Zoological Parks Board of New South Wales

Taronga Zoo Master Plan Implementation

Traffic, Transport and Parking Strategy

Final Report

April 2003

Zoological Parks Board of NSW

PARSONS BRINCKERHOFF

Parsons Brinckerhoff Australia Pty Limited ACN 078 004 798 and
Parsons Brinckerhoff International (Australia) Pty Limited ACN 006 475 056
trading as Parsons Brinckerhoff ABN 84 797 323 433

PPK House
9 Blaxland Road
Rhodes NSW 2138
Locked Bag 248
Rhodes NSW 2138
Australia
Telephone +61 2 9743 0333
Facsimile +61 2 9736 1568
Email sydney@pb.com.au

ABN 84 797 323 433
NCSI Certified Quality System ISO 9001

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Author: **Matthew Stephens** MTM, CertEng(Civil), MAITPM .....

Reviewer: **Gillian Akers** BSc, BE, AmusA, MIEAust, CPEng .....

Approved by: **Matthew Stephens** .....

Signed: .....

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Introduction

The Taronga Zoo Master Plan (TZMP) provides the framework for a significant and progressive upgrading of Taronga Zoo (TZ) over the next 12 years. Over a series of discrete stages, entire precincts will be closed, developed and re-opened, providing a continuous stream of new attractions.

Parson Brinckerhoff (PB), formerly PPK Environment & Infrastructure, was engaged in June 2002 to ensure that the Taronga Zoo Master Plan encompasses all the transport, traffic and parking needs both during construction and in the long term.

In order to maintain a visitor focus to the traffic and transport strategies developed for the Taronga Zoo Master Plan, this report has been structured in terms of the following current visitor experiences:

- *The decision to visit Taronga Zoo (past admission patterns);*
- *The arrival and departure experiences (travel options and choices, wayfinding, parking);*
- *The entry and exit experiences (pedestrians access, entry requirements);*
- *The internal circulation experiences.*

Within the context of each visitor experience, the report will then discuss:

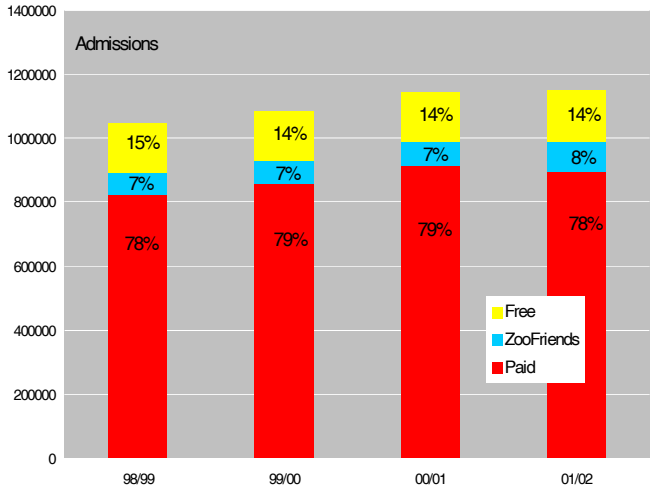
- *The potential impacts of Master Plan Implementation (MPI) on these experiences;*
- *The strategic context for a set of Traffic, Transport and Parking strategies and guidelines to assist Master Plan Implementation;*
- *A set of Traffic, Transport and Parking strategies and guidelines to assist Master Plan Implementation.*

Decision to Visit

Taronga Zoo is a major education and learning centre, helping to link people with nature, developing understanding and positive attitudes towards animals and their environments.

During the 2001/2002 financial year Taronga Zoo recorded 1,151,500 admissions.

A review of admissions for the last 2 years revealed that the highest recorded daily admissions level is nearly three times the daily average. Designing for the daily average number of admissions would not be appropriate as this capacity would be



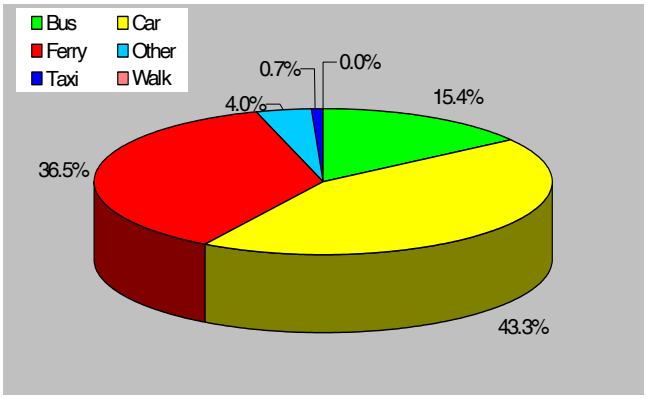
exceeded more than 60 to 70 percent of the year. Conversely, designing for the peak day is not cost effective as the level of infrastructure required to accommodate this demand would rarely be used. Accordingly, for the purposes of the Taronga Zoo Master Plan strategy, it is recommended that the 20th highest admission day peak (7,249 admissions), based on the last two years, be adopted as the current Design Day.

The Departure and Arrival Experience

As part of the study, PB undertook interview surveys of Taronga Zoo visitors in order to determine their current mode choice patterns. The surveys were undertaken over two five-day periods. The first survey was held between 17 July 2002 and 21 July 2002 to capture school holiday patterns. The second survey was held between 31 July 2002 and 4 August 2002 to capture a typical weekly pattern.

The results of the mode share analysis indicate that:

- *more than 56 percent of all trips to Taronga Zoo are by non-car modes. This strong support for public transport should be maintained and further encouraged where possible;*
- *ferries are the most popular non-car transport mode (36.5 percent) followed by buses (15.4 percent).*



Taronga Zoo Ferry Wharf is the second busiest wharf on the Harbour. Taronga Zoo is approximately 12 minutes travel time from Circular Quay by ferry. Services to Taronga Zoo depart Circular Quay from Wharf 2. Sydney Ferries generally provides two services an hour to/from Taronga Zoo for most of the week. However, during Sunday peak periods the regular Taronga Zoo service is supplemented by a Mosman ferry service each hour that diverts from its regular run to include an extra stop at Taronga Zoo.

Sydney Buses' Routes 238 (Taronga Zoo to Balmoral) and 247 (Taronga Zoo to CBD) provide bus services to Taronga Zoo. In addition to its local service role, the 238 acts as a connecting shuttle bus service between the lower (wharf) and upper Taronga Zoo entries. This service is vital when Sky Safari (SkS) is closed (e.g. due to high winds) and will become even more important during the Master Plan Implementation as work on some precincts will require Sky Safari closures to facilitate construction. Bus stop facilities are provided at Taronga Zoo Wharf and adjacent to Taronga Zoo's top entry (ToE). The top entrance to Taronga Zoo stop, is used as a terminus for Routes 247, 227 and 250. The wharf stop is used as a terminus for Route 238. The current bus arrangements are expected to change as a result of the Better Buses North program.

On-site visitor parking is located at the northern end of the site close to the top entrance to Taronga Zoo. The estimated capacity of the car park is approximately 540 spaces (250 formal spaces + 290 informal spaces). However, the capacity of the visitor car park largely depends on the number of coaches visiting during a given day and the efficiency of parking in informal parking areas. During recent surveys, in excess of 600 vehicles have been observed parked in the facility. The capacity of the car park is a constraint to the future expansion/viability of Taronga Zoo. Visitors are charged an $8 parking fee on exit from the car park. There are also some 278 formal and informal on-street

parking spaces within a 400m walk of the Taronga Zoo entrances. The staff car park is located adjacent to the visitor car park. Access is restricted to service and delivery vehicles and it has a capacity of 110 spaces.

Table 1: Estimate of Existing Peak Parking Demands for the Major Taronga Zoo Parking Scenarios

	Average Admissions (Last 2-years)	Estimated Visitor Parking Demand (1)	No. Taronga Zoo Staff	Estimated Staff Parking Demand (2)	Estimated No Coaches	Estimated Coach Parking Demand (3)	Estimated Total Taronga Zoo Parking Demand
Regular Weekday	2,102	223	350	169	15	45	437
School Holiday Weekday	4,728	425	360	173	5	15	613
Public Holiday	5,931	517	220	106	5	15	638
Weekend	4,185	383	220	106	5	15	504
Design Day Weekend	7,249	618	220	106	5	15	739

1) Demand based on the formula "Visitor Parking Demand = (0.0768 * Admissions) + 61.596"

2) Based on Journey To Work data from the 1996 Census.

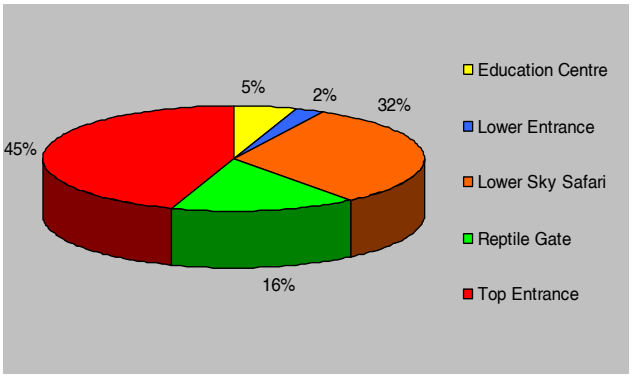
3) Estimated car space equivalent based on 1 coach space being equal to 2.5 car spaces.

An audit was undertaken of Taronga Zoo wayfinding tools. Potential Taronga Zoo visitors use tools such as road signs, marketing materials and the Taronga Zoo web site to navigate their way to Taronga Zoo. The audit revealed the following deficiencies:

- *road signage is inconsistent, inconspicuous, infrequent and fails to reflect the Taronga Zoo branding strategy;*
- *marketing materials and the web site fail to include vital public transport information such as bus route numbers, railway connections, and wharf numbers, whilst road maps fail to include route markers.*

Entry & Exit Experience

Analysis of Taronga Zoo entry transactions for the months of September 2001, January 2002 and April 2002 reveals that most entries to Taronga Zoo are via the top entrance and Reptile Gate (61%), lower Sky Safari (32%) and Education Centre (5%).



The Sky Safari is a distinctive feature of Taronga Zoo that not only improves visitor access between Taronga Zoo wharf and the top entrance to Taronga Zoo but also contributes to the overall Taronga Zoo experience. The Sky Safari has a capacity to cater for up to

700 passengers per hour. Windy conditions can sometimes interrupt Sky Safari operations. The closure of the facility can cause considerable inconvenience for visitors (particularly children and the less mobile) that wish to access the top entrance to Taronga Zoo and main car park. The only alternatives are to catch a bus from the ferry terminal or walk up through the Lower Entrance (LoE). The future role/relationship of the Sky Safari will change in the proposed Taronga Zoo Master Plan. In future both end stations will be excluded from the future paid-areas of Taronga Zoo and the Sky Safari will take on a role as a free connection between the Ferry Wharf and the top entrance to Taronga Zoo.

The only integrated ticketing arrangement currently offered to Taronga Zoo patrons is the Zoopass. The Zoopass *ticket was developed in partnership with Sydney Ferries and Sydney Buses. The Zoopass ticket includes return ferry travel, Sky Safari or shuttle bus travel and Taronga Zoo admission. However Taronga Zoo does not offer visitors a family or concession Zoopass ticket. This restricts take-up of the integrated ticket. Interview surveys completed in July and August of 2002 revealed that up to 44 percent of interviewees arriving by ferry also used the rail system earlier in their journey. In light of these numbers, consideration should be given to reintroducing a combined rail, ferry and Taronga Zoo entry pass.*

Internal Circulation

The major service vehicle access requirements within Taronga Zoo are pest control, day-to-day operations and animal transactions. There are in excess of 50 vehicles used in day-to-day operations on-site. Whilst these vehicles are relatively small in size and will not impact on internal path design requirements, consideration has been given to out-of-service parking requirements and construction traffic conflicts in back-of-house areas. A 12-month survey of animal transactions revealed that there were nearly 6 animal transactions per month between the Veterinary & Quarantine Centre and the animal exhibits. The average size of animal involved was 40kg. This survey did not include the delivery of animals to Taronga Zoo. The master plan arrangements will be designed to provide good access for large vehicles in the vicinity of the big animal enclosures.

The NSW Fire Brigade have three major appliances likely to access the site in an emergency. They are the 'Firepak' and 'Varley' trucks and the larger 'Bronto Skylift'. Bronto access will need to be accommodated should Taronga Zoo decide to maintain NSW Fire Brigade participation in Taronga Zoo's Sky Safari evacuation procedures. This will be a decision of Taronga Zoo's Occupational Health & Safety committee. If the NSW Fire Brigade remains part of evacuation procedures, the sections of path immediately under the Sky Safari should be widened to at least 5.8 metres so that the Bronto can deploy its outriggers.

The above internal circulation issues have been addressed in Section 3.1 of the Public Domain Strategy prepared by DPWS.

Master Plan Impacts

Taronga Zoo Master Plan forecasts a growth in annual admissions of 22 percent over the next 10-years (Taronga Zoo, 2002).

Taronga Zoo is currently constructing the new Backyard to Bush (B2B) exhibit. Construction is due for completion in April 2003. Parking surveys undertaken along Bradleys Head Road in July and August would suggest that by 9:00 am, Taronga Zoo operations and construction activities are generating between 20 and 30 parked vehicles along Bradleys Head Road in the vicinity of the site entry. School students arriving by coach are expected to be the major target audience for Backyard

to Bush Precinct. Discussions with Taronga Zoo suggest that it may be operated as a stand-alone educational visit for students. However, the current precinct plans do not address the issue of how the students will be delivered to the precinct. A review of access options indicates that the most practical arrangement is to process students through the Education Centre (EdC) and walk them through Taronga Zoo to the Backyard to Bush Precinct. Accordingly, the pedestrian linkages through Taronga Zoo have been considered in the Public Domain Strategy prepared by DPWS.

The Education Centre is currently undergoing improvements works. These will be completed shortly. Completion of the Education Centre works will free up the Contractors compound located in the staff car park. This compound will be utilised continuously during the Master Plan Implementation program.

Construction of the Food and Beverage (F&B) precinct is scheduled to commence in February 2003 and be completed by November 2003. The work includes the excavation of some 4,350 cubic metres of soil and rock, most of which will be transported off-site. The proposed traffic movements represent less than 3.4 percent of daily traffic flows. Later in the project, the construction of the Food and Beverage precinct will require delivery of up to 350 cubic metres of concrete. The single largest concrete pour is expected to be a slab on ground requiring some 200 cubic metres of concrete. The proposed traffic movements represent less than 1.9 percent of daily traffic flows along Bradleys Head Road. The Food and Beverage precinct construction access will be via the staff car park, back-of-house areas and Taronga Boulevard. Taronga Boulevard will remain an active visitor access road to key Taronga Zoo exhibits such as the Bird Show during this same period. This construction access arrangement raises a number of internal circulation issues, including:

- *Management of construction traffic through back-of-house areas;*
- *Management of construction traffic and pedestrian conflict points;*
- *Management of construction traffic speeds along pedestrian routes;*
- *Curfews for construction traffic access along Taronga Boulevard during the Bird Show events (daily at 12.30pm and 3pm).*

The Food and Beverage precinct and Asian Elephant Precinct work sites are located underneath the alignment of the Sky Safari. Closures of Sky Safari will be required at certain times to facilitate construction. During Sky Safari closures, bus services between the Wharf and the top entrance to Taronga Zoo will need to be increased and use of the lower entrance encouraged.

The Asian Elephant precinct is scheduled to commence in February 2003 and be completed by February 2005. Work on the precinct is expected to involve excavation of some 6,000 cubic metres of soil and rock, the majority of which will be transported off-site. The proposed truck movements represent less than 2.3 percent of daily traffic flows on Bradleys Head Road. Later in the project, the construction of the Asian Elephant precinct and Hillside Link will require delivery of up 2,250 and 750 cubic metres of concrete, respectively. The single largest concrete pour is expected to be the Elephant Moat slab that requires some 230 cubic metres of concrete. The proposed truck movements represent less than 2.2 percent of daily traffic flows along Bradleys Head Road.

Table 2: Workforce Estimates for Major Master Plan Implementation Precincts

Year	B2B	F&B	AEP	ACP	HoZ	Workforce Totals
2002	70	-	-	-	-	70
2003	-	65	30	-	-	95
2004	-	-	90	60	-	150
2005	-	-	-	100	30	130
2006	-	-	-	100	50	150
2007	-	-	-	-	40	40
2008	-	-	-	-	10	10

Although a major redevelopment of the Taronga Zoo car park was not included in the original Master Plan, it became clear during the integrated Master Plan Implementation planning process that a major upgrade was essential. Whilst redevelopment proposals for the car park will be subject to a feasibility study and detailed design, it is most likely that construction would have to be undertaken in 3 stages (CP1 to CP3) as part of the new Taronga Zoo entry experience. CP1 will have the lowest potential impact on parking supplies. It is therefore essential, that the parking yields from this first stage be maximised to assist in offsetting temporary parking losses to be incurred during the construction of later stages. The impact of the car park redevelopment stage on parking at Taronga Zoo, parking supplies is summarised below in Table 3.

Table 3: Estimated Car Parking Supplies During Car Park Construction

Phase	Existing Visitors	Existing Staff	Existing Coaches (1)	New Spaces (2)	Totals
Existing	510	110	30	-	650
2004 (CP1 construction)	510	50	-	-	560
2004 (At completion)	510	80	-	240	830
2005 (CP2 construction)	490	-	-	240	730
2005 (At completion)	510	-	-	400	910
2007 (CP3 construction)	200	-	-	400	600
2007 (At completion)	-	-	-	975	975

1) *All figures are expressed in terms of car space equivalents. One coach space is assumed to be equivalent to 2.5 car spaces.*
2) *Parking space yields from each stage are based on concept footprints and an assumed yield of 1 space per 30 square metres of new car park development.*

The lower entrance to Taronga Zoo currently plays a minor role as an entry experience for Taronga Zoo visitors. This is a result of the popularity of the Sky Safari ride and Taronga Zoo's policy to encourage visitors to use the Sky Safari or bus service to access the top entrance. As a result, less

than two percent of visitors enter via the lower entry. However, due to construction associated with the car park and entry redevelopment works between 2004 and 2008, there will be significant impacts on the quality of the top entrance to Taronga Zoo visitor's experience. Conversely, by 2007, much of the Master Plan Implementation exhibit related works in the southern part of Taronga Zoo would have been completed. Accordingly, the integrated Master Plan Implementation strategies increased emphasis on the role of the lower entrance during the later stages of the Master Plan Implementation, particularly as an exit point.

Work on the Australian Coastline Precinct will involve excavation of some 4,900 cubic metres of soil and rock, over a 6-month period, most of which will be transported off-site. The proposed traffic movements represent less than 1.9 percent of daily traffic flows. This extraction work may coincide, for a short period, with concrete deliveries for the Asian Elephant precinct and Hillside Link. Later in the project, the construction of the Australian Coastline precinct will involve concrete deliveries. The single largest pour on-site is estimated to be 93 cubic metres (a 100mm slab for the substructure of the seal performance theatre).

The Heart of the Zoo precinct works are scheduled to commence in March 2005 and be completed by March 2008. The Heart of the Zoo precinct will be redeveloped in four stages. The work will not involve any significant excavation or concrete pours. Up to 2007, construction access to the site will be from Bradleys Head Road via the Backyard to Bush precinct entry and Taronga Boulevard. After 2007, construction work moves to the north of the precinct and the construction access arrangements change. Whilst the Jungle Cat enclosure remains in use as a staging area, construction access will shift north along Bradleys Head Road to a new entry adjacent to the Taronga Centre.

The impacts of the Master Plan Implementation construction works on parking conditions in and around Taronga Zoo is summarised below in Table 4.

Table 4: Estimated Utilisation of Available Taronga Zoo Parking Supplies During MPI

Year	Regular Weekday	School Holiday Weekday	Public Holiday	Weekend	Design Day Weekend (7,249)
2002	75%	**102%**	98%	85%	**122%**
2003	78%	**105%**	98%	88%	**125%**
2004	98%	**130%**	**114%**	**110%**	**152%**
2005	73%	97%	87%	82%	**115%**
2006	60%	80%	70%	68%	94%
2007	78%	**107%**	**106%**	89%	**128%**
2008	46%	64%	65%	52%	77%
Days Per Annum	200	54	7	104	

The Master Plan Implementation Parking and Transport Strategy

Within the strategic context set by the Zoological Parks Board (ZPB) and the Zoo 2000 Master Plan, the recommended transport vision for the Master Plan Implementation should be:

- *'To develop a gracious, accommodating, reliable, safe and sustainable transport experience for visitors to the Zoo over the next 10 years and beyond'.*

Tables ES1 to ES3 provide a summary of the issues identified above and a list of strategies that could be employed in the Master Plan Implementation to address them. Each strategy has also been provided with the following:

- *The suggested timing of implementation;*
- *A suggested priority (based on the likely visitation and revenue implications);*
- *An indication of the resourcing implications of the strategy. They are described as Low (<$30K), Medium ($30K to $150), High (>$150K);*
- *References in the document to assist in the implementation of the strategies.*

Table ES1: Arrival & Departure Strategies

Ref	Issues	Strategies	Suggested Timing	Suggested Priority	Resourcing Implications	Guidelines
C1.1	▪ What level of current demand should Taronga Zoo design for?	▪ That Taronga Zoo adopt the 20th highest admission day peak (over a 2yr period) as its current 'Design Day' for all future transport design work. ▪ That Taronga Zoo adopt a "Future Design Day" of 8,844 admissions for all long-term traffic, transport and parking design.	2002	High	Low	Section 8.1
C1.2	▪ The arrival experiences for the large proportion of visitors travelling to Taronga Zoo by public transport need to be improved and facilitated.	▪ Zoo brochures and web pages should provide more public transport related travel instructions.	2002	High	Low	Section 3.13
		▪ The ferry terminal and bus stop as well as their linkages to Taronga Zoo should be upgraded.	2004	Medium	High	Section 6.8 Section 8.6 Section 8.7
C1.3	▪ Taxis facilities are informal and impact on Sydney Buses' service operations.	▪ Include formal taxi facilities in the redevelopment proposals for the car park.	2007	High	Medium	Section 8.7
C1.4	▪ Road access to Taronga Zoo is constrained and will limit growth in arrivals by car and bus.	▪ Zoo brochures and web pages should provide more public transport related travel instructions.	2002	High	Low	Section 3.13
C1.5	▪ Most visitors travelling by car arrive before 1:00 pm and leave by 3:00 pm to avoid evening traffic peaks.	▪ Consider visitor demand spreading strategies such as extended Taronga Zoo hours.	2003	Low	Medium	Section 2.3
C1.6	▪ Parents with pre-school children prefer to travel to Taronga Zoo by car.	▪ Offer family concessions to *Zoopass* users to encourage parents with pre-school children to use public transport. ▪ Promote Taronga Zoo's public transport links to parents with pre-school children. ▪ Marketing should focus on ease-of-use, cost savings, safety and the special "Taronga Zoo" experience of a ferry ride and Sky Safari. ▪ Provide a *Zoopass* Family Concession fare that competes with Sydney Aquarium ($61.50). ▪ Investigate re-introduction of an integrated Rail/Ferry/Taronga Zoo Entry ticket.	2003	Medium	High	Section 3.1
C1.7	▪ The poor experience presented to visitors in Taronga Zoo car park. ▪ Parking capacity, layout and safety are inadequate. ▪ Visitor overflow parking demands displaced by Mosman Council proposals to introduce parking meters and eliminate informal parking areas along Bradleys Head Road. ▪ Low priority of car park redevelopment in the current Master plan implementation program. ▪ Inadequate funding of car park redevelopment.	▪ Taronga Zoo to prepare and cost a redevelopment proposal for the Taronga Zoo car park which seeks to: < Improve Taronga Zoo's entry image; < formalise coach, taxi and visitor parking; < reduce pedestrian and vehicle conflicts; < automate parking fee collection operations; < increase visitor parking capacity to meet the future needs of the Master Plan and accommodate current on-street parking demands; < increase staff parking capacity.	2003	High	Low-medium	Section 6.7 Section 8.7
		▪ Taronga Zoo to construct new car park.	2004 to 2008	High	High	Section 6.7 Section 8.7
C1.8	▪ Arrival experience will be poor during redevelopment of the car park and main entry from 2004 to 2005. ▪ Increased staff and construction traffic parking demands during	▪ Encourage a mode shift to public transport. ▪ Manage expectations through marketing.	2004 to 2008	High	Low	Section 6.5 Section 6.6
		▪ Provide up to 190 staff parking spaces on-site.	2004 - 2008	High	High	Section 3.6 Section 8.7

Ref	Issues	Strategies	Suggested Timing	Suggested Priority	Resourcing Implications	Guidelines
	Master Plan Implementation.	▪ Introduce a staff overflow parking arrangement in the main car park at off peak times. ▪ Investigate staff satellite parking opportunities in the vicinity of Taronga Zoo. ▪ Identify opportunities to provide staff parking in the vicinity of B2B and Taronga Centre. ▪ Restrict concentrated construction activities such as concrete pours to regular weekdays. ▪ Schedule worker rostered days off to coincide with peak Taronga Zoo admission days. ▪ Taronga Zoo to request Mosman Council to delay removal of the informal parking areas along Bradleys Head Road until completion of the Taronga Zoo car park redevelopment in 2008. ▪ Taronga Zoo to request Mosman Council to delay the introduction of paid parking and residential parking schemes on adjacent streets until completion of the Taronga Zoo car park redevelopment in 2008.	2004	High	Low	Section 3.6 Section 6.7 Section 8.7
C1.9	▪ Informal parking along Bradleys Head Road is causing erosion damage. ▪ Mosman Council proposals to introduce parking meters and eliminate informal parking areas along Bradleys Head Road may worsen the potential parking supply problems associated with Master Plan Implementation.	▪ Taronga Zoo to request Mosman Council to delay the introduction of any proposals for metered parking, elimination of informal parking areas or introduction of resident parking schemes, until such time as the new Taronga Zoo car parking facilities are completed in 2008.	2003	High	Low	Section 3.4
		▪ Mosman Council to introduce No Standing restrictions in the informal parking areas along Bradleys Head Road.	2008	High	Low	Section 3.4
C1.10	▪ Absence of footpath facilities on Bradleys Head Road. ▪ Student access arrangements to the Backyard to Bush precinct is unclear.	▪ future access to the Backyard to Bush precinct will have to be through the paid area of Taronga Zoo; or	2003	High	Low	Section 8.2
		▪ via a direct coach set-down and pick-up area at the immediate entrance to the precinct.	2003	Low	High	Section 8.2
C1.11	▪ Poor quality arrival experience for cyclists.	▪ Improve location, security and design of bicycle parking facilities to Austroads standards.	2005 to 2008	High	Low	Section 3.12 Section 8.7
C1.12	▪ A high percentage of ferry users travel to Circular Quay by Train. ▪ Arrival experience is degraded by multiple transactions that emphasise the cost of travel to Taronga Zoo.	▪ Investigate re-introduction of an integrated Rail/Ferry/Taronga Zoo Entry ticket.	2003	Low	High	Section 3
C1.13	▪ Current road signs at Belmont Road and Bradleys Head Road have poor conspicuity and legibility. ▪ The current car park entry signs have poor legibility, are too low to the ground and need to be rationalised;.	▪ Taronga Zoo to replace these external road signs with an improved sign standard that reflects the Taronga Zoo brand and is easier for visitors to use and follow.	2003	High	Medium	Section 8.6
C1.14	▪ Whilst Taronga Zoo signs have been provided at the eastern end of Belmont Road to capture visitors using this by-pass route of Spit Junction, no signage is provided at the western end to encourage visitors to use this route.	▪ The wayfinding Strategy should not encourage Taronga Zoo visitors to use Belmont Road to access Taronga Zoo. ▪ However, driver navigation should be assisted once the decision has been made.	2003	High	Medium	Section 3.13 Section 8.6
C1.15	▪ Wayfinding information in the current brochure is inadequate.	▪ Update wayfinding information in brochures (bus route numbers, ferry wharf number, railway stations). ▪ Maps to include Metroad Route numbers and key rail/ferry interchanges.	2003	High	Low	Section 3.13
C1.16	▪ Wayfinding information in the current Taronga Zoo's web page is inadequate.	▪ Update wayfinding information (bus route numbers, ferry wharf number, railway stations). ▪ Map to include Metroad route numbers and key rail/ferry interchanges. ▪ The wayfinding link on Taronga Zoo's web page (How to get to Taronga Zoo) should be made more specialised and prominent.	2003	High	Low	Section 3.13

Ref	Issues	Strategies	Suggested Timing	Suggested Priority	Resourcing Implications	Guidelines
C1.17	▪ Lost car parking revenue due to: < On-street parking; < Zoo Friends; < Manual collection operations.	▪ Introduce a temporary automatic fee collection system. ▪ Revue nature of Zoo Friend parking privileges giving consideration to: < Limited number of all-day parking vouchers for each Zoo Friend; < Free parking only at low demand times (e.g. Mon-Fri excluding school holidays and public holidays); < Free parking only after 2pm; < Reduced fees for Zoo Friends (e.g. $6).	2003-2008	High	Medium	Section 8.7
		▪ Install an automated parking fee collection system as an integral part of an redevelopment proposal for the car park.	2008	High	High	Section 8.7
C1.18	▪ Sydney Buses is proposing a number of changes to bus routes on the northern peninsular. These changes may simplify travel by bus to Taronga Zoo. However, the impacts on frequencies is unknown. ▪ The proposed changes may have some impacts on marketing messages and provide marketing opportunities.	▪ Taronga Zoo to request Sydney Buses to advise as to: < Impacts on frequencies of services between the top entrance to Taronga Zoo and Wharf; < Opportunities to introduce special loop services between the top entrance to Taronga Zoo and Wharf during peak periods; < Layover requirements for 247 services at the Wharf.	2002	High	Low	Section 3.10 Section 8.5
		▪ Taronga Zoo to advise its marketing department of any changes to bus routes servicing Taronga Zoo. ▪ Taronga Zoo to update all its brochures and web-page with any bus service changes that occur. ▪ Taronga Zoo to consider purchase of livery rights to all 247 service buses if they become the only route servicing the Zoo.	2002-2005	High	Low	Section 3.10 Section 8.5
C1.19	▪ Car parking will be critical at times on-site in 2004 and 2007 as a result of the workforce associated with Master Plan Implementation and reconstruction of the main car park.	▪ Taronga Zoo to request Mosman Council to delay the introduction of any proposals for metered parking, elimination of informal parking areas or introduction of resident parking schemes, until such time as the new Taronga Zoo car parking facilities are completed in 2008.	2003	High	Low	Section 3.4
		▪ Taronga Zoo to permit overflow of staff and Master Plan Implementation workforce parking into the visitor parking areas on a regular weekdays.	2004	High	Low	Section 6.12 Section 8.9
		▪ Taronga Zoo to ensure that interim coach parking facilities remain flexible/informal during construction of the car park so that any under-utilised capacity is available for use by visitors on Weekends, Public Holidays and School Holidays.	2003	High	Low	Section 3.7 Section 6.12
		▪ Taronga Zoo to maximise parking space yields in car park stage CP1 to help minimise lost parking impacts of stage CP2 work.	2004	High	High	Section 8.9
		▪ Taronga Zoo to construct stage CP1of car park redevelopment on the area of the sandstone outcrop and bushland between the staff car park and the main car park so that the impacts on Taronga Zoo parking supplies are minimised.	2004	High	High	Section 6.7 Section 6.12 Section 8.9
		▪ Taronga Zoo to promote public transport access arrangements to Taronga Zoo in all advertising and marketing and to warn visitors, particularly during 2004 and 2007 Master Plan Implementation works, that parking facilities at Taronga Zoo are limited.	2004	High	Low	Section 8.9

Table ES2: Entry & Exit Strategies

Ref	Issue	Strategies	Suggested Timing	Suggested Priority	Resourcing Implications	Guidelines
C2.1	▪ Sky Safari capacity may constrain access to Taronga Zoo.	▪ Eliminate entry fee collection at the southern end of Sky Safari.	2006	High	Low	Section 4.2
		▪ Increase the speed (capacity) of Sky Safari.	2003	Medium	High	Section 4.2
		▪ Increase the percentage of Ferry visitors who purchase a *Zoopass* by: < Offering a family concession ticket; or < Reducing the number of vouchers issued to sponsors.	2003	Low	High	Section 4.3
C2.2	▪ The entry experience at the top entrance to Taronga Zoo will be degraded during car park and entry plaza redevelopment works between 2004 and 2008.	▪ Upgrade lower entrance to Taronga Zoo facilities and pedestrian links to the Ferry Wharf. ▪ Encourage visitors to use the improved alternate facilities at the lower entrance to Taronga Zoo.	2004	High	Low	Section 6.9 Section 8.6
C2.3	▪ Entry via Sky Safari access will be closed at times to facilitate construction of Food and Beverage precinct and Asian Elephant precinct. ▪ Closures may contribute to a reduced visitor experience. ▪ Signage advising visitors of a Sky Safari closure is poor.	▪ Minimise Sky Safari closure impacts by: < Restricting during peak usage times (between 9am and 1pm); < Coordinating Food and Beverage precinct and Asian Elephant precinct closure requests to coincide; < Provide advance closure warnings to Guest Services staff at the upper and lower entrances. ▪ Arrange additional Sydney Buses services between the Wharf and the top entrance to Taronga Zoo to replace the service. ▪ Encourage more visitors to the upgraded lower entrance to Taronga Zoo post completion in 2004. ▪ Upgrade signage at Wharf that warns visitors of Sky Safari closures due to weather or construction.	2003 to 2005	High	Medium to High	Section 8.4 Section 8.5 Section 3.13
C2.4	▪ Visitors exiting the top station of the Sky Safari often have difficulty finding the information centre.	▪ Improve internal wayfinding that directs visitors from Sky Safari to the information centre.	2003	High	Low	Section 4.2
C2.5	▪ The lower entrance to Taronga Zoo will be closed in 2004 for redevelopment. ▪ Visitors will not be permitted to enter via the lower entrance to Taronga Zoo. ▪ Visitors will not be permitted to exit via the lower entrance to Taronga Zoo.	▪ All visitors arriving by Ferry will be required to access Taronga Zoo via Sky Safari or Bus to the top entrance to Taronga Zoo. ▪ Temporary signage to be erected at the Wharf to warn visitors of the lower entrance to Taronga Zoo closure. ▪ Additional bus services to be provided to cope with the increased travel demands between Wharf and the top entrance to Taronga Zoo. ▪ Visitors will be required to return to the top entrance to Taronga Zoo to catch Sky Safari or a bus down to the wharf or to exit via the pedestrian path down to the lower Sky Safari terminal. ▪ Exit conditions via lower Sky Safari terminal to be monitored. If this exit is problematic, the exit to be closed.	2004	High	Medium	Section 4.1 Section 6.9

Table ES3: Internal Circulation

Ref	Issue	Strategies	Suggested Timing	Suggested Priority	Resourcing Implications	Guidelines
C3.1	▪ Maintenance of minimum level of service standards for Taronga Zoo pedestrian access during construction.	▪ Specify a minimum benchmark for pedestrian access during construction. ▪ Specify a minimum benchmark for long-term pedestrian.	2003	High	Low	Section 5.1
C3.2	▪ Low loader and crane access to large animal enclosures.	▪ Designated routes to large animal enclosures to be identified. ▪ DPWS to design paths along designated routes within Taronga Zoo to accommodate low loader requirements.	2003	High	Low	Section 5.3
C3.3	▪ All new paths within Taronga Zoo need to accommodate access for NSW Fire Brigade appliances.	▪ DPWS to design all new paths within Taronga Zoo to accommodate NSW Fire Brigade appliances.	2003	High	Low	Section 5.3
C3.4	▪ The use of NSW Fire Brigade "Bronto" sky lift to assist in evacuation of the Sky Safari may have implications for the design of internal paths.	▪ Taronga Zoo's Occupational Health and Safety committee to confirm the continued participation of NSW Fire Brigade in the evacuation procedures for the Sky Safari. ▪ DPWS to widen all sections of path immediately under the Sky Safari to at least 5.8m so that the "Bronto" appliance can deploy its outriggers.	2003	High	Low	Section 5.3
C3.5	▪ Food and Beverage precinct and Asian Elephant precinct construction access arrangements via Taronga Boulevard may impacts on internal circulation experience	▪ Develop a construction access management protocol designed to: < Manage pedestrian and vehicle conflicts; < Manage vehicle speeds in shared zones; < Restrict vehicle access during busy pedestrian periods.	2003 to 2004	High	Medium	Section 8.4
C3.6	▪ HoZ construction access arrangements via main ring road may impacts on internal circulation experience and access to the Backyard to Bush precinct.	▪ Development a construction access management protocol designed to: < Manage pedestrian and vehicle conflicts; < Manage vehicle speeds in shared zones.	2005 to 2008	High	Medium	Section 8.5
C3.7	▪ Food and Beverage precinct and Asian Elephant precinct construction access arrangements through back-of-house areas may compromise Taronga Zoo activities and staff safety.	▪ Develop a construction access management protocol for back-of-house areas designed to: < to identify and signpost designated staff crossing points across the route; < improve channelisation and delineation of the access route; < Provide priority to Taronga Zoo movements; < Control passing conflicts in narrow sections; < Clearly define Taronga Zoo pedestrian paths; and < Provide a safe and convenient storage area for concrete trucks and deliveries.	2003	High	Low/medium	Section 8.4
C3.8	▪ External Taronga Zoo operations are constrained by the lack of service vehicle parking in proximity to Sky Safari and lower entrance to Taronga Zoo.	▪ Taronga Zoo to submit application to RTA for the installation of loading zones (sign type: R5-23) in the following locations: < One space on the northern side of Athol Wharf Road adjacent to the lower entrance to Taronga Zoo; < Two spaces on the northern side of Athol Wharf Road near the ferry terminal.	2003	Medium	Low	Section 5.3

1. Introduction

1.1 Background

The Taronga Zoo Master Plan (TZMP) provides the framework for a significant and progressive upgrading of Taronga Zoo (TZ) over the next 12 years. Over a series of discrete stages, entire precincts will be closed, developed and re-opened, providing a continuous stream of new attractions. A copy of the original master plan and the DPWS proposed circulation strategy is included in *Appendix A* of this report. The DPWS implementation strategy is expanded in Section 3.1 of the MPI report.

A key component of ensuring that the site remains attractive to visitors during the long transition period will be the legibility of the entire experience for visitors, starting with their journey to TZ and then being reinforced as they approach and enter the site and traverse it during their visit. Transport is a fundamental component of delivering this experience.

It is also essential to ensure that during construction all the potentially conflicting activities that occur in and around the TZ precinct can co-exist safely and efficiently; this includes pedestrians, service activities, construction workers and delivery of construction materials to areas deep within the site.

1.2 Scope

Parson Brinckerhoff (PB), formerly PPK Environment & Infrastructure, was engaged in June 2002 to ensure that the TZMP encompasses all the transport, traffic and parking needs both during construction and in the long term.

PB's specific objectives were:

- to develop an understanding and document the current transport provision and use, and to identify existing deficiencies;
- to obtain and analyse information on current visitor patterns and their travel choices;
- to collect new information on parking, traffic, public transport use to fill in gaps in available data;
- to apply a range of sensitivities to visitor forecasts for testing future transport strategies and provision;
- to produce guidelines for signage and way finding for all visitors to TZ;
- to develop a long term operating strategy and interim measures to cater for staged upgrading of TZ; and
- to produce published Transport, Parking and Traffic Management Guidelines for use throughout the development of TZ until 2012.

1.3 Structure

In order to maintain a visitor focus to the traffic and transport strategies developed for the TZMP, this report has been structured in terms of the following current visitor experiences:

- **Section 2** - The decision to visit TZ (past admission patterns);
- **Section 3** - The arrival and departure experiences (travel options and choices, wayfinding and parking);
- **Section 4** - The entry and exit experiences (pedestrian access, ticketing and entry requirements);
- **Section 5** – The internal circulation experiences (pedestrian access).

Within the context of each visitor experience, the report will then discuss:

- **Section 6** - The potential impacts of Master Plan Implementation (MPI) on these experiences;
- **Section 7** – The strategic context for a set of Traffic, Transport and Parking strategies and guidelines to assist MPI;
- **Section 8** - a set of Traffic, Transport and Parking strategies and guidelines to assist MPI.

1.4 Abbreviations

The following abbreviations will be used in this report.

TZMP	Taronga Zoo Master Plan
TZ	Taronga Zoo, Sydney
MPI	Master Plan Implementation
B2B	Backyard to Bush Precinct
AEP	Asian Elephant Precinct
F&B	Food & Beverage Precinct
HLi	Hill Link
ACP	Australian Coastline Precinct
RTA	Roads & Traffic Authority of NSW
MMC	Mosman Municipal Council
NSWFB	NSW Fire Brigade
LoE	Lower entrance to Taronga Zoo
ToE	Top entrance to Taronga Zoo
SkS	Sky Safari
EdC	Education Centre
TaC	Taronga Centre
ZPB	Zoological Parks Board of NSW

2. The decision to Visit

2.1 Zoo Attraction

Taronga Zoo (TZ) is a major education and learning centre, helping to link people with nature, developing understanding and positive attitudes towards animals and their environments.

TZ also provides for organised events and functions. There is a range of function areas within TZ enabling a variety of event types, including:

- Taronga Centre - it has two function areas both overlooking Sydney's Harbour that can be sub-divided according to the size and style of event. Functions generally occur outside of peak TZ opening hours.
- Education Centre - it hosts school education programs and can facilitate up to 2,500 students on a peak day.
- The *'Roar & Snore'* event provides opportunities for families, friends or social clubs to remain within TZ overnight. It includes a two-hour night zoo safari led by a zoo educator, accommodation, dinner and breakfast.
- Outdoor Functions - there are marquee options on the Centenary Lawns or adjacent to the Elephants at Sarina's Lawn and dinner opportunities nearby the Cats of Asia. Various access requirements need to be considered, including vehicles/cranes access to enable erection of the marquee and pedestrian and physically disadvantaged access to the function/concert.
- Special events held on the Concert Lawns during the year include:
  - < Carols by Candle light (First week of December - 3000 visitors);
  - < Twilight Concerts (January to March - 1,500 visitors);
  - < Missions Australia Sleep-out (Second Week of August - 1,000 to 1,500 visitors);
  - < Anzac Day and New Years Eve celebrations; and
  - < Picnic Days (3,000 visitors).

TZ is open from 9:00am to 5:00 pm for general admission. There are also opportunities to visit TZ outside of these hours through special arrangement. Such arrangements include:

- The *'Zoorise'* package is a two to three-hour package, beginning at 7am, that offers a unique early morning TZ experience starting with an Australian animal encounter;
- The *'Taronga By Night'* package is a one to one and a half-hour package where expert staff share their knowledge of the animals in an exclusive interactive tour at night providing a unique opportunity to see and hear many of the animals spring into action; and
- The *'Zoosnooze'* package is a unique educational opportunity for school groups to participate in. It involves an interactive education program as part of an overnight

stay. It is available on Monday to Thursday nights during the school term for a maximum of 35 (students and adults) for each program.

The annual TZ admissions for the last 10-years is illustrated in *Figure 2.1*. Annual TZ admissions have generally risen over the past five years since a significant drop in 1997/1998. During that year admissions fell by some 150,000 people. Up to 2001/2002, admission levels had still not recovered to the 1996/1997 annual peak of 1,210,647 admissions.

During the 2001/2002 financial year there were:

- 90,300 'Zoo Friend' admissions;
- 896,900 Paid admissions;
- 154,300 Free admissions; and
- 1,151,500 Total Zoo admissions.

2.2 Admission Categories

The main admission categories are:

- 'Zoo Friends';
- Free (sponsors/vouchers); and
- Paid.

The first two categories receive free entry. 'Zoo Friends' receive unlimited free entry to TZ as part of their membership subscription. They also receive free parking at TZ. The 'Zoo Friend' membership card does not include photo identification of the member, so abuse of the 'Zoo Friend' privileges can occur. The 'Free' admissions include complimentary passes provided to TZ sponsors and staff.

A revue of admission data over the last four financial years reveals the following:

- the breakdown of the three categories has remained consistent;
- Zoo friends consistently represents between seven and eight percent of all annual admissions; and
- Free admissions consistently represents between 14 and 15 percent of total admissions.

The consistency of this pattern is illustrated in *Figure 2.2*.

2.3 Admission Patterns

A review of Zoo admissions for the last two years has revealed the following admission patterns:

- the highest number of monthly admissions occur during January, April and July (see *Figure 2.3*);
- the average weekly admission profiles are clearly influenced (positively) by school holidays and public holidays (See *Figures 2.4, 2.7 and 2.8*);
- the highest average daily admissions occur on Saturdays and Sundays. Sundays admissions are nearly double the average weekday levels (See *Figure 2.5*);
- the average daily admissions on a public holiday are nearly three times that of a typical weekday (see *Figure 2.6*);
- the highest number of admission was recorded on the 25 April 2001 (Anzac Day). On this particular day, TZ recorded 10,309 admissions (See *Figure 2.7*). Other peak days include:
  - < 31 March 2002 (10,161 admissions);
  - < 10 June 2001 (9,791 admissions);
  - < 28 and 29 December 2000 (9,610 and 9,777 admissions respectively); and
- TZ recorded an average of 3,160 admissions per day during the two-year period. This is less than 31 percent of the highest day of admissions.

The daily Zoo admissions for the last two years have been graphed in chronological and descending order (highest to lowest daily admissions). The resulting graphs are presented in *Figures 2.7* and *2.8*. Each day has been colour-coded depending on whether it is classified as a Weekend, School Holiday, Regular Weekday or Public Holiday. These figures, particularly *Figure 2.8*, demonstrate the impact of public holidays, school holidays and weekends on TZ admission levels.

2.4 Design Day

Figure 2.8 is also useful in identifying a suitable design day. The highest recorded daily admissions level is nearly three times the daily average for the two-year period. Clearly designing for the daily average number of admissions would not be appropriate as this capacity would be exceeded by more than 60 to 70 percent of the year. Conversely, designing for the peak day is not cost effective, as the level of infrastructure required to accommodate this demand would rarely be used.

For the purposes of the TZMP strategy, it is recommended that the 20th highest admission day peak (7,249 admissions), based on the last two years, be adopted as the current Design Day.

This level of demand is considered appropriate for the following reasons:

- based on the historical data, admissions will only exceed the design day capacity up to 10 times a year; and
- the design day falls on that part of the demand curve where the recorded demand begins to increase exponentially (see *Figure 2.8*).

This is a base figure and does not take into account future growth in admissions. Future growth will be discussed later in *Section 6*.

Figure 2.1: Annual TZ Admissions for last 10-years

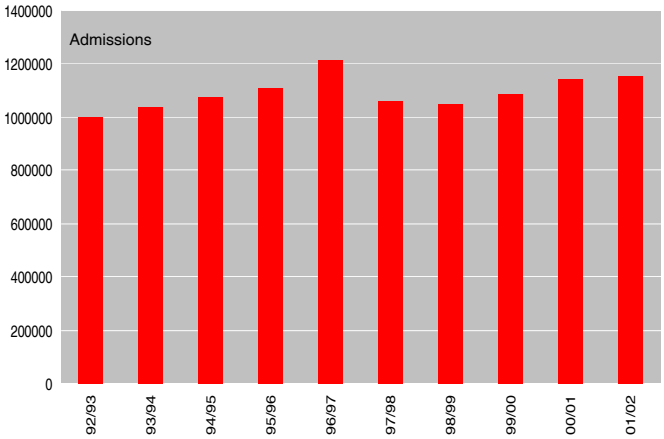


Figure 2.2: Breakdown of Annual TZ Admissions for last 4-years

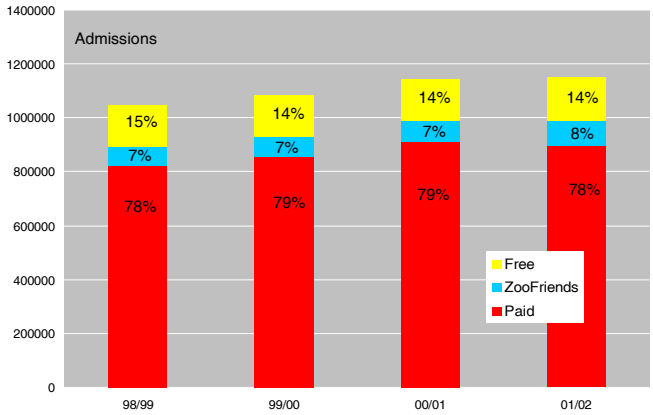


Figure 2.3: Average Monthly TZ Admissions For last 2 years

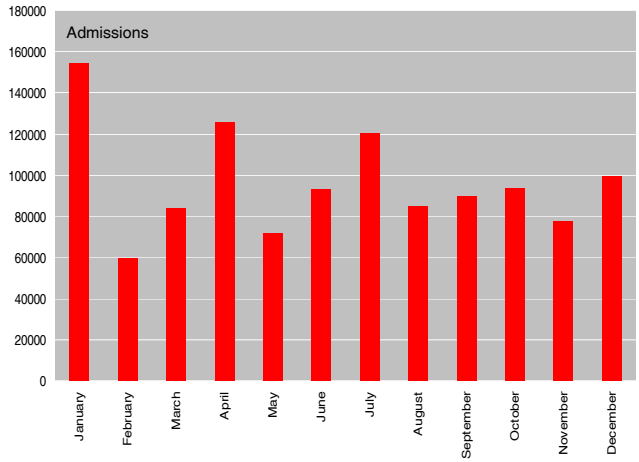


Figure 2.4: Average Weekly TZ Admissions For Last 2-years (Jan to Dec)

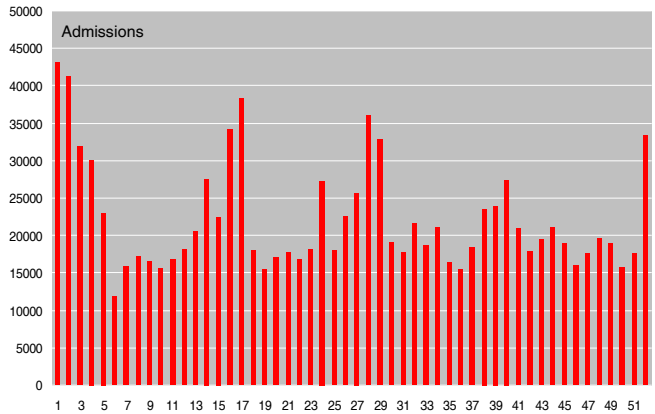


Figure 2.5: Average Daily TZ Admissions For Last 2 years (Mon-Sun)

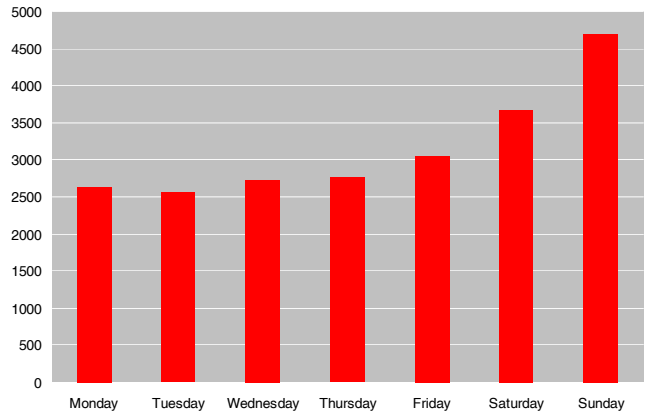


Figure 2.6: Average Daily TZ Admissions For Last 2 years (Day Type)

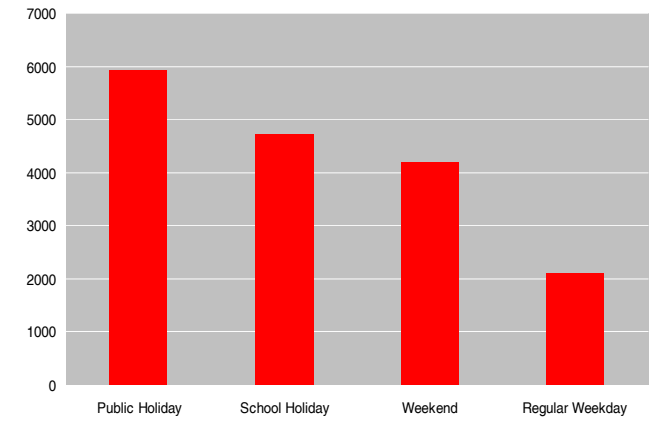


Figure 2.7: Chronological Summary of Daily TZ Admissions For Last Two Years (July2000 to June2002)

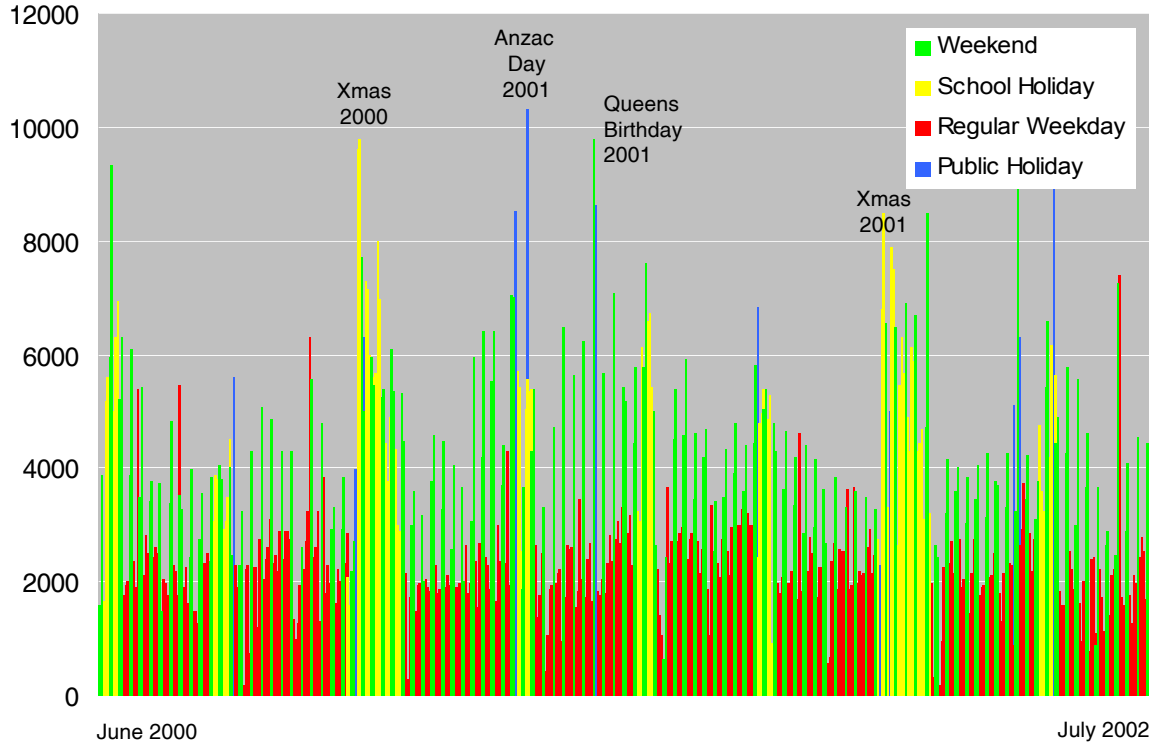
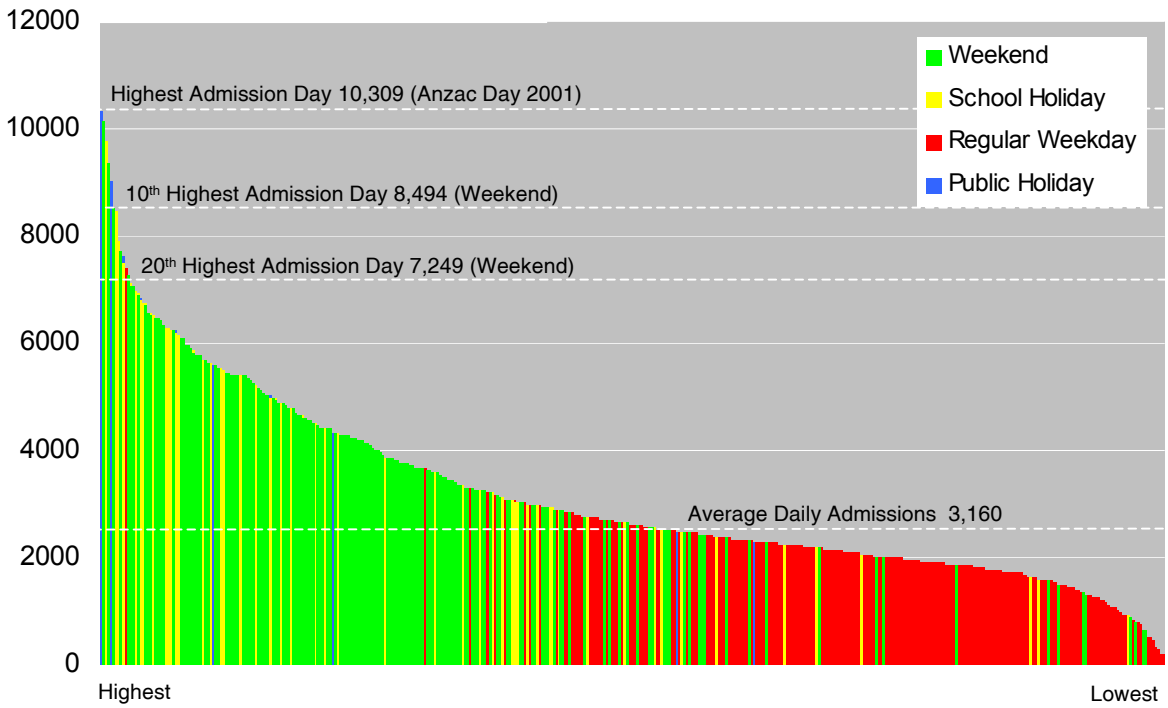


Figure 2.8: Descending Summary of Daily TZ Admissions For Last Two Years (July2000 to June2002)



3. Arrival & Departure

3.1 Travel Choices

3.1.1 Surveys

PB undertook interview surveys of TZ visitors in order to determine their current mode choice patterns. The surveys were undertaken over two five-day periods. The first survey was held between 17 July 2002 and 21 July 2002 in order to capture school holiday patterns. The second survey was held between 31 July 2002 and 4 August 2002 to capture a regular weekly pattern.

The surveyors were stationed outside the top and bottom entrances to TZ. The surveyors completed 2,268 interviews. The interviews covered the travelling habits of 9,214 people entering TZ on these days.

TZ visitors were asked to supply the following data as part of the interview:

- their origin suburb and postcode;
- the last three modes they used to travel to TZ; and
- the number of adults, school children and pre-school children in their group.

3.1.2 Travel Patterns

The following observations are made concerning visitors surveyed at the ToE:

- 1,286 interviews were carried out at the ToE covering the travelling habits of 5,255 people visiting TZ on the survey days;
- 53 percent were adults, 27 percent were school age and 20 percent were pre-school age (see *Figure 3.1*);
- 70 percent indicated that their last mode of travel was by car and 25 percent by bus (See *Figure 3.2*);
- 14 percent (752 persons) indicated that their last two modes were ferry and then bus; and
- average group size was 4.1 persons.

The following observations are made concerning visitors surveyed at the bottom entrance:

- 982 interviews were carried out at the bottom entrance covering the travelling habits of 3,959 people visiting TZ on the survey days;
- 67 percent were adults, 27 percent were school age and six percent were pre-school age (see *Figure 3.3*);

- 91 percent indicated that their last mode of travel was by ferry and 3 percent by car (see *Figure 3.4*); and
- average group size was 4.0 persons.

In order to estimate an overall mode travel pattern for TZ, admission data for each of the survey days was used to relate the sample data to the overall admission populations at each entry point.

Based on the survey results, the estimated mode choice patterns of visitors to TZ, during the survey periods, are presented in *Figure 3.5* below.

The results of the analysis indicate that:

- more than 56 percent of all trips to TZ are by non-car modes. This strong support for public transport should be maintained and further encouraged where possible. This also suggests that more emphasis should be placed on public transport in the wayfinding strategies than is currently the case;
- ferries are the most popular non-car transport mode (36.5 percent) followed by buses (15.4 percent); and
- taxis were used by 0.7 percent of visitors. This may represent up to 100 persons on an average day. This would suggest that an improvement in taxi facilities at TZ might warrant consideration in the strategy.

3.2 Road Access

TZ is located on a peninsular of land that extends out from Mosman into Port Jackson. The primary vehicular access routes to TZ are via Bradleys Head Road and Military Road. Both Roads are State classified roads under the care and control of the RTA. The location of TZ, in the context of the adjacent road system, is illustrated in *Figure 3.6*.

Military Road passes through Mosman Junction and provides a connection to Sydney's Metroad road system (Metroad 10) at Spit Junction.

This link through Mosman to connect with Sydney's primary arterial road network is one of the most significant constraints to the future growth of TZ. This link is generally four lanes wide providing a single traffic lane in each direction and kerbside parking. The estimated mid-block capacity of these roads is approximately 1,500 vehicles per hour. However, the actual capacity of this road link is constrained by a number of critical junctions that include:

- Military Road and Spit Road;
- Military Road and Belmont Road; and
- Military Road and Raglan Street.

All three intersections are currently under traffic signal control.

Consultation with Council officers revealed that Council currently has no proposals to upgrade the capacity of Bradleys Head Road or Military Road. Indeed, Council is

proposing a number of traffic calming measures (e.g. footpath widening) that may impact on some streets intersecting with Military Road.

3.3 Visitor Parking (On-site)

3.3.1 Parking Capacity

On-site visitor parking is located at the northern end of the site close to the main entrance to TZ. The estimated capacity of the car park is approximately 540 spaces, which comprises:

- 250 formal spaces; and
- 290 informal spaces.

However, the capacity of the visitor car park depends on the number of coaches visiting during a given day and the efficiency of parking in informal parking areas. During recent school holiday surveys, in excess of 600 vehicles were observed parked in the facility. The capacity of the car park is a constraint to the future expansion/viability of TZ.

The general layout of the main TZ car park is illustrated in *Figure 3.2*.

3.3.2 Deficiencies

The following major deficiencies were identified in the current TZ car park:

- missed revenue due to on-street parking;
- pedestrian connections are poor;
- there are numerous vehicle/pedestrian conflicts (see photo 26 and 36);
- visitor set-down activities are conflicting with bus services (see photo 19);
- there is a lack of pedestrian storage on the footpaths. Pedestrians tend to spill over into the access roads (see photo 36);
- buses overhang the footpath when performing turns in the u-turn facility at the front entrance;
- the entry barrier is too close to the road and vehicles may queue back onto the road if entry is delayed in any way;
- landscaping at the car park entry obscures the driver's view of the barrier;
- there is poor guidance to the car park entry; and
- some coaches drop-off passengers at the main entry.

3.3.3 Disabled Parking

There are nine disabled parking spaces provided in the main Zoo car park. Most are located adjacent to the bus turning area and TZ's main entrance. The remainder are

located close to the EdC. There are also two disabled parking spaces at the TaC. There are some additional spaces that may have been designated disabled parking at some stage, however, the poor pavement markings and absence of signage makes ineffective for this purpose.

Based on AS 2890.1 (1993), TZ should allocate between two and three percent of its parking spaces for use by people with disabilities. Assuming a capacity of 540 spaces, TZ should be providing between 10 and 16 clearly marked and sign posted spaces. The current provision of nine spaces is inadequate.

3.3.4 Usage Patterns

Analysis of data collected by detectors at the car park entry reveal the following car park usage patterns:

- up to 1,300 vehicles may enter and exit the car park on a peak day;
- most vehicles arrive between 9:00 am and 11:00 am; and
- there is a small peak at the end of the day associated with functions.

Car park data for the six-month period ending 1 August 2002 is presented below in *Figures 3.3* and *3.4*.

Peak exit times from the car park span between 2:00 pm and 4:00 pm, with most visitors leaving by 3:00 pm to avoid commuter traffic. This may represent a marketing opportunity for TZ. If TZ hours were extended to 7:00 pm or 8:00 pm, visitors may be encouraged to stay at TZ till after the evening peak is finished. This should be tested with market research.

Occupancy and duration surveys of the car park were undertaken over a two five-day periods in July and August 2002. The first five-day period represents a school holiday period. The results of the occupancy surveys are presented in *Figures 3.5* and *3.6*.

The surveys indicate the following during the survey period:

- car park usage was much higher during the school holiday period;
- car park usage consistently peaks between 12:00 pm and 1:00 pm and then begins to fall quickly;
- in one instance, a Sunday during school holidays, there were 603 vehicles parked in the car park; and
- car park usage is much heavier on Sundays.

The duration surveys were undertaken over the same two five-day periods. The results of the duration surveys are presented below in *Figures 3.7* and *3.8*. The duration surveys indicate the following:

- during the school holiday period most vehicles stayed for more than two hours and peaked at between three and three and a half hours;
- during non school holiday periods the length of stay is shorter;

- the Saturday profiles were very consistent regardless of the effects of school holidays; and
- there is a distinctive gap between the short stays and the long stays.

3.3.5 Car Park Operations

The entry/exit of vehicles is managed by TZ staff. They play an important role in:

- ensuring the car park is filled to its maximum capacity;
- regulating the in-flow of vehicles once the car park is full; and
- collecting parking fees from departing vehicles.

The manual supervision and fee collection activities generally require one staff member on regular weekdays and up to three staff on busy weekends and school holidays.

When the car park becomes full, TZ staff erect signage at the front entrance. Arriving vehicles are then required to find parking off-site in the surrounding local street network. This creates unwanted traffic circulation around the site and within neighbouring residential areas. Many vehicles enter the bus turning circle to the south of the car park entrance to set-down visitors. They then search for available on-street parking in the surrounding residential areas to the north. Significant conflicts occur during peak periods at the ToE between these vehicles, pedestrians, visitors queuing and buses dropping-off and picking-up.

Visitors are charged a fixed $8 parking fee on exit from the car park. The fee is manually collected at the exit gate by TZ staff. This arrangement ensures that any vehicle queues that form as a result of the transaction remain within the site. *Zoo friends* are not charged for parking in the car park. This concession, as well as absences by TZ staff at the exit gate, results in some lost parking revenue. The introduction of an automated fee collection system (pay-and-display or pre-paid tickets) may assist in reducing revenue losses and would free up additional TZ staff for other work.

The majority of visitors travelling by car to TZ are prepared to pay the TZ parking fees for the privilege of parking in proximity to the main entrance. This is most likely due to the high proportion of children and prams that accompany adults and their need for close access to TZ. Visitor interviews undertaken in July and August of 2002 indicate that 20 percent of the main entry admissions were pre-school age children. Conversely, pre-school age children only represent 6 percent of admissions at the SkS entry.

3.4 Visitor Parking (On-street)

The following on-street parking facilities are available within reasonable walking distance (400 metres) of TZ:

- 45 spaces on Athol Wharf Road in the vicinity of the LoE;
- 36 angled parking spaces on the eastern side of Bradleys Head Road in the vicinity of the TaC.

- 10 parallel parking spaces on the western side of Bradleys Head Road in the vicinity of the TaC;
- up to 55 formal spaces and 30 informal spaces along Bradleys Head Road;
- 59 spaces along Whiting Beach Road; and
- 43 spaces along Prince Albert Street.

The formal spaces located in the vicinity of the TaC are predominantly used by TZ staff and are often full by 9:00 am.

On-street parking supply within reasonable walking distance to TZ is somewhat constrained in terms of capacity and accessibility. There are informal parking areas along Bradleys Head Road (some 30 spaces) in the vicinity of the B2B entry. NPWS has expressed a concern that this parking, often on unformed road shoulders and under trees, is causing erosion damage to the road and National Park. In addition, these parking areas are not linked to TZ by pedestrian paths. Visitors using these informal areas are required to walk along the active traffic lanes of Bradleys Head Road to access the ToE. For these safety and environmental reasons, it is recommended that informal parking practices are banned at this location once additional compensatory staff and visitor parking spaces are provided on-site.

Occupancy and duration surveys of the on-street parking were undertaken over two five-day periods in July and August 2002. The first five-day period represents a school holiday period. The results of the occupancy surveys are presented in *Figures 3.9* to *3.15*.

The surveys reveal the following usage patterns during the survey period:

- usage of on-street parking was generally higher during the school holidays;
- between 20 and 100 parking spaces along Bradleys Head Road are already in use by staff, commuters and construction traffic prior to the 9:00 am opening of TZ. Usage prior to 9:00 am is highest on weekdays when more than half the available spaces may be full before TZ opening;
- parking space utilisation on Bradleys Head Road and Whiting Beach Road rises steadily after 9:00 am and peaks at noon; and
- parking space utilisation on Prince Albert Street is not significantly affected until later in the morning when TZ car park becomes full. Utilisation then rises quickly as desperate motorists search for on-street parking further a field.

The results of the duration surveys are presented in *Figures 3.15 to 3.18*. The surveys suggest the following duration patterns during the survey periods:

- most parking in Prince Albert Street is of short duration (less than one-hour); and
- on a typical weekday TZ visitor parking has less influence and the profile has more short-stays (less than one-hour) and long-stays (commuters).

Mosman Council is currently considering:

- the introduction of parking meters in the formal parking spaces of Bradleys Head Road;

- the banning of all informal parking along Bradleys Head Road; and
- the introduction of a resident parking schemes along Bradleys Head Road, Whiting Beach Road and Prince Albert Street.

Depending on pricing regimes, the introduction of these restrictions would reduce TZ's overflow parking capacity by some 278 spaces. Any future expansion of TZ car park should make provision for these spaces. In the interim, it is recommended that TZ approach Mosman Council and request that the introduction of these proposals be delayed until on-site compensatory parking arrangements are completed. The introduction of paid parking or residential parking schemes before expansion of the TZ car park would exacerbate the current overflow parking problems and push the problem further a field.

3.5 Staff Parking

The staff car park is located adjacent to the visitor car park. Access is restricted to service and delivery vehicles and it has a capacity of 110 spaces. It is currently restricted to 80 spaces due to construction associated with the redevelopment of the EdC.

The staff car park is normally full with some minor overflow into the adjacent informal visitor parking area. The current staff parking supply appears to satisfy staff parking demand.

TZ has provided the following staffing estimates for day-to-day operations and planning as listed in *Table 3.1*:

Table 3.1: TZ Staffing Estimates

	Catering Level	Mon	Tue	Wed	Thur	Fri	Sat	Sun
School Holiday	High	350	355	362	360	394	217	218
	Low	333	338	345	343	347	169	175
Typical Day	High	336	342	349	347	381	205	206
	Low	319	325	332	330	334	158	164

Notes

1) Excludes volunteers and work experience students.

2) Includes staffing requirements for functions.

The highest numbers of staff are present at TZ on a Friday due to function requirements.

Analysis of journey to work data obtained from the 1996 census revealed that 57.8 percent of work trips to the travel zone dominated by TZ (Travel Zone 578) were by car as driver or passenger. Assuming that TZ employs up to 394 staff on a heavy day and that the 1996 journey to work travel patterns are sustained, up to 228 staff may travel to TZ by car as a driver or passenger. Assuming a vehicle occupancy rate of 1.2 people per vehicle, the staff parking requirement may be as high as 190 spaces.

Since 110 spaces are catered for in the current staff car park, the remaining 80 spaces would need to be provided on-site.

The introduction of paid parking or the elimination of informal parking along Bradleys Head Road may impact significantly on TZ staff parking supplies. Current overflow parking practices would be restricted.

3.6 Coach Parking

A site inspection of coach parking was undertaken on 2 August 2002 and drivers interviewed. At the time of inspection there were twelve coaches in the car park located in three distinct areas.

Drivers advise that:

- peaks of up to 20 coaches and mini-buses on-site at one time are not uncommon;
- inbound tourists are generally short stay (one to two hours) and come by mini-bus (6 metre to10 metre long vehicle);
- buses are generally less than 12.5 metres long;
- the three tonne limit on Belmont Road restricts bus access to Military Road;
- a school may hire up to three buses at a time to move students. This results in bus platoons along Military Road and at Spit Junction;
- the Spit Junction signals represent a major delay problem for buses;
- children may be dropped in the top car park when the coach area is full. These students then have to filter through the car park to access the EdC;
- there are no driver facilities in the car park. Drivers use TZ toilets and stand around in the car park or sit in their buses;
- the island in front of the informal coach area restricts the amount of bus parking possible; and
- buses often get parked-in by cars when the car park is full. This has led to defensive and inefficient bus parking practices (see photos 22 and 23).

Recommended improvements include:

- designated/reserved coach spaces as per the arrangements used by the Maritime Museum;
- driver facilities in the car park; and
- timed coach parking spaces so that small short-term buses do not take up valuable parking spaces of larger long-term buses (Darling Harbour is a good example of this type of operation).

There is currently a restriction on over-length (14.5m) buses and coaches. Most coaches are less than 12.5m in length and are not impacted. However, this restriction may impact on TZ's ability to service the inbound market. These length restrictions were implemented some four years ago following complaints and a field trial.

The RTA has advised that the restrictions were applied as a result of design deficiencies at the following locations:

- The TZ car park; and
- The intersection of Bradleys Head Road and Athol Wharf Road.

If the problems in the car park were addressed in the MPI then TZ would have grounds for an application to have the restrictions removed to the TZ car park. The restrictions south of the TZ car park would have to remain - unless TZ were to improve the alignment around the Athol Wharf Road bend.

To have the restrictions removed, TZ would have to submit a request for a review to the RTA and Council's traffic committee. A field trial may be required and a formal assessment be undertaken.

Accordingly, TZ must ensure that any future vehicle entrances and car park facilities completed as part of the Master Plan are designed for the larger 14.5m length buses.

3.7 Overall Parking Demand

The overall demand for parking over the two five-day survey periods in July and August 2002 is presented in *Table 3.2* below.

Table 3.2: Visitor Parking Demand

Date of Survey	Day of Week	Total TZ Admissions	Maximum Demand (1)		Total Parking Demand
			TZ Car Park	On-street(2)	
17-Jul	Wed	7,898	455	214	669
18-Jul	Thu	8,417	510	246	756
19-Jul	Fri	9,734	527	245	772
20-Jul	Sat	7,918	454	152	606
21-Jul	Sun	9,801	587	238	825
31-Jul	Wed	3,637	196	169	365
1-Aug	Thu	4,327	205	160	365
2-Aug	Fri	4,303	220	161	381
3-Aug	Sat	6,832	401	172	573
4-Aug	Sun	7,476	531	178	709

Notes

1) Based on peak hour ending 12.30 pm

2) Includes Bradleys Head Road, Whiting Beach Road and Prince Albert Street within 400 metres of TZ. Also includes commuter parking on Athol Wharf Road.

The parking demand on these days has been compared with the overall TZ admissions on each day. The consistent pattern that emerges is shown in *Figure 3.19*. This pattern offers a useful tool for forecasting TZ parking requirements for given levels of daily admissions. This relationship between admissions and parking demand will be used later in this section to estimate parking demands for the major TZ parking scenarios.

The parking demands at TZ vary significantly depending on the day of the week, public holidays and school holidays. For example, demand for coach parking is highest during regular weekdays and drops significantly during school holidays, public holidays and weekends with the absence of a school excursion component. Staff parking is heaviest on weekdays. Visitor parking is heaviest on weekends, school holidays and public holidays. Construction parking related to MPI is heaviest on weekdays. These variations are summarised in the parking demand matrix in *Table 3.3*.

Table 3.3: TZ Parking Demand Matrix

Type of Day	Visitor Parking	Staff Parking	Coach	Construction
Regular Weekday	o	ooo	ooo	ooo
School Holiday Weekday	oo	ooo	oo	ooo
Public Holiday	ooo	oo	o	o
Weekend	oo	o	o	oo

'o' = lowest demand, 'oo' = medium demand, 'ooo' = highest demand

Table 3.4 below provides an estimate of parking demands for each of these demand scenarios. In addition, the table includes estimates for the design day weekend of 7,249 admissions. These estimates have been based on:

- The average admissions rates for each scenario day identified previously in *Figure 2.6*;
- The relationship between admissions and parking demand, identified earlier in *Figure 3.19*; and
- The staffing and coach estimates from Sections 3.5 and 3.6

Construction parking demands will be added later to these parking scenarios following discussion of the MPI program in *Section 6*.

This discussion of demand scenarios will need to be considered in the MPI parking strategy and the detail design of the car park. The peak demands for each demand component do not necessarily coincide. Therefore, the parking strategy should promote a flexible approach that permits:

- controlled use of coach parking areas for visitor parking on public holidays and weekends when coach parking areas are under-utilised; and/or
- controlled use of visitor parking areas by staff and construction workers on regular weekdays when visitor parking is under-utilised.

Table 3.4: Estimate of Existing Parking Demands for the Major TZ Parking Scenarios

	Average Admissions (Last 2-years)	Estimated Visitor Parking Demand (1)	No. Staff	Estimated Staff Parking Demand (2)	Estimated No Coaches	Estimated Coach Parking Demand (3)	Estimated Total TZ Parking Demand
Regular Weekday	2,102	223	350	169	15	45	437
School Holiday Weekday	4,728	425	360	173	5	15	613
Public Holiday	5,931	517	220	106	5	15	638
Weekend	4,185	383	220	106	5	15	504
Design Day Weekend	7,249	618	220	106	5	15	739

1) Demand based on the formula "Parking Demand = (0.0768 * Admissions) + 61.596"

2) Based on journey to work data from the 1996 Census and assumed vehicle occupancy rate of 1.2 persons per vehicle.

3) Estimated car space equivalent based on 1 coach space being equal to 2.5 car spaces

3.8 Ferry Services

An estimated 36.5 percent of all TZ visitors travel to TZ by ferry. Taronga Zoo Ferry Wharf is the second busiest wharf on the Harbour. TZ is approximately 12 minutes travel time from Circular Quay by ferry. Services to TZ depart Circular Quay from Wharf 2 (see photo 13).

Sydney Ferries generally provides two services an hour to/from TZ for most of the week. However, during Sunday and holiday peak periods, the regular TZ service is supplemented by a Mosman ferry service each hour which diverts from its regular run to include an extra stop at TZ. TZ staff members are in contact with Sydney Ferries via marine radio and can request additional services, on other days, as demand requires.

The scheduled ferry services to TZ are summarised in *Table 3.5* below. It is interesting to note that the current ferry timetable does not facilitate usage by TZ staff travelling to work at TZ. Most TZ staff start work at 6.30am. Unfortunately, the first ferry does not leave Circular Quay until much later at 7.15am (Monday to Saturday). This timetable will constrain TZ staff usage of the Ferry for journey to work travel.

Table 3.5: Ferry Services and Frequencies to Taronga TZ Ferry Wharf

Direction	Frequency	First and Last Service
To TZ	2 per hour Monday to Saturday 3 per hour Sundays and Public Holidays	7.15 to 18.45 Monday to Friday 8.45 to 18.45 Saturdays 8.45 to 17.30 Sundays 8.45 to 18.45 Public Holidays
To Circular Quay	2 per hour Monday to Sunday 3 per hour Public Holidays	7.30 to 19.00 Monday to Friday 9.00 to 19.00 Saturday and Public Holidays 9.00 to 18.37 Sunday

In May 2000, consultants Booz Allen and Hamilton were engaged by Sydney Ferries to undertake a series of surveys of ferry users. As part of this work, the consultants counted 1,147 people alighting at TZ wharf during a weekday survey and 1,919 during a weekend day survey. Some 22 percent of these weekday people and nine percent of the weekend people completed survey forms asking them for information on their travel habits and purpose. This survey revealed the following about TZ Wharf ferry users:

- 27 percent of weekday ferry users were commuters travelling to work. This number dropped to nine percent on the weekend;
- the percentage of social/recreational users was 45 percent on a weekday and 54 percent on a weekend;
- the number of commuters also impacted on the frequency of ferry use. On a weekday, 35 percent of users said that they used the ferry weekly or more. On a weekend this figure for regular users dropped to 21 percent. There were also a lot of first time users who consistently represented between 27 and 28 percent of all users on both weekdays and weekends; and
- the type of tickets used are summarised below in *Table 3.6*. Combined entry tickets to TZ were used by between 24 and 26 percent of TZ ferry users.

Table 3.6: Survey of Ticket Types Sold to TZ Ferry Users

Ticket type	Weekday	Weekend
Single	9%	26%
FerryTen	10%	5%
TravelPass	27%	23%
Pensioner Excursion Ticket	13%	13%
Zoopass	26%	24%
Other	11%	9%
Total	100% (248 people)	100% (180 people)

Source: Sydney Ferries (2000)

Sydney Ferries generally allocates its smaller ferry vessels to TZ and Mosman services (see photo 10). The maximum capacity of these ferries is close to 400 passengers.

Assuming a frequency of three services an hour, the maximum capacity of this transport link currently stands at some 1,200 passengers an hour.

This load capacity, and the concentrated arrival pattern of ferry patrons has implications for the SkS entry and the ride itself. Surveys indicate that up to 83 percent of TZ visitors exiting TZ wharf use the SkS to access TZ. The remainder mostly use the 238 or 247 bus services up to the main entrance. Assuming that a ferry could unload up to 400 passengers, that 50 percent are destined for TZ and that 83 percent of these may wish to enter TZ via the SkS, the SkS staff may only have 20 minutes to process 166 visitors (say 7.2 seconds per visitor) before the next ferry arrives. Based on the Sydney Ferries surveys of purpose and ticket types, nearly half may be required to purchase TZ entry tickets.

3.9 Bus Services

An estimated 15.4 percent of all TZ visitors travel to TZ by bus (refer Section 3). On an average weekend (say 4,000 TZ admissions), buses may deliver in excess of 600 bus passengers to TZ.

The following bus routes service TZ:

- Route 238 (Sydney Buses) is a local service between TZ and Balmoral; and
- Route 247 (Sydney Buses) provides a regional connection to the CBD at Circular Quay and Town Hall.

A summary of the service frequencies is presented in *Table 3.7* below.

Table 3.7: Summary of Bus Services Servicing and terminating at TZ

Route No.	Route Description	AM (9am to 11am)			MID (11am to 1pm)			PM (1pm to 3pm)		
		M/F	Sat	Sun	M/F	Sat	Sun	M/F	Sat	Sun
227	TZ to Milsons Point	1	-	-	-	-	-	-	-	-
238	TZ Wharf to Balmoral	8	9	11	8	8	14	8	9	18
247	TZ to Town Hall	8	8	7	7	8	8	8	8	8
250	TZ to Lane Cove	-	-	-	-	-	-	-	-	-
	Total	17	17	18	15	16	22	16	17	26

In addition to its local service role, the 238 acts as a connecting shuttle bus service between the lower (wharf) and upper TZ entries. Visitors arriving by ferry are directed/encouraged by Taronga TZ staff to catch the 238 bus up to the main entrance. This helps to relieve the pressure on the SkS, particularly during peak times. However, surveys suggest that less than 20 percent of people arriving by ferry use the bus service to access the main entrance.

The cost of the trip up to the ToE is $1.50 for visitors without a *Zoopass*. This provides a further disincentive to use the bus service when compared to the free and more spectacular SkS.

When the SkS is closed (e.g. due to high winds) the 238 service provides the only motorised access to the main entrance of TZ. It therefore provides a vital transport function for TZ. This role is likely to become even more vital during MPI as work on some precincts will require SkS closures to facilitate construction.

Bus stop facilities are provided at TZ Wharf (see photos 16 and 17) and adjacent to the ToE (photos 19 to 20). The ToE stop is used as a terminus for Routes 247, 227 and 250. The wharf stop is used as a terminus for Route 238.

Only limited data is available on bus patronage. Sydney Buses have provided the patronage data listed in Table 3.8. However, its use as an analysis tool is limited. These boardings relate to the route as a whole and are based on a mid-winter survey. Patronage could be higher at different times of the year, particularly the summer holidays.

Table 3.8: Summary of Daily Patronage for Routes 238 and 247 at TZ

Direction/ Route	Balmoral to TZ (Route 238)	TZ to CBD (Route 247
Weekdays	729	112
Saturdays	447	381
Sundays	620	116
Holidays (8-19 July)	618	152

Source: AFC 17 June – 28 July

More instructive may be analysis using the mode share patterns discussed in the previous sections of this report. *Table 3.9* provides estimates of bus passenger movements to TZ on the days of the survey based on the total admissions for the day and their estimated mode choice.

Table 3.9: Estimated Bus Patronage

Date of Survey	Day of Week	Total Top Entry TZ Admissions	Ferry Wharf to TZ Main Entry (Route 238) (1) (2)	Other Origin to TZ Main Entry (Route 238 and 247) (1) (3)
17-Jul	Wed	5162	854	375
18-Jul	Thu	5152	944	485
19-Jul	Fri	5510	1104	623
20-Jul	Sat	5161	923	320
21-Jul	Sun	5715	578	104
31-Jul	Wed	1474	199	90
1-Aug	Thu	1822	23	889
2-Aug	Fri	2144	156	0
3-Aug	Sat	3333	415	102
4-Aug	Sun	6739	1386	496

Notes:

1) Estimates of Bus Patronage based on travel interview surveys undertaken on the subject days at the Top Entry of TZ. Some 1,286 interviews were carried out at the ToE covering the travelling habits of 5,255 people visiting TZ on the survey days;

2) Based on estimated percentage of total top entry admissions that travelled to TZ by ferry and then bus. This is representative of the 238 Service from the wharf up to the Main Entry.

3) This is an estimate of the remaining top entry admissions who travelled to TZ by bus but did not use a ferry in their journey. This is representative of those who arrive using the 247 from the City or the 238 service from the Balmoral.

3.10 Pedestrian Access

Pedestrian linkages along Athol Wharf Road between the Ferry Wharf and the bottom entrances of TZ are generally good (see photos 7 to 9). Whilst stairs and a ramp have been provided at the bottom entry to TZ, SkS has only lift and stair access (see photos 7 and 9). The lifts are only available for disabled access. Parents with children are required to carry children and prams up the stairs to the SkS entry (see photo 1).

There are no footpaths along Bradleys Head Road south of the TaC. Informal parking occurs on both sides of this section of road (see photo 32). Visitors parking in this area are forced to walk along the active roadway. Unless a footpath is constructed along the western side of this section Bradleys Head Road, future access to B2B will have to be either through the paid area of TZ or via a direct coach set-down and pick-up area at the immediate entrance to the precinct. This issue will be discussed in later sections of this report.

A footpath has been provided along the western side of Bradleys Head Road north of the TaC. This footpath provides an unpaid pedestrian connection between the TaC and the main TZ car park. However, the footpath is uneven and of poor quality (see photo 40). There are no pedestrian footpaths to service the formal parking on the eastern side of Bradleys Head Road.

There is no dedicated pedestrian crossing facility at the intersection of Bradleys Head Rd and Whiting Beach Road to facilitate safe north/south pedestrian movements (see photo 41).

Pedestrian access to the Ferry Wharf, SkS and LoE is also possible from Whiting Beach Road and Richard Avenue via some steps and an off-road walking track through Sirius Cove Reserve. Another walkway exists to the east through Sydney Harbour National Park winding its way to Clifton Gardens Wharf at Mosman. The walkways are not sealed and lighting is not provided.

3.11 Bicycle Access

An on-road cycleway facility exists along Bradleys Head Road to the north of TZ, providing local cycle access to the surrounding Mosman residential area as well as possible regional links along Military Road and Spit Road.

A cycle rack has been provided in the main car park (see photo 25). The rack is located some distance from the ToE and can accommodate up to three bicycles. Its position on the kerb close to active car parking spaces increases the potential risk of damage to bicycles. Ideally, the rack should be set back 450 mm from the kerb and provide a clear area of some 1,700 mm to accommodate the length of the bicycle.

Lockers are available on-site near to the main entrance. There are no public shower or change room facilities. TZ Staff have access to shower and change room facilities within various staff buildings in the back-of-house areas and are able to safely leave their bikes in these areas (which are prohibited to the public).

Access to TZ by bicycle is not a viable travel choice for most visitors. Visitor demographics tend to comprise of families with young children who reside in the broader regional areas of Sydney.

Mosman Council plans to undertake a review of the existing cycleway network in the near future.

Improvements to end of trip facilities for both visitors and employees could be significantly enhanced, however further investigation into the potential increase of cycle modal access needs to be undertaken first before any expenditure on cycle facilities can be justified.

3.12 Wayfinding

This section discusses how the public currently find their way to TZ. Potential TZ visitors use the following tools to navigate their way to TZ:

- road and pedestrian signs;
- marketing materials and brochures; and
- TZ Web site.

An audit of each has been undertaken and is presented in the following sections.

3.12.1 Road Sign Audit

An audit of road signs providing directions to TZ was undertaken. The results of the audit are presented in photos 44 to 59 in *Appendix B*.

TZ currently has road signs positioned at the following locations:

- Spit Road and Military Road, Spit Junction (see photos 44 to 46 of Appendix B);
- Belmont Road and Military Road, Mosman Junction (see photos 47 and 48);
- Bradleys Head Road, Middle Head Road and Prince Albert Street, Mosman (see photos 49 and 50);
- Bradleys Head Road and Whiting Beach Road, Mosman (see photo 51);
- Bradleys head Road at TZ car park entry (see photos 52 to 56); and
- Ferry Wharf (see photos 57 and 58).

The audit revealed the following:

- the RTA provided signs at Spit junction are of high standard;
- there is inconsistency in the colour scheme of TZ road signs. The RTA signs at Spit Junction are brown and white. The signs provided by Council are heritage yellow and green. The signs provided by TZ are pastel green and yellow;
- with the exception of the RTA colour scheme, the colours used on most TZ signs provide poor contrast;
- the Council signs are too small. They are inconspicuous and provide poor legibility (see photos 47and 49);
- the current TZ logo design is ineffective as a wayfinding tool and offers poor legibility see photo 45);
- some signs are obscured by tree foliage;
- some signs display too many pieces of information to be effective;
- the target audience of some TZ road signs is unclear and can send false messages to drivers (e.g. signs which point to a destination which has no parking facilities for general traffic);
- the current system of signage at the wharf is inflexible and does not accommodate the changeable access arrangements at the LoE (e.g. when SkS is closed); and
- the current matt paint sign faces do not support legibility and conspicuity. TZ signs should be made with 3M Class 1 Retro-reflective sign face material. This would increase their legibility and conspicuity, particularly at night. Retro-reflective sign face material has little reflective elements, either glass spheres or triangular prisms (pyramids) that take the car headlight beam and bend it back or “return” it to the car driver and passengers.

In August 2002, TZ consulted with representatives of Mosman Council on the issue of TZ road sign requirements. During discussions, Council representatives indicated that:

- signposting that encourages use of Belmont Road is unlikely to be acceptable to Council as it is a light-traffic route through a residential area;
- installation of reassurance signs that assist navigation for drivers who have already committed themselves to back-routes may be acceptable to Council;
- the upgrade of existing sub-standard signage on Belmont Road and Bradleys Head Road is acceptable in principle; and
- Council is unlikely to object to the use of the RTA standard brown and white tourist sign colour scheme for TZ directional signs.

3.12.2 Audit of Marketing Material

A wayfinding audit of TZ's current marketing brochure was undertaken. The results of the audit are presented in *Figure 3.25* below.

The audit identified the following concerns with regard to the brochure:

- it fails to identify key public transport travel information (e.g. wharf number, service frequencies);
- wayfinding messages are confused with booking messages;
- it does not advise drivers of the availability or cost of parking;
- the map provided does not provide key wayfinding information such as:
  - route markers;
  - rail network connections; and
- some of the roads highlighted do not provide access to TZ (e.g. the Warringah Freeway north of Falcon Street).

3.12.3 Audit of TZ Webpage

An audit was undertaken of TZ webpage. The results of the audit are presented in *Figure 3.26.*

Sample web pages from other zoos are provided for comparison in *Figures 3.27 to 3.29*.

Figure 3.1: Demographics of TZ Visitors Surveyed at the Top Entrance

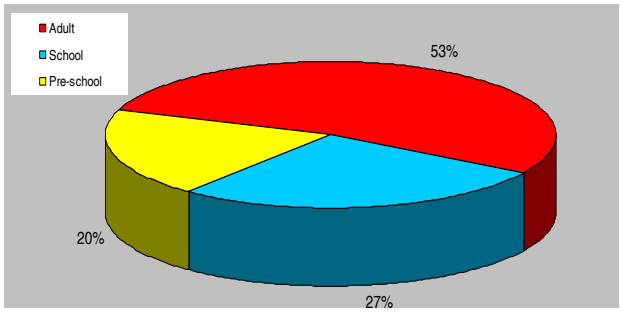


Figure 3.3: Demographics of TZ Visitors Surveyed at the bottom Entrance

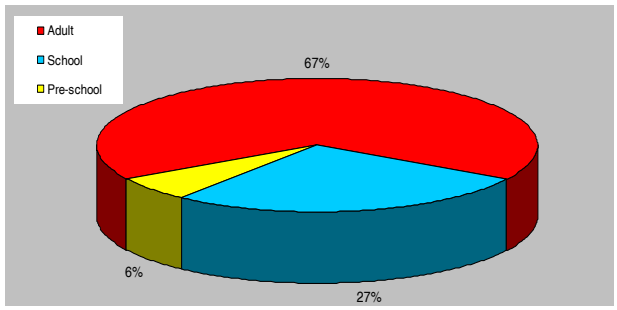


Figure 3.2: Mode Choice of TZ Visitors Surveyed at the Top Entrance

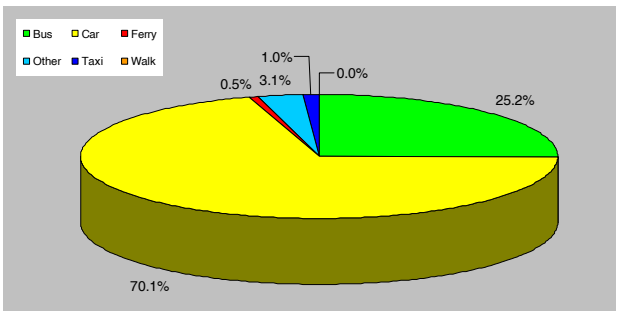


Figure 3.4: Mode Choice of Visitors Surveyed at the Bottom Entrance

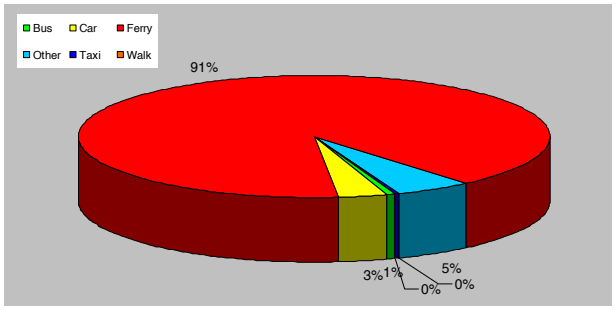
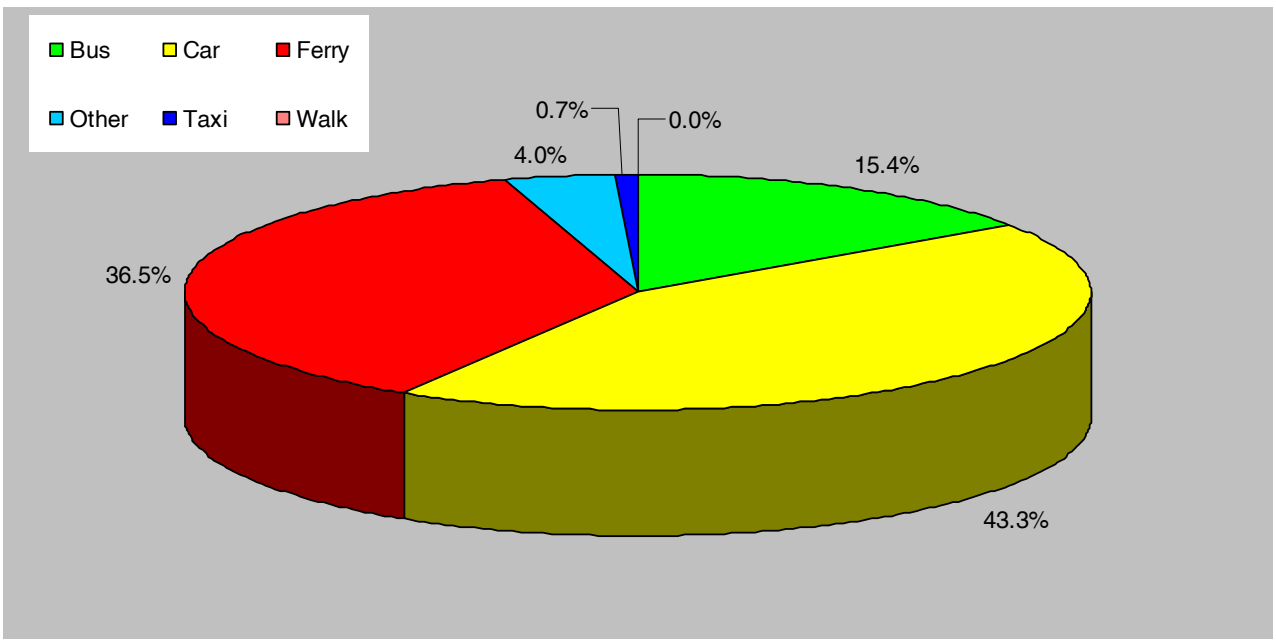
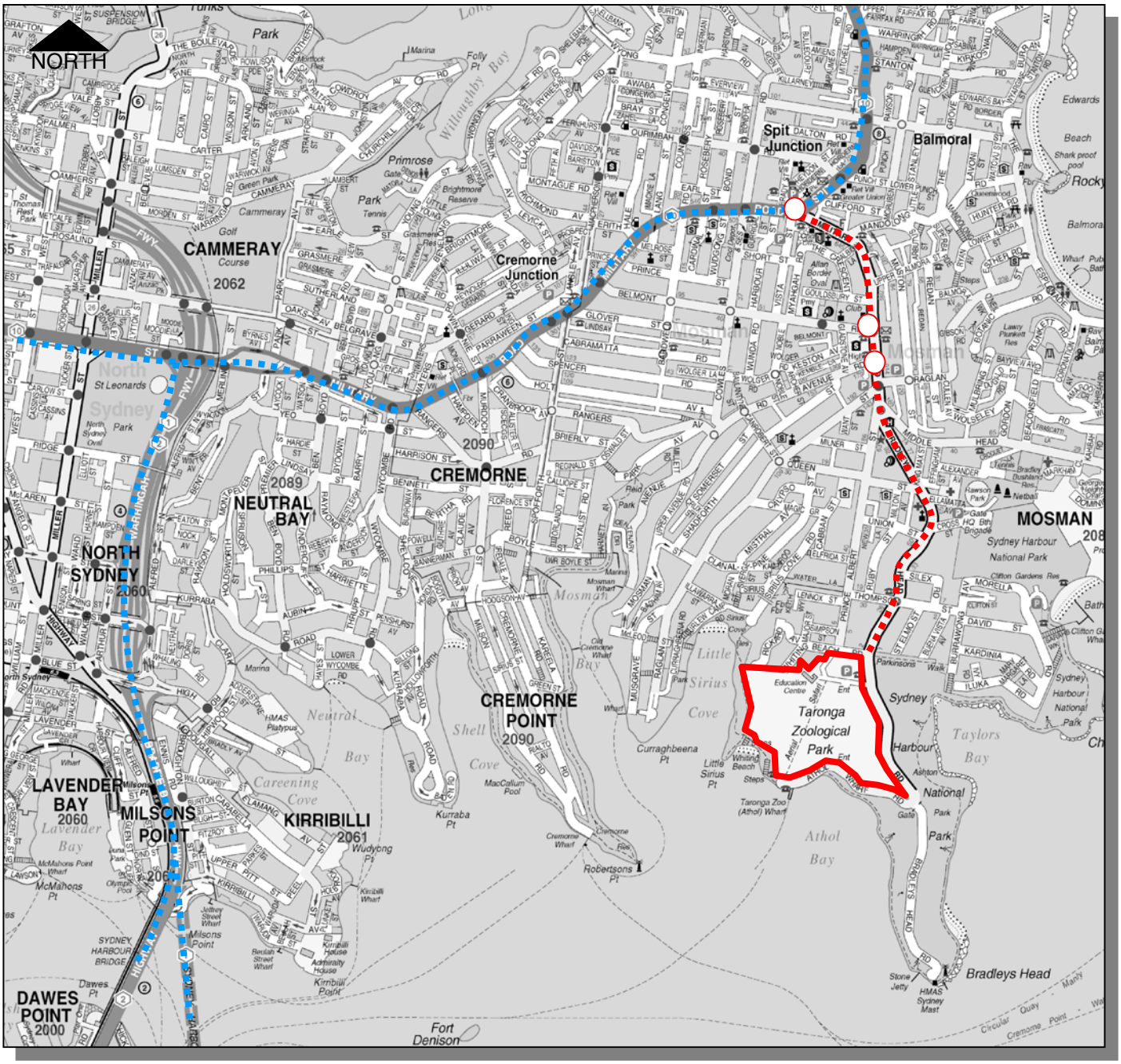


Figure 3.5: Mode Choice For Average Daily TZ Admissions





Map Source: UBD Copyright © Universal Press Pty Ltd

0 1km

Approximate Scale

Sydney's Major Arterial Road Network

The Link Through Mosman

Critical Intersections

Figure 3.6
TZ Location and Road Access
Taronga Zoo Master Plan Implementation

Figure 3.7
General Layout of the Main TZ Car Park
Taronga Zoo Master Plan Implementation

Figure 3.8: Daily Volumes of Vehicles Entering TZ Car Park (Jan 2002 to Aug 2002)

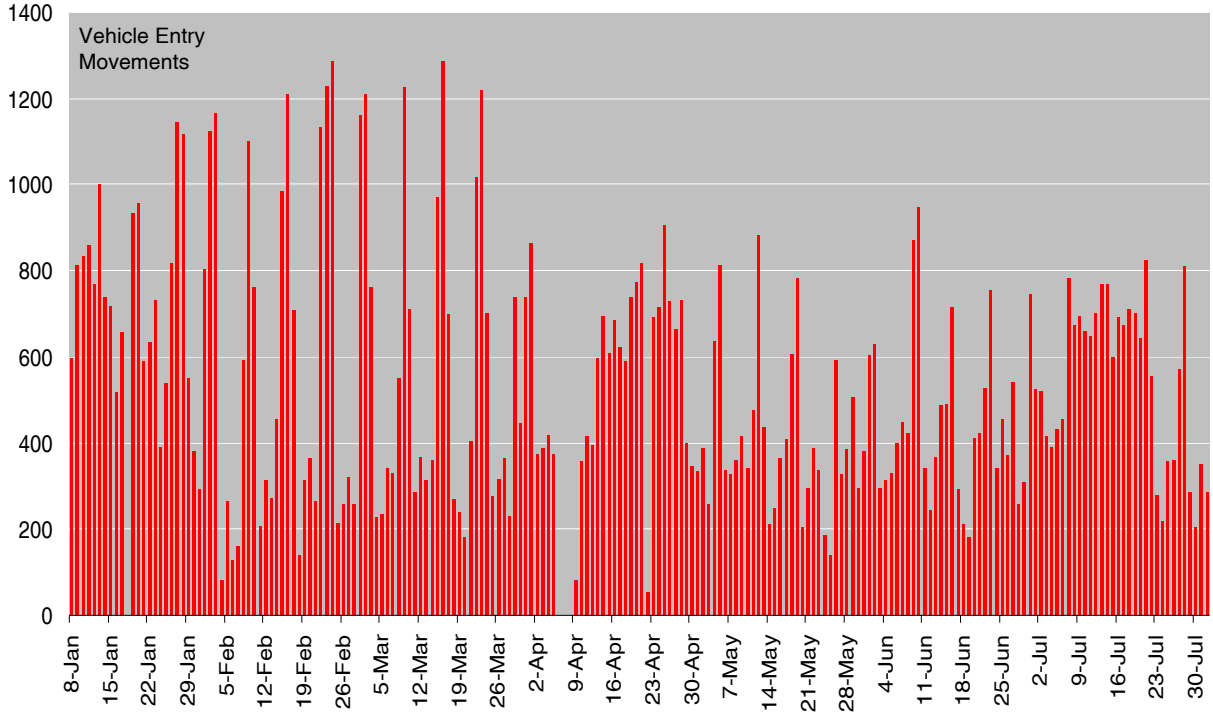


Figure 3.9: Average Entry Profile for Vehicles Entering TZ Car Park (Jan 2002 to Aug 2002)

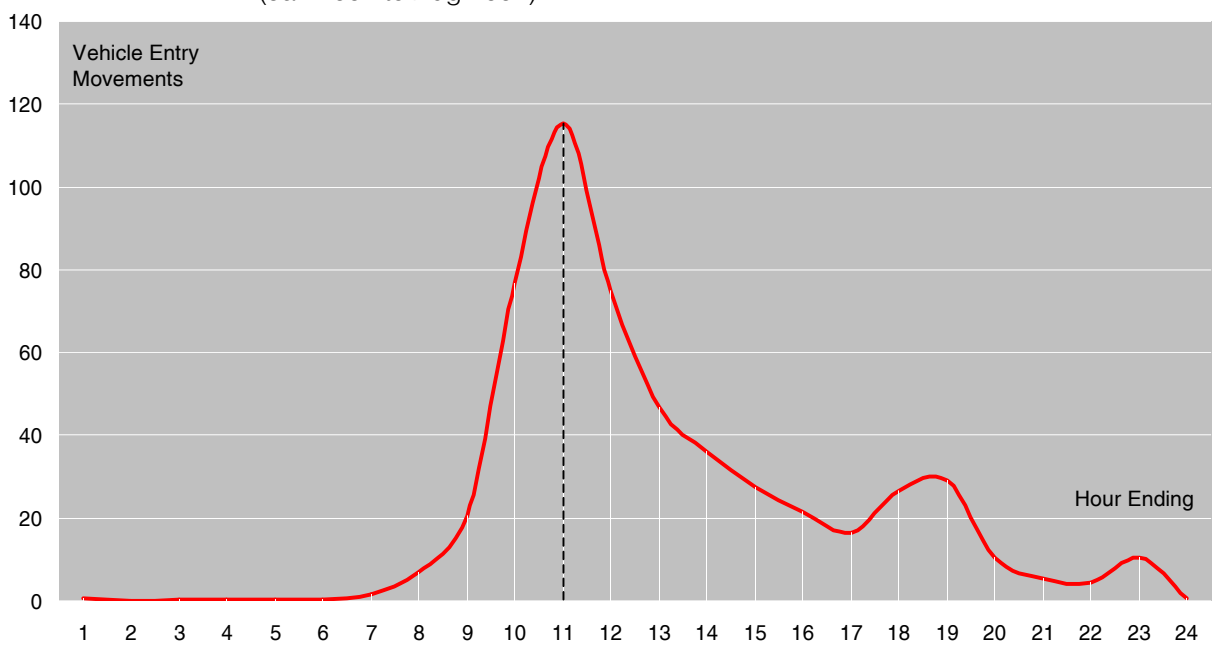


Figure 3.10: Surveys of TZ Car Park Occupancies (School Holidays)

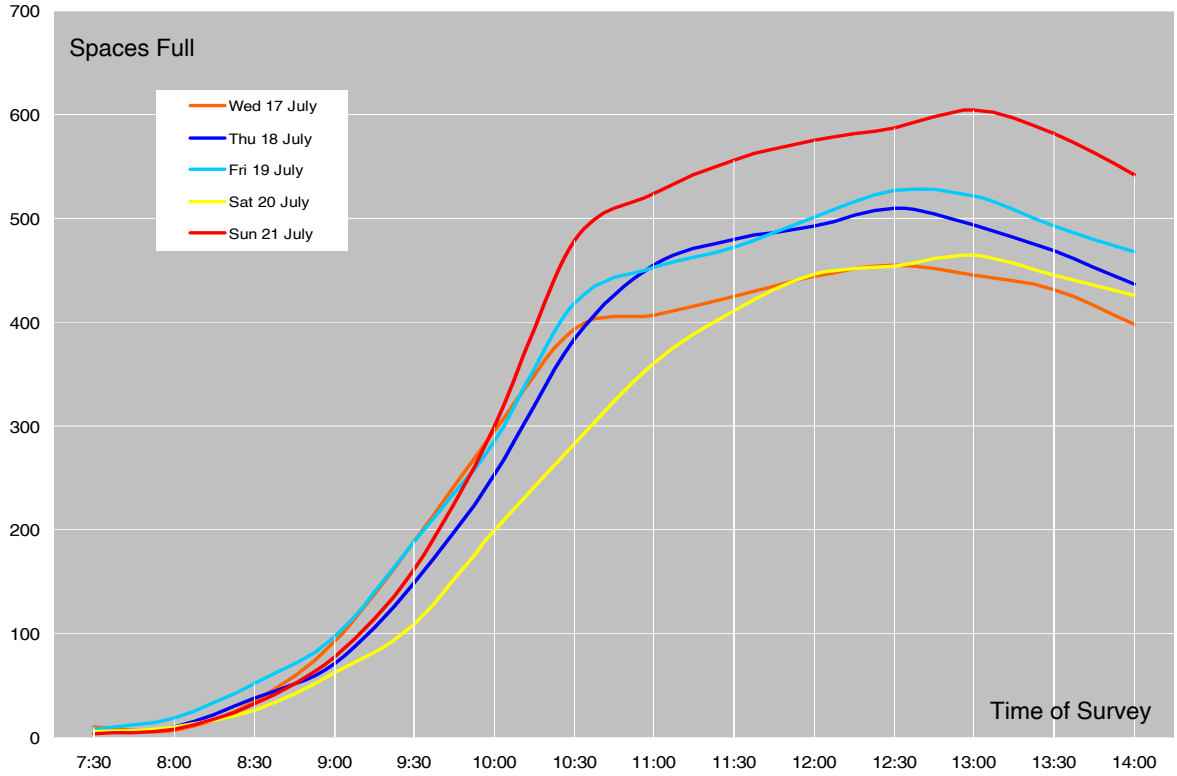


Figure 3.11: Surveys of TZ Car Park Occupancies (Typical Days)

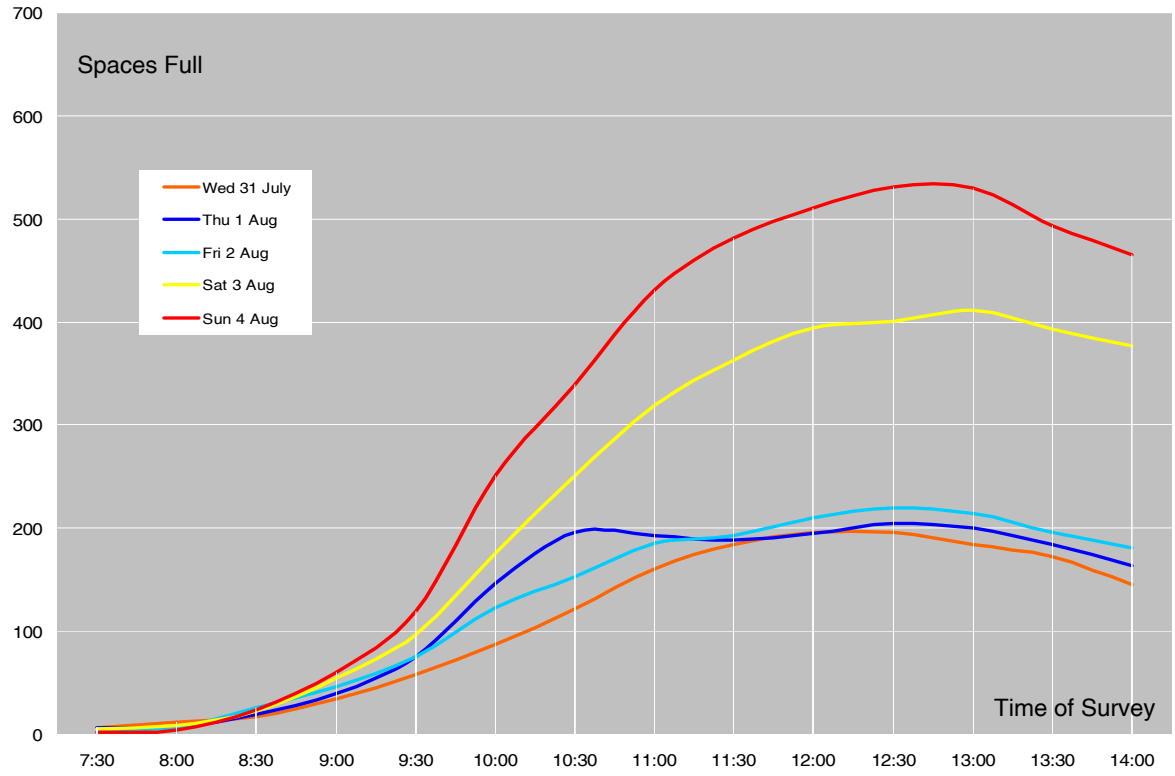


Figure 3.12: Survey of TZ Car Park Duration of Stay (School Holidays)

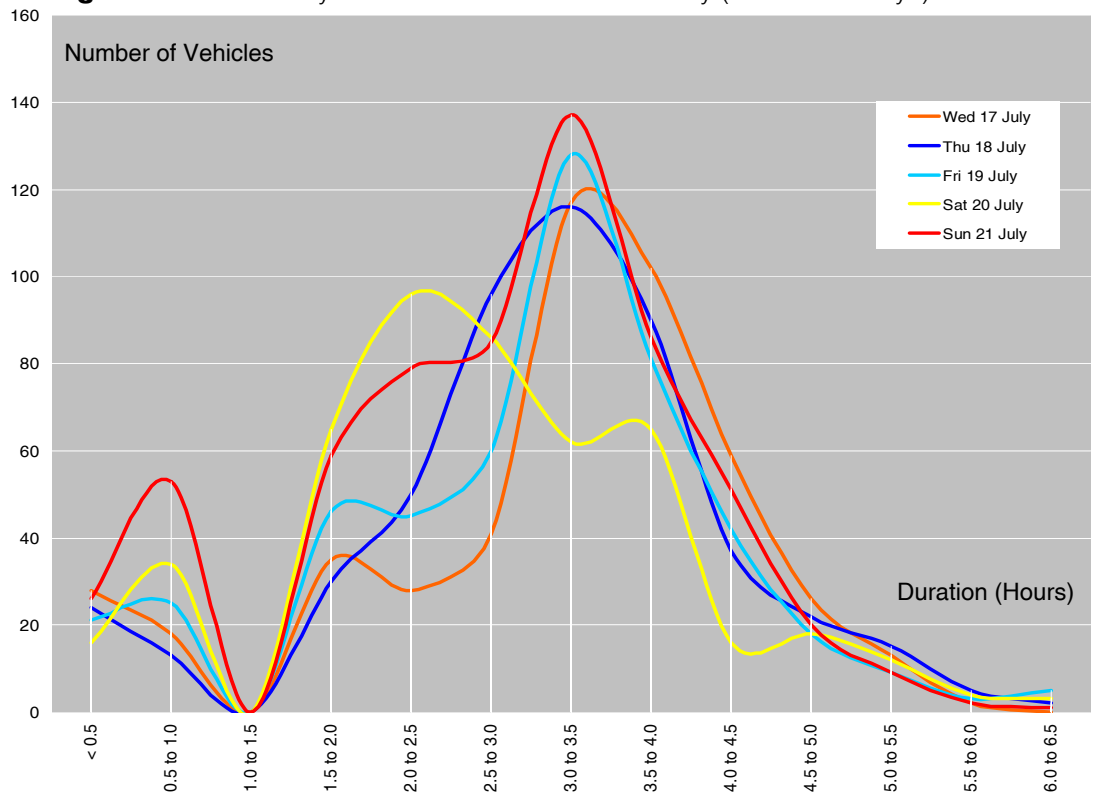


Figure 3.13: Survey of TZ Car Park Duration Of Stay (Typical Days)

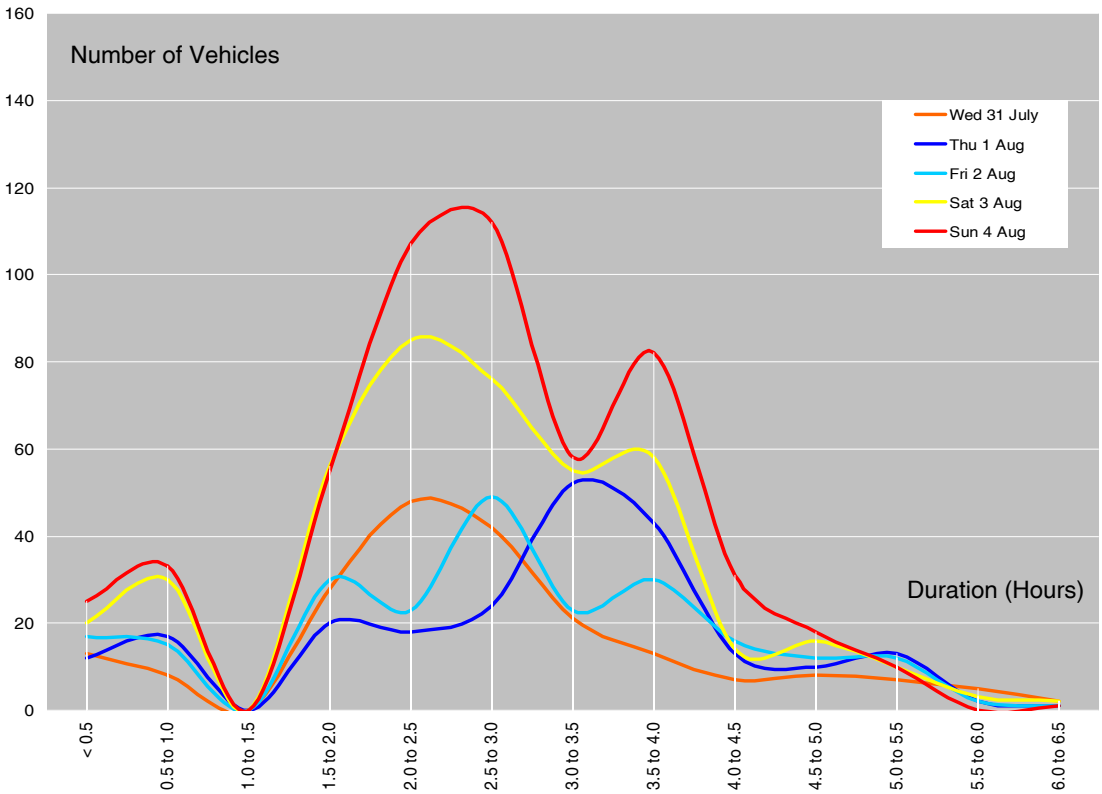


Figure 3.14: Usage of Parking Spaces on Bradleys Head Road (School Holidays)

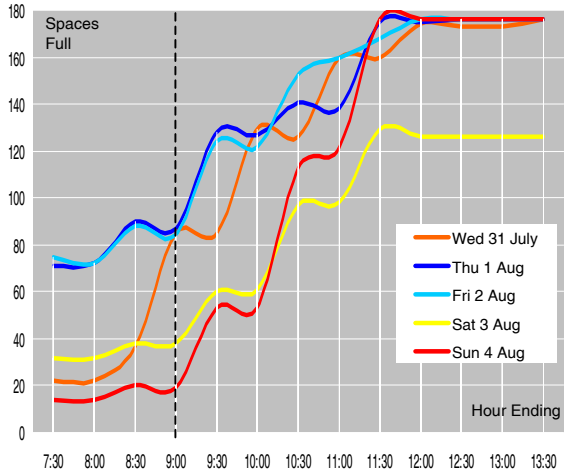


Figure 3.15: Usage of Parking Spaces on Bradleys Head Road (Typical Day)

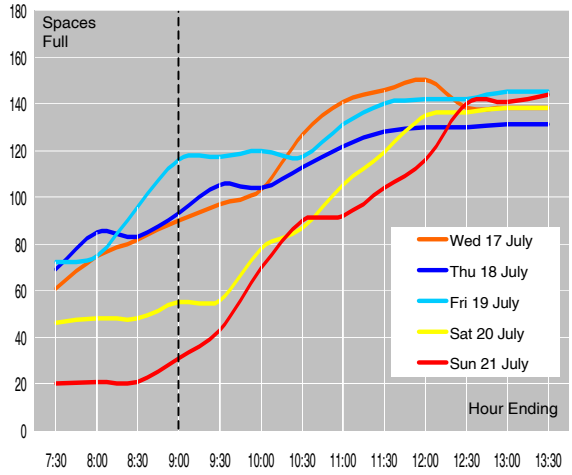


Figure 3.16: Usage of Parking Spaces on Whiting Beach Road (School Holidays)

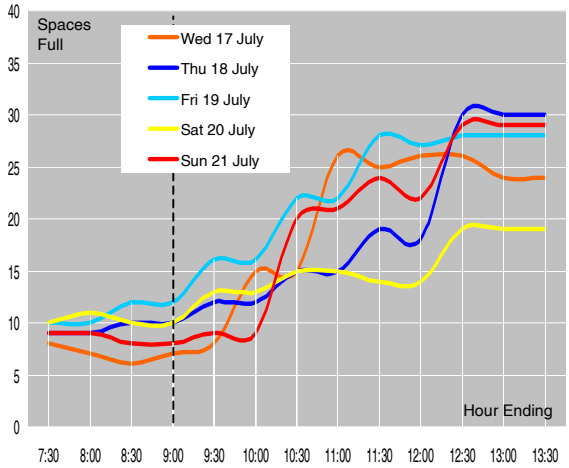


Figure 3.17: Usage of Parking Spaces on Whiting Beach Road (Typical Day)

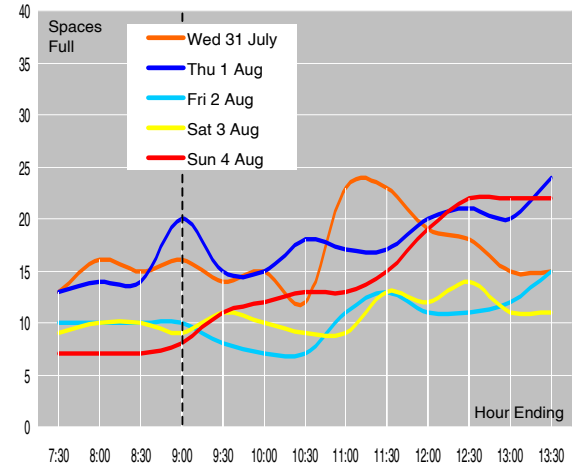


Figure 3.18: Usage of Parking Spaces on Prince Albert Street (School Holidays)

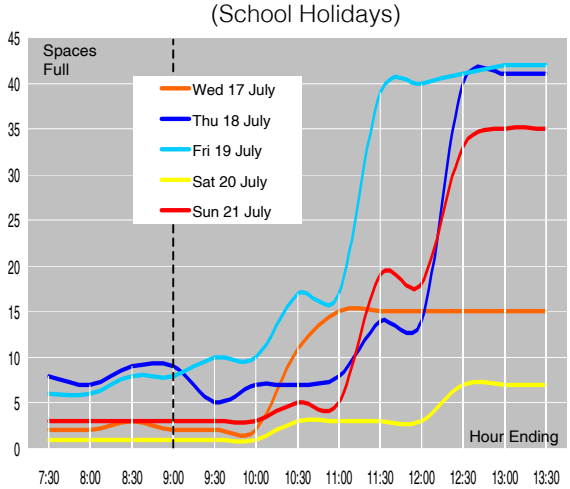


Figure 3.19: Usage of Parking Spaces on Prince Albert Street (Typical Day)

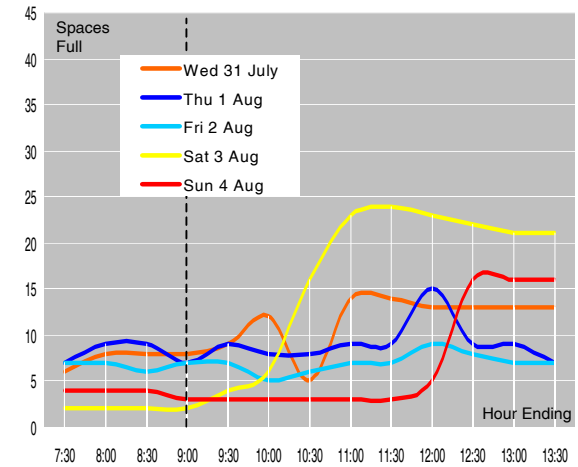


Figure 3.20: Average Duration of On-street Parking in Vicinity of TZ During a School Holiday Weekday (17-19 July2002)

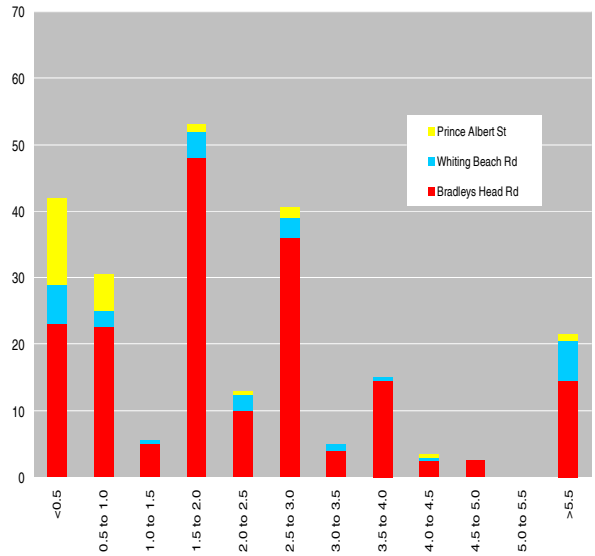


Figure 3.21: Average Duration of On-street Parking In Vicinity of TZ During a School Holiday Weekend (20-21 July 2002)

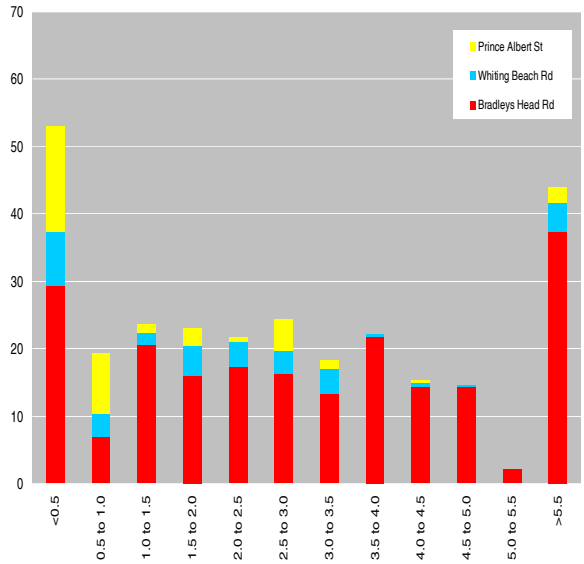


Figure 3.22: Average Duration of On-street Parking in Vicinity of TZ During a Normal Weekday (31 July to 2 August 2002)

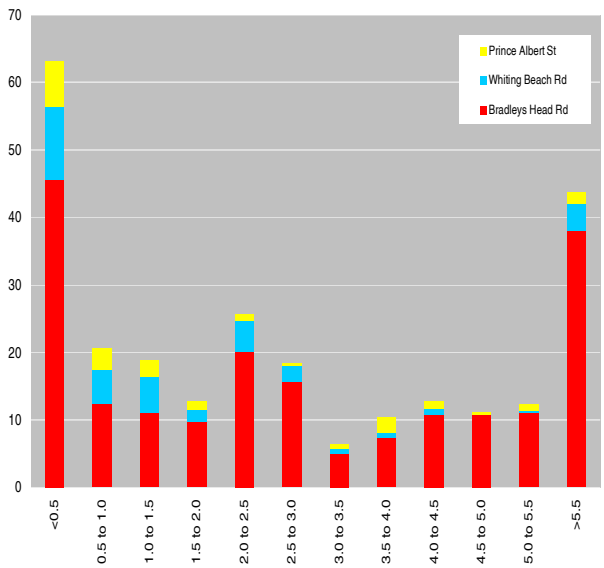


Figure 3.23: Average Duration of On-street Parking in Vicinity of TZ During a Normal Weekend (3-4 August 2002)

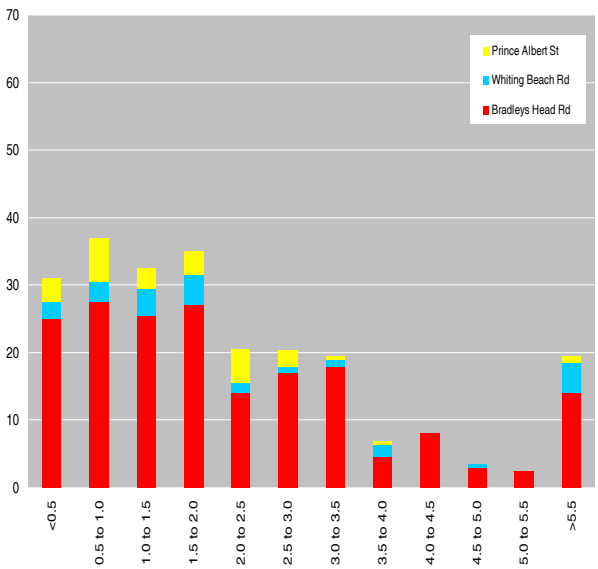
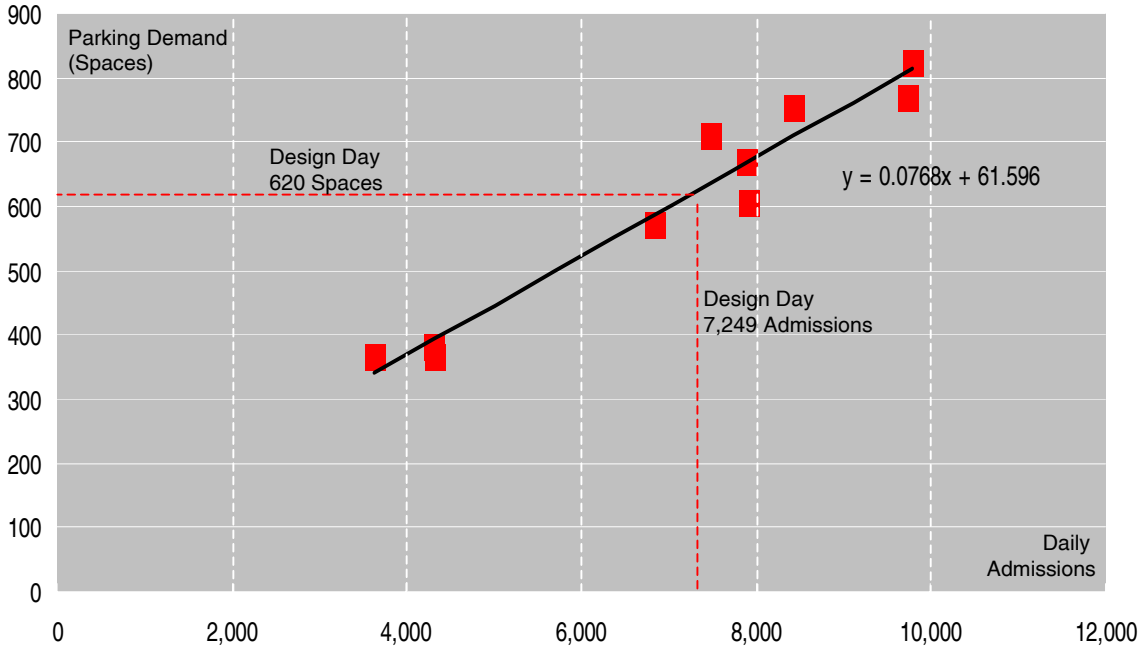


Figure 3.24: Total Parking Demand versus Daily Admission During Survey Days (17-21 July 2002 and 31 July – 4 August 2002)



Brochure fails to identify key public transport travel information such as ferry terminal number, which railway station to exit at or bus route numbers.

There is no heading to this section of the brochure. What is the following information about?

It should read something simple such as 'Transport' or 'How to visit us' and then follow with subheadings, 'Ferry', 'Bus'

Ticket is not strictly 'all-inclusive'. Covers entry fee bus and ferry travel. The language should be changed

1 Metroad Route Marker

Does not advise drivers about availability of parking or parking fees.

There may be an opportunity to manage car park demand by a message such as 'Come early or come late if you want a spot.

No mention of coach parking or disabled parking facilities.

Map does not provide key route markers such as Metroad 1 and Metroad 10. Route markers are an essential way-finding tool and should be shown.

Map is complicated by irrelevant information such as 'Crows Nest', skyline graphic and and black dots which mean nothing.

Drivers cannot access Zoo from some of the highlighted routes – so why are they highlighted?

Map does not include rail network connections to ferry terminal.

The key route from/to the northern beaches is cut off the map.

Roads do not show key exit ramp from Waringah Freeway to Falcon Street.

This presents a mixed message. Is this section about Way-finding or Bookings?

Website does not provide any additional Way-finding information.

Way-finding information on website is difficult to find. It is hidden under a section called 'Plan your visit' which deals also with group bookings.

Figure 3.25
Wayfinding Audit – Zoo Brochure
Taronga Zoo Master Plan Implementation

Map to Zoo is listed under 'Regional Map' link some three levels down from the home page. I mistakenly opened the 'Zoo Map' link first.

Map does not provide key route markers such as Metroad 1 and Metroad 10. Route markers are an essential way-finding tool and should be shown.

Map is complicated by irrelevant information such as 'Crows Nest', city skyline graphic and and black dots which mean nothing.

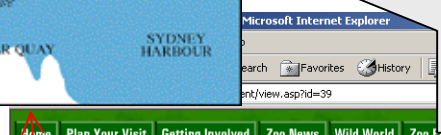
Drivers cannot access Zoo from some of the highlighted routes – so why are they highlighted?

Map does not include rail network connections to ferry terminal.

The key route from/to the northern beaches is cut off the map.

Roads do not show key exit ramp from Warringah Freeway to Falcon Street.

The map should be on a single way finding page with the way finding text.



This page presents a mixed message. Why is way finding information hidden amongst all these other messages and links.

Website fails to identify key public transport travel information such as ferry terminal number, which railway station to exit at or bus route numbers.

There may be an opportunity to manage car park demand by a message such as 'Come early or come late if you want a spot.

Should include the message that the Sky Safari is free with your Zoo admission and provides the most convenient and scenic way to travel from the bottom of the Zoo to the Top of the Zoo.

Overall layout is cluttered and confusing. The viewer is being presented with far too many competing messages.

Other Zoo websites have adopted a much more simplified approach.

Wayfinding is given a much higher priority.

Figure 3.26
Wayfinding Audit – Zoo Website
Taronga Zoo Master Plan Implementation

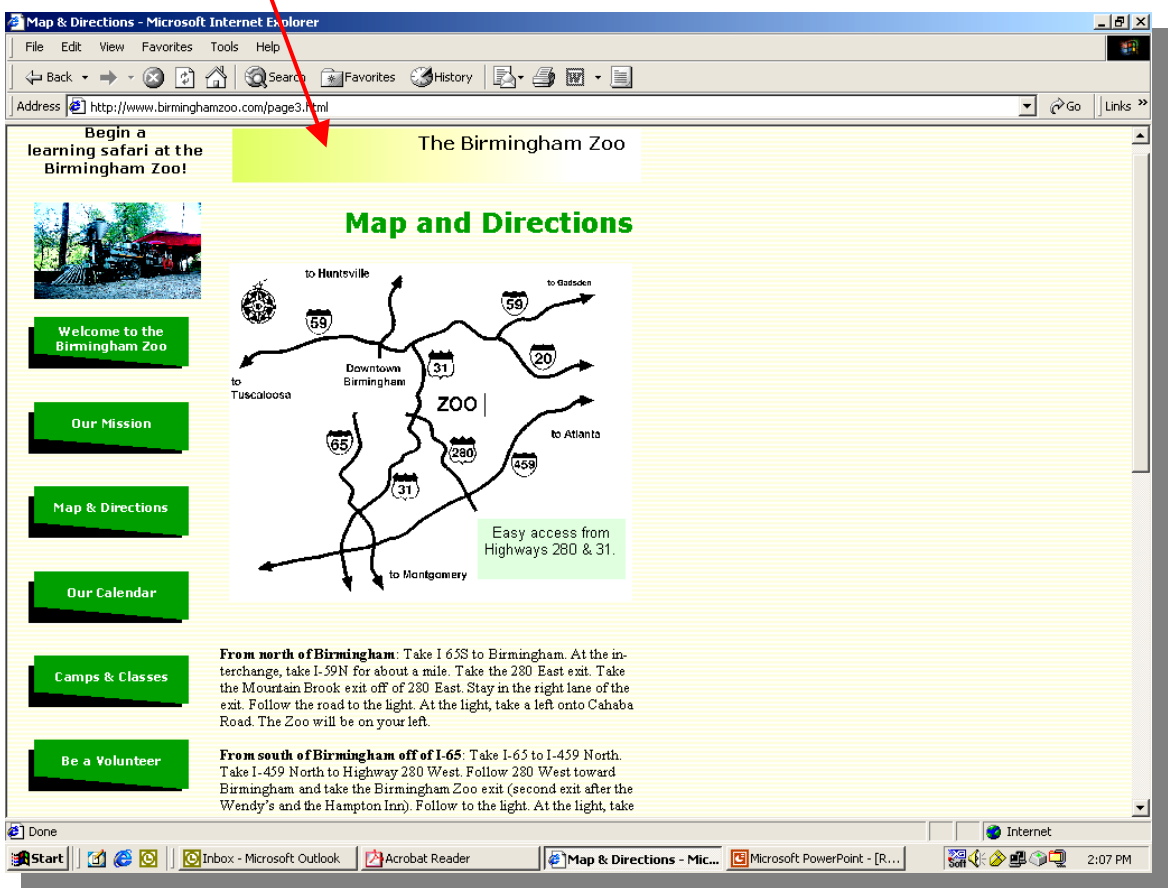
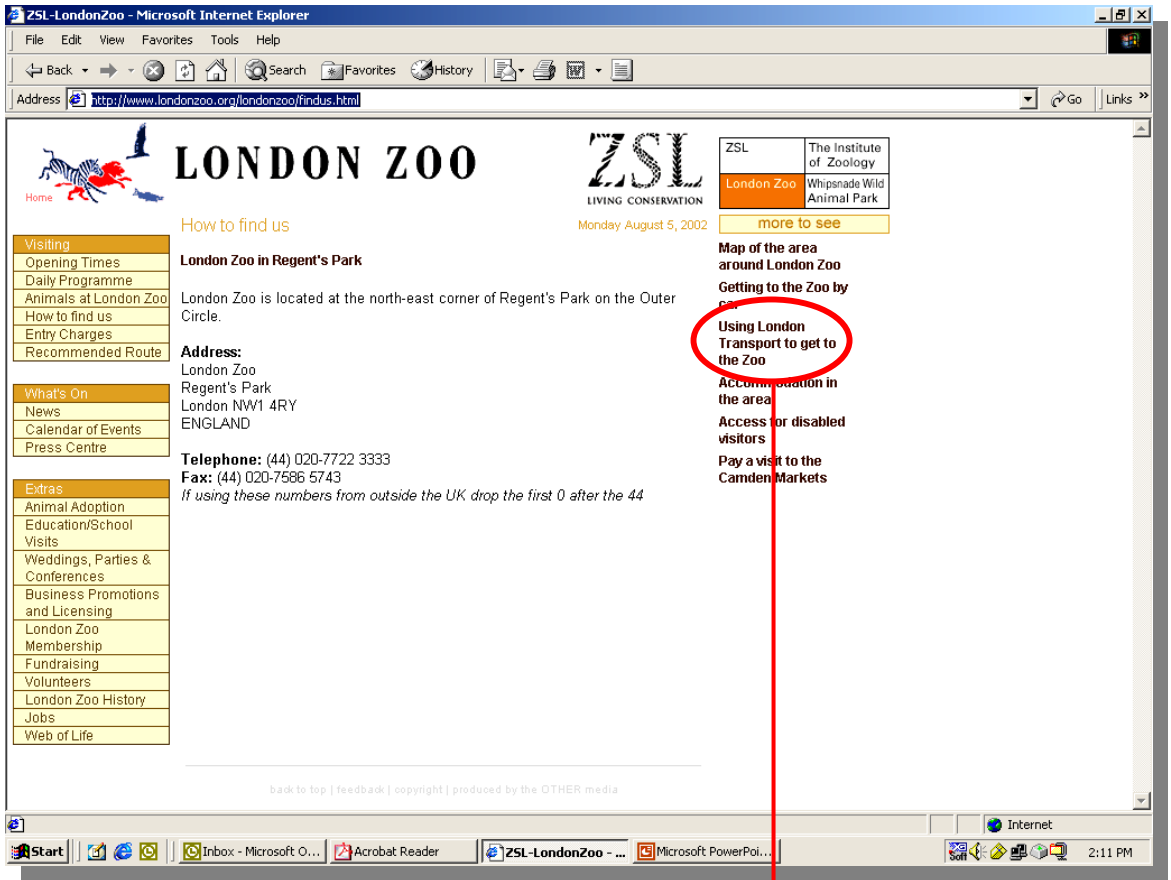


Figure 3.27
Wayfinding Audit – Sample Websites
Taronga Zoo Master Plan Implementation



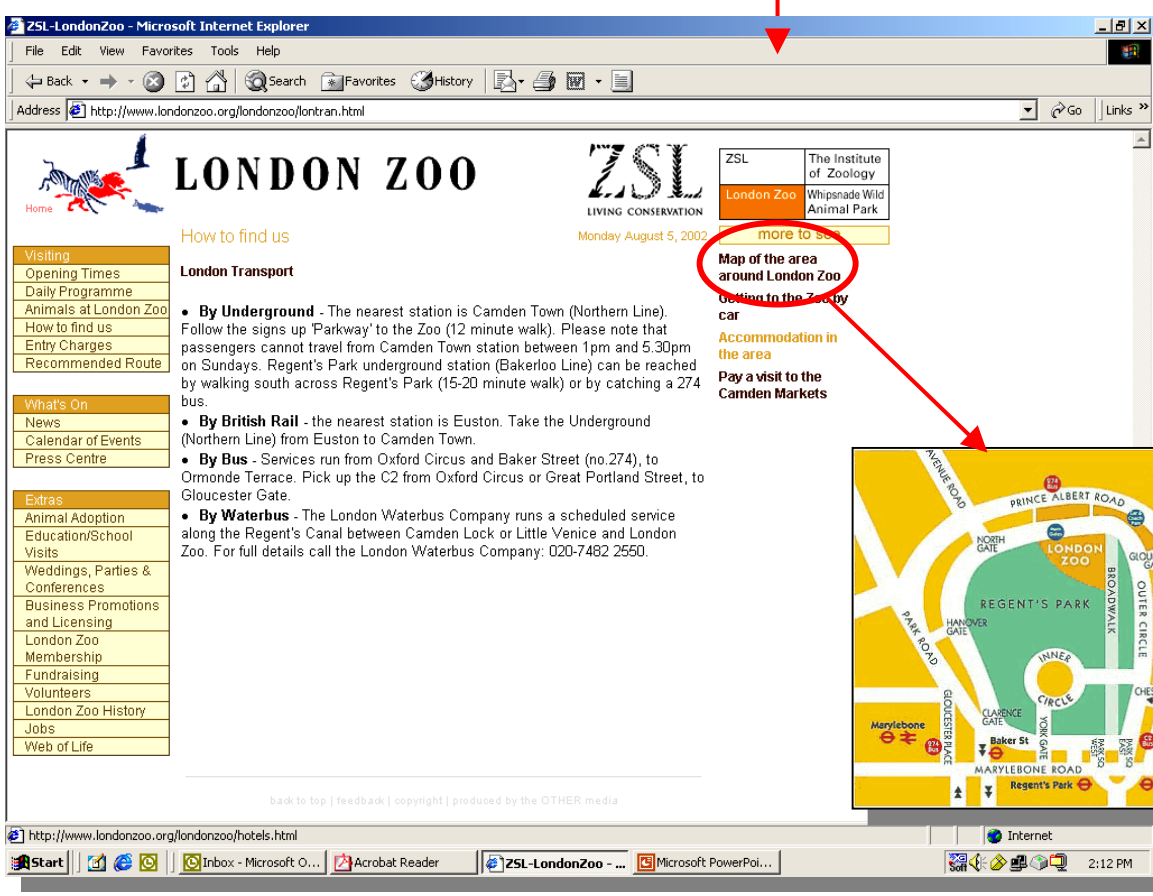
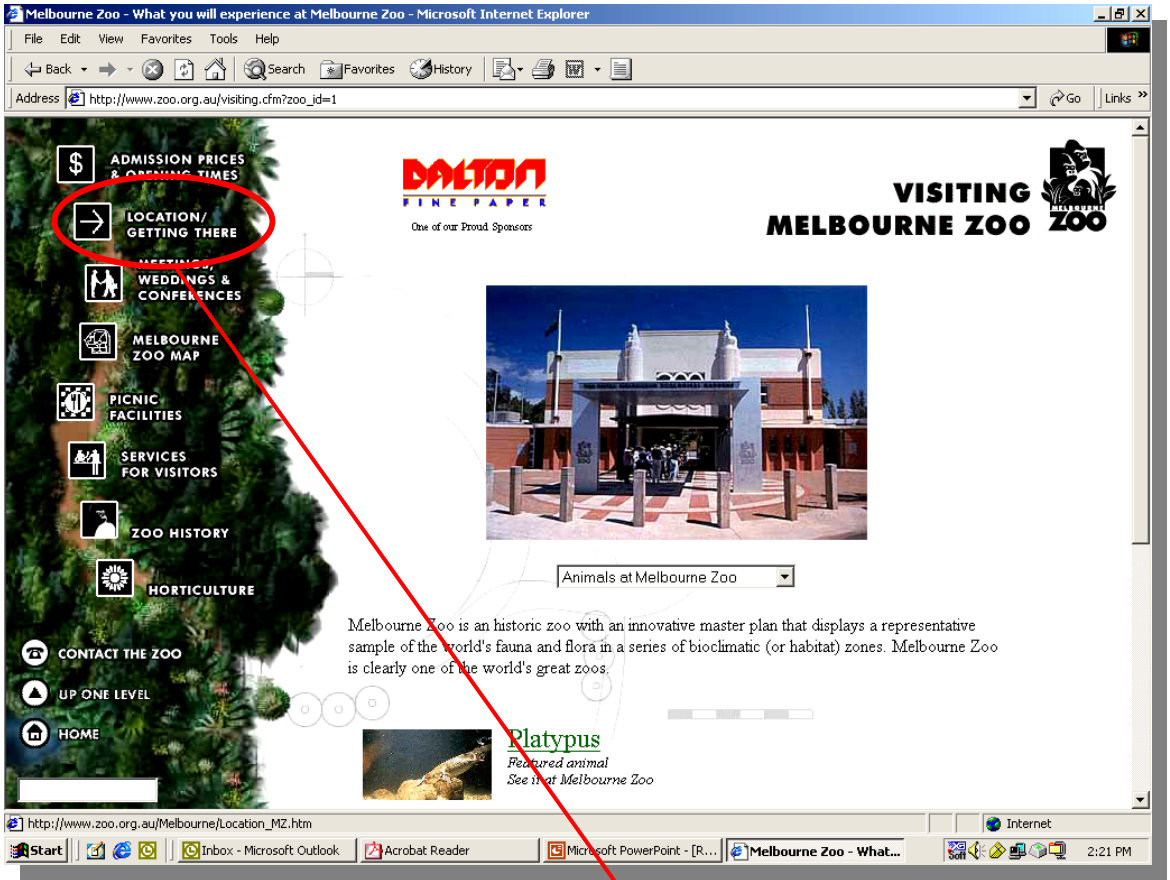


Figure 3.28
Wayfinding Audit – Sample Websites
Taronga Zoo Master Plan Implementation



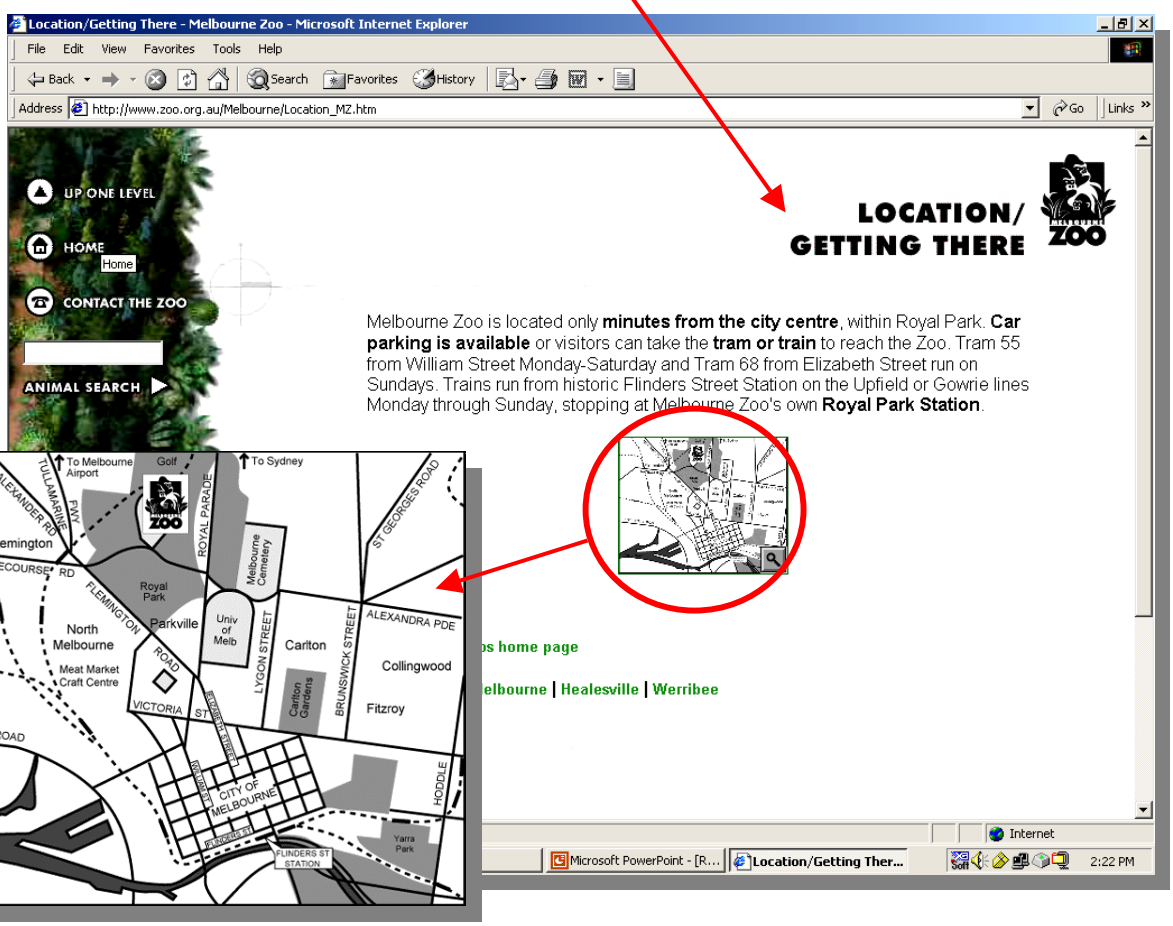


Figure 3.29
Wayfinding Audit – Sample Websites
Taronga Zoo Master Plan Implementation

4. Entry & Exit

4.1 TZ Entry Activity

Analysis of TZ entry transactions for the months of September 2001, January 2002 and April 2002 reveals the following distribution of admissions to each of the main TZ entry points:

- Education Centre (five percent);
- Lower Entry (two percent);
- Lower Sky Safari (32 percent); and
- Top Entry including Reptile Gate (61 percent).

The analysis reveals the minor role played by the LoE in collecting entry fees. This is a result of the popularity of the Sky Safari ride and TZ policy to encourage visitors to use the Sky Safari or bus service up to the ToE. As a result, on a design day (7,249) the LoE may process as few as 145 admissions (a significant proportion of which arrive by ferry and will have a *Zoopass* that entitles them to free entry). The future role and demand for the LoE should be reviewed as part of the Master Plan implementation process. Whilst the proposed easy access "ring road" circulation arrangement may reduce the demand for a LoE, MPI staging and commercial floor space requirements may warrant its continued existence and/or upgrade.

4.2 Sky Safari

4.2.1 Operations

The SkS is a distinctive feature of TZ that not only improves visitor access between TZ wharf and the ToE but also contributes to the overall TZ experience.

The SkS operates from 9.00 am to 5.00 pm daily and is covered in the general admission fee to TZ. There is easy wheelchair access at both terminals. A lift service at the ferry wharf terminal provides access for wheelchairs.

The SkS has 21 carriages. Each carriage is able to carry six people. It is also capable of transporting most wheel chairs.

The ride operates at an average speed of 2.5 metres per second. This speed may be increased, by up to 3.0 metres per second, when there is a demand to clear visitor queues and provided weather conditions are favourable. Assuming an average ride speed of 2.5 metres per second, the ride would cater for up to 700 passengers per hour.

Operation of the SkS may be interrupted by windy conditions. For safety reasons, the ride cannot be operated when wind speeds exceed between 12 and 18 metres per second, depending on wind direction.

When the SkS is closed, TZ activates the following contingency plan measures:

- signage is erected immediately at the top station and at the paths leading to the bottom station (see photos 2 and 3), indicating to visitors that the SkS is temporarily closed. This sign, on its own, is not particularly effective; accordingly
- TZ staff at the ferry wharf direct arriving visitors away from the SkS and onto awaiting Sydney Buses shuttle bus service (Route 238) up to the ToE; and/or
- TZ staff at the ferry wharf advise arriving visitors to walk up to the LoE, although, it is generally TZ policy to encourage use of the bus service.

The closure of the facility can cause considerable inconvenience for visitors (particularly children and the less mobile) that wish to access the ToE and main car park. The only alternatives are:

- to catch a bus from the ferry terminal;
- to walk up through the LoE; or
- in some special cases alternate transport up to the main entrance is arranged using TZ's private staff shuttle van.

4.2.2 Usage

The SkS is often at capacity during busy peak periods.

The majority of visitors accessing the SkS do so at the bottom station. These users consist of visitors who have just arrived by ferry or who have walked down through TZ and require a lift back to the ToE.

As visitors exit the top station of the SkS, signage indicating where information can be obtained is provided, however many visitors become confused once they pass the sign and are unable to find the visitor information centre.

The future role/relationship of the SkS to TZ will change in the proposed Master Plan. In future both end stations will be excluded from the future paid-areas of TZ and the SkS will take on a role as a free connection between the Ferry and the ToE. This would reduce some of the current congestion problems experienced at the bottom terminal as a result of entry transactions. However, even without entry transactions, the capacity limitations of SkS may still generate some congestion problems at the lower SkS station during peak periods.

4.3 Integrated Ticketing

General TZ admission rates can be seen in *Table 4.1* below.

Table 4.1: General TZ Admission Rates

Category	Entry Fee
Adults	$23.00
Children (4–15)	$12.50
Children (<4)	Free
Seniors / Pensioners	$14.00
Students	$16.00
Family (2 Adults + 2 Children)	$57.00

There are also group rates available offering between 20–45 percent discount, dependant on the size of the group.

The only integrated ticketing arrangement currently offered to TZ patrons is *Zoopass*. The *Zoopass* ticket was developed in partnership with Sydney Ferries and Sydney Buses. The *Zoopass* ticket includes return ferry travel, SkS or shuttle bus travel and TZ admission and is available for the independent traveller from Circular Quay.

The cost of a *Zoopass* is $28.40 for adults and $14.30 for children. A concession *Zoopass* fare is not available. Holders of concession cards are encouraged to purchase separate tickets for their travel and admission. TZ offers no family group tickets. Conversely, TZ's main competitor, Sydney Aquarium, offers a family group ticket at a cost of $61.50.

Prior to August 2001 TZ also offered an integrated rail travel and TZ entry pass called *Zoolink*. However, when the GST was introduced this integrated ticketing arrangement with CityRail was terminated.

Table 4.2 below provides a summary of the historical usage of integrated tickets. The analysis indicates that a *Zoopass* is used for some 32 percent of all paid admissions.

Table 4.2: Usage of Integrated Tickets For Last Two years

Ticket	Type	00/01	Percentage of Total Paid Admission	01/02	Percentage of Total Paid Admission
Zoopass	Adult	231,269	25%	234,437	26%
	Child	41,011	4%	51,958	6%
Zoolink	Adult	51,647	6%	7,512	1%
	Child	25,981	3%	5,444	1%
Total Integrated Tickets Sold		349,908	38%	299,351	33%
Total Paid TZ Admissions		912,195	100%	896,901	100%

Source: (TZ, 2002)

The interview surveys completed in July and August of 2002 revealed that up to 44 percent of interviewees arriving by ferry also used the rail system earlier in their journey.

In light of these numbers, consideration should be given to reintroducing a combined rail, ferry and TZ entry pass.

The major benefits to TZ of integrated ticketing are:

- Faster entry transactions at TZ;
- Visitors are only required to pay once in their trip rather than being required to constantly put their hand in their pocket. This helps to reduce the perceived cost of the travel on the day; and
- It encourages use of environmentally sustainable transport modes.

5. Internal Circulation

5.1 Pedestrian Access

Whilst not strictly part of PB's scope of work, the following observations relating to internal pedestrian access are offered:

- TZ may wish to consider specifying a minimum Level Of Service (LOS) for all pedestrian paths within TZ during construction and in the long-term.
- The concept of pedestrian LOS is based on the width of a path, the volume of pedestrians attempting to walk along it, the distances between pedestrians and their ability to change direction and speed without interfering with others. As a path gets more crowded the LOS will drop and people become frustrated. The concept of pedestrian LOS is illustrated in *Figure 5.1*.
- A minimum of LOS "C" may be appropriate for TZ. This represents a flow rate of 23-33 pedestrians per metre per minute and is normally a recommended design level for heavily-used transport terminals, public buildings or open space where severe peaking and space restrictions limit design feasibility;
- However, TZ may wish to raise the bar higher and adopt LOS "B" or even "A". It will depend on how much they are willing to compromise on the visitor experience.
- Other considerations are the movement patterns of visitors (i.e. frequent stopping, family groups, strollers, age and make-up of visitors). In this context, TZ may wish to consider LOS "C" or "B" as the minimum benchmark during construction and LOS "B" and "A" for the design of long-term works.

The above internal circulation issues have been addressed in Section 3.1 of the Public Domain Strategy prepared by DPWS.

5.2 Pedestrian Signage

It will be important that any future internal/external signage transition should be seamless, consistent and reflect TZ branding. The following observations are offered with regard to internal wayfinding:

- TZ staff are currently having problems in clearly identifying locations within TZ road network (e.g. when identifying meeting places, road closures or locating incidents). They need some sort of comprehensive path naming or junction naming system. Such a system would also greatly assist TZ visitors;
- as a visitor, orientating yourself on the map (which has no path names or junction names) can be a big problem. Not everyone can read or orientate a map;
- a common problem with some of the external signs is that they are too low to the ground. The same problem occurs internally. Internal signage needs to be above the crowd or they will not be seen;

- the colour schemes of signs are also a problem. The sign background must provide a strong contrast to the lettering. Pale yellow lettering on pale green background is not a good choice. The colour scheme will, however, need to be linked to TZ branding. White lettering on dark green background may be a better choice; and
- use of all capital letters on signs makes individual words harder to read and recognize. A combination of lower and upper case should be adopted for all TZ signs.

The above wayfinding issues have been addressed in Section 3.1 of the Public Domain Strategy prepared by DPWS.

5.3 Service Vehicle Access

The major service vehicle access requirements are:

- pest control;
- day to day operations; and
- animal transactions.

5.3.1 Pest Control and Day-to-day Operations

Pest control is undertaken using a Standard Hilux vehicle. In some cases, the pest control equipment can be carried around road closures.

Day to day operations are undertaken using motorbikes and two-axle four wheel drive and two wheel drive vehicles. There are in excess of 50 vehicles used in day-to-day operations on-site. A list of these vehicles, and the departments that use them, are provided in *Table C1* of *Appendix C*.

The Security vehicle, a Toyota Town Ace van, is used 24 hours a day every day of the year. The vehicle is used for day-to-day security patrols of internal roads, car parks and the TZ perimeter. In emergency situations (e.g. such as snake bite cases) the security van is used to transport the patient to the Royal North Shore Hospital. The vehicle travels an average of 20 kilometres per shift (three shifts) per day.

The Guest Services mini bus is used before 9am to transport staff and cash floats, as needed, to remote retail and ticket points from the ToE and Halstrom House. The process repeats from 3pm onwards as various retail and tickets points close.

Restocking, cleaning and function set-up activities, requiring on-site vehicle movements, are usually scheduled before 10am and after 3pm.

The garbage trucks do a round of the grounds before 10am and again between 1pm and 2.30pm.

Whilst these vehicles are relatively small in size and will not impact on internal path design requirements, consideration has been given to the following in the MPI:

- the out-of-service parking requirements of these vehicles as part of the urban design work for the master plan; and

- construction traffic conflicts in back-of-house areas.

In addition to internal operations, there a number of external operations carried out by TZ staff, including:

- Emptying of the garbage cans at the ferry terminal using the Zoo's garbage truck;
- Servicing of the Sky Safari plant located near the entrance to the chairlift;
- Transfer of equipment between the top and lower entrances of the Zoo;
- Maintenance of, and access to, the Zoo wharf and stormwater pumping station; and
- Revegetation and maintenance of bushland.

These external operations require the use of various TZ service vehicles (cars, utilities and trucks). At present there are no designated TZ parking facilities in proximity to the LoE or wharf.

Whilst public parking is currently available along the northern side of Athol Wharf Road between the Ferry Wharf and TZ LoE, on most days this parking is fully utilised by commuters and/or visitors, thereby limiting the Zoo's ability to undertake its operations. In the case of emergencies, it has been necessary to park TZ vehicles in unauthorised parking areas. To facilitate TZ operations, designated loading zones (sign type: R5-23) are required in the following locations:

- One space on the northern side of Athol Wharf Road adjacent to the LoE (see photo 9); and
- Two spaces on the northern side of Athol Wharf Road near the ferry terminal;

5.3.2 Animal Transactions

Animal transaction requirements are significant and may include use of the following:

- low loaders; and
- cranes (20 t to 100t maximum);

A survey of large animal transactions was undertaken between August 2001 and July 2002. The results of the survey are listed in *Table D1* of *Appendix D*. This data has been summarised in *Table 5.1* below. This data lists animal transactions, requiring vehicle transport, from/to the Veterinary and Quarantine Centre (VQC) and enclosures for the following reasons:

- medical treatments; and
- quarantine.

Table 5.1: Summary of VQC Animal Transactions (Aug 01 to July 02)

Month	Number of Transactions	Total Size of Transactions (kg)	Biggest Single Animal Transaction (kg)	Average Transaction Size (kg)
Aug-01	4	156	62	39
Sep-01	4	270		67
Oct-01	4	83	24	21
Nov-01	11	1058	750	96
Dec-01	8	158	24	20
Jan-02	7	194	44	28
Feb-02	8	198	109	25
Mar-02	5	154	106	31
Apr-02	3	79	69	26
May-02	7	322	97	46
Jun-02	2	108	68	54
Jul-02	6	170	60	28
Survey Period Monthly Averages	**5.75**	**245.9**	**129.0**	**40.1**

Source: Taronga Zoo VQC Daily Reports

This above list in *Table 5.1* does not include:

- animal transactions involving the transport of large animals to or from TZ; and
- large animal anaesthetics on-site (where there is no transfer of the animal to VQC).

The really large animals (i.e. Kodiak Bears, Giraffes, Elephants) are not transferred to VQC for procedures, because of the logistical difficulties in transporting such animals. Instead, procedures are mostly done on-site.

The duration and timing of large animal transactions is estimated to include:

- generally one to two days of conditioning (In case of large animals conditioning may take require up to two weeks); and
- four hours to secure the animal (depends on the animal behaviour).

The transaction usually occurs first thing in the morning or last thing at night and is linked to the estimated arrival time at the destination. Moving a 4t elephant requires a low loader and crane. Elephants are mostly untrained and are usually transported and lifted into their enclosure whilst still caged. The master plan arrangements will be designed to provide good access for large vehicles in the vicinity of the big animal enclosures.

5.3.3 Emergency Vehicle Access

The NSWFB have three major appliances likely to access the site in an emergency:

- "Firepak" FP3500 (local Mosman fire truck);
- "Varley" Type 5 Urban Pumper (relief fire truck – bigger than the Firepak); and
- "Bronto Skylift" F37 HD2000 Aerial Ladder Platform.

The current accessibility of the site for emergency vehicles is illustrated in *Figure 5.2.* Some areas of the site are not easily accessible to fire all NSWFB appliances. This is an issue for TZ's OH&S committee to address. However, the urban design of any new precincts in TZ should all provide for NSWFB appliance access. A listing of the clearances and dimensions of the appliances likely to require access TZ are presented below.

The "Varley" dimensional requirements are:

- Height = 3.2m
- Width = 2.5m
- Length = 7.8m
- Weight = 16 tonne
- Kerb to Kerb turning radius = 14.6m
- Wall to wall turning radius = 16.1m

As a minimum, all new internal paths will be designed to accommodate the turning paths of this vehicle. A standard Austroad Turning Path template for an 8.8m Service Vehicle (absolute minimum turning radius of 12.5m) should provide sufficient clearances for the NSWFB "Varley" Type 5 Urban pumper appliance.

The "Bronto" is sometimes used by NSWFB to evacuate the SkS. It has a 37 metre boom. The boom on this vehicle can drop 10 degrees below horizontal, 75 degrees above and has a 360-degree rotation. It seats two fire-fighters and can rescue up to eight people on the ladder at any one time.

The "Bronto" dimensional requirements are:

- Height = 3.85m
- Width = 2.55m
- Length = 11.8m
- Weight = 26.5 tonne
- Kerb to Kerb turning requirements = 25.12m

Bronto access will need to be accommodated should TZ decide to maintain NSWFB participation in TZ's SkS evacuation procedures. This will be a decision of TZ's OH&S committee. If NSWFB remains part of evacuation procedures, the sections of path

immediately under the SkS should be widened to at least 5.8 metres so that the “Bronto” can deploy its outriggers.

The above internal circulation issues have been addressed in *Section 3.1* of the Public Domain Strategy prepared by DPWS.

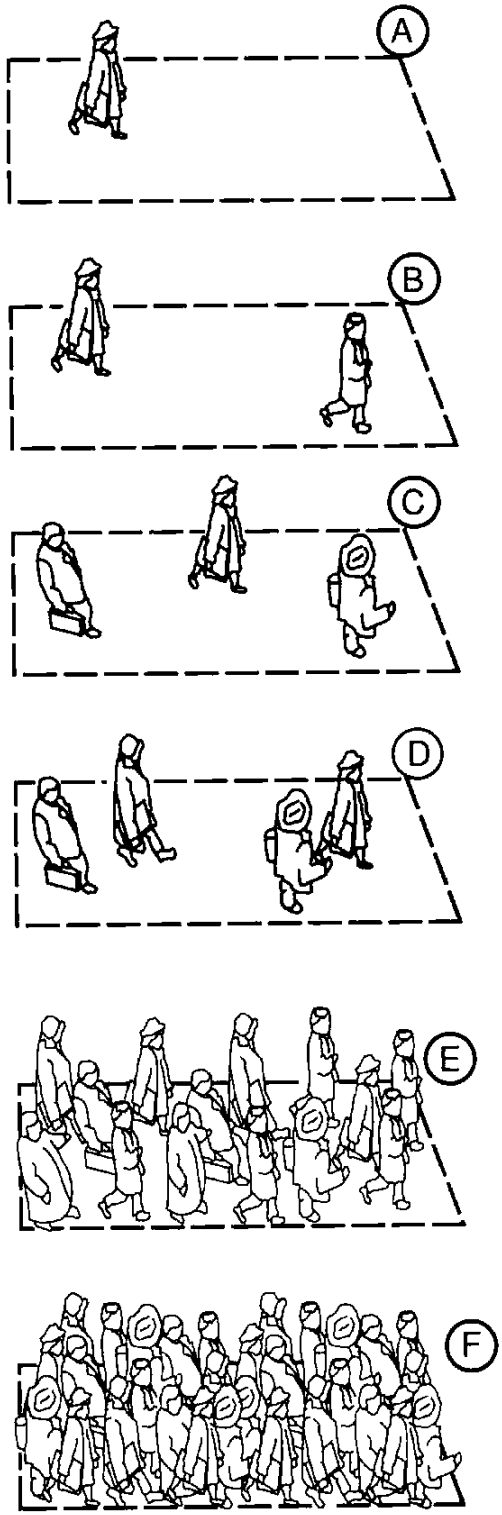
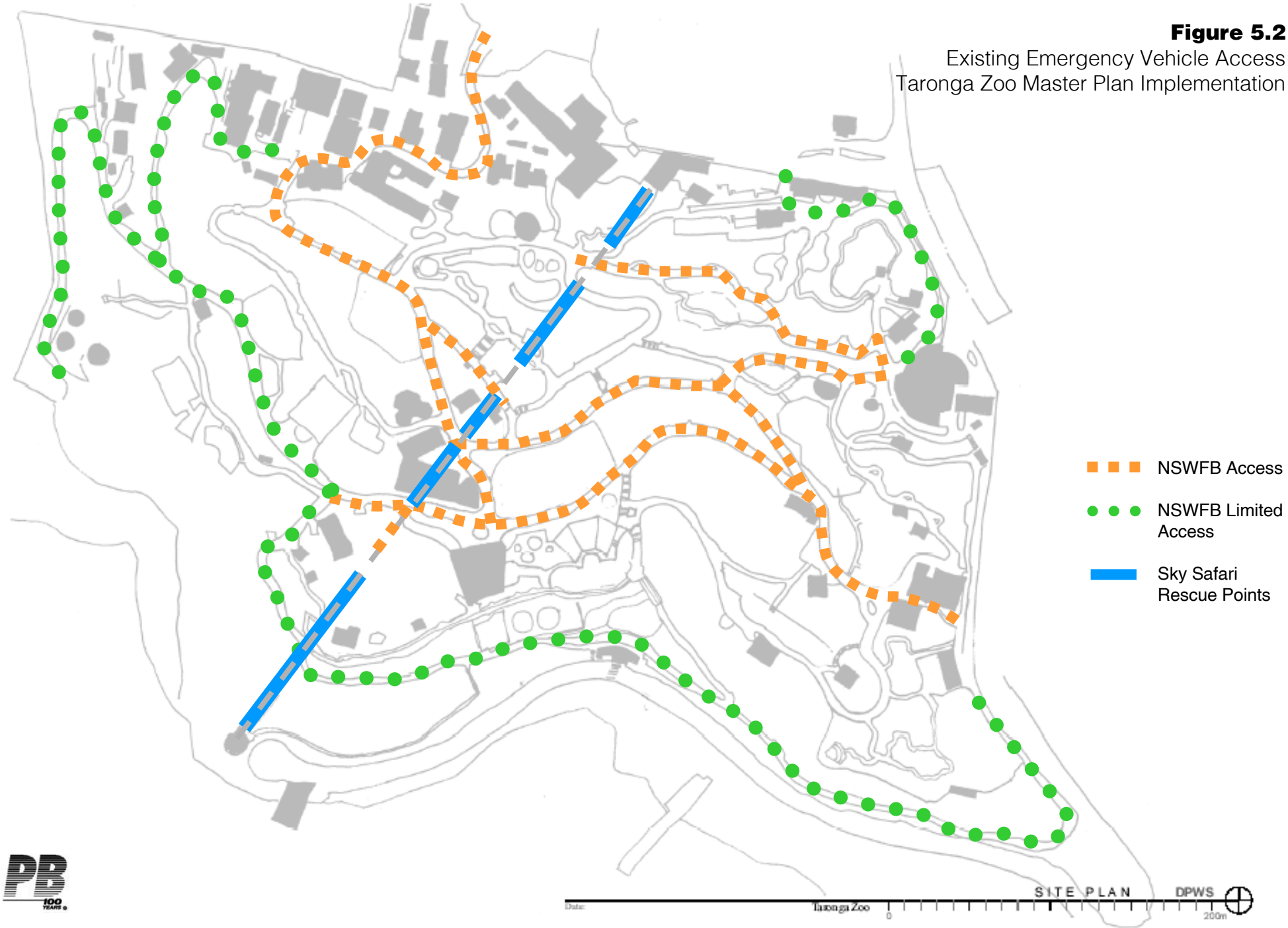


Figure 1.5 Illustration of Walkway Levels of Service

Source:
Austroads Guide to Traffic Engineering Practice, Part 13. Based on work by Fruin, 1971.

Figure 5.1
Pedestrian LOS Definitions
Taronga Zoo Master Plan Implementation

Figure 5.2
Existing Emergency Vehicle Access
Taronga Zoo Master Plan Implementation



6. MPI Impacts

6.1 TZ Master Plan Implementation Program

The TZ MPI program is presented in *Figure 6.1*.

The implementation scenarios, based on June/July snapshots, are presented in *Figures 6.2 to 6.6*.

The various transport and parking issues arising from the implementation program are discussed in the following sections.

6.2 Admission Growth

TZMP forecasts a growth in annual admissions of 22 percent over the next 10-years (TZ, 2002). The forecasts are presented below in *Figure 6.7*.

In addition to the 'Paid' admission forecasts presented in TZMP, 'Free' and *Zoo Friends* admission forecasts have also been added to reflect all travel requirements. For the purpose of this strategy, it has been assumed, based on analysis of last four years of admission data (see *Figure 2.2*), that their contribution to total visitation levels will continue to remain constant at 14 percent and 7 percent respectively.

6.3 Backyard to Bush

TZ is currently constructing the new B2B exhibit. This exhibit forms the first stage of the TZMP. Construction commenced in April 2002 and is due for completion in April 2003.

The DA conditions (ref: DA 301-10-2001) imposed by planning NSW restrict on-site construction activities to:

- 7am to 4pm (Monday to Friday); and
- 7am to 1pm (Saturdays).

All deliveries to the site must occur between 7am and 4pm (Monday to Friday).

The major traffic impacts of the construction work are:

- displacement of some TZ staff parking onto Bradleys Head Road; and
- construction parking on Bradleys Head Road in the vicinity of the site entry.

Parking surveys undertaken along Bradleys Head Road in July and August would suggest that by 9:00 am, TZ operations and construction activities are generating between 20 and 30-parked vehicles along Bradleys Head Road in the vicinity of the site entry (see photo 32).

School students arriving by coach are expected to be major target audience for B2B. Discussions with TZ suggest that it may be operated as a stand-alone educational visit for students. However, the current precinct plans do not address the issue of how the students will be delivered to the precinct. The major transport options are:

- deliver students by coach to the EdC. Students then walk through TZ to B2B. To support this strategy, the link between the EdC would need to be strengthened through urban design; or
- coaches deliver students directly to the Bradleys Head Road entry to B2B. Coaches would then return to a coach parking area in the main car park. This is the preferred option. To support this strategy, the design of B2B should be expanded to include a coach u-turn facility with set-down and pick-up area immediately adjacent to the precinct entry.

The student arrival/departure arrangements for B2B will need to be implemented prior to its opening.

6.4 Education Centre

The EdC is currently undergoing improvements works. These will be completed shortly.

The EdC focuses on lessons with animals and face-to-face learning. Lessons generally last between 40 and 90 minutes.

In 2001/2002 the EdC delivered programs to 86,400 students, visitors and wider community. This total included 66,870 students visiting TZ as part of school excursions. The majority of school groups (some 60 percent) arrive by coach. The peak visitation times are:

- March/April;
- May/June; and
- October/November (heaviest).

During the October/November period, up to 25 schools (some 2,500 students) may attend on a heavy day. Assuming that 60 percent come by coach and a coach holds 45 students, there could be as many as 30 coaches visiting TZ at various times on a peak day.

The peak arrival times for coaches are between 9:15 am to 10:15 am. The peak departure times are between 1.00 pm and 2.30 pm (depends on distance of school from TZ or Coach Operator resourcing requirements).

Students are dropped off at the main entrance (bus turning area) or in the informal coach parking area in the car park (see photos 22 and 23).

Set-downs in the bus turning area is problematic for the following reasons:

- coach/bus conflicts;
- congestion at the entry;

- it blocks Sydney Buses access; and
- students spill-over into the car park access roads adjacent the narrow footpath (see photo 36).

Once the children alight the coaches they then:

- assemble at a meeting point;
- carry out a roll-call; and
- proceed to the EdC entry.

These student-related activities will need to be considered in the redevelopment strategy for the car park. Specific issues that should be addressed in the car park redevelopment strategy include:

- Location of temporary coach parking facilities during redevelopment of the car park;
- The proximity of future coach parking to the EdC; and
- The appropriate quantum of coach parking spaces and flexible overflow parking arrangements for peak periods.

Completion of the EdC works will free up the Contractors compound located in the staff car park. This compound will be utilised continuously during the MPI program for the following projects:

- Food & Beverage;
- Car Park Precinct (Stage 2);
- Entry Precinct (Stage 2); and
- African Savannah.

6.5 Food & Beverage Precinct

Construction of the F&B precinct is scheduled to commence in February 2003 and be completed by November 2003.

The work includes the excavation of some 4,350 cubic metres of soil and rock, most of which will be transported off-site. Assuming an average truck capacity of 6 cubic metres (which allows for bulking), an excavation period of up to 3 months and a 6-day working week, this work is estimated to generate up to 60 truck trips (2-way movements) per working day in the first 3 months of the project. Converted to car equivalent movements (assuming a truck to car equivalent conversion factor of 1.5), this represents up to 180 car equivalent movements (i.e. 60 x 1.5 x 2 = 180). The Annual Average Daily Traffic flows along Bradleys Head Road (south of Middle Head) are more than 5,240 vehicles per day (RTA, 1999). The proposed traffic movements represent less than 3.4 percent of daily traffic flows. Provided that truck movements are restricted to the times and routes specified in the DA conditions, the extraction activities are not expected to have any significant impact on local residents.

Later in the project, the construction of F&B precinct will require delivery of up to 350 cubic metres of concrete. The single largest concrete pour is expected to be a concrete slab requiring some 200 cubic metres of concrete. Assuming an average concrete truck capacity of 6 cubic metres, this pour would generate less than 34 concrete truck trips (2-way movements) on the day of the pour. Converted to car equivalent movements (assuming a concrete truck to car equivalent conversion factor of 1.5), this represents up to 102 car equivalent movements (i.e. 34 x 1.5 x 2 = 102). The proposed traffic movements represent less than 1.9 percent of daily traffic flows along Bradleys Head Road.

The DA conditions (ref: 362-12-2001) imposed by Planning NSW restrict construction activity on-site to:

- 7am to 4pm (Monday to Friday); and
- 7am to 1pm (Saturdays).

All deliveries to the site are restricted to 7am to 4pm (Monday to Friday).

The F&B contractor will take over the EdC work compound in the main staff car park. Construction access will be via the staff car park, back-of-house areas and Taronga Boulevard. Taronga Boulevard will remain an active visitor access road to key TZ exhibits such as the Bird Show during this same period. This construction access arrangement raises a number of internal circulation issues, including:

- Management of construction traffic and pedestrian conflict points;
- Management of construction traffic speeds along pedestrian routes; and
- Curfews for construction traffic access along Taronga Boulevard during the Bird Show events (daily at 12.30pm and 3pm).

The work site is located underneath the alignment of the Sky Safari. Closures of sky safari will be required at certain times to facilitate construction. It is essential that these scheduled impacts on sky safari are:

- Restricted to times outside the peak Sky Safari usage times (between 9am and 1pm);
- Coordinated to coincide with AEP closure requests;
- Communicated in advance to Guest Services staff at the upper and lower entrances; and
- Supported by a scheduled increase in bus services between the Wharf and ToE.

Due to access constraints in the back-of-house areas behind, some deliveries of large items (e.g. steel members) may need to be made from Bradleys Head Road via B2B and Taronga Boulevard. These deliveries should be completed before 9am.

The staging compound in the staff car park will continue to restrict staff parking to less than 80 spaces. Some minor overflow TZ staff parking into the adjacent visitor car park will continue.

The site is expected to have a base workforce of 50 that would peak at 65 during concrete pours. Construction workers travelling to the site by car are most likely to park in the following locations in and around the site:

- The staff and visitor car park; and potentially
- The commuter spaces along Athol Wharf Road.

The impact of construction parking during a typical weekday will be minimal due to the reduced demands for visitor parking. However, the impacts on weekends and during school holidays may be higher. It is essential that wherever possible, activities generating high workforce requirements (e.g. concrete pours) are restricted during these times. The issue of MPI workforce parking will be discussed in more detail later in *Section 6.12*.

6.6 Asian Elephant Precinct

The AEP is scheduled to commence in February 2003 and be completed by February 2005.

Work on the precinct is expected to involve excavation of some 6,000 cubic metres of soil and rock, the majority of which will be transported off-site. Rock excavation work will be slow and is expected to last some 6 months. Assuming an average truck capacity of 6 cubic metres (which allows for bulking), an excavation period of up to 6 months and a 6-day working week, this work is estimated to generate up to 41 truck trips (2-way movements) per working day in the first 6 months of the project. Converted to car equivalent movements (assuming a truck to car equivalent conversion factor of 1.5), this represents up to 123 car equivalent movements (i.e. 41 x 1.5 x 2 = 123). The proposed truck movements represent less than 2.3 percent of daily traffic flows on Bradleys Head Road. Provided that truck movements are restricted to the times and routes specified in the DA conditions, the extraction activities are not expected to have any significant impact on local residents.

This extraction work on AEP will initially coincide, for a short period (3 months), with extraction work on the F&B precinct. The combined impacts of both works during this period could be up to 303 car equivalent movements per day. This volume of traffic represents up to 5.8 percent of daily traffic flows on Bradleys Head Road.

Later in the project, the construction of the AEP and Hillside Link will require delivery of up 2,250 and 750 cubic metres of concrete, respectively. The single largest concrete pour is expected to be the Elephant Moat slab that requires some 230 cubic metres of concrete. Assuming an average concrete truck capacity of 6 cubic metres, this pour would generate less than 40 concrete truck trips (2-way movements) on the day of the pour. Converted to car equivalent movements (assuming a concrete truck to car equivalent conversion factor of 1.5), this represents up to 120 car equivalent movements (i.e. 40 x 1.5 x 2 = 120). The proposed truck movements represent less than 2.2 percent of daily traffic flows along Bradleys Head Road.

The DA conditions (ref: DA 374-12-2001 and DA 51-3-2002) imposed by planning NSW restrict on-site construction activities to:

- 7am to 4pm (Monday to Friday); and

- 7am to 1pm (Saturdays).

All deliveries to the site must occur between 7am and 4pm (Monday to Friday).

This work is being undertaken in conjunction with the final stages of the F&B precinct works.

Initially, construction access to the site will be from Bradleys Head Road via existing service roads that loop around B2B and the lower seal pools to approach the precinct from the east. However, following completion of the F&B facility in August 2003 and prior to commencement of the ACP in March 2004, the AEP construction access will change to an approach via the staff car park, back-of-house areas and Taronga Boulevard.

The site is expected to employ the following peak workforce levels during the course of the project:

- 2003 – Up to 30 workers; and
- 2004 – Between 80 and 90 workers.

The above peaks are most likely to occur during concentrated activities such as concrete pours. Construction workers travelling to the site by car are most likely to park in the following locations in and around the site:

- The staff and visitor car park; and potentially
- The commuter spaces along Athol Wharf Road.

The internal circulation issues raised by this new construction access arrangement have already been discussed in F&B. Any management strategies or access curfews developed for F&B would need to apply to AEP construction access also.

The AEP is located under the alignment of Sky Safari and is likely to have the greatest potential impact on Sky Safari operations. The issues related to Sky Safari closures have already been covered in the review of F&B.

6.7 Car Park Redevelopment

Although a major redevelopment of the TZ car park was not included in the original Master Plan, it became clear during the integrated MPI planning process that a major upgrade was essential. Earlier in *Section 3.3* of this report, the current deficiencies of the car park are discussed. These deficiencies contribute to a poor visitor arrival experience. Later in *Section 8* of this report we will discuss the future visitor and staff needs driving redevelopment of the TZ car park.

Whilst redevelopment proposals for the car park will be subject to a feasibility study and detailed design, it is most likely that construction would have to be undertaken in 3 stages (CP1 to CP3) as part of the new TZ entry experience. Work on the car park is scheduled to commence in March 2004, with stage 2 being completed by December 2005. Commencement of work on stage 3 will be delayed until January 2007 to allow completion of the eastern side of the ToE plaza.

CP1 is likely to involve the following:

- Excavation of the existing coach parking area and strip of bushland between the staff car park and main car park to the level of the staff car park and lower area of the main car park; and
- Construction of two new levels of parking.

The impact of this stage on parking supplies will be:

- Loss of up to 10 informal coach parking spaces or 30 visitor spaces. Coaches will have to be temporarily relocated to the informal parking area at the Whiting Beach Road end of the car park;
- The relocated coach parking will reduce visitor-parking capacity during a typical weekday by up to 30 spaces. However, the overall demand for parking is less during these times. On weekends and public holidays, the impacts of losing the equivalent of 30 informal spaces will be greater; and
- 20 to 30 staff parking spaces may be lost to provide a construction staging area for the car park work.

This stage of car park redevelopment will have the lowest potential impact on parking supplies. It is therefore essential, that the parking yields from this first stage be maximised to assist in offsetting temporary parking losses to be incurred during the construction of later stages.

CP2 will involve an extension of the CP1 parking structure deck over the staff car park to generate additional spaces. During this stage, the entire staff car park will be lost to either construction or storage. Staff parking will be relocated to the new parking structure completed as part of CP1 or the existing informal areas of the visitor car park. The impact of this stage on parking supplies will be:

- A loss of 110 staff parking spaces;
- The relocated coach parking will reduce visitor-parking capacity during a typical weekday by up to 30 spaces. However, the overall demand for parking is less during these times. On weekends and public holidays, the impacts of losing the equivalent of 30 informal spaces will be greater; and
- In addition, some 10 to 20 spaces will be lost to provide a staging area in the lower car park for the first stage of redevelopment of the new entry plaza.

However, the parking losses in CP2 will be offset by whatever parking capacity is generated from the construction of CP1. Assuming that the area could generate up to 7,200 sqm of new parking area (say 2 levels of 3,600 sqm), based on an average parking space yield of 1 space per 30 sqm (90 degree parking layouts), CP1 may generate as much as 240 spaces to offset the loss of spaces experienced during construction of CP2.

At the completion of CP2, the car park redevelopment could generate some 400 new spaces. This capacity will be essential during the construction of CP3 during which the greatest impacts on parking supplies are likely to be felt. The final impacts on parking supplies cannot be estimated until such time as a detailed parking concept and construction staging plan is prepared. The development of these plans will need to be fast-tracked in the MPI program.

CP3 will involve redevelopment of the remainder of the car park to include:

- Formalisation of the parking areas in the northern sections of the car park;
- Provision of formal coach parking facilities;
- Excavation of rock to permit an extension of the CP1 car park deck. The extent of excavation will depend on the car park design and the parking space yields that can be achieved during stage CP1 and CP2; and
- Construction of new Sydney Buses and taxi facilities;

Table 6.1 below provides a summary of the likely impacts of car park redevelopment on the overall supply of TZ car parking.

This work will need to be staged so that:

- the loss of parking at any one time is minimised;
- Sydney Buses operations can continue uninterrupted; and
- In addition, the informal coach parking areas at the northern end of the car park will need to be maintained until such time as the formal coach parking facility is completed.

Table 6.1: Estimated Car Parking Supplies During Car Park Construction

Phase	Existing Visitors	Existing Staff	Existing Coaches (1)	New Spaces (2)	Totals
Existing	510	110	30	-	650
2004 (CP1 construction)	510	50	-	-	560
2004 (At completion)	510	80	-	240	830
2005 (CP2 construction)	490	-	-	240	730
2005 (At completion)	510	-	-	400	910
2007 (CP3 construction)	200	-	-	400	600
2007 (At completion)	-	-	-	975	975

Notes

1) All figures are expressed in terms of car space equivalents. One coach spaces is assumed to be equivalent to 2.5 car spaces.

2) Parking space yields from each stage are based on concept footprints and an assumed yield of 1 space per 30 square metres of new car park development.

6.8 ToE Plaza Redevelopment

The redevelopment of the ToE will be undertaken in two stages. This work on the ToE will commence in February 2005 with car park improvements and is scheduled for completion by December 2006.

E1 will involve redevelopment of the western half of the new plaza, including the ultimate ticketing arrangements, in the vicinity of the upper Sky Safari station. The work will

impact on some parking (10 to 20 spaces) adjacent to the front entrance. The proposed construction staging area may block pedestrian linkages between the bus u-turn facility and the EdC. It will be important to maintain pedestrian access (minimum 2.4m wide) around any construction staging areas penetrating into the car park. With the completion of E1 in January 2006, both ends of Sky Safari will discharge into unpaid areas of TZ.

E2 will involve redevelopment of the eastern half of the plaza and pedestrian connections to the main TZ internal ring road. The work is scheduled to commence in January 2006.

6.9 Lower Entry

The LoE currently plays a minor role as an entry experience for TZ visitors. As discussed previously, this is a result of the popularity of the Sky Safari ride and TZ policy to encourage visitors to use the Sky Safari or bus service to the ToE. As a result, less than two percent of visitors enter via the lower entry. On a design day (7,249 admissions) the LoE may process as few as 145 admissions (a significant proportion of which arrive by ferry and will have a *Zoopass* that entitles them to free entry).

However, due to construction associated with car park and entry redevelopment works between 2004 and 2008, there will be significant impacts on the quality of the TZ ToE visitor experience. Conversely, by 2007, much of the MPI exhibit related works in the southern part of TZ would have been completed.

Accordingly, the integrated MPI plan places increased emphasis on the role of the lower entry during the later stages of the MPI, particularly as an exit point. The MPI includes completion of the following projects by 2005:

- The Hillside link building;
- An upgrade of the LoE including a new decompression zone; and
- Construction of a widened pedestrian footpath along the southern edge of Athol Wharf Road between the LoE and the Ferry Wharf.

The potential impacts of the LoE precinct works during 2004 will be:

- Short-term loss of commuter parking along the southern kerb of Athol Wharf Road during footpath widening. Parking on the southern kerb will need to be removed to provide a minimum 2.4m wide temporary footpath around construction activities. The work should be staged as much as possible so that impacts on parking are localised;
- Construction workers parking along Athol Wharf Road and in the main TZ car park;
- Visitors will not be permitted to enter TZ at the LoE. All visitors arriving by Ferry will be required to access TZ via SkS or bus to the ToE. Temporary signage will need to be erected at the Wharf to warn visitors and additional bus services provided to cope with the increased travel demands to the ToE; and

- In addition, visitors will not be permitted to exit via the LoE. During the closure of the LoE, visitors will be required to return to the ToE to catch SkS or a bus down to the wharf or to exit via the pedestrian path down to the lower SkS terminal.

The exiting of the visitors via the lower SkS terminal may be problematic. The exit path is narrow and exiting visitors will be in conflict with visitors attempting to access SkS. This temporary arrangement will need to be monitored during initial operation and may need to be closed completely if it proves to be too disruptive to the visitor entry/exit experience. If the exit to the lower SkS terminal were closed, this would place increased pressure on the alternate access arrangements such as:

- The pedestrian connections between the lower and upper sections of the main ring road. Forcing all visitors to walk back to the ToE may impact negatively on a visitor's internal circulation experience;
- The bus service between the Wharf and ToE; and
- Sky Safari.

6.10 Australian Coastline

The ACP is scheduled to commence in March 2004 and be completed by February 2007.

Work on the Precinct will involve excavation of some 4,900 cubic metres of soil and rock, over a 6-month period, most of which will be transported off-site. Assuming an average truck capacity of 6 cubic metres (which allows for bulking), an excavation period of up to 6 months and a 6-day working week, this work is estimated to generate up to 34 truck trips (2-way movements) per working day in the first 6 months of the project. Converted to car equivalent movements (assuming a truck to car equivalent conversion factor of 1.5), this represents up to 102 car equivalent movements (i.e. 34 x 1.5 x 2 = 102). The Annual Average Daily Traffic flows along Bradleys Head Road (South of Middle Head) are more than 5,240 vehicles per day (RTA, 1999). The proposed traffic movements represent less than 1.9 percent of daily traffic flows. Provided that truck movements are restricted to the times and routes specified in the DA conditions, the extraction activities are not expected to have any significant impact on local residents.

This extraction work may coincide, for a short period, with concrete deliveries for the Asian Elephant and Hillside Link.

Later in the project, the construction of the ACP will involve concrete deliveries. The single largest pour on-site is estimated to be 93 cubic metres (a 100mm slab for the substructure of the seal performance theatre). Assuming an average concrete truck capacity of 6 cubic metres, this pour would generate less than 16 concrete truck trips (2-way movements) on the day of the pour. Converted to car equivalent movements (assuming a concrete truck to car equivalent conversion factor of 1.5), this represents up to 48 car equivalent movements (i.e. 16 x 1.5 x 2 = 48).

The DA conditions imposed by planning NSW restrict on-site construction activities to:

- 7am to 4pm (Monday to Friday); and
- 7am to 1pm (Saturdays).

All deliveries to the site must occur between 7am and 4pm (Monday to Friday).

Construction access to the site will be from Bradleys Head Road via an existing TZ service road that loops around B2B and approaches the precinct from the east.

The site is expected to employ the following peak workforce levels during the course of the project:

- 2004 – Up to 60 workers;
- 2005 – Between 80 and 100 workers; and
- 2006 – Between 80 and 100 workers.

The above peaks are most likely to occur during concentrated activities such as concrete pours. Construction workers travelling to the site by car are most likely to park in the following locations in and around the site:

- The staff and visitor car park; and potentially
- The commuter spaces along Athol Wharf Road.

The major impacts associated with this work will be:

- Internal circulation restrictions. Visitors will not be permitted to exit via the rustic bridge. During work on the LoE in 2004, visitors will be required to exit TZ via the path looping around the western side of AEP or via the ToE. In later stages the Hillside link and LoE will become available; and
- Construction worker parking.

This work is being undertaken in conjunction with the:

- The final stages of AEP;
- ToE Precinct;
- Gorillas; and
- The commencement of HoZ.

6.11 Heart of Zoo

The HoZ is scheduled to commence in March 2005 and be completed by March 2008. The HoZ precinct will be redeveloped in four stages. The work will not involve any significant excavation or concrete pours. The major works include:

- Transportation of some 372 cubic metres of bulk fill to the site for backfill of ponds;
- Installation of paths, paving and turfing;
- Installation of site furniture items (e.g. wishing well, benches, playground equipment);
- Serina's Building fit-out; and

- Demolition of the Jungle Cats enclosure and various retaining walls.

The quantities involved in these works will be finalised in the detail design phase of the project.

Up to 2007, construction access to the site will be from Bradleys Head Road via the B2B entry and Taronga Boulevard. This construction access arrangement raises a number of internal circulation issues, including:

- Management of construction traffic and pedestrian conflict points;
- Maintenance of pedestrian access to B2B; and
- Inadequate driveway clearances between the B2B Urban House and the Jungle Cats enclosure prior to the demolition of the enclosure for use as a construction staging area in 2006. As a minimum the driveway needs to be 3.5m wide.

The Jungle Cats enclosure will need to be removed prior to this route being used for HoZ construction access. The Jungle Cats site will provide a useful HoZ construction staging area.

In 2007, construction work moves to the north of the precinct and the construction access arrangements change. Whilst the Jungle Cat enclosure remains in use as a staging area, construction access will shift north along Bradleys Head Road to a new entry adjacent to the TaC. This construction traffic arrangement raises a number of issues including:

- Management of construction traffic and pedestrian conflict points on the ring road;
- Heritage issues relating to the removal of a section of the sandstone wall adjacent to the TaC; and
- Revenue control and security at the TaC.

The site is expected to employ the following peak workforce levels during the course of the project:

- 2005 – up to 30 workers;
- 2006 – up to 50 workers;
- 2007 – up to 40 workers; and
- 2008 – up to 10 workers.

Construction workers travelling to the site by car are most likely to park in the following locations in and around the site:

- The staff and visitor car park; and
- Formal and informal parking areas along Bradleys Head Road in the vicinity of TaC.

6.12 MPI Impacts on TZ Parking Demands

Table 6.2 below summarises the peak workforce estimates for the major MPI precincts up to 2008. It indicates that the MPI related workforce is expected to peak in 2004 and 2006 with the overlap of AEP completion and ACP commencement.

Table 6.2: Workforce Estimates for Major MPI Precincts

Year	B2B	F&B	AEP	ACP	HoZ	Workforce Totals
2002	70	-	-	-	-	70
2003	-	65	30	-	-	95
2004	-	-	90	60	-	150
2005	-	-	-	100	30	130
2006	-	-	-	100	50	150
2007	-	-	-	-	40	40
2008	-	-	-	-	10	10

Table 6.3 provides an estimate of the likely impact of the MPI related workforce on TZ parking supplies.

Table 6.3: MPI Workforce Parking Demand Estimates[(1)]

Year	B2B	F&B	AEP	ACP	HoZ	Parking Demands
2002	52	-	-	-	-	52
2003	-	49	23	-	-	71
2004	-	-	68	45	-	113
2005	-	-	-	75	23	98
2006	-	-	-	75	38	113
2007	-	-	-	-	30	30
2008	-	-	-	-	8	8

Notes:

1) Based on Workforce estimates in Table 6.2

2) Assumes 90% of workers travel to TZ by car and a vehicle occupancy rate of 1.2 persons per vehicle.

Table 6.4 provides a comparison of the TZ parking demand and supply estimates during MPI. It has been collated from the following sources:

- The estimates of existing parking demands for the major TZ parking scenarios listed in *Table 3.4*;

- The estimated car parking supplies during car park construction listed in *Table 6.1*; and
- The MPI workforce parking demand estimates listed in *Table 6.3.*

Table 6.4: Comparison of TZ Parking Demand and Supply Estimates During MPI

Year	Regular Weekday		School Holiday Weekday		Public Holiday		Weekend		Design Day Weekend (7,249)	
	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply
2002	489	650	665	650	638	650	556	650	791	650
2003	508	650	684	650	638	650	575	650	811	650
2004	549	560	726	560	638	560	616	560	852	560
2005	534	730	711	730	638	730	601	730	837	730
2006	549	910	726	910	638	910	616	910	852	910
2007	467	600	643	600	638	600	534	600	769	600
2008	444	975	621	975	638	975	511	975	747	975

The analysis of MPI impacts on parking supplies indicates the following:

- Parking supplies should be adequate to meet demand on regular weekdays throughout the MPI program provided the car park arrangements are flexible enough to permit under-utilised visitors spaces to be available for staff and construction workers;
- Parking conditions during School Holiday weekdays will be critical at times. In 2004 parking demands may exceed on-site supply by some 30 percent. This will result in overflow parking problems on adjacent streets;
- The combined impacts of a high MPI workforce and car park construction will result in critical parking conditions during 2004 in all but the regular weekday scenario;
- Parking conditions on weekends are only likely to be critical in 2004;
- A design day of 7,249 admissions would result in critical parking conditions throughout most stages of the MPI program; and
- Years 2004 and 2007 in the MPI program appear to be most critical stages for parking.

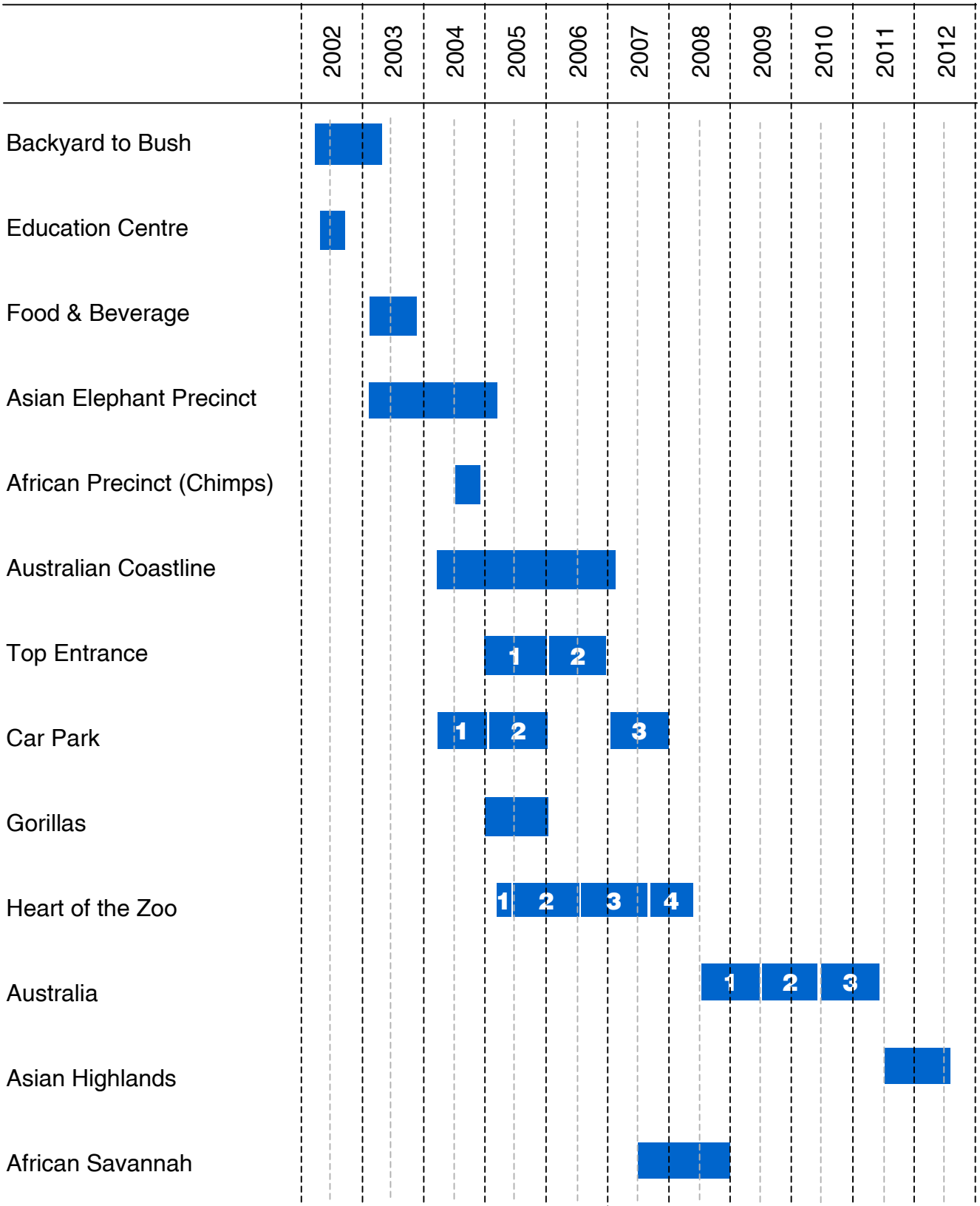


Figure 6.1
TZ Master Plan Implementation Program
Taronga Zoo Master Plan Implementation

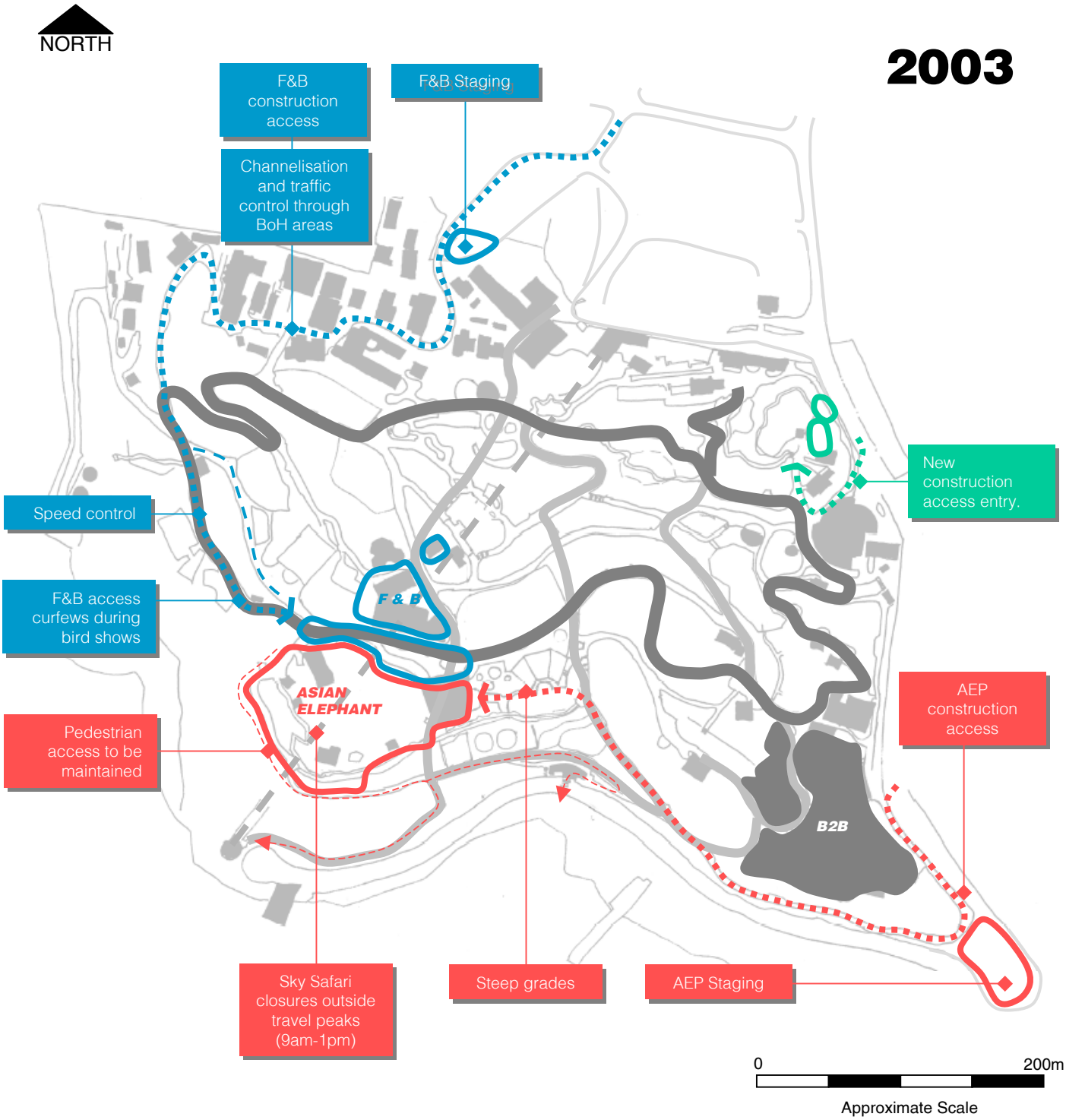


Figure 6.2
Scenario Planning - June 2003
Taronga Zoo Master Plan Implementation

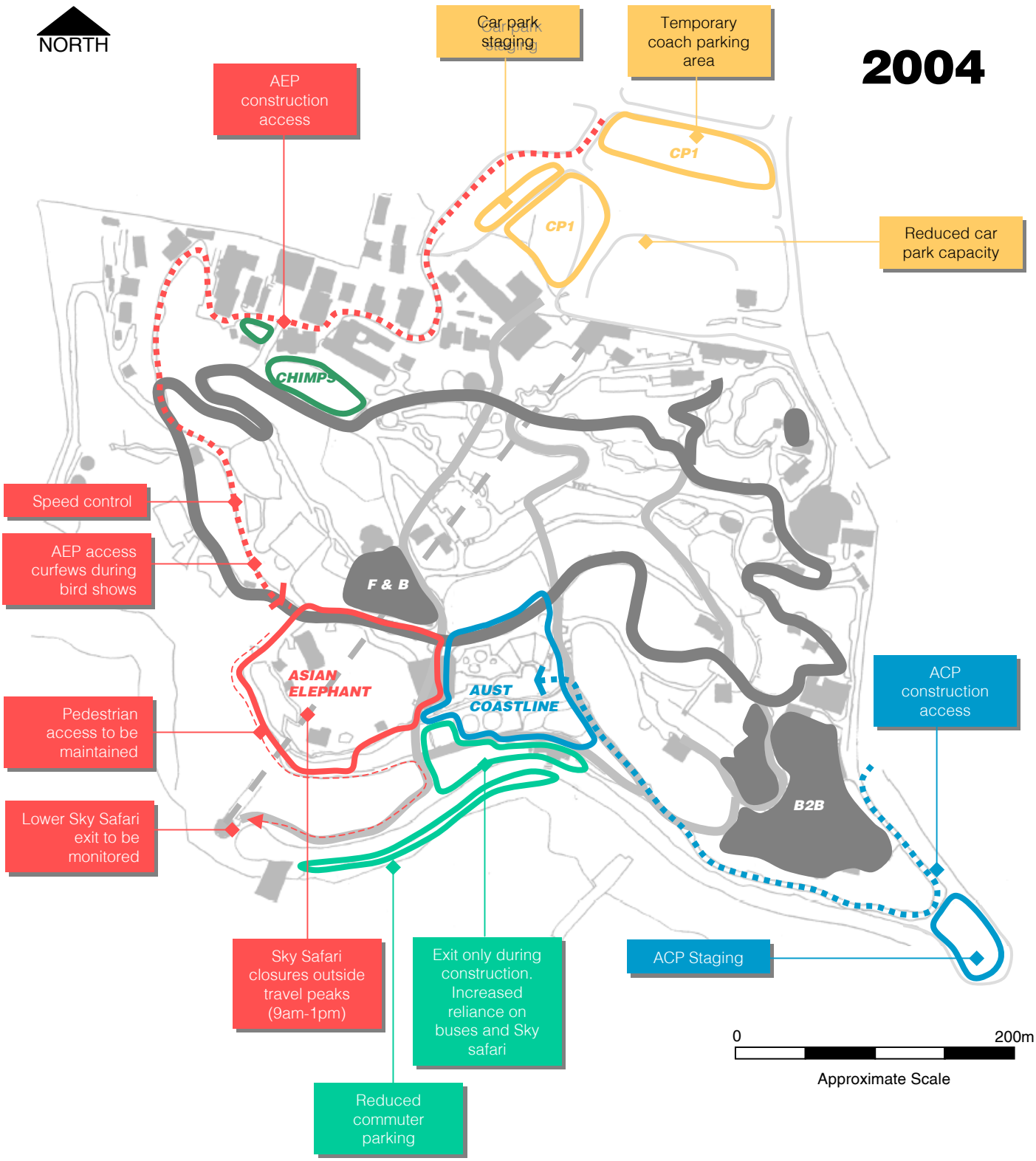


Figure 6.3
June 2004
Taronga Zoo Master Plan Implementation

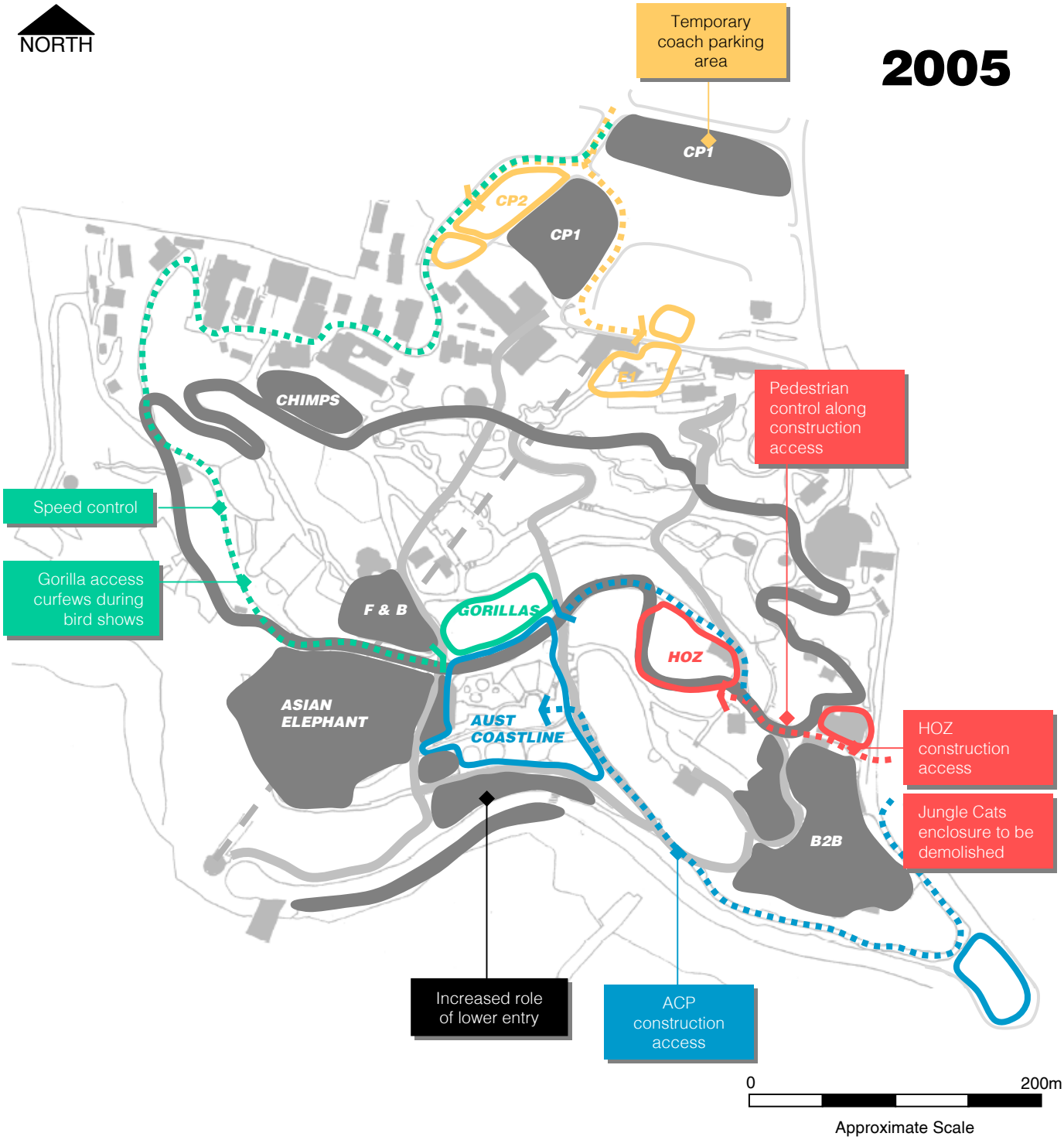


Figure 6.4
June 2005
Taronga Zoo Master Plan Implementation

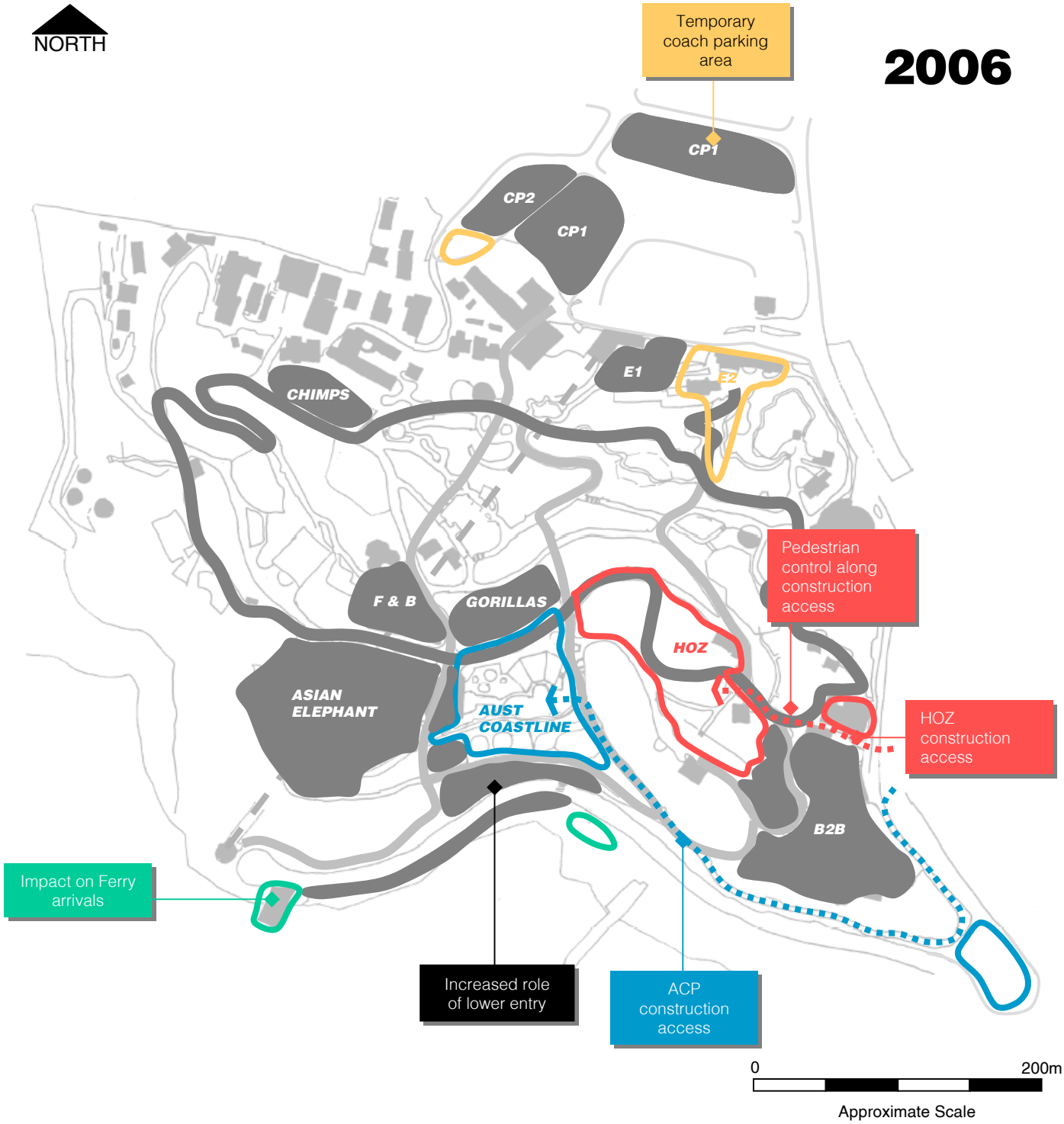


Figure 6.5
June 2006
Taronga Zoo Master Plan Implementation

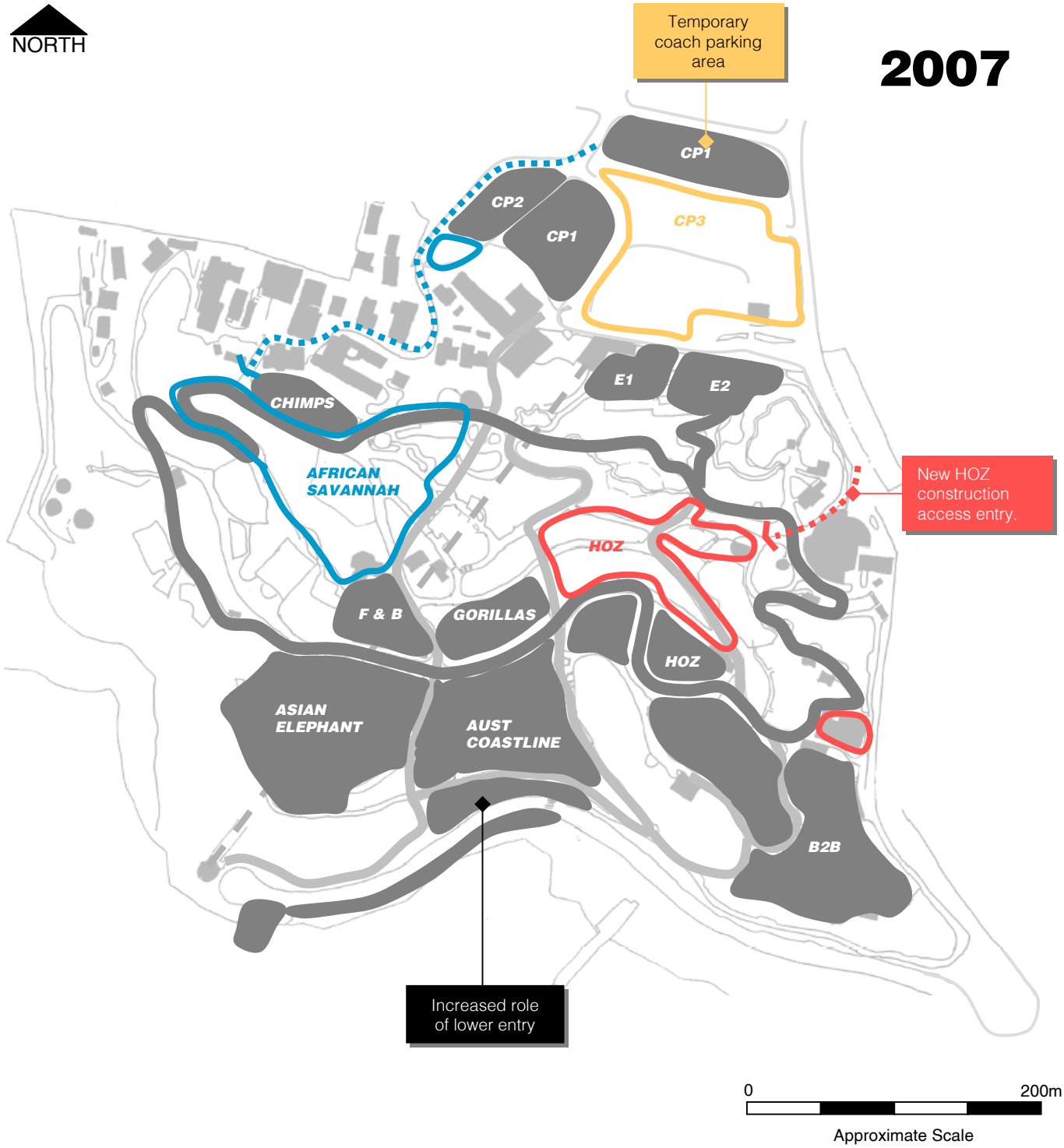
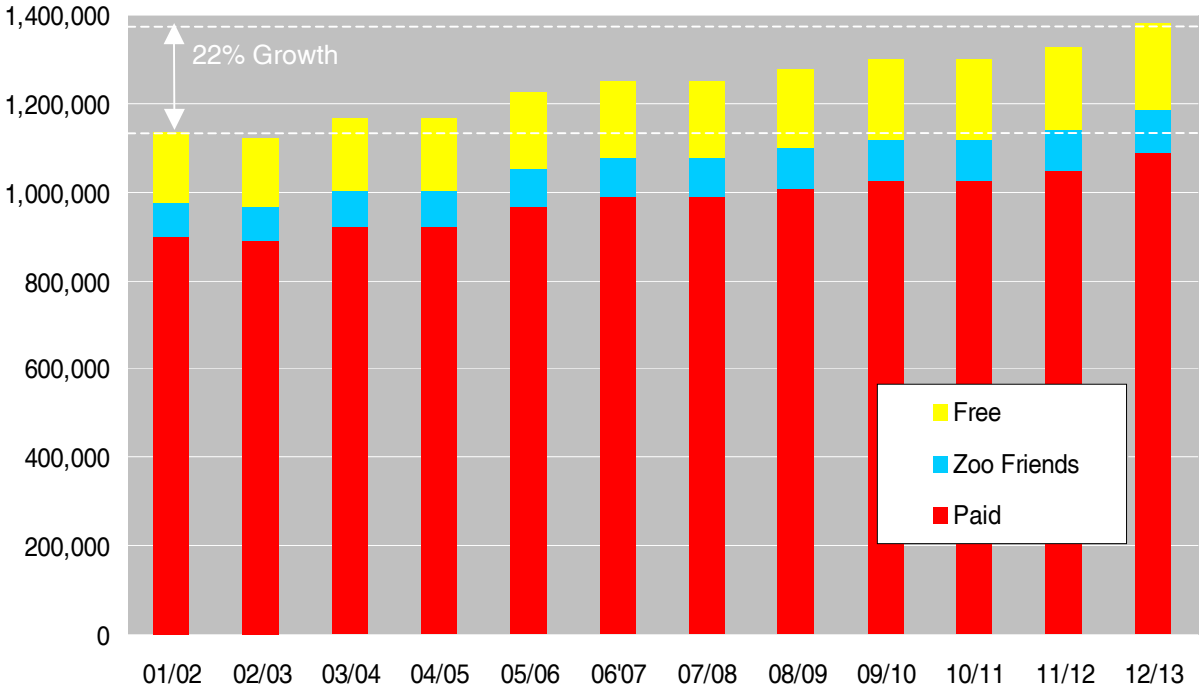


Figure 6.6
June 2007
Taronga Zoo Master Plan Implementation

Figure 6.7: Annual TZ Admission Forecasts Up to 2012/2013 Financial Year



Note:
The 'Zoo Friends' and 'Free' forecasts assume that their contribution to total visitation levels will remain constant at 7% and 14% respectively.

7. Traffic, Transport and Parking Strategy

7.1 TZ's Vision & Mission

The Zoological Parks Board of NSW (ZPB) operates TZ. The Vision of the ZPB is:

'To inspire Australians and our visitors to explore, discover, delight in and protect our natural world.'

The Mission[1] of the ZPB is:

'We will demonstrate a meaningful and urgent commitment to wildlife, our natural environment and the pursuit of excellence in our conservation, recreation and scientific endeavours.

Through effective communication and example ***we will promote positive and measurable conservation outcomes****. We will inspire active and enjoyable learning experiences and be a catalyst in creating understanding and wonderment of our natural world.*

By encouragement and demonstration our Zoos will ***lead individuals and communities in the wise and sustainable use of natural resources*** *for the benefit of future generations'.*

7.2 Zoo 2000

The ZPB has created a new vision for visitor experience at TZ that will set the standard for all future development at TZ. This vision is outlined in a new Master Plan entitled '*Taronga Zoo 2000, The view to the Future'*.

The master Plan has set out to:

- Upgrade a facility that has seen years of service; as well as
- Inject a new lease of life in a dynamic and interesting way.

The intent of the Master Plan was:

- *To* ***develop a gracious and accommodating series of 'front doors'*** *to the Zoo that set the stage for the ensuing experiences, and can meet visitors' needs for predictability and welcome, as well as the Zoo's needs for security, organisation and revenue enhancement;*
- *To develop a* ***gracious and accommodating central circulation spine*** *that can link together the major exhibit precincts while also providing direct access from the Upper Entry to the Heart of the Zoo which is the focus for visitor services and after-hours public events;*

[1] *The bold highlights have been added by PB and relate to philosophy adopted for the Transport Strategy*

- *To develop a central visitor-orientated space within the Zoo's exhibit precincts that provides visitor orientation to the Zoo site and is the focus for visitor services, special interpretation about the role of the Zoo, and after-hours public events;*
- *To develop a series of discrete exhibit experiences where visitors can comfortably spend time experiencing the thrill of discovery and the joy of acquiring new insights in face-to-face encounters with living animals and staff of the Zoo;*
- ***To make each and every visitor feel welcomed and at home at the Taronga Zoo**. Provide all of the physical comforts which a visitor would expect as a guest: shade, shelter, or sun as the day determines, easy access to food and drink, comfortable areas to sit and rest, and places to socialize with family and friends and discuss the day's adventures; and*
- *To provide appropriate areas for Zoo staff – life sciences, education and marketing, and technical services – to provide the myriad tasks which provide the foundation for each visitor's Taronga Zoo experience. Clearly distinguish between those work tasks which should take place 'behind the scenes' and those which should form a part of the visitor experience. Minimize conflicts between service activities and the visitor experience.*

7.3 Transport Vision For the MPI

Within the strategic context set by the ZPB and the Zoo 2000 Master Plan, the recommended transport vision for the MPI should be:

To develop a gracious, accommodating, reliable, safe and sustainable transport experience for visitors to the Zoo over the next 10 years and beyond.

7.4 MPI Transport and Parking Strategy

In previous sections of this report, PB has identified a series of transport and parking related issues associated with the following visitor experiences during the MPI:

- The Arrival and Departure Experience;
- The Exit and Entry Experience; and
- The Internal Circulation Experience.

Tables ES1 to ES3 in the *Executive Summary* provides a summary of the issues identified and a list of strategies that could be employed in the MPI to address them. Each strategy has also been provided with the following:

- The suggested timing of implementation;
- A suggested priority (based on the likely visitation and revenue implications);
- An indication of the resourcing implications of the strategy. They are described as Low (<$30K), Medium ($30K to $150), High (>$150K); and
- References in the document to assist in the implementation of the strategies.

Section 8 expands on some of these strategies and provides additional guidance on how they should be implemented.

8. Traffic, Transport and Parking Guidelines

8.1 Design Day Guidelines

The current Design Day is 7,249 admissions. Assuming that admissions will grow by 22 percent over the next 10-years, a "Future Design Day" of 8,843 admissions should be adopted for all long-term traffic, transport and parking design.

8.2 Backyard to Bush Guidelines

Backyard to Bush is scheduled to open in April 2003. As discussed earlier in *Section 6*, the access arrangements for student arrivals and departures are not clarified in the current precinct plans. Since the facility is focused towards students and may be operated as a stand-alone educational visit for students, the preferred transport arrangement is to develop a separate coach parking facility on Bradleys Head Road at the entrance to B2B.

A concept sketch for such a facility was developed to determine the viability of such a proposal. A copy of the sketch is provided in *Appendix E*. Unfortunately, investigations revealed that such an arrangement was not viable. The proposed turn bay and u-turn facilities would require widening of Bradleys Head Road. This could be expensive and problematic.

Due to site constraints (i.e. the new B2B buildings and an existing heritage sandstone wall) the facility would only accommodate two coach stands and would require the widening of Bradleys Head Road and National Park land. With such a small facility, it would not be possible to provide long-term coach parking. Coaches would have to park in the main car park. It was also insufficient to permit student pick-ups (coach dwell times during pick-ups are much longer than during set-downs).

If the coach stands were only used for set-downs, students would have to pick-up their bus from the main car park at the end of their visit. This introduced a number of operational issues, including:

- How would TZ educate schools and coach drivers in use of the facility?
- How would students/teachers find the right bus at the end of the day?
- How would TZ ensure that coaches/students do not dwell too long in the facility?
- How would TZ control admissions at the B2B gate?

To make this work operationally, the following additional guest service resources would have been required:

- Additional person/s at the B2B set-down facility to manage coach movements and group entries; and

- Additional person/s at the main car park to show school groups where their bus is waiting;

If it were to also function as a pick-up facility in the afternoon, there are the added operational complexities of:

- How would TZ notify the appropriate coach drivers in the main car park that their school group is ready to leave?
- How would school groups identify which coach to board?

In consideration of these operational issues, the most cost effective solution is to maintain current coach parking operations in the vicinity of the EdC in the short-term and formalise these arrangements in the long-term. In this instance, coaches would park and discharge students in the main car park, students would all enter via the EdC and walk through TZ to B2B.

Accordingly, as part of the integrated MPI planning process, DPWS has reviewed the pedestrian linkages between the Education Centre and B2B to ensure that they are adequate for use by large school group movements.

Consideration has also been given to introducing a temporary pick-up-only bus stop at B2B, during works on the LoE in 2004, to facilitate visitor access to the SkS and ToE. However, for the following reasons this proposal was rejected:

- It would be operationally difficult to communicate and enforce the pick-up-only restrictions;
- It would require construction of an exit facility at B2B;
- It would increase the bus travel times on the route;
- It would require construction of a u-turn facility for the bus services travelling down to the wharf. As discussed earlier, this would require road widening and have impacts on National Park land; and
- It would require visitors using the B2B exit to pay $1.50 (a bus fare) to exit TZ.

8.3 Sky Safari Closure Guidelines

Between February 2003 and February 2005 there may be need for limited closures of the Sky Safari during normal operating times to facilitate construction of the F&B precinct or AEP.

The Sky Safari performs an important TZ access function for the large number of visitors arriving by Ferry. More importantly, Sky Safari is an essential component of the overall TZ visitor experience offering a unique view of the TZ and the Sydney Harbour.

It is therefore essential that any impacts on Sky Safari during the construction of AEP and F&B should be minimised in the following ways:

- By undertaking most of the work that may impact on Sky Safari outside of normal SkS operating hours (9am to 5pm, Mon-Sun);

- By restricting scheduled closures to periods outside the peak Sky Safari usage times (between 9am and 1pm);
- Coordinating AEP and F&B closures to coincide wherever possible. A single TZ representative should be responsible for coordinating, approving and monitoring closures;
- Providing guest services with advance warning of any scheduled closures;
- Arranging for Sydney Buses to schedule additional bus services between the Wharf and ToE during scheduled closures. The capacity of the SkS is approximately 700 persons per hour. In order to provide an equivalent capacity replacement bus service would require, on average, a bus service every 4 minutes between the Wharf and ToE during the peak arrival periods; and
- Developing flexible work arrangements with Contractors that permit certain scheduled event works to be brought forward when Sky Safari closures occur due to poor weather.

These requirements will impose significant constraints on construction activities and may increase the capital cost of these projects. In order to reduce construction costs, TZ could give consideration to relaxing closure curfews during the following periods when demand is lowest:

- Monday to Thursday outside of school holiday periods (excepting public holidays); and
- Months of February, May & November.

Whilst the relaxation of closure curfews during these periods may help minimise the number of visitors impacted, caution should be exercised. As discussed earlier, the SkS provides visitors with a unique TZ experience. Loss of that unique experience opportunity, at a time when construction activities are negatively impacting on the variety of other TZ experiences, could have significant word-of-mouth implications for the image of TZ. Any saving in MPI capital costs resulting from relaxation of the closure curfew could have a negative impact on TZ revenue.

8.4 F&B and AEP Construction Access Guidelines

At various stages of construction, both F&B and AEP will rely on construction access via the staff car park, back-of-house areas and Taronga Boulevard. Taronga Boulevard will remain an active visitor access road to key TZ exhibits such as the Bird Show during this same period. This construction access arrangement raises a number of internal circulation issues, including:

- Management of construction traffic through back-of-house areas;
- Management of construction traffic and pedestrian conflict points;
- Management of construction traffic speeds along shared pedestrian routes; and
- Curfews for construction traffic access along Taronga Boulevard during the Bird Show events (daily at 12.30pm and 3pm). The concentration of pedestrians in the

area will begin well in advance of the scheduled show. During the show it is not uncommon for pedestrians to spill onto the roadway and block vehicular access. After the show, pedestrians disperse relatively quickly.

Where construction traffic is required to travel through the staff car park and the back-of-house, the following construction access management measures, as outline in *Figure 8.1*, should apply. These measures will include:

- TZ OH&S Committee to identify designated staff crossing points across the route. These points should be signposted and their use by staff monitored and enforced;
- The channelisation and delineation of the access route through the back-of-house areas should be improved using barrier lines and/or rumble strips;
- Install give-way signs behind the Chimpanzee Building to provide priority to TZ vehicle movements across the construction access;
- Access along narrow links should be controlled by flag-men to minimise passing conflicts;
- Where longitudinal pedestrian access is required along the construction route, it shall be clearly defined by line marking. Such a path shall be a minimum of 1.2m wide; and
- A designated concrete truck storage bay should be installed in the staff car park so that waiting trucks do not compromise normal back-of-house activities.

Where Taronga Boulevard is to be used for construction vehicle access, the following construction access management measures should apply:

- The conflict zone, at the point where construction traffic enters the shared zone from the back of house areas, shall be controlled by suitably qualified traffic controllers when in use;
- At locations where there is a strong pedestrian crossing movement, pedestrians should be channelised and forced to cross at a clearly defined location. Channelisation can be achieved with fencing, retail carts, temporary visitor seating or planter boxers;
- The entries to the shared construction/pedestrian access zones should be clearly defined with signposting;
- Vehicle speeds should be signposted and constrained to a walking speed of 10km per hour; and
- Construction traffic access should be restricted from using Taronga Boulevard during the following hours:
  - < 11:45am to 1:15pm; and
  - < 2:30am to 3:45pm.

8.5 Bus Services (Better Buses North Program)

Sydney Buses is currently undertaking a major review of the bus services on the northern peninsular from North Sydney to Palm Beach. Called the '*Better Buses North'* program, its aim is to improve bus services on the peninsular by:

- Introducing new direct City services;
- Improving frequencies on main roads;
- Improving links to regional centres;
- Simplifying stopping patterns for the limited stop services; and
- Simplifying the peak hour express stopping patterns.

The potential impacts of the new arrangements on TZ will be:

- Access to the Zoo by bus will be simplified;
- The 247 service will be extended to terminate at the Zoo Wharf (when ferries are operating). It will be the only service to travel to the Zoo. This should make TZ communications much simpler;
- The 238 and 257 services will no longer travel to the Zoo;
- There will remain a need for bus lay-over space at the ToE to accommodate 247 services that terminate at the ToE when ferry services are not operating; and
- TZ's marketing group will need to adjust the public transport messages issued in its brochures and on its web page to reflect any Sydney Bus changes.

A meeting was held with Sydney Buses' representatives in December 2002. The purpose of the meeting was to discuss:

- the potential impact of the Better Buses North Program on the frequency of services to TZ and between the Zoo Wharf and the ToE;
- the potential MPI impacts on bus services;
- opportunities to purchase livery rights to all 247 service buses.

During the course of discussions the following observations were made:

- At this stage Sydney Buses has not prepared any new timetables for the proposed changes so it not possible to determine the potential impacts of the changes on service frequencies between the Wharf and ToE;
- However, arrangements between TZ and Sydney Buses have always been flexible and Sydney Buses would respond to any increases in travel demand for bus services between the wharf and the ToE;
- SkS closures during MPI to facilitate construction of AEP and F&B will have a significant impact on demand for bus services from the Ferry up to the ToE;
- Closures of the LoE will have significant impact on demand for bus services from the ToE down to the Ferry;

- Whilst the future 247 service route will be extended down to the Wharf, a lay-over facility at the ToE will still be required to accommodate;
  - < 247 services that terminate at the ToE when ferry services are not operating;
  - < lay-over of northbound 247 services at the ToE to use up recovery time built into the schedule to ensure that the commencement of these services are not delayed by late running ferries;
  - < toilet stops;
- The design of the ToE lay-over facility should include the following;
  - < u-turn facility for terminating buses;
  - < provision for 3 to 4 stands during normal operations;
  - < provision for up to 8 stands when the LoE is closed;
  - < provision for 18.5m articulated buses;
- Livery rights to the Sydney Buses' fleet may be purchased from the Buspak Advertising Group Pty Ltd. The company website is located at the following internet address http://www.buspak.com.au/;
- The opportunities to purchase livery rights on target routes is limited as the fleet is regularly rotated;

The following demand estimates will be relevant in any discussion of service needs and frequency increases with Sydney Buses:

- Surveys indicate that 20 percent of visitors arriving by ferry currently use the 238 service to access the ToE. On a TZ design day (7,249 admissions) this represents a base demand of some 530 patrons for the loop service;
- Surveys indicate that 15.4 percent of TZ visitors travel to TZ by bus (i.e. from destinations north of TZ along the 238 and 247 service routes). On a TZ design day (7,249 admissions) this represents a demand of some 1,120 patrons;
- Surveys indicate that 36.5 percent of TZ visitors travel to TZ by ferry. On a TZ design day (7,249 admissions) this represents some 2,650 patrons;
- The capacity of the SkS is approximately 700 persons per hour. A replacement bus service, of equivalent capacity, would require, on average, a bus service every 4 minutes between the Wharf and the ToE during peak arrival periods;
- The majority of TZ admissions occur between 9am and 1pm; and
- TZ is forecasting a 22 percent increase in admissions over the next 10-12 years.

8.6 Ferry Services

Surveys indicate that 36.5 percent of TZ visitors travel to TZ by ferry. On a TZ design day (7,249 admissions) this represents some 2,650 patrons. The forecast increase in admissions by 22 percent over the next 10-12 years could see the TZ demand for Ferry services increase to 3,230 patrons during a design day.

To meet this expected increase in demand and provide an improved arrival experience, TZ should enter discussion with Sydney Ferries to provide the following for TZ visitors:

- Higher capacity ferry services between Circular Quay and Zoo Wharf;
- A family concession *Zoopass*;
- TZ retail opportunities at the Zoo Wharf and at Circular Quay;
- TZ retail opportunities on Zoo ferry services;
- An upgrade of the wharf facilities to provide improved weather protection, seating, signage and retail facilities for TZ visitors; and
- Maintenance of the existing timetable. The current service benefits from strong passenger 'timetable recollection'. (It is easy to remember that Zoo Ferry services depart Circular Quay *"..every quarter past and quarter to the hour.."*).

During the 50 percent workshop, some discussion was given to the potential for increasing market penetration through the introduction of additional or expanded ferry services linking TZ to destinations such as Darling Harbour and Parramatta. These strategies may be impractical and are not recommended in this strategy for the following reasons:

- Sydney Ferries is finding it very difficult to make its current ferry services run revenue neutral. It is unlikely to want to introduce additional services;
- In the case of Darling Harbour, the most logical way of providing the new service would be to extend the existing service from Circular Quay. This would disrupt the current timetable arrangements and lose TZ the current benefits of visitor "timetable recollection"; and
- Due to the service contract constraints of the Passenger Transport Act (1990), another ferry operator would not be permitted to provide a 'regular passenger service' to the Zoo from these destinations. However, 'charter services' are permitted.
- Discussion with representatives of Sydney Ferries in December 2002 revealed the following impediments to expansion of ferry services;
  - < From Parramatta, train services provide a much quicker and more frequent travel option to the City;
  - < Ferry speeds are low and services infrequent due to environmental constraints along the Parramatta River;

Under the Act, a 'charter service' is defined as a public passenger service pre-booked for hire to take passengers for an agreed fee, but only if, according to the terms of the hire:

- the hirer is entitled to determine the route for the journey and the time of travel;
- all passengers' journeys have a common origin or a common destination, or both;
- individual fares are not payable by the passengers (either to the operator of the service or to the driver of the vehicle), and
- service is not provided according to regular routes and timetables.

8.7 Heart of Zoo Construction Access Guidelines

Up to 2007, construction access to the site will be from Bradleys Head Road via the B2B entry and Taronga Boulevard. This construction access arrangement raises a number of internal circulation issues, including:

- Management of construction traffic and pedestrian conflict points;
- Maintenance of pedestrian access to B2B; and
- Driveway clearances between the B2B Urban House and the Jungle Cats enclosure. The jungle Cats enclosure will need to be demolished before this route can be can be used.

The following construction access management measures should apply to the short section of roadway north of B2B:

- At locations where there is a strong pedestrian crossing movement to/from B2B (i.e. a the western end of the Jungle Cat enclosure), pedestrians should be channelised and forced to cross at a clearly defined location. Channelisation can be achieved with fencing, retail carts, temporary visitor seating or planter boxers;
- The entries to the shared construction/pedestrian access zones should be clearly defined with signposting (for both pedestrians and drivers); and
- Vehicle speeds should be signposted and constrained to a walking speed of 10km per hour.

Post 2007, the focus of the HoZ redevelopment shifts northward along with the construction access. During this revised construction access arrangement the pedestrian and construction traffic conflicts will be concentrated to a single major crossing of the main ring road adjacent to the TaC. This crossing will need to be supervised by qualified traffic controllers that can temporarily halt pedestrian flows to permit vehicle access. The concentrated nature of the conflict and its distance from any major crowd generators (e.g. like the bird show) would suggest that internal access curfews are unnecessary so long as pedestrian access and safety is guaranteed.

8.8 Road Sign Guidelines

8.8.1 Locations requiring new signage

As part of its Wayfinding Strategy TZ should replace the signs at the following locations:

- Military Road and Belmont Road; and
- Bradleys Head Road and Middle Head Road.

It is recommended that the proposed new TZ sign at the junction of Military Road and Belmont Road be installed on a new Type 6 signal post. This is an integrated signal/sign structure that helps to reduce post clutter at such intersections. The preferred location for the Type 6 structure is the secondary signal post located on the northern kerb in front of the Australia Post building. An investigation of footpath services will be required to determine the suitability of this location for a Type 6 replacement structure. TZ will need to seek RTA approval and design input for the proposal. The RTA will nominate the contractor to be used for the installation work.

In addition to the two intersection signs, TZ should also provide icon based reassurance signs at the locations identified in *Figure 8.2*. These reassurance signs should be located on power poles and existing pole infrastructure in order to reduce their costs and minimise their impact on adjacent properties.

Approval from both Mosman and North Sydney Council will be required. Initial consultation with Mosman Council officers on these proposals has been positively received.

It will be important for TZ to stress in its submission that these signs are not designed to influence drivers to use these alternate routes, rather, they are to assist driver navigation once the decision has been made.

8.8.2 Road Sign Specification

The following is a recommended materials specification for all TZ road signs:

- all signs should be manufactured using 3M Class 1 Retro-reflective sign face material. This increases their legibility and conspicuity, particularly at night;
- all signs shall have the RTA's standard "Tourist" colour scheme of white legend on brown background;
- minimum letter height for sign legends should be should be 180 mm; and
- legends shall be constructed of upper and lower case letters.

8.8.3 Road Sign Messages

An ideal sign is one that is big and brief. However, considerations such as branding will play an important role in the sign message decision. A compromise is required.

The following *Table 8.1* provides a suite of possible TZ road sign messages and commentary on their strengths and weakness:

Table 8.1: TZ Road Sign Message Options

Option	Sample TZ Messages	Commentary
1	"Zoo" or Icon	▪ This is the only piece of information that drivers really need. ▪ There is no chance of mistaken identity. ▪ Any additional information will be branding related and will not benefit way finding. ▪ The major benefits of this legend would be: ▪ Size - you can get a bigger word for a given size of sign; and ▪ It is quick to recognise and react to. ▪ May be ideal for use as reassurance signs after major junctions or along rat runs at regular intervals (once drivers have decided to use that particular route).
2	"Zoo" and Icon	▪ Two pieces of information. ▪ You are still able to maintain some size benefits. ▪ However, the current icon is virtually useless. It quickly becomes an incoherent smudge from a distance of more than 50m. The current icon is too complex and delicate. An ideal icon should have a distinctive shape and be filled - rather than an outline.
3	"Taronga Zoo"	▪ Once you start adding the extra word, the letter heights have to be significantly reduced for a given size sign and it takes longer for drivers to read, register and react. The alternative is to increase the overall size of the sign to compensate. This can then create unacceptable community impact problems as well as increased sign structure sizes to compensate for increased wind loading.
4	"Taronga Zoo" and Icon	▪ This is probably the worse case scenario. Lots of words and a problematic icon. ▪ This is the current situation for the RTA signs at Spit Junction.

Option 3 may offer a good compromise between legibility, size and branding requirements.

A sample guideline of recommended signs layouts, including a revised logo, is presented in *Figure 8.3*.

8.9 MPI Parking Guidelines

Table 8.2 provides a summary of the utilisation of TZ parking supplies at various times during MPI. This table is derived from earlier work in *Table 6.4*. It shows that the most critical parking conditions will occur:

- School Holiday weekdays (2002, 2003,2004 and 2007);
- Public Holidays and weekends (2004);
- Public Holidays (2007); and
- Design Days (most years).

Table 8.2: Estimated Utilisation of Available TZ Parking Supplies During MPI

Year	Regular Weekday	School Holiday Weekday	Public Holiday	Weekend	Design Day Weekend (7,249)
2002	75%	**102%**	98%	85%	**122%**
2003	78%	**105%**	98%	88%	**125%**
2004	98%	**130%**	**114%**	**110%**	**152%**
2005	73%	97%	87%	82%	**115%**
2006	60%	80%	70%	68%	94%
2007	78%	**107%**	**106%**	89%	**128%**
2008	46%	64%	65%	52%	77%
Days Per Annum	**200**	**54**	**7**	**104**	

During these critical scenarios demand will exceed capacity and overflow parking will occur in local streets. *Table 8.2* also provides an estimate of the number of days per annum these events may occur. Whilst overflow parking is already a common experience, the frequency and impact of overflow parking may temporarily increase during MPI as a result of the following:

- MPI construction worker parking;
- Construction impacts on existing TZ parking supplies; and
- Council plans to eliminate informal parking along Bradleys Head Road.

In addition, Council plans to introduce paid parking and residential parking schemes on local roads may exacerbate the overflow parking problem and have a significant detrimental effect on the TZ visitor's arrival experience.

Accordingly, to minimise the impacts of these critical parking conditions, TZ should implement the following MPI demand and supply management strategies:

- Restrict concentrated construction activities such as concrete pours to regular weekdays;
- Schedule worker rostered days off to coincide with peak TZ admission days;
- Investigate the feasibility of staff satellite parking opportunities in the vicinity of TZ during school holiday periods;
- Identify opportunities to provide additional staff parking in the vicinity of B2B and TaC;
- TZ to promote sustainable transport travel modes (e.g. buses, cycling and ferries) to TZ in all advertising and marketing and to warn visitors, particularly during 2004 and 2007 MPI works, that parking facilities for cars at TZ are limited;
- TZ to maintain flexibility in MPI car park arrangements that permits:

- < controlled use of coach parking areas for visitor parking on public holidays and weekends when coach parking areas are under-utilised; and
- < controlled use of visitor parking areas by staff and construction workers on regular weekdays when visitor parking is under-utilised.

- TZ to request Mosman Council to delay removal of the informal parking areas along Bradleys Head Road until completion of the TZ car park redevelopment in 2008; and
- TZ to request Mosman Council to delay the introduction of paid parking and residential parking schemes on adjacent local streets until completion of the TZ car park redevelopment in 2008.

As discussed earlier in *Section 6*, the car park is most likely to be constructed in three stages. The following strategies will be essential to the implementation of the car park stages:

- CP1 (2004) - this stage of car park redevelopment will have the lowest potential impact on parking supplies. It is therefore essential, that the parking yields from this first stage be maximised to assist in offsetting temporary parking losses to be incurred during the construction of later stages;
- CP2 (2005) - will involve an extension of the CP1 parking structure deck over the staff car park to generate additional spaces. During this stage, the entire staff car park will be lost to either construction or storage. Staff parking will need be relocated to the new parking structure completed as part of CP1 or to the existing formal areas of the visitor car park;
- CP3 (2007) – will have the biggest potential impact on TZ parking supplies. This work will need to be staged so that:
  - < the loss of parking at any one time is minimised;
  - < Sydney Buses operations can continue uninterrupted; and
  - < In addition, the informal coach parking areas at the northern end of the car park will need to be maintained until such time as the formal coach parking facility is completed.

8.10 Long-term Car Parking Guidelines

8.10.1 Visitor Parking Capacity

In the previous analysis of TZ admissions over the past two years, the 20th highest day of admissions was identified as an appropriate “design” day. On this day, TZ had recorded 7,249 admissions.

With the expected growth rate of 22 percent in TZ admission over the next ten years, the future design day would be 8,843 admissions.

Using the earlier graph in *Figure 3.24*, the estimated total future demand for visitor parking on a Future Design Day of 8,843 admissions, would be some 745 spaces. This quantum of parking takes into account the need for additional on-site spaces to

accommodate any on-street spaces lost as a result of future Mosman Council's proposal to:

- remove some informal areas of parking on Bradleys Head Road;
- introduce parking meters on Bradleys Head Road; and
- introduce some resident parking schemes in the vicinity of TZ.

8.10.2 Coach Parking Capacity

On peak days during the months of October/November, the EdC can process up to 2,500 student admissions. Assuming that 60 percent come by coach and that a coach holds 45 students, there could be as many as 25 to 30 coaches visiting TZ on a peak day. The EdC and B2B are expected to generate an additional 30,000 student visits per annum (1,000 per week in peak season) over the next 10 years. This represents a potential 45 percent growth in current student visits. Assuming that there are no controls on school attendance patterns, a 45 percent increase in student visits on a peak day may increase demand for coach parking to 40 spaces.

Since most school coaches have departed TZ by 2.30 pm (students must be returned to their school by 3.30 pm) this amount of coach parking represents an expensive investment that may be under-utilised for much of the day and for many days per year. TZ should establish a student booking threshold which manages/restricts the demand for coach parking to a more cost effective coach parking investment level (say 15 to 20 spaces). Consideration should also be given to flexible over-flow parking arrangements that can be used for both coaches and cars depending on demands.

The layout and dimensions of the coach parking area should be as follows:

- Buses spaced at 7m intervals;
- Buses parked at an angle of 45 degrees to the kerb;
- A saw-tooth kerb arrangement is recommended. Each tooth in the saw-tooth arrangement is 4m wide and 4m deep, with the bus overhanging the kerb up to the front wheels, this provides sufficient room for passengers to board and alight straight onto the kerb;
- The manoeuvre area behind the bays needs to be about 8-10m from the tail of the buses; and
- The design of coach parking should allow for large coaches up to 14.5m in length. Whilst they are banned at the moment the restrictions may removed in the future following car park redevelopment.

Typical layouts for a saw-tooth coach parking arrangement are presented in *Figure 8.4*.

8.10.3 Staff Parking Capacity

TZ currently estimates that there may be as many as 400 staff on-site at any one time during peak days. Previous analysis of 1996 census data would suggest that the demand for staff parking on these days might be close to 190 spaces. TZ has also indicated that there is unlikely to be any significant increase in staffing levels at TZ over

the life of the Master Plan. Assuming the demand for 190 staff parking spaces remains constant, the existing staff car park is 80 spaces short of meeting existing staff parking demands. On-street parking supplies are currently satisfying this excess demand. However, with the planned introduction of parking meters and elimination of informal parking areas along Bradleys Head Road, these parking supplies will no longer be accessible to staff and will have to be met on-site.

8.10.4 Functional Requirements

Any design for a future car park redevelopment should feature the following;

- A single entry/exit to the TZ car park to reduce driver confusion and cost of entry/exit controls. The exit should be located as far away from the junction of Bradleys Head Road and Whiting Beach Road as possible;
- Automated paid-parking management system with ticket validation machines located on the threshold/transition between the car park and entry plaza;
- Physical separation of Coach and Sydney Bus operations;
- Sydney Buses should be provided a minimum of two bus stands in each direction;
- A formal taxi rank for two to three spaces. Visitors should approach the taxi rank from the front;
- Disabled parking provisions located close to the entry plaza in accordance with AS 2890.1 (1993);
- Bicycle parking provisions in accordance with Austroads Guide (Part 14);
- Formal coach parking for between 15-20 coaches, with some provision for over-flow parking on-site. Weather protection should be provided in assembly/waiting areas;
- Coach parking areas should be designed to accommodate vehicles up to 14.5m in length and be located as close as possible to the EdC;
- Up to 190 formal staff parking spaces (approximate area required is 5,700 sqm);
- Up to 745 formal visitor parking spaces (approximate area required 22,400 sqm); and
- Maximisation of parking space yields during early stages of redevelopment of the car park. The early stages of redevelopment will have a minimal impact on car park capacity. However, in later stages, the loss of parking will be much greater and must be offset by the spaces that can be generated by the initial redevelopment.

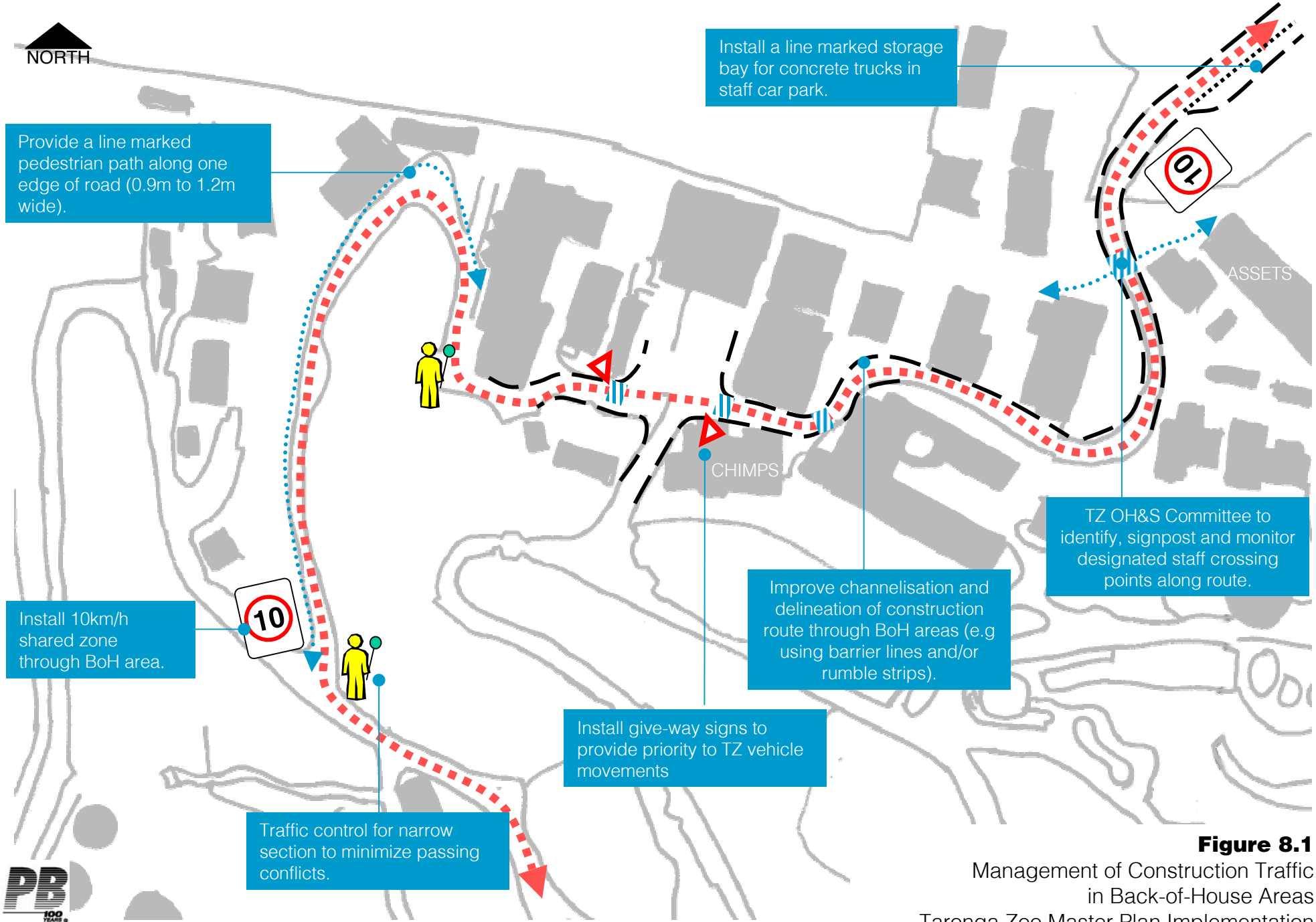


Figure 8.1
Management of Construction Traffic
in Back-of-House Areas
Taronga Zoo Master Plan Implementation

Appendix A

Taronga Zoo Master Plan & DPWS Circulation Strategy

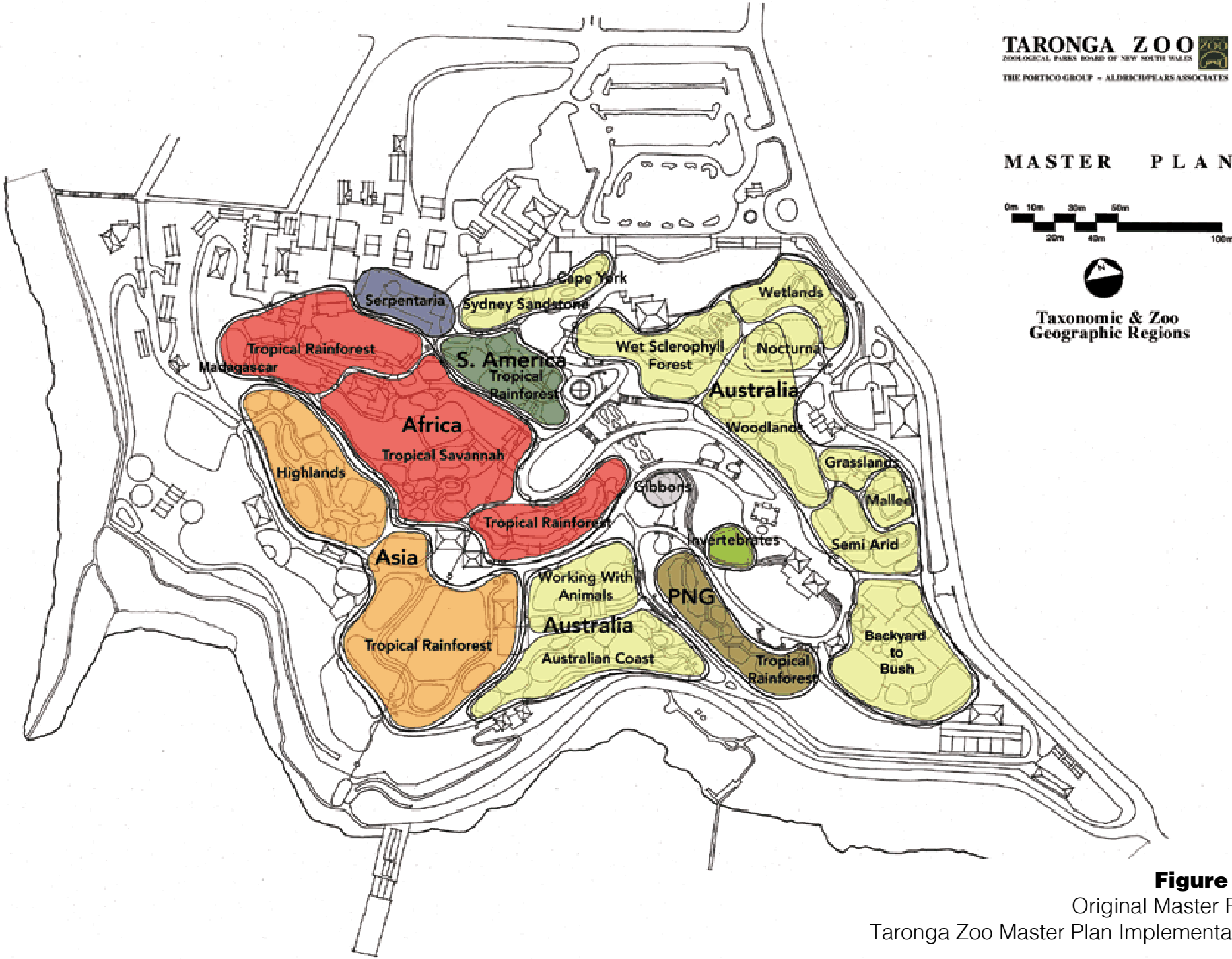


Figure A1
Original Master Plan
Taronga Zoo Master Plan Implementation

Figure A2
DPWS Circulation Strategy
Taronga Zoo Master Plan Implementation

Appendix B

Site Photos & Sign Audit

Photo 1
Visitors queuing at Sky Safari. Parents with pre-school children are required to carry children and strollers up to the entry.

Ticket purchases create a bottleneck to the Sky Safari entry.

Photo 2
Manual warning sign inside the Zoo advising visitors that Sky Safari is closed.

Visitors wishing to return to the main entrance car park must walk back up the hill or walk down to the wharf and catch a bus up.

Photo 3
Manual warning sign at the exit to the wharf advising visitors that Sky Safari is closed.

Visitors wishing to enter the Zoo must walk up to the bottom entrance or catch a bus up to the main entry.

Photo 4
Top entry to Sky Safari.

This is predominantly a destination station rather than origin station.

Photo 5
Passengers exiting the Sky Safari gondola at the bottom station.

Photo 6
Picture illustrating the height of the Sky Safari gondolas.

The NSWFB 'Bronto' skylift appliance is currently included in the evacuation procedures for the Sky Safari. The alternative is an abseil down under the control and supervision of the Zoo evacuation team.

Photo 7
Looking west along southern footpath of Athol Wharf Road.

The parking to the west of the lower Zoo entrance is unrestricted parking used mostly by Ferry commuters.

The footpath is between 2 and 2.5 m wide and provides the main pedestrian link between the lower Zoo entrance and the Ferry wharf.

Photo 8
Looking south across Athol Wharf Road pedestrian crossing.

Note the absence of a sign directing pedestrians down to the wharf on right.

Photo 9
Looking west along the lower entrance ramp.

The last parking space (shown highlighted) is required for TZ operations. It is recommended that this commuter space be converted to a 'Loading Zone'.

Photo 10
The Taronga Zoo ferry wharf.

Sydney Ferries allocates its smaller Ferry fleet to the Taronga Zoo and Mosman services. These ferries can carry up to 400 passengers.

Photo 11
The Taronga Zoo ferry wharf.

Photo 12
Sample of Ferry timetable information provided at the lower Zoo exit.

Photo 13
Taronga Zoo services depart from Wharf 2 at Circular Quay.

Photo 14
Sample of the passenger information system provided at Circular Quay.

Photo 15
Looking west along Athol Wharf Road to the wharf bus stop.

Photo 16
This 12.5m bus is performing a three-point turn in the turning circle at the end of Athol Wharf Road.

Photo 17
Passengers boarding at the wharf bus stop for the trip up the hill.

Photo 18

Looking east from the bus turning circle at the main entry.

The building on the left is the remains of an old tram stop and is heritage listed.

Buses set-down on the right and pick-up on the left.

Photo 19

Another view west towards the main entry. Vehicles parking in front of the gate (foreground) and along the southern kerb (background) obstruct bus operations.

Photo 20

Passengers boarding a service outside the Tram Shed.

Photo 21

The entry to the Zoo car park.

Photo 22

Looking east through the formal parking area on the upper level.

The inefficient bus parking is designed to ensure that the buses are not trapped by errant car parking.

Photo 23

Same view looking looking west back towards the entry.

Photo 24

Disabled parking facilities in the car park.

Photo 25

Bicycle rack provided at the entry to the car park.

Photo 26

Circulation patterns in the car park are quite confusing and conflict with pedestrian movements.

It is unclear whether these marked foot crossings have legal status.

Photo 27

The $8 parking fees are collected on exit from the car park.

Revenue may be lost when Zoo staff are called away.

This arrangement does eliminate the problem of vehicles queuing back onto Bradleys Head Road.

Photo 28

A view of the car park wayfinding sign immediately inside the entry to the car park.

The circulation patterns in the car park are confusing.

Photo 29

Additional disabled parking facilities close to the education centre.

Note the narrow pedestrian footpath (left).

Photo 30

Looking west along Athol Wharf Road towards the wharf.

Photo 31

Looking south along Bradleys head Road to the formal parking in the vicinity of the Visitor Centre.

Photo 32

Looking south along Bradleys Head Road towards the entry to the Backyard to Bush construction site. Note the informal parking and lack of footpaths.

Photo 33

Bradleys Head Road entrance to the Backyard to Bush construction site.

Photo 34

Looking west along a back-of-house access road behind the Chimpanzee exhibit.

During MPI this route will be used for construction access. Accordingly, delineation of the routes needs to be improved and priority given to TZ operations (using give-way signs).

Photo 35

Looking east along a back-of-house access road behind the Chimpanzee exhibit.

Note the small garbage truck used to collect refuse on site.

During MPI this route will be used for construction access. Accordingly, delineation of the routes needs to be improved and priority given to TZ operations (using give-way signs).

Photo 36

School children walking from the Education Center to a coach pick-up at the main entry.

Note how the children spill-over into the car park access road due to the narrow footpath width. The vehicle barrier then acts as a bottleneck for pedestrian access.

Photo 37

The car park contains numerous pedestrian and vehicle conflicts.

Pedestrians exposure is high. This crossing should be shortened.

Note the two pedestrian crossing in close proximity.

Photo 38

The disabled and parents with prams are required to take the long detour round.

This could add some 50m to their trip and forces them to cross at a more exposed site.

Photo 39

The main pedestrian link across the bus turning area.

Photo 40

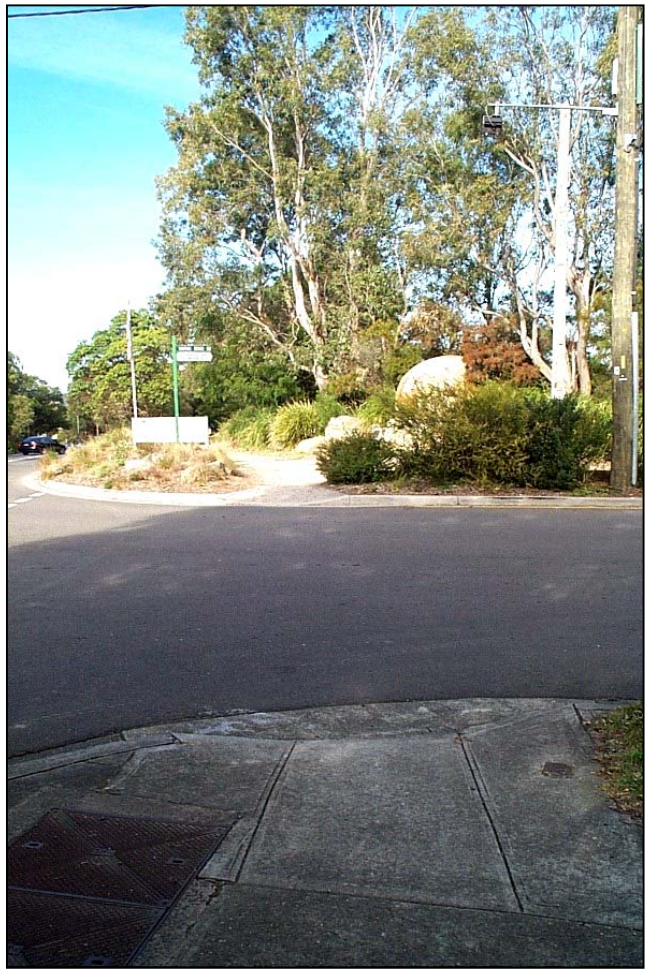
Looking south along the eastern pedestrian path of Bradleys Head Road. This footpath connects the main car park with the Visitor Centre.

Note the uneven surface.

Photo 41

Looking south along the eastern edge of Bradleys Head Road to Whiting bay Road.

This crossing connects the Zoo to the main pedestrian links to Mosman.



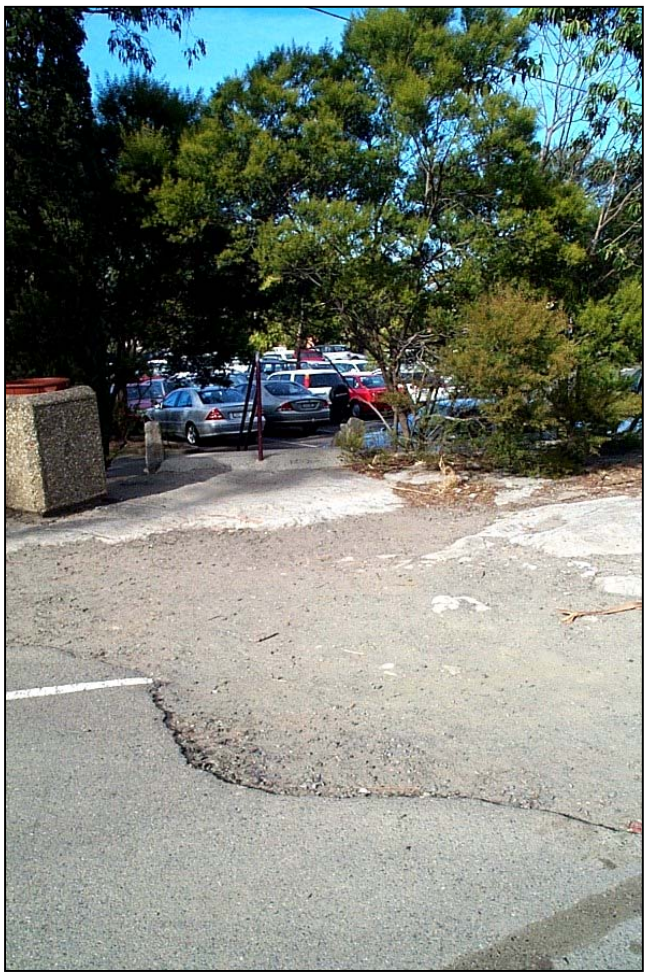


Photo 42

Poor and uneven surface in the upper level of the main car park.

Photo 43

The narrow footpath connecting the Education Centre and the bus set-down area at the Zoo's Main Entrance.

Photo 44

Advance direction sign located on the eastern approach to Spit Junction.

The sign has an RTA standard brown and white 'tourist sign' color scheme for the Taronga Zoo section of the sign.

The Taronga Zoo logo legibility is poor from a distance.

Photo 45

Intersection direction signs at Spit Junction.

Photo 46

Advance Direction sign located on Spit Road north of Spit Junction.

Most of the sign is obscured by tree foliage on approach.

Photo 47

Small intersection sign located at the intersection of Belmont Road and Military Road.

The sign is too small and easily missed amongst the visual clutter and plethora of competing signs. Notice how effective the red Australia Post signs are in attracting driver attention.

There is no corresponding sign at the other end of Belmont Street to direct traffic down this road.

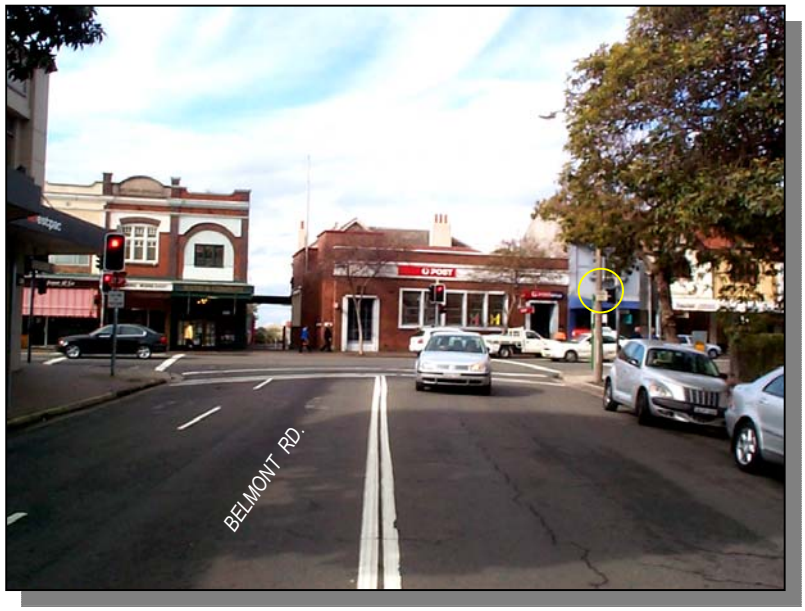


Photo 48

A close up view of the sign at Belmont Road and Military Road.

The sign letter height is only 80mm. The effective reading distance is less than 50m.

The use of all-capital lettering reduces legibility and increases the time for a driver to recognize the word.

Photo 49

Intersection sign at the Mosman Junction roundabout.

Note that it is too small and the directions to the Zoo are unclear.

Photo 50

A close-up of the Mosman Junction roundabout sign.

The sign is only 450mm x 600mm in size.

The word 'Taronga' is 100mm letter height. Whilst the word 'Zoo' is 160mm letter height. The effective reading distance is less than 70 to 80m.

The use of all-capital lettering reduces legibility and increases the time for a driver to recognize the word.

The color scheme does nothing to attract driver attention.

The color scheme and font is not consistent with Zoo branding.

Photo 51

Looking to the Zoo signposting at the intersection of Bradleys Head Road and Whiting Beach Road.

The directional signs are overpowered by the Zoo emblem sculpture.

The sign color scheme offers a poor contrast between the lettering and the background.

The lettering is too small and the sign is located too low to the ground. It will be obscured by any passing vehicle.

Photo 52

Looking south along Bradleys Head Road to the car park entry

The sign color scheme offers a poor contrast between the lettering and the background.

The lettering is too small and the sign is located too low to the ground. It will be obscured by any passing vehicle.

Drivers are being asked to assess and respond to multiple word text messages in different quadrants of their field of vision.

The sign on the left is partially obscured by tree foliage.

Photo 53

Looking south along Bradleys Head Road to the car park entry sign.

The large 'P' symbol is quite effective – but too close to the ground.

Photo 54

The stacked directional sign located inside the car park entry.

Photo 55

The stacked directional signs located at the Bus turning circle.

Color scheme offers poor contrast between lettering and background.

The signs are not retro-reflective. They will be difficult to find at night for visitors attending a function.

The signs send mixed messages to drivers. This is not the destination for their vehicle.

The target audience needs to be considered. If the target audience is pedestrians - it should not face the road.

Photo 56

The stacked directional signs located at the entry to the Function Centre and Administration building.

Located too low to the ground. Color scheme offers poor contrast between lettering and background.

The signs are not retro-reflective. They will be difficult to find at night for visitors attending a function.

These signs send mixed messages to drivers. The signs tell drivers the location of their final destination but they are not permitted to park here.

Photo 57

Pedestrian direction sign located at the exit from the Ferry terminal.

There is no repeater signs at the top of the ramp. Instead, Taronga Zoo staff provide directions to visitors which can be inefficient under crowded conditions.

Signs are not changeable in the event that the Sky Safari is closed.

Photo 58

View of small sign located on pedestrian fence at the Wharf Exit providing directions to the Sky Safari.

It is too small and located too low. It would be totally obscured by a crowd.

The direction sign is competing for attention against the larger and more prominently placed sponsorship sign and bus stop sign.

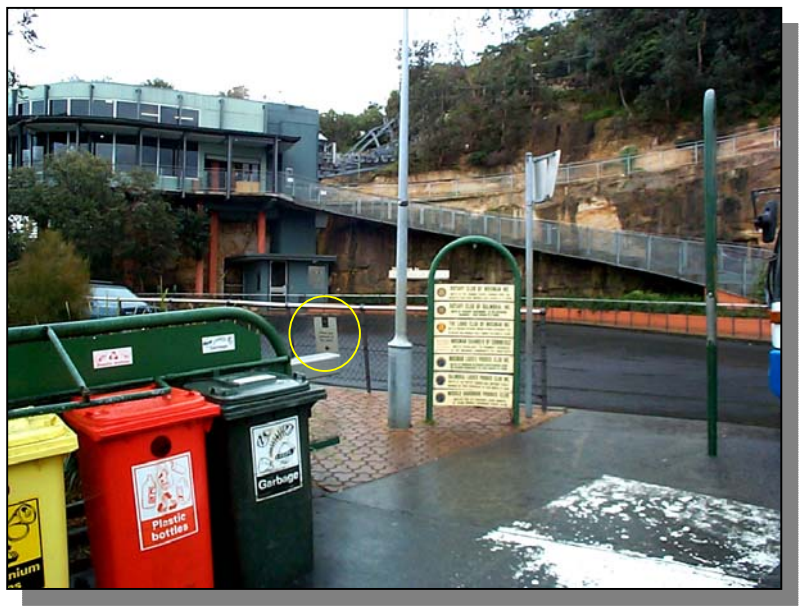


Photo 59

Looking east along Military Road from its intersection with Belmont Road. This end of Belmont Road has no Zoo signage, although a sign is provided at the other end.

An ideal location for a new Taronga Zoo sign at this intersection would be on the traffic signal post shown. This would provide a neat solution that minimizes on clutter.

The existing Type 2 signal post would have to be replaced with a Type 6 signal post that is specifically designed to support sign structures.

Appendix C

TZ Service Vehicles

Table C1: Inventory of TZ Service Vehicles

No.	Vehicle	Fuel	Rego	Delivery Date	Department	Code
1	TOYOTA SPACIA	P	WPH-836	May-00	AD/SEC	15900
2	HONDA LEADBIKE	P		Nov-85	ADMIN	15220
3	HOLDEN BERLINA	P/S	XVL-816	Feb-02	ASSETS	15800
4	DYNA 2T TIPPER	D	QVS-807	Jun-99	BIRDS	11250
5	HI LUX DUEL CAB	D	VWA-251	Jun-99	BIRDS	11250
6	YAMAHA BIKE	P		Jun-89	CARPENTERS	15740
7	HOLDEN COMBO	P	VUU-712	Jun-99	CLEANERS	15100
8	DYNA 400 COMPACT	D	VDP-571	Jun-98	CLEANERS	15100
9	HINO COMPACTOR	D	XLA-739	Jan-01	CLEANERS	15100
10	VW TRANSPORTER	D	ZOO-001	Jun-95	ED CENTRE	13920
11	MERCEDES 'Zoo mobile'	P	AKW-09Y		ED CENTRE	19300
12	YAMAHA BIKE	P		Jun-89	ELECT	15740
13	HOLDEN COMBO	P	VUU-711	Jun-99	ELECT	15740
14	TOYOTA HIACE	P	XZH-890	May-02	EUREST	384850
15	TOYOTA HILUX UTE	P	YAB-465	Jun-02	EUREST	384850
16	CLUB CART FIRST AID	P		Aug-97	FIRST AID	15660
17	RAV 4	P/S	YAY-207	Jul-02	FLINDERS	15220
18	VW TRANSPORTER	P	UXY-242	Mar-98	FOOD PREP	15360
19	DAIHATSU TIPPER	D	VXX-064	Jun-99	GARDENS	15500
20	HI LUX T/T	D	VWA-380	Jun-99	GARDENS	15500
21	TORO MOWER	D		Sep-89	GARDENS	15500
22	FORD TRANSIT	D	QVS-934	Sep-97	GARDENS	15500
23	MITSUBISHI MAGNA	P/S	XDM-246	Feb-00	IT	15620
24	YANMAR DUMPY	D			MAINT	15740
25	FORD TRANSIT	P	VXK-457	May-99	MAINT	15740
26	MITSU 8T	D	QDE-117	Oct-92	MAINT	15740
27	CASE 580 LOADER	D	QCL-893	Sep-92	MAINT	15740
28	HI LUX DUEL CAB	P	VZF-157	Jul-99	MAINT	15740
29	MITSUBISHI TRIT	P	XFL-904		MAINT	15740
30	DAIHATSU	D	VXX-065	Jun-99	MAINT	15740
31	CASE 1840	D	QHV-439	Jun-94	MAINT	15740

No.	Vehicle	Fuel	Rego	Delivery Date	Department	Code
32	CP COMPRESSOR			Jun-83	MAINT	15740
33	TOYOTA LITE ACE	P	UXF-684	Feb-98	MAINT	15740
34	Mitsubishi Triton	P	XRM-643	Dec-01	MAINT	15740
35	MITSUBISHI MAGNA	P/S	XBP-067	Dec-00	MEIKLE	15220
36	HOLDEN FRONTIERA	P/S	XVL-722	Feb-02	NOAK	15220
37	HOLDEN COMBO	P	VUU-714	Jun-99	PLUMBER	15740
38	HI LUX T/T	P	WEF-284	Aug-99	PLUMBER	15740
39	SPACIA VAN	P	UJY-443	Sep-96	PR	13300
40	FORD GHIA	P/S	YIU-732	Nov-02	RANKIN	15220
41	SUBARU FORESTER	P/S	YBY-346	Aug-02	REES	15220
42	CHERRY PICKER	P	J83-367	May-96	RELIEF	11270
43	LITE ACE BUS	P	RSX-257	Jan-91	RETAIL	13800
44	YAMAHA BIKE	P		Nov-88	SECURITY	15900
45	TOWNACE	P/S	VWA-358	Jun-99	SECURITY	15900
46	HI LUX	P	QVS-805	May-97	SOS	11360
47	HI LUX DUEL CAB	P	VZF-162	Jul-99	SOS	11360
48	STACER BOAT	P	UC9-52N	May-92	SOS	113690
49	HOLDEN RODEO	P	TDW-746	Mar-94	SOS	11360
50	CLUB CART MICKS	P		Dec-97	STORES	15360
51	HI ACE VAN	P	UBH-483	Jun-96	VQC	11380
52	TOYOTA TOWNACE	P	SKZ-519	Sep-92	WORKS	15740

Appendix D

Survey of Animal Movements
(August 01 to July 02)

Table D1: Survey of Animal Movements (Aug 01 to Jul 02)

No.	Date	Day of Week	Species	Name	Id No.	Size of animal (kg)	Reason for move
1	7/08/2001	Tue	Chimpanzee	Koko	930029	54.0	Anaesthetised for removal of hormonal implant
2	7/08/2001	Tue	Chimpanzee	Kamili	950311	30.0	Anaesthetised for general check
3	9/08/2001	Thu	Chimpanzee	Lulu	650003	61.6	Anaesthetised for ultrasound
4	29/08/2001	Wed	Red-necked wallaby	Kirra	960306	10.1	Anaesthetised to treat lumpy jaw
5	5/09/2001	Wed	Australian Fur Seal	Sandy	960177	99.5	Anaesthetised for eye surgery
6	6/09/2001	Thu	Golden Cat	Mao	A10316	9.2	Transferred to Asian after quarantine period at VQC
7	11/09/2001	Tue	Aldabran tortoise	Lance	790064	137.0	Anaesthetised to scope nostrils, x-rays, lung-wash
8	30/09/2001	Sun	Eastern grey kangaroo	Jedda	940478	24.0	Anaesthetised to x-ray and treat injury to left fore.
9	2/10/2001	Tue	Eastern grey kangaroo	Jedda	940478	24.0	Anaesthetised to treat injury to left fore.
10	11/10/2001	Thu	Eastern grey kangaroo	Jedda	940478	23.4	Anaesthetised to treat injury to left fore.
11	16/10/2001	Tue	Eastern grey kangaroo	Jedda	940478	23.6	Anaesthetised to treat injury to left fore.
12	17/10/2001	Wed	Red-necked wallaby	Charlie	A10073	11.9	Anaesthetised to x-ray jaw.
13	2/11/2001	Fri	Red-necked wallaby	Minna	A00490	6.7	Anaesthetised to x-ray jaw
14	7/11/2001	Wed	Chimpanzee	Sacha	800018	60.9	Anaesthetised to remove contraceptive implant
15	7/11/2001	Wed	Chimpanzee	Kuma	910946	55.4	Anaesthetised to remove contraceptive implant
16	7/11/2001	Wed	Eastern grey kangaroo	Jedda	940478	23.4	Anaesthetised to x-ray foot
17	12/11/2001	Mon	Indian rhino	Dora	A10433	750.0	Transferred from Quarantine to African section
18	15/11/2001	Thu	Swamp wallaby	Rusty	950294	17.8	Anaesthetised to remove hormonal implant.
19	15/11/2001	Thu	Red-necked wallaby	Amber	950318	13.2	Anaesthetised to remove hormonal implant.
20	20/11/2001	Tue	Red-necked wallaby	Charlie	A10073	12.0	Anaesthetised for x-ray & bone needle biopsy
21	21/11/2001	Wed	Western Lowland	Mouila	960333	83.9	Anaesthetised for ultrasound & remove hormone implant
22	27/11/2001	Tue	Eastern grey kangaroo	Jedda	940478	23.1	Anaesthetised to remove antibiotic implant from leg
23	28/11/2001	Wed	Red-necked wallaby	Charlie	A10073	11.8	Anaesthetised to insert antibiotic implants
24	6/12/2001	Thu	Eastern grey kangaroo	Jedda	940478	22.6	Anaesthetised to clean new wound on hock
25	10/12/2001	Mon	Fishing cat	Fiddle	980123	7.8	Anaesthetised to remove tick give fluids, etc.
26	12/12/2001	Wed	Eastern grey kangaroo	Jedda	940478	23.2	Anaesthetised to re-bandage leg.
27	19/12/2001	Wed	Eastern grey kangaroo	Jedda	940478	23.0	Anaesthetised to x-ray leg and treat wound
28	24/12/2001	Mon	Red-necked wallaby	Charlie	A10073	11.5	Anaesthetised to remove antibiotic beads from jaw

No.	Date	Day of Week	Species	Name	Id No.	Size of animal (kg)	Reason for move
29	24/12/2001	Mon	Eastern grey kangaroo	Jedda	940478	23.7	Anaesthetised to re-bandage leg.
30	24/12/2001	Mon	Eastern grey kangaroo	Jedda	940478	23.0	Anaesthetised to re-bandage leg.
31	30/12/2001	Sun	Eastern grey kangaroo	Jedda	940478	23.4	Anaesthetised to re-bandage leg & x-rays
32	4/01/2002	Fri	Southern hairy-nosed wombat	Mallee	960300	28.9	Anaesthetised to get skin scraping biopsy
33	7/01/2002	Mon	Snow leopard	Prafula	900484	43.5	Anaesthetised to investigate lameness
34	7/01/2002	Mon	Snow leopard	Prafula	900484	43.5	Anaesthetised to investigate eye injury.
35	9/01/2002	Wed	Eastern grey kangaroo	Jedda	940478	22.6	Anaesthetised to re-bandage leg.
36	16/01/2002	Wed	Red-necked wallaby	Charlie	A10073	11.5	Anaesthetised to x-ray jaw
37	21/01/2002	Mon	Eastern grey kangaroo	Jedda	940478	22.2	Anaesthetised to re-bandage leg
38	29/01/2002	Tue	Eastern grey kangaroo	Jedda	940478	22.0	Anaesthetised to check leg
39	1/02/2002	Fri	Red-necked wallaby	Amber	950318	12.0	Anaesthetised to x-ray jaw
40	3/02/2002	Sun	Red-necked wallaby	Marsden	970543	15.0	Anaesthetised to x-ray head
41	5/02/2002	Tue	Red-necked wallaby	Marsden	970543	15.2	Anaesthetised to insert antibiotic impregnated balls
42	7/02/2002	Thu	Red-necked wallaby	Amber	950318	12.3	Anaesthetised to x-ray jaw
43	8/02/2002	Fri	Fishing cat	Pak Ikan	960259	9.0	Anaesthetised to remove paralysis tick
44	13/02/2002	Wed	Red-necked wallaby	Amber	950318	12.3	Anaesthetised to clean mouth wounds
45	20/02/2002	Wed	Red-necked wallaby	Amber	950318	13.0	Anaesthetised to check jaw
46	27/02/2002	Wed	Sumatran tiger	Shiva	850083	108.8	Anaesthetised for general check and ultrasound.
47	6/03/2002	Wed	De Brazza's Guenon	Sophocles	890425	10.9	Anaesthetised for x-ray & ultrasound
48	7/03/2002	Thu	Red-necked wallaby	Amber	950318	13.2	Anaesthetised to remove antibiotic implants
49	14/03/2002	Thu	Red-necked wallaby	Amber	950318	12.7	Anaesthetised to x-ray jaw
50	26/03/2002	Tue	Red-necked wallaby	Charlie	A10073	11.9	Anaesthetised to x-ray jaw
51	28/03/2002	Thu	Sumatran tiger	Shiva	850083	105.5	Euthanasia - moved to post mortem room
52	3/04/2002	Wed	Red kangaroo	Harvey	A20061	10.6	Moved from quarantine to Australian Mammals
53	13/04/2002	Sat	Alligator				Moved from Amazonia to VQC Holding yards
54	24/04/2002	Wed	Chimpanzee	Spitter	900005	68.8	Anaesthetised to remove and replace hormone implants
55	1/05/2002	Wed	Orang-utan	Jantan	870038	97.0	Anaesthetised for general health check
56	9/05/2002	Thu	Eastern grey kangaroo	Tilly	890231	28.0	Moved to VQC
57	14/05/2002	Tue	Sumatran tiger	Selatan	920001	80.0	Anaesthetised for ultrasound

No.	Date	Day of Week	Species	Name	Id No.	Size of animal (kg)	Reason for move
58	22/05/2002	Wed	Snow leopard	Prafula	900484		Anaesthetised to check eye and move to new exhibit
59	23/05/2002	Thu	Nubian goat	Jackson	A10436	38.6	Anaesthetised for castration
60	23/05/2002	Thu	Nubian goat	Jackson	A10436	38.6	Returned to farm
61	27/05/2002	Mon		Amber	950318		Anaesthetised to check jaw
62	6/06/2002	Thu	Australian Sealion	Katanya	960402		Sedated to transport to Seal Bay
63	20/06/2002	Thu	Red Kangaroo	Mr Jones	A00155	40kg	Anaesthetised to x-ray toe
64	10/07/2002	Wed	Red-necked wallaby	Charlie	A10073	11.2	Anaesthetised to check mouth.
65	19/07/2002	Fri	Clouded leopard		930431	10.3	Anaesthetised for emergency surgery.
	21/07/2002	Sun		Nonah	930431	10.3	Returned to Division
67	23/07/2002	Tue	Western grey kangaroo	Cobar	930110	24.4	Anaesthetised for x-ray back/pelvis
68		Thu	Chimpanzee		650003	60.2	Anaesthetised for general health check
69		Thu	Chimpanzee	Lubutu	930161	53.9	

Source: Taronga Zoo VQC Daily Reports

Appendix E

Backyard to Bush Coach Set-down Concept Sketch

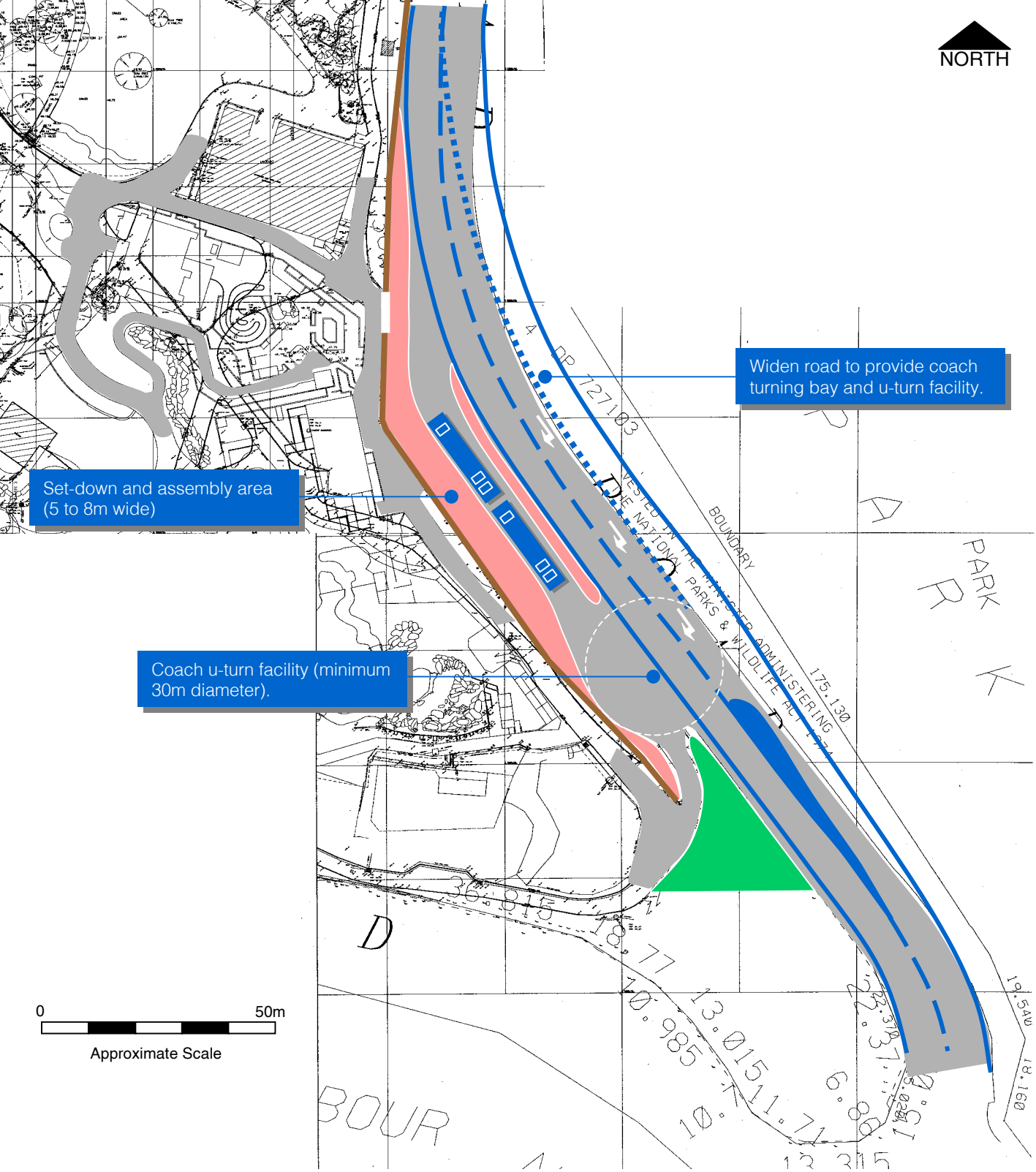


Figure 8.1
Backyard to Bush
Coach Set-down Area
Taronga Zoo Master Plan