (ABS)
Campus Development Plan (CDP)
City of Ryde (CoR)
Contributions Plans (CP)
Development Application (DA)
Department of Planning (DoP)
Director General's Requirement (DGR)
Gross Floor Area (GFA)
Journey to Work (JTW)
Local Environmental Plan (LEP)
Macquarie Park (MP)
Macquarie Park Corridor (MPC)
Macquarie Park Corridor Master Plan (MPCMP)
Macquarie University (MU)
Macquarie University Concept Plan (MUCP)
Macquarie University Simulation Transport Model (MUSTM)
Roads and Traffic Authority's (RTA)
Ryde City Council (RCC)
State Environmental Planning Policy (SEPP)
State Significant Site (SSS)
Sydney Strategic Transport Model (SSTM)
Traffic Impact Assessment (TIA)
Transport Data Centre (TDC)
Transport Management & Accessibility Plan (TMAP)
Voluntary Planning Agreements (VPA)