

PROPOSED MARINA DEVELOPMENT
CATTLE BAY, EDEN
***Assessment of Traffic and
Parking Implications***

July 2014
Rev B

Reference 12097

TRANSPORT AND TRAFFIC PLANNING ASSOCIATES
Transportation, Traffic and Design Consultants
Suite 502, Level 5
282 Victoria Avenue
CHATSWOOD 2067
Telephone (02) 9411 5660
Facsimile (02) 9904 6622
Email: info@ttpa.com.au

TABLE OF CONTENTS

1.	INTRODUCTION	1
2.	PROPOSED DEVELOPMENT SCHEME.....	2
2.1	Site, Context And Former Use.....	2
2.2	Proposed Development.....	2
2.3	Other Development	3
3.	ROAD NETWORK AND TRAFFIC CONDITIONS.....	5
3.1	Road Network.....	5
3.2	Traffic Controls.....	6
3.3	Traffic Conditions	6
4.	ACCESS AND TRAFFIC	7
5.	PARKING	11
6.	ROAD ACCESS, INTERNAL CIRCULATION AND SERVICING	12
7.	PEDESTRIANS AND CYCLISTS.....	13
8.	CONSTRUCTION.....	14
9.	CONCLUSION	15

APPENDIX A	EXTRACTS OF EDEN PORT MASTERPLAN
APPENDIX B	IMAGES OF ACCESS ROADS
APPENDIX C	HALLAM REPORT

LIST OF ILLUSTRATIONS

FIGURE 1	LOCATION
FIGURE 2	SITE
FIGURE 3	ROAD NETWORK
FIGURE 4	TRAFFIC CONTROLS
FIGURE 5	EXISTING TRAFFIC FLOWS
FIGURE 6	FUTURE TRAFFIC FLOWS

1. INTRODUCTION

This report has been prepared for Eden Resort Hotels Pty Ltd to supplement a Part 4 Application to the Department of Planning for a proposed Marina with temporary land facilities on part of the former “Heinz Cannery” site at Eden (Figure 1).

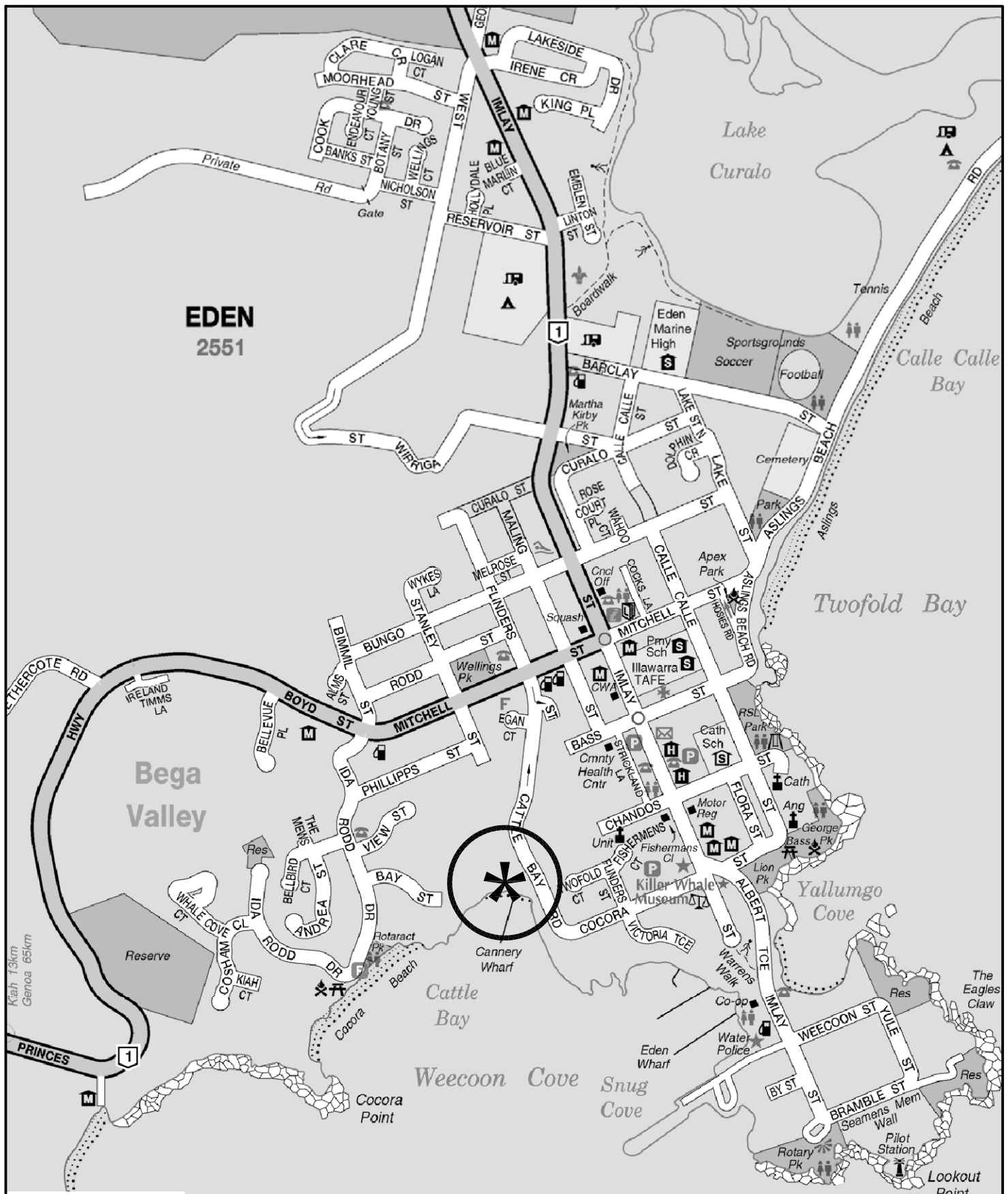
Eden and its environs is a popular coastal area which has a growing population base and attracts a wide range of tourists and visitors. The site of the proposed development is located on Cattle Bay, which is contained within the larger Twofold Bay. Much of the former cannery complex which operated for more than 50 years has been demolished although the existing jetty and access connection to Cattle Bay Road remain.

The Director General’s Requirements under Part 4 of the EP and A Act include the following:

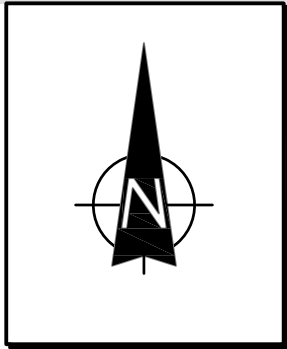
“Traffic Impact Study (TIS) – is required to identify the largest design vehicles associated with the development and give consideration to any necessary road upgrades. In addition, intersection modelling is required using ‘SIDRA’ for the junction of Mitchell Street with Flinders Street, and Chandos Street and Imlay Street, plus any other key intersections with the classified road network that are likely to be impacted by the proposal.”

The purpose of this report is to:

- * describe the site and the proposed development scheme
- * describe the road network serving the site and the prevailing traffic conditions
- * assess the vehicle access arrangements and potential traffic implications
- * assess the adequacy of the proposed parking provision
- * assess the proposed internal circulation and servicing arrangements



LEGEND



LOCATION

FIG 1

2. PROPOSED DEVELOPMENT SCHEME

2.1 SITE, CONTEXT AND FORMER USE

The site of the proposed Marina is part of a consolidated landholding lots which occupies an irregular shaped area of some 8.5 ha (Figure 2) bounded by:

- * Bass Street to the north
- * Flinders Street to the east
- * View Street/Bay Street to the west

The total Eden Resort Hotel site includes the immediate foreshore of Cattle Bay and the surrounding bushland and hills being located just to the west of the Eden Town Centre and to the south of Princes Highway (Mitchell Street). The Heinz Tuna Cannery operated on the site for more than 50 years in buildings located on the flat areas near the foreshore and at its peak employed some 500 persons and involved significant truck movements. The main buildings were demolished in 2003, however 2 Council owned buildings are retained on the foreshore along with a 150 metre jetty extending into the bay.

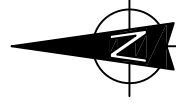
2.2 PROPOSED DEVELOPMENT

It is proposed to:

- * relocate some 24 existing swing moorings to provide for the Marina
- * construct 3 floating pontoon arms to accommodate some 154 berths (12m to 28m)
- * refurbish the existing jetty
- * construct a wave attenuator



LEGEND



SITE

FIG 2

- * construct a temporary carpark of 97 spaces and 3 loading bays on the existing hardstand area
- * provide vehicle access through the existing gate on Cattle Bay Road
- * provide 2 temporary buildings for administration and amenities
- * provide for casual berthing of vessels along the western side of the jetty and berthing for occasional super yachts as well as setdown/pickup berths along the western side of the pontoon connector

It is proposed that the Marina will be open and public access available as follows:

Summer (Daylight Saving)	7am – 6pm
Winter	7am – 5pm

A security system will enable access for boat owners and Marina staff at other times.

Details of the proposed development are provided on the plans prepared by Black Architects and Haskoning Australia which are reproduced in part overleaf.

2.3 OTHER DEVELOPMENT

The existing circumstances in regard to other related development issues are as follows:

- * **Eden Resort Hotel Development**

Concept Approval has been granted to DA05-0032 as well as 2 subsequent applications for minor modifications. The Marina did not form part of this proposal for a mixed use tourist and residential development which has “physical commencement” and is envisaged to proceed at some future time.

- * **Boydton Marina**

Consent for this proposed staged development has “substantial commencement” and comprises:

- a “Marine village”
- 250 wet berths
- 100 dry berths
- mooring for 40 craft
- jetty, boat launching and parking area

This project is currently ‘stalled’ pending rezoning of surrounding land.

*** Port of Eden Marina**

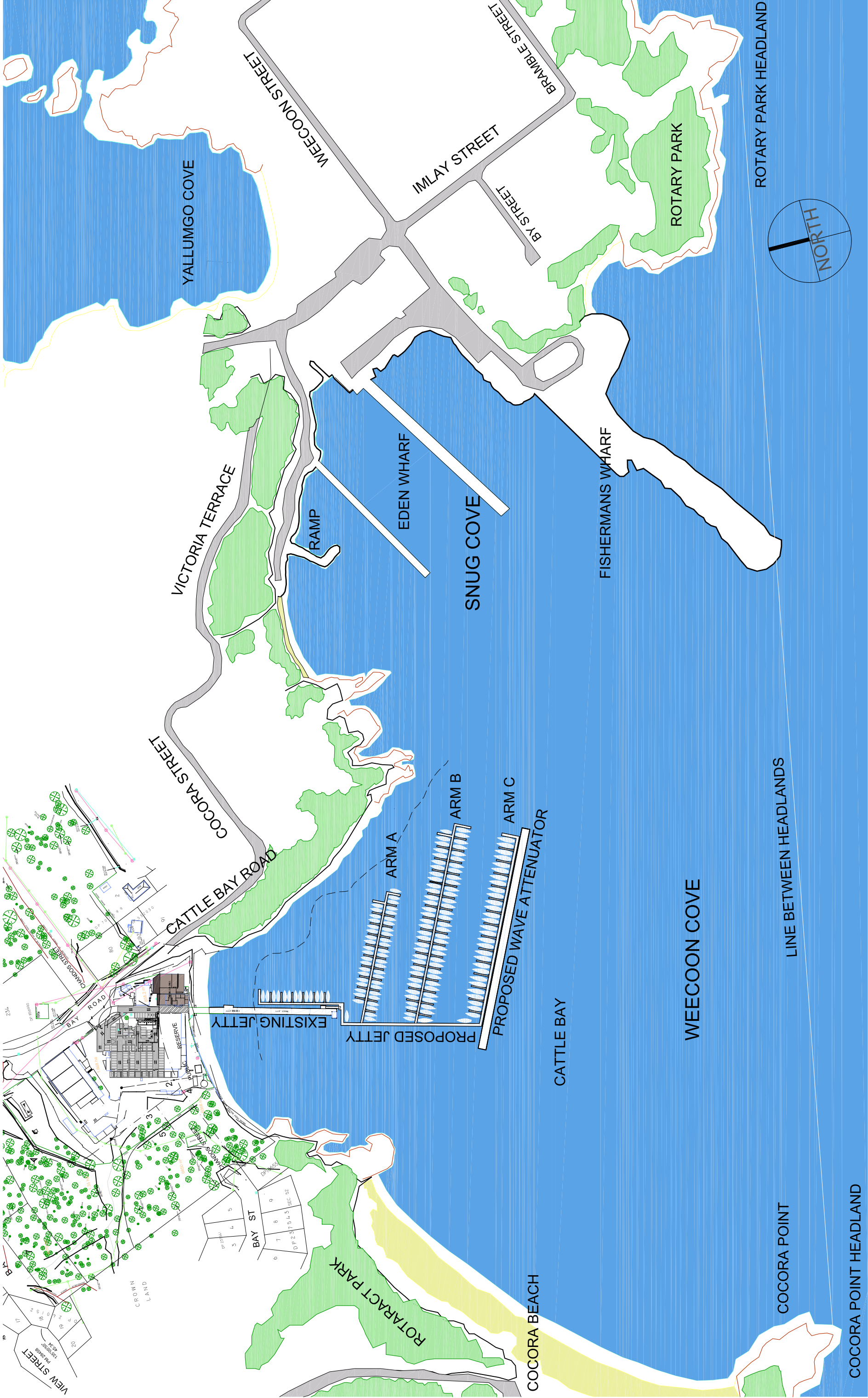
A consortium has been established to seek Government funding for this proposed Marina which would comprise:



- reclamation of part of the Snug Bay foreshore
- 193 berths (in 2 stages)
- Marina facilities and car parking

*** Port of Eden (Snug Bay) and Environs Master Plan**

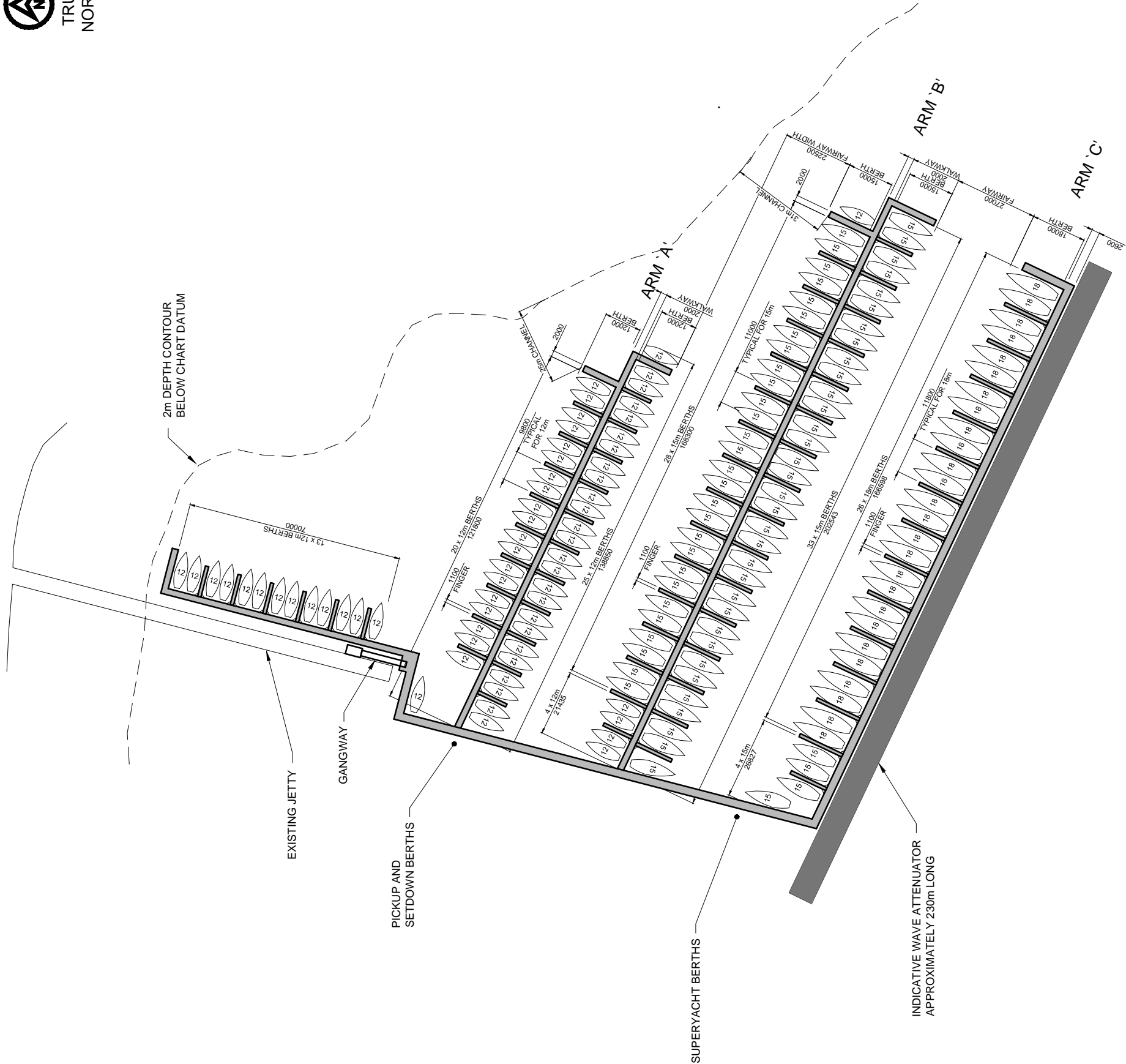
The 2005 Master Plan was revised with a new Draft Plan in 2013. Extracts of this plan are provided in Appendix A which include development of the marina in Snug Bay as well as the adjoining lands to the east along Imlay Street and Weecoon Street.

A feature of this plan is the construction of a “boardwalk” connecting the proposed Snug Bay Marina with the Cattle Bay Marina.



PROJECT :		CLIENT :		TOWN PLANNING CONSULTANT :		ARCHITECT :		DRAWING TITLE :		DWG NO. :	
STAGE ONE - PROPOSED MARINA DEVELOPMENT, CATTLE BAY, EDEN, NSW		EDEN RESORT HOTEL PTY LTD		INSPIRE URBAN DESIGN + PLANNING Tel. 0411 486 768 www.inspireplanning.com PO Box 7277 South Sydney Business Hub NSW 2015		BLACK blackarchitecture and project management PO Box 439, Alexandria, NSW 1435 NSW Registration No. 6026, ABN: 26 086 957 832 Tel (02) 8971 6666 Mob 0414 765 104 Email: kevinlynnblack@blackapm.com		CONTEXT PLAN INDICATING PROPOSED SITE LAYOUT & MARINA LAYOUT		DA-A-01	
										SCALE 1:3500@A3	
										PROJECT NO. KLB	
										CHECKED BY KLB	
										ISSUE DATE 6-05-13	
										ISSUED FOR D'WENT APPLICATION	
											

PROPOSED CATTLE BAY MARINA AND WAVE ATTENUATOR
DETAILED GENERAL ARRANGEMENT

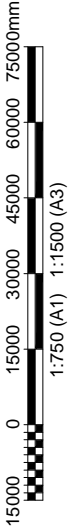


MARINA BERTH SCHEDULE

ARM	12	15	18	TOTAL
	45			45
	5	61		66
		4	26	30
ALONGSIDE JETTY	13			13
TOTAL PROPOSED BERTHS	63	65	26	154
TOTAL PROPOSED BERTHING LENGTH (m)	756	975	468	2199

WIDTH OF MARINA WALKWAYS AND FINGERS, AND LOCATION OF PILING, SUBJECT TO DETAILED DESIGN

FINAL ALIGNMENT OF WAVE ATTENUATOR SUBJECT TO DETAILED DESIGN





proposed temporary accommodation viewed from entrance steps



view along deck

Temporary Accommodation Schedule

Temporary Building No. 1:-

- Female WC, containing:**
2 x WC cubicles, 2 x wash hand basins in vanity counter, hand dryer and other accessories
- Male WC, containing:**
1 x WC cubicle, 2 x urinals, 2 x wash hand basins in vanity counter, hand dryer and other accessories
- Accessible Unisex Facility, containing:**
1 x WC, 1 x wash hand basin, and, 1 x shower, hand dryer and other accessories, all to comply with AS1428.1
- to future layout.

Temporary Building No.2:-

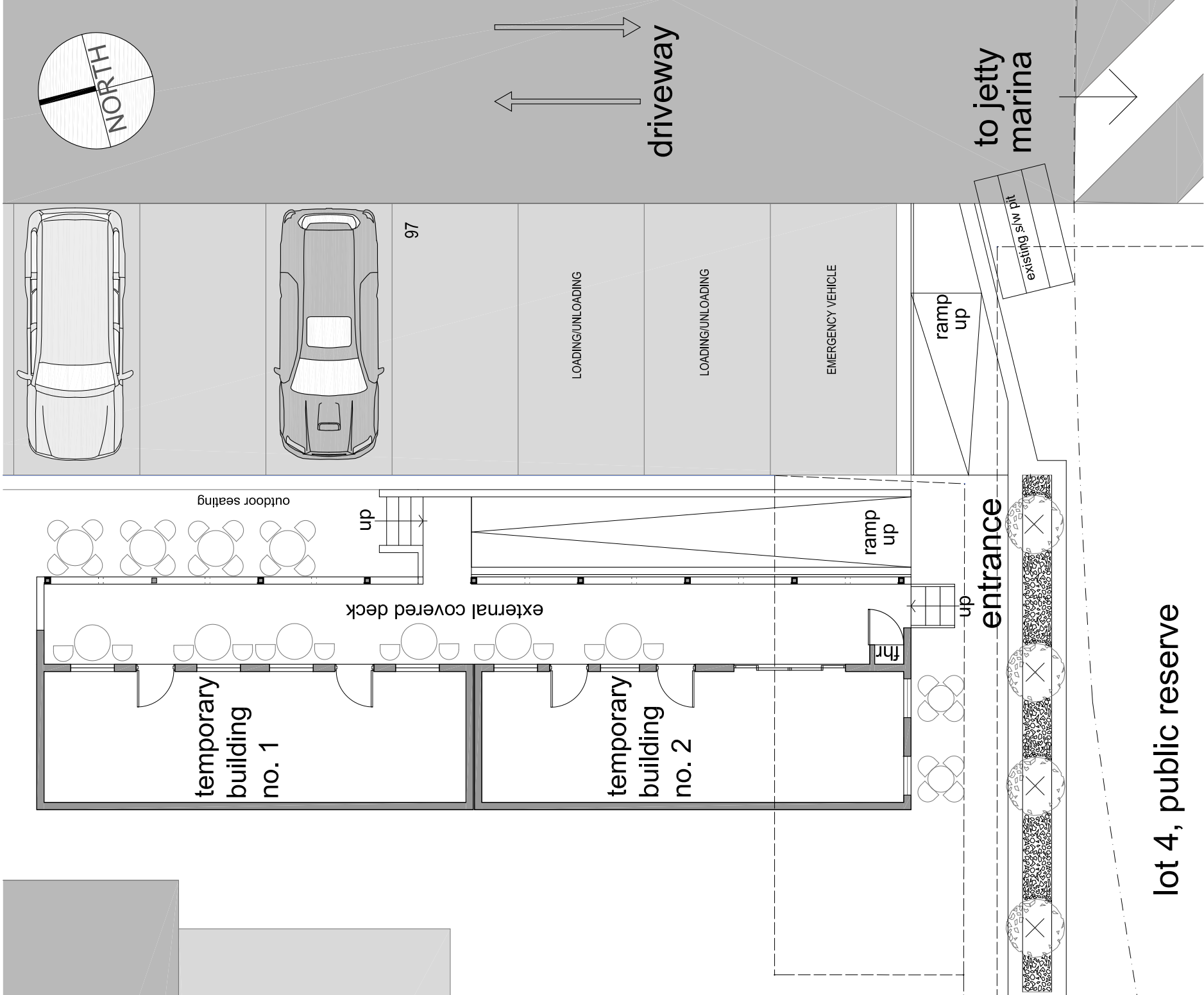
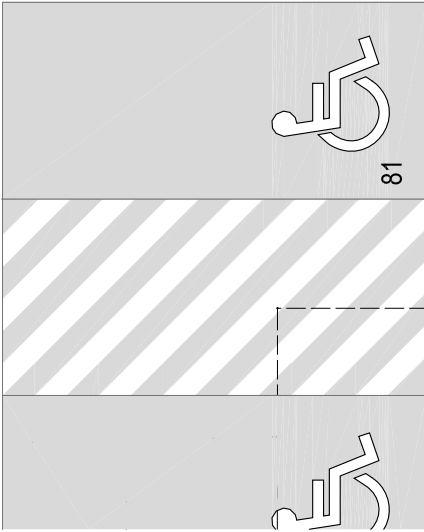
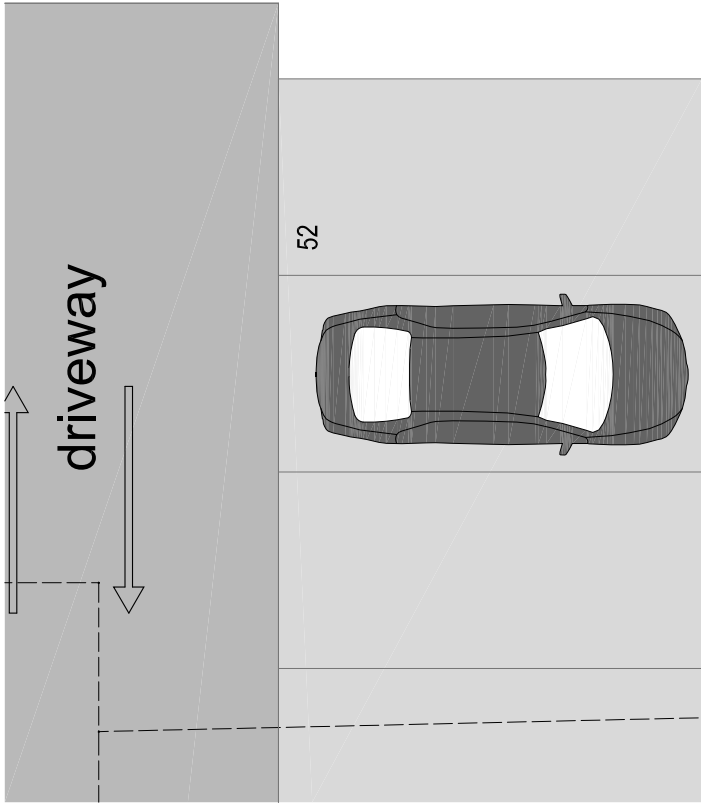
- Office, Meeting Room, and Storage
Facilities to future layout



typical office accom



typical tearoom



lot 4, public reserve

line of boundary with public reserve

NOTE: all work protected under copyright law ©

PROJECT :		CLIENT :		TOWN PLANNING CONSULTANT :		ARCHITECT :	DRAWING TITLE :		DWG NO. :	
STAGE ONE - PROPOSED MARINA DEVELOPMENT, CATTLE BAY, EDEN, NSW		EDEN RESORT HOTEL PTY LTD		INSPIRE URBAN DESIGN + PLANNING Tel. 0411 486 768 www.inspireplanning.com PO Box 7277 South Sydney Business Hub NSW 2015		<div>BLACK</div> <div>architecture and project management</div> <div>PO Box 439, Alexandria, NSW 1435</div> <div>NSW Registration No. 6026, ABN: 26 086 957 832</div> <div>Tel (02) 8971 6666 Mob 0414 765 104</div> <div>Email: kevinlynnblack@blackapm.com</div>	TEMPORARY BUILDINGS FLOOR PLAN AND TYPICAL IMAGES		DA-A-03	
							0 1 2 3 4 5 6m		SCALE 1:100@A3	
									PROJECT NO.	
									DRAWN BY	
									CHECKED BY	
									ISSUE DATE	
									ISSUED FOR	
									6-05-2013	
									KLB	
									KLB	
									1:100@A3	
									ISSUE	
									DA-A-03	
									NORTH	
									A	

3. ROAD NETWORK AND TRAFFIC CONDITIONS

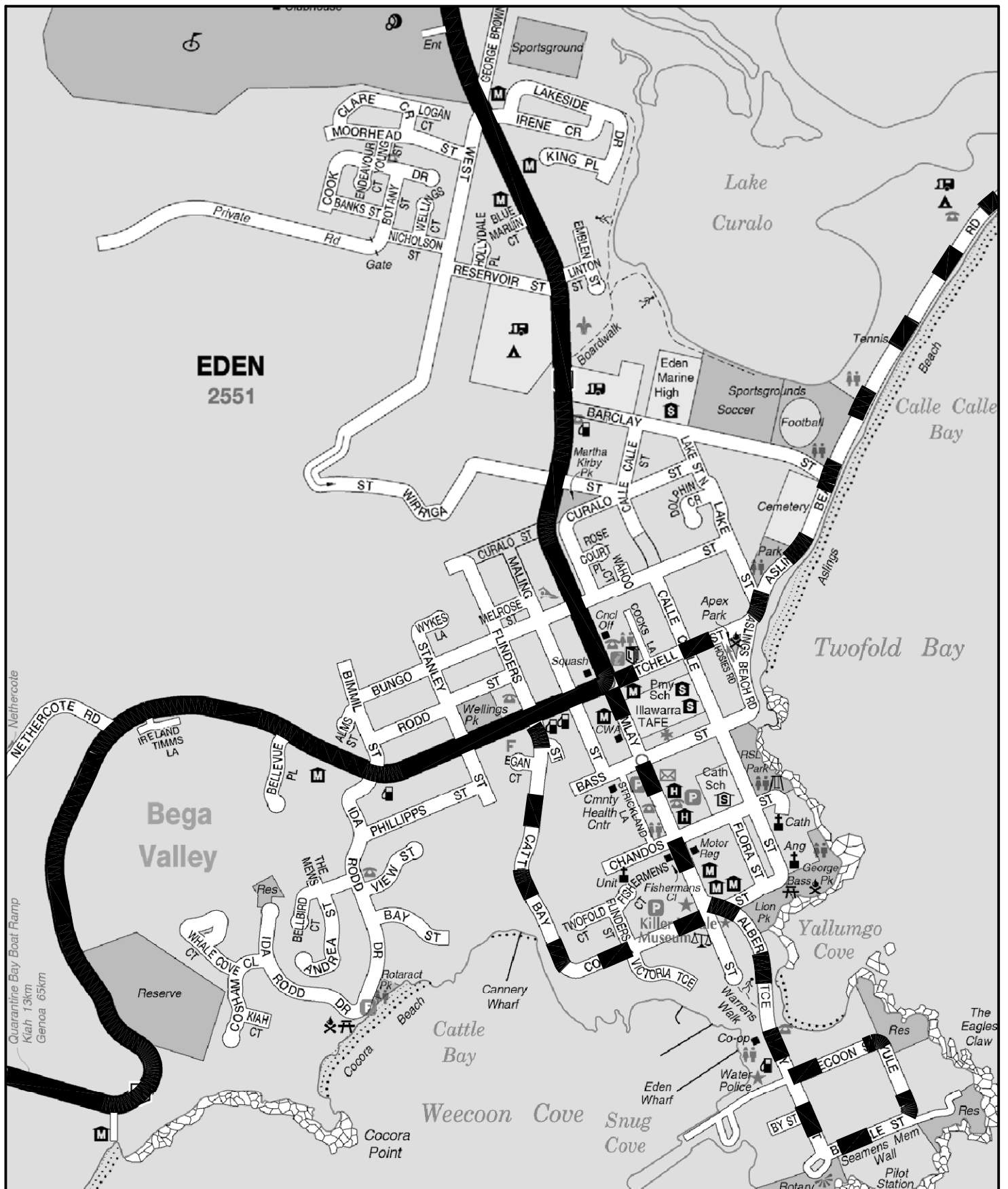
3.1 ROAD NETWORK

The road network serving the site (Figure 3) comprises:




- * *Princes Highway:* a State Highway (part of National Route 1) and an arterial route providing the coastal connection between Sydney and Melbourne
- * *Imlay Street (south)/Weecoon Street/Yule Street/Bramble Street:* a State Road (in part) and collector route extending through the Eden township
- * *Mitchell Street (east)/Aslings Beach Road:* a collector road route along Aslings Beach connecting to the Highway
- * *Barclay Street:* a collector route linking between the Highway and Aslings Beach Road
- * *Cattle Bay Road and Cocora Street:* a minor collector route connecting to the Princes Highway (via Flinders Street) in the north and to Imlay Street in the east
- * *Catlin Avenue, Dolphin Avenue, Marlin Avenue and Avalon Street/Tuna Street:* Local access roadways

The Cattle Bay Road/Cocora Street route in the vicinity of the site has a curvilinear alignment being 5 – 6 metres wide with gravel shoulders in the narrowest sections while there are wider sections with kerb and gutter to the north and east (see Appendix B images).

The Princes Highway at the Flinders Street intersection has 2 lanes in each direction while a number of local road corridors exist without constructed carriageways including:



LEGEND

-  ARTERIAL
-  SUB-ARTERIAL
-  COLLECTOR



ROAD NETWORK

FIG 3

- * Flinders Street between Twofold Circuit and Cattle Bay Road
- * Bass Street between View Street and Mailing Street
- * Stanley Street between Phillips Street and Cattle Bay Road
- * Chandos Street between Bay Street and Flinders Street

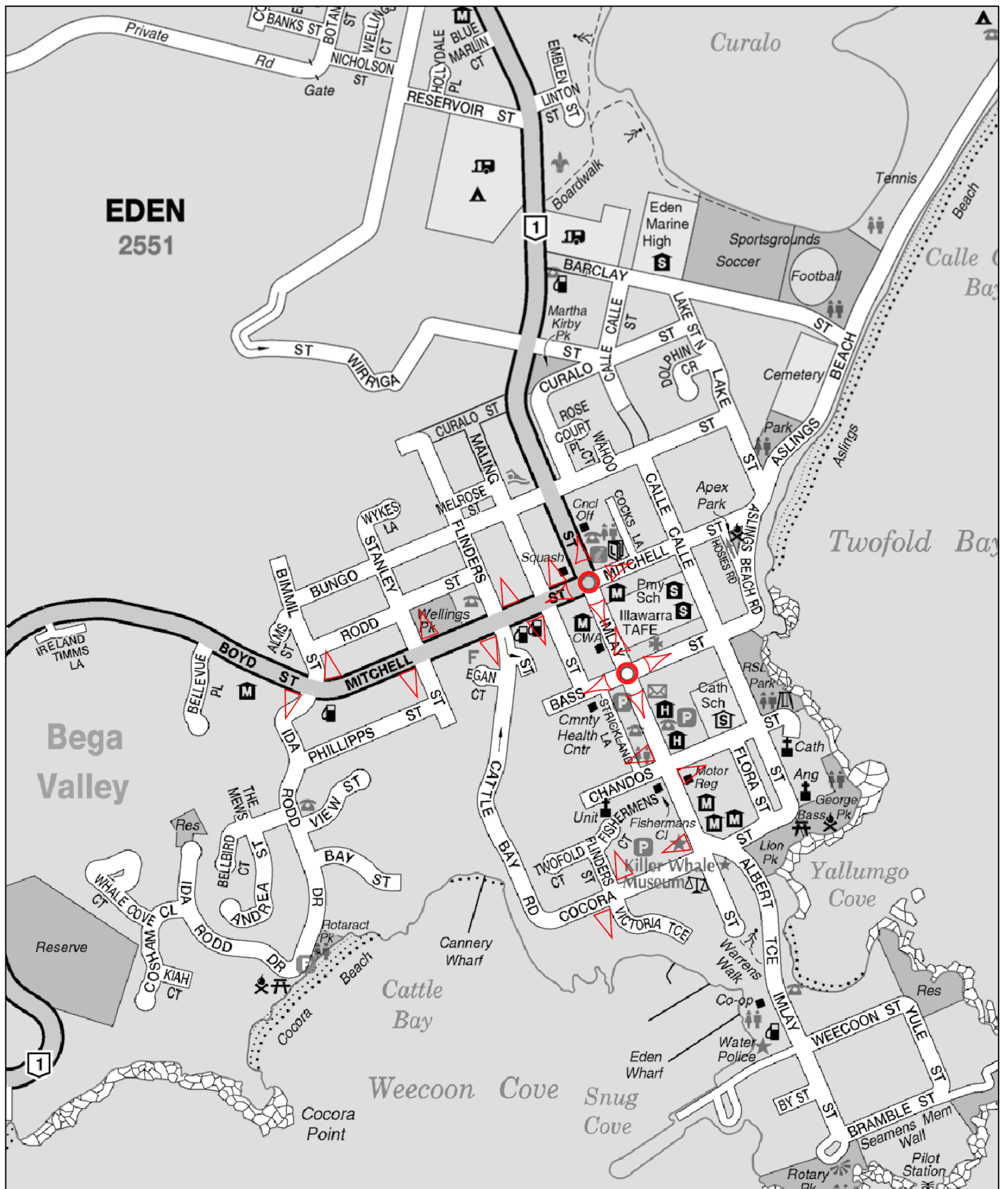
3.2 TRAFFIC CONTROLS

The relatively few traffic controls provided on the road system serving the site (Figure 4) comprise:




- * the roundabout at the Mitchell Street/Imlay Street intersection
- * the roundabout at the Imlay Street/Bass Street intersection
- * the 60 kmph speed restriction on Princes Highway (ie Mitchell Street west of Imlay Street and Imlay Street north of Mitchell Street) and 50 kmph on the remainder of the road system (including Cattle Bay Road and Cocora Street) with some sections of 40 kmph School Zones
- * the GIVE WAY sign controls on the side streets intersecting with Mitchell Street and Imlay Street
- * the unbroken centre line and lane lines along Mitchell Street.

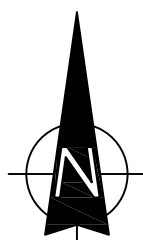
3.3 TRAFFIC CONDITIONS

An indication of traffic conditions in the area is provided by data published by RMS, previous assessments in relation to the site and recent surveys undertaken as part of this study. The RMS data is published in terms of Annual Average Daily Traffic (AADT) and volumes recorded at the nearby RMS stations reveal typical steadily increasing traffic flows of 1-2% p.a. Additional traffic flow characteristics are provided by the recent surveys at intersections along Flinders Street and Imlay Street during the weekday morning and afternoon peak periods. The results of those surveys are provided on Figure 5 indicating little change from the earlier surveys.



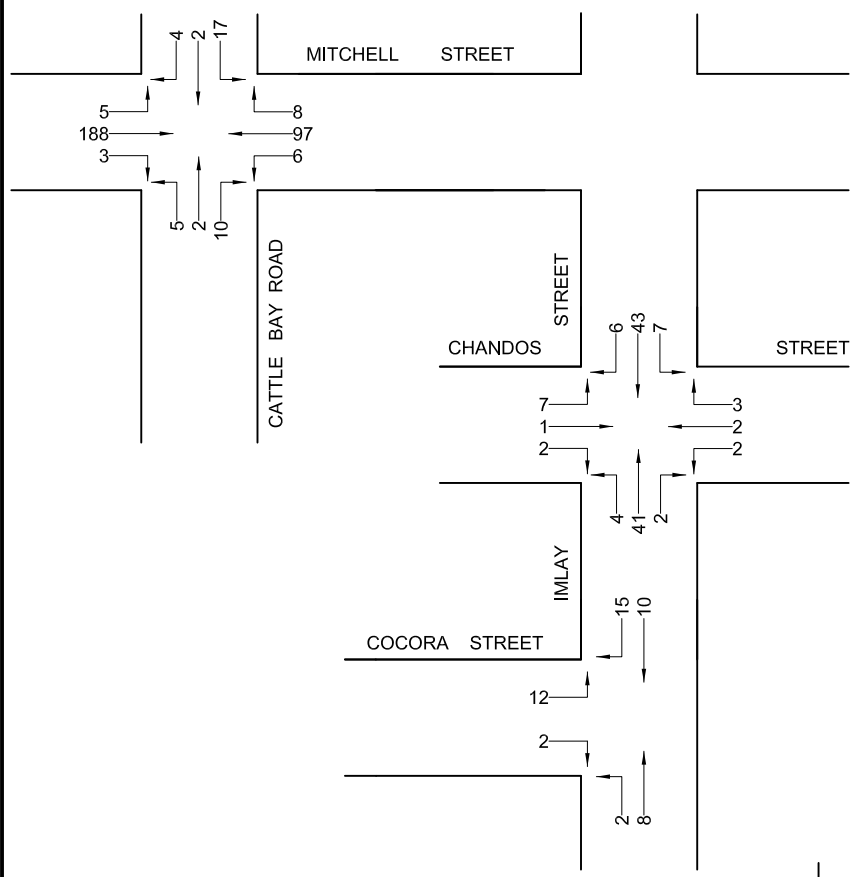
LEGEND

-  TRAFFIC SIGNAL CONTROL
-  ROUNDABOUT
-  RESTRICTED TURNING MOVEMENT

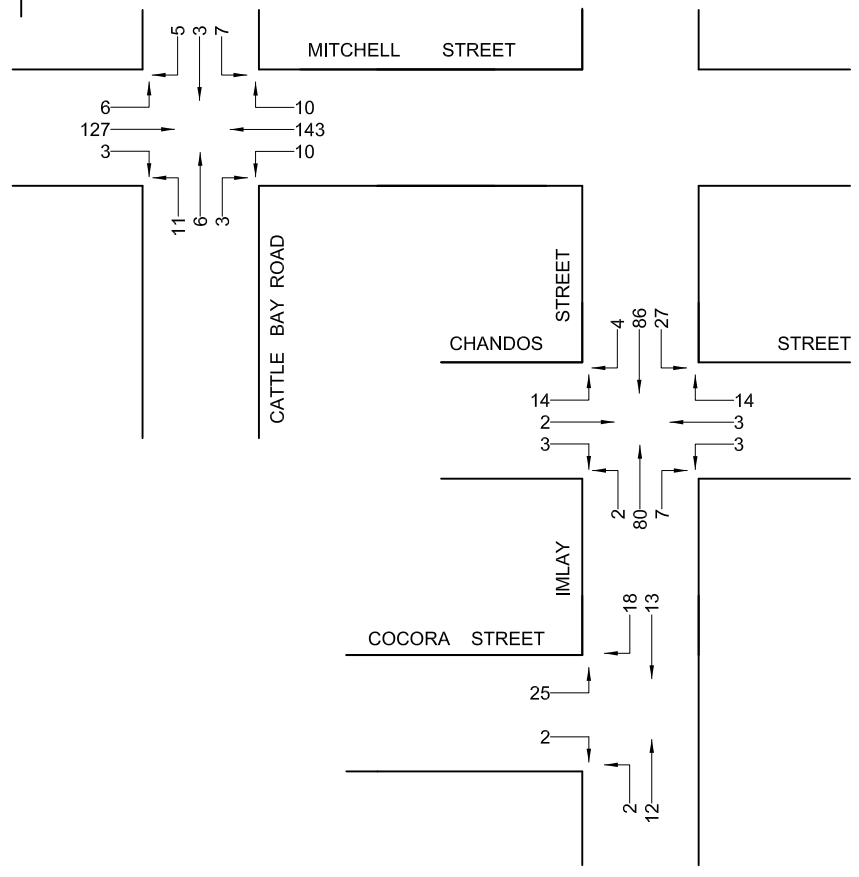


TRAFFIC CONTROLS

FIG 4

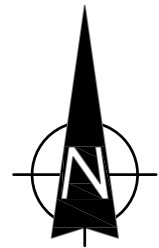


AM PEAK



PM PEAK

LEGEND



**EXISTING PEAK
TRAFFIC FLOWS**

FIG 5

4. ACCESS AND TRAFFIC

ACCESS

Vehicle access will be provided by the existing access gate on Cattle Bay Road where there are excellent sight distances available. The gate will be wide enough to enable access for all vehicles which would require to access the site both for the construction and subsequent operation of the marina.

TRAFFIC

The RMS Development Guidelines specify traffic generation rates in relation to a marina use of:

- 2.7 vtpd per boat for fixed berths
- 1.4 vtpd per boat for swing berths

This criteria, which is accompanied by a number of qualifications, was derived from some small sample surveys at 1 site undertaken at a “super peak” activity time in 1978 and the inappropriateness of this criteria is dealt with in the report prepared by Christopher Hallam (November 2008) which is reproduced in Appendix C.

There are however very clear and obvious factors in relation to boat usage at marinas, namely:

- there is higher use on the weekend days than weekdays
- there is higher use in summer than winter
- the larger the vessels the higher the traffic generation

The extensive surveys undertaken by Hallam were for marinas on Sydney Harbour and quite likely reflect a potentially higher level of utilisation than the proposed Marina at Eden and therefore represent a robust assessment ‘tool’ as follows:

December/January (weekends/public holidays)

Boat usage per day 0.0757 (av. per berth/mooring)

Sample size 242 boats

Reference to Hallams Table 2.18 indicates that boat usage on weekdays is only some 30% to 50% of the weekend/public holiday use which equates to some 0.0227 to 0.0378. Application of these factors to the proposed 154 berths would indicate the following usage:

Summer Weekend/Public Holiday	12 boats used per day
Summer Weekday	4 – 6 boats used per day

Hallams Table 2.9 puts together the results of surveys at 3 Marinas and highest Level of Use (summer Saturday/Sunday) was 0.153 (the result does not include the Double Bay Marina which is different due to the number of racing yachts with 65 berth/moorings compared to 319 at Point Piper and Rosebay).

Conversely it might be assumed that there could be a higher level of use at Eden due to the proportion of retirees and holiday makers. However even if a sensitivity factor of 100% were applied the level of summer weekday usage would only be 8-12 boats.

The size of boats (and therefore number of persons per boat) would be greater for the Sydney Eastern Suburbs marinas surveyed by Hallam as compared to the proposed Eden Marina. Hallam recorded the number of “cars per boat used” as 1.0 to 1.2 so again the worst case would be some 15 cars per day plus say 5 cars for staff would be a total of some 20 cars visitations on a summer weekday and some 40 on a summer weekend day/public holiday. The Hallam assessment shows the RMS Guideline rate to be an aberration which is also reflected in the parking criteria which suggests that 60% of boats could be used in 1 day.

Hallam does not provide any details in relation to the time of day of boat usage/car movements although it is apparent that this would be reasonably ‘spread’ with very little likelihood of any car arriving in weekday morning peak and then departing in

afternoon peak. The assessed traffic movements generated by the proposed Marina development are as follows:

WD AM			WD PM	
IN	OUT		IN	OUT
15	5		5	15

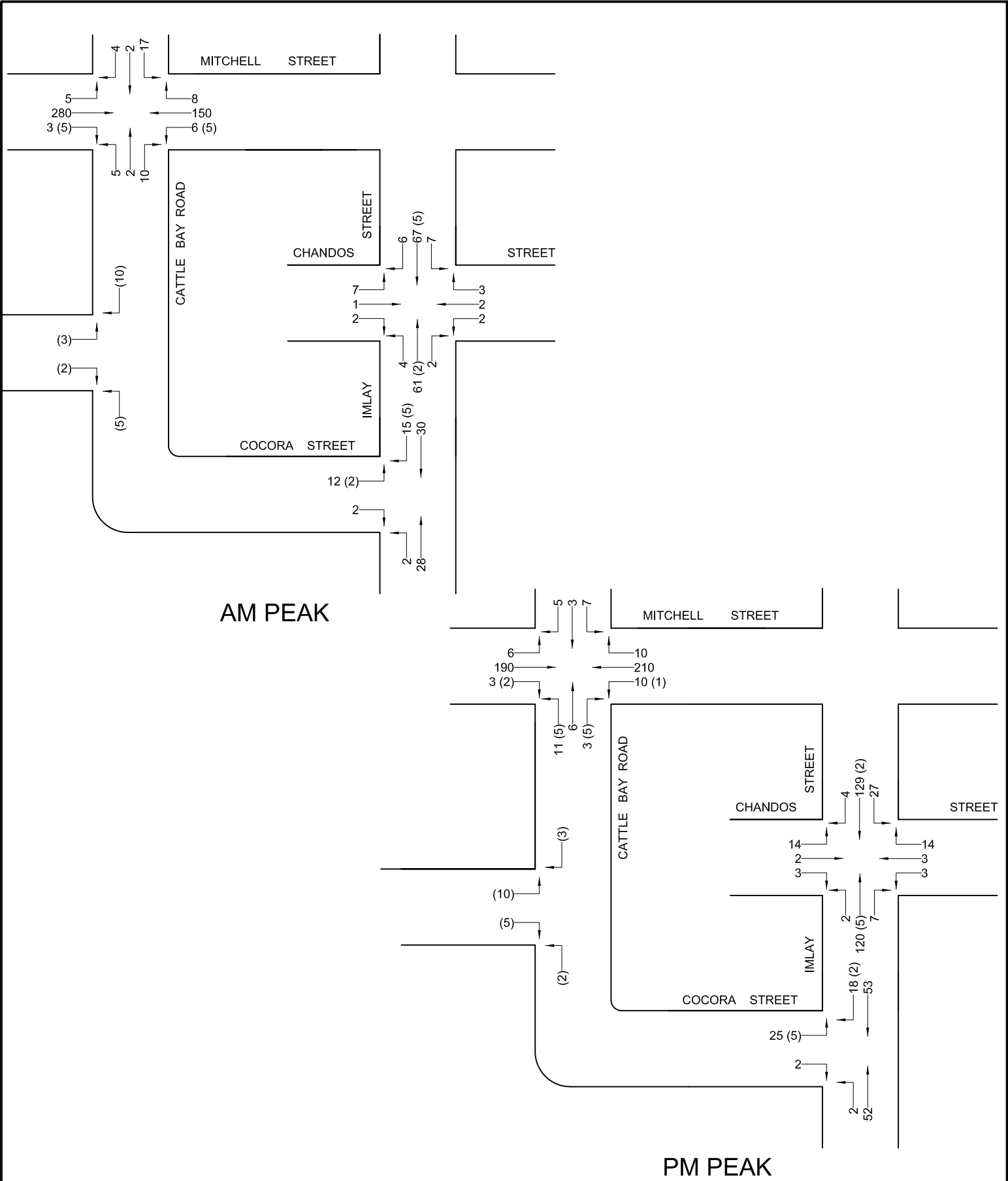
The generated movements are projected to be distributed 70% to/from the Highway and 30% to/from Cocora Street.

The RMS data indicates that traffic flows during the holiday periods along the Highway increase by some 50% (over normal weekday flows) and in order to reflect this circumstance the through movements from the recently recorded flows have been increased by 50% (this supersedes the normal '10 years at annual growth' assessment). The resultant projected flows reflecting the post development circumstances during 'holiday time' morning and afternoon peak periods are shown on Figure 6.

The operational performance of these intersections under these projected future traffic demands has been assessed using SIDRA. The results of that assessment are summarised in the following while the criteria for interpreting SIDRA output is provided overleaf.

	LOS	AM DS	AVD		LOS	PM DS	AVD
Mitchell/Flinders	A	0.089	2.5		A	0.075	2.6
Imlay/Chandos	A	0.053	2.8		A	0.085	3.3

The outcome of this assessment indicates that the intersections will provide satisfactory operational performance with a significant degree of 'reserve' capacity.



Criteria for Interpreting Results of SIDRA Analysis

1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'A'	Good	Good
'B'	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
'C'	Satisfactory	Satisfactory but accident study required
'D'	Operating near capacity	Near capacity and Accident Study required
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
'F'	Unsatisfactory and requires additional capacity	Unsatisfactory and requires other control mode

2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below which relates AVD to LOS. The AVD's listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (ie inner city conditions) and on some roads (ie minor side street intersecting with a major arterial route).

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

3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections.

For intersections controlled by **traffic signals**¹ both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

For intersections controlled by a **roundabout or GIVE WAY or STOP signs**, satisfactory intersection operation is indicated by a DS of 0.8 or less.

¹ the values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs

5. PARKING

Whilst the RMS Development Guidelines have criteria for the provision of carparking for marina developments these are based on the same 1978 survey data which is refuted in the Hallam assessment. Hallams review of surveys of weekend and public holiday use over a 7 month period was that the 85th percentile boat usage was only 10% of all boats moored/berthed. Therefore the RMS criteria for 60% of wet berths is clearly errant.

Hallams assessed parking provision is some 0.2234 cars per boat which for 154 berths equates to 35 parking spaces. It is proposed to provide 97 parking spaces with the development which is significantly more than any potential super peak demand. It is proposed to incorporate 2 disabled driver spaces in compliance with AS2890.6.

6. ROAD ACCESS, INTERNAL CIRCULATION AND SERVICING

ROAD ACCESS

The Cattle Bay Road – Cocora Street route which will provide for all vehicle movements to and from the site is in good condition albeit only having kerb and gutter along some 50% of its length between Mitchell Street and Imlay Street.

This access route remains in the form which provided for the operation of the former cannery with its significant car and truck movements.

The proposed marina will only generate very infrequent movements for large vehicles while the generated car movements will only be a minor fraction of that which occurred when there was a workforce of some 500 persons at the cannery.

It is apparent that the access road and intersections in the vicinity will not require any upgrading to accommodate the construction and operation of the proposed marina.

INTERNAL CIRCULATION

The design of the vehicle access, internal circulation and parking area will accord with the requirements of AS2890.1, 2 and 6.

SERVICING

There will be 3 bays provided adjacent to the temporary building for service vehicles while other small vehicles will also be able to use the parking spaces.

Refuse will be removed from the bins located just inside the entrance gates where there will be quite adequate manoeuvring area for trucks. No other large vehicles will be required to access the site.

7. PEDESTRIANS AND CYCLISTS

The principal external connections will be along Cattle Bay Road to Mitchell Street and along Cocora Street to Imlay Street as they are at present.

There are no existing bicycle routes to connect with, however the future proposed provisions identified in the Port of Eden Master Plan with the foreshore boardwalk and footways along Victoria Terrace, Cocora Street and Imlay Street with greatly enhance accessibility for pedestrians and cyclists.

8. CONSTRUCTION

All major/large construction elements (eg pontoons, wave attenuator etc) will be manufactured off site and transported to the Port of Eden. The pontoons will be launched into the water and towed to the site while other materials will be loaded onto a barge with on board crane and transported to the site for unloading.

9. CONCLUSION

The site of the proposed marina is part of the former Heinz Tuna Cannery which operated for many years and at its zenith employed some 500 persons with significant related car and truck movements. The proposed development will utilise the existing jetty and vehicle access and will only involve a low level of traffic generation with access movements spread on the road system.

Assessment of the proposed development scheme has concluded that:

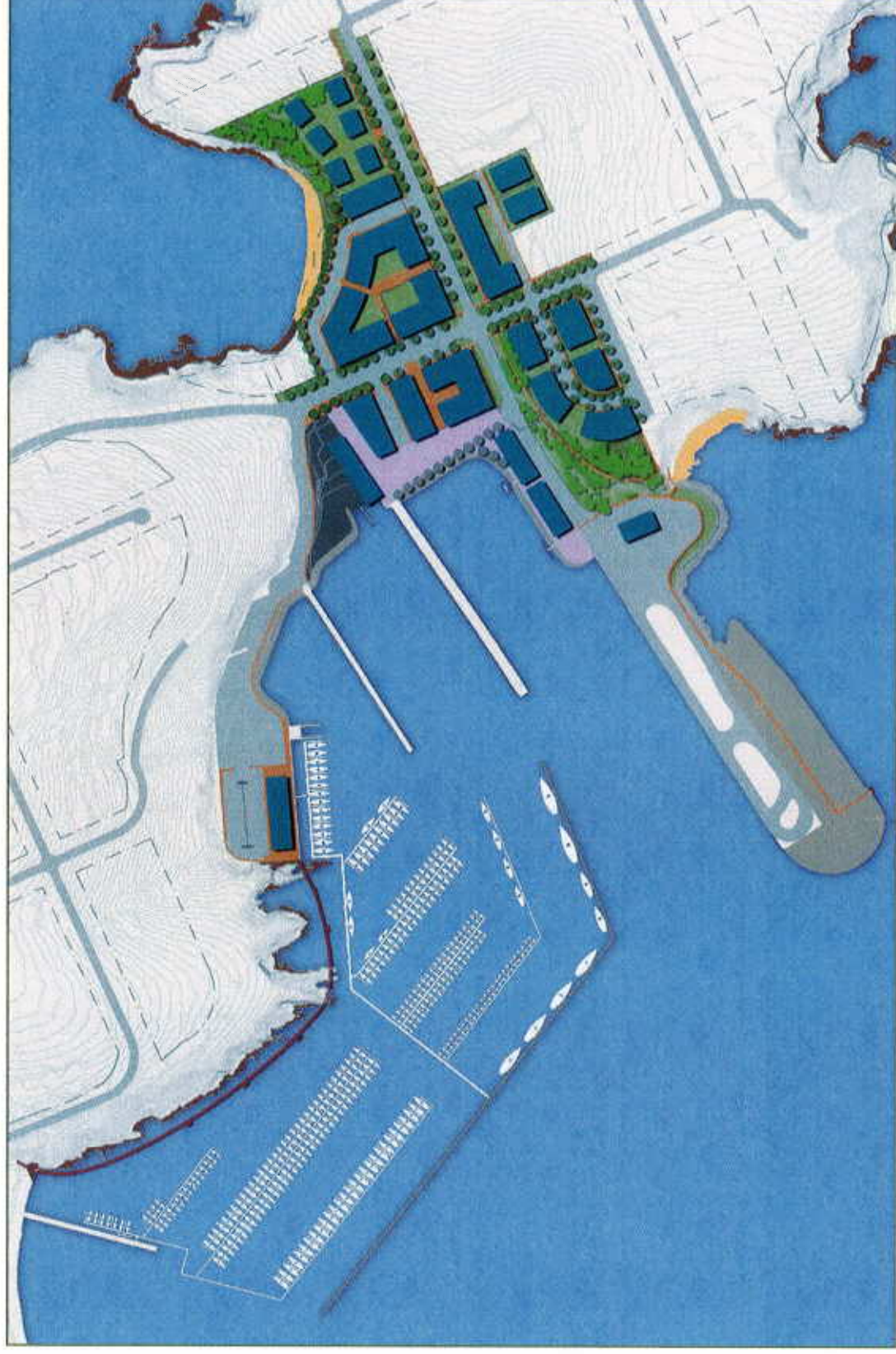
- * there will not be any unsatisfactory traffic implications
- * the vehicle access and circulation arrangements will be suitable and appropriate
- * the proposed parking provisions will be adequate
- * the proposed arrangements for pedestrians, cyclists and service vehicles will be suitable and appropriate

APPENDIX A













EXTRACTS OF EDEN PORT MASTERPLAN

SNUG COVE

Concept Plan

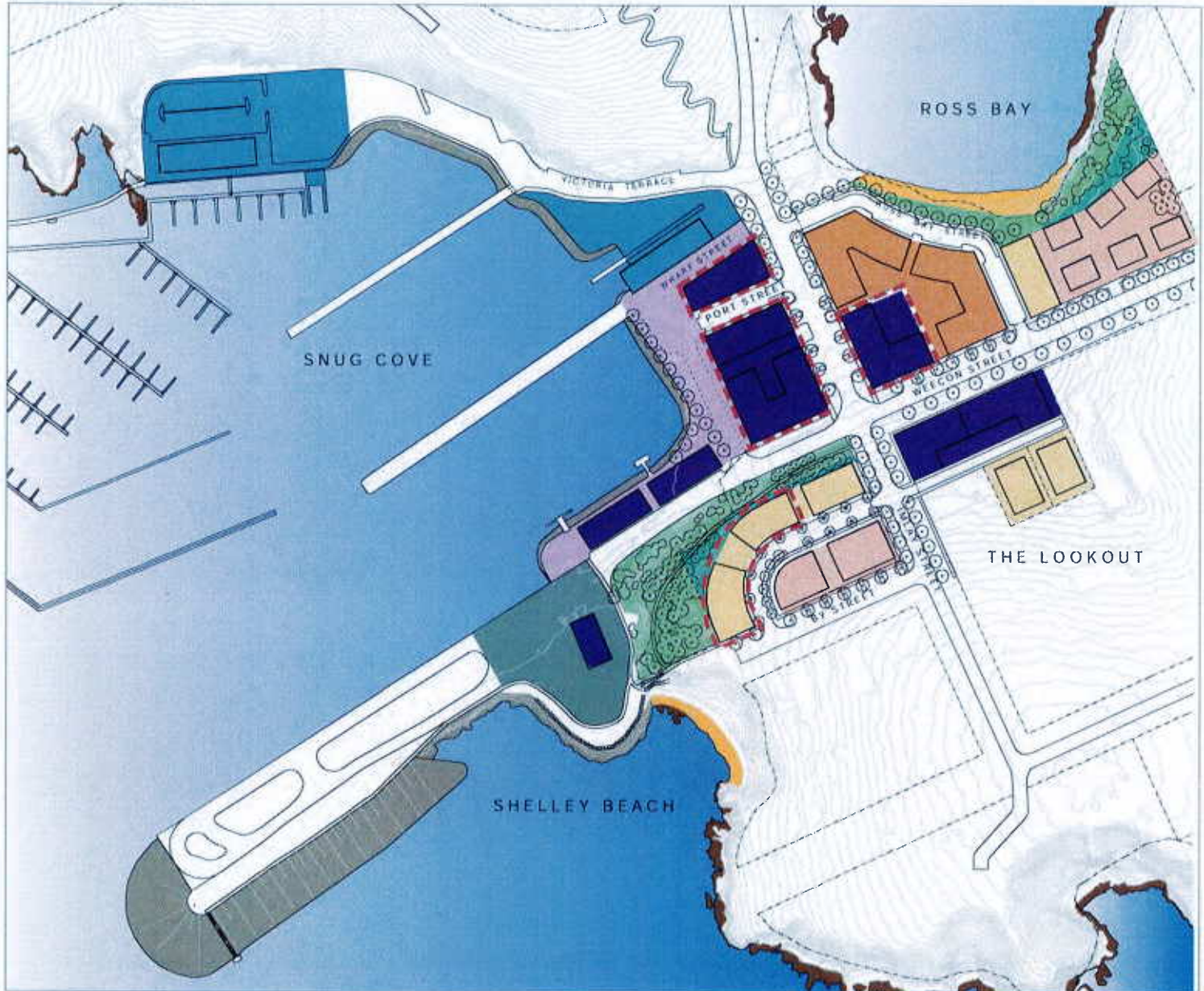


KEY

-  Streets
-  New building envelopes
-  Natural rock to be protected
-  Man-made shoreline
-  Proposed parks
-  Shared port / civic area
-  Footpaths and paved areas
-  Proposed street trees
-  Coastal vegetation to be enhanced
-  Public beach
-  Proposed marina with temporary and permanent berths
-  Proposed boardwalk with viewing / fishing platforms

Activities and Uses

PRINCIPLES PLAN



KEY

PUBLIC

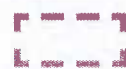
- Public beach
- New public open space / recreation
- Public open space coastal vegetation
- Natural rock shoreline to be protected

PORT

- Port commercial uses, boat building and repair facilities, boat launching ramps, marina, commercial boating facilities, retail and cafes. Tourist accommodation permitted above the ground floor.
- Port commercial uses / offices, authorities, marine related light industrial, marine related businesses, restaurants and cafes, marine related shops
- Port area hard stand
- Port and Civic hard stand area

PRIVATE

- Private open space / coastal vegetation
- Mixed use: marine related shops, restaurants and cafes, and offices. Tourist and visitor accommodation / hotel permitted above the ground floor
- Mixed use: marine related shops, restaurants and cafes, offices and tourist, visitor accommodation / hotel / motel
- Permanent residential, tourist and visitor accommodation



CIVIC

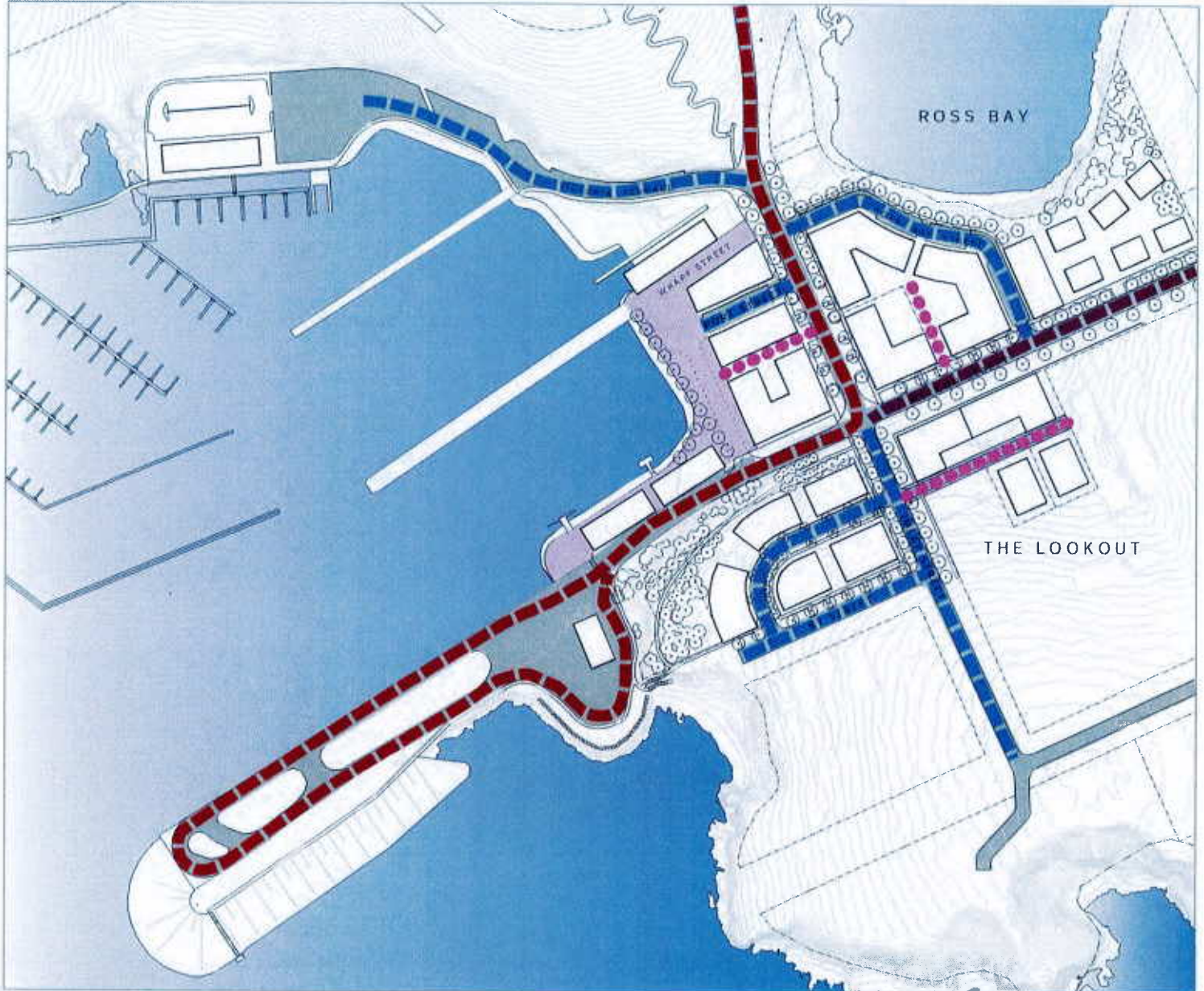
Additional uses permitted: civic, educational, cultural, public, research, marine discovery centre










0 40 80 160m

Vehicular and Circulation

PRINCIPLES PLAN



KEY

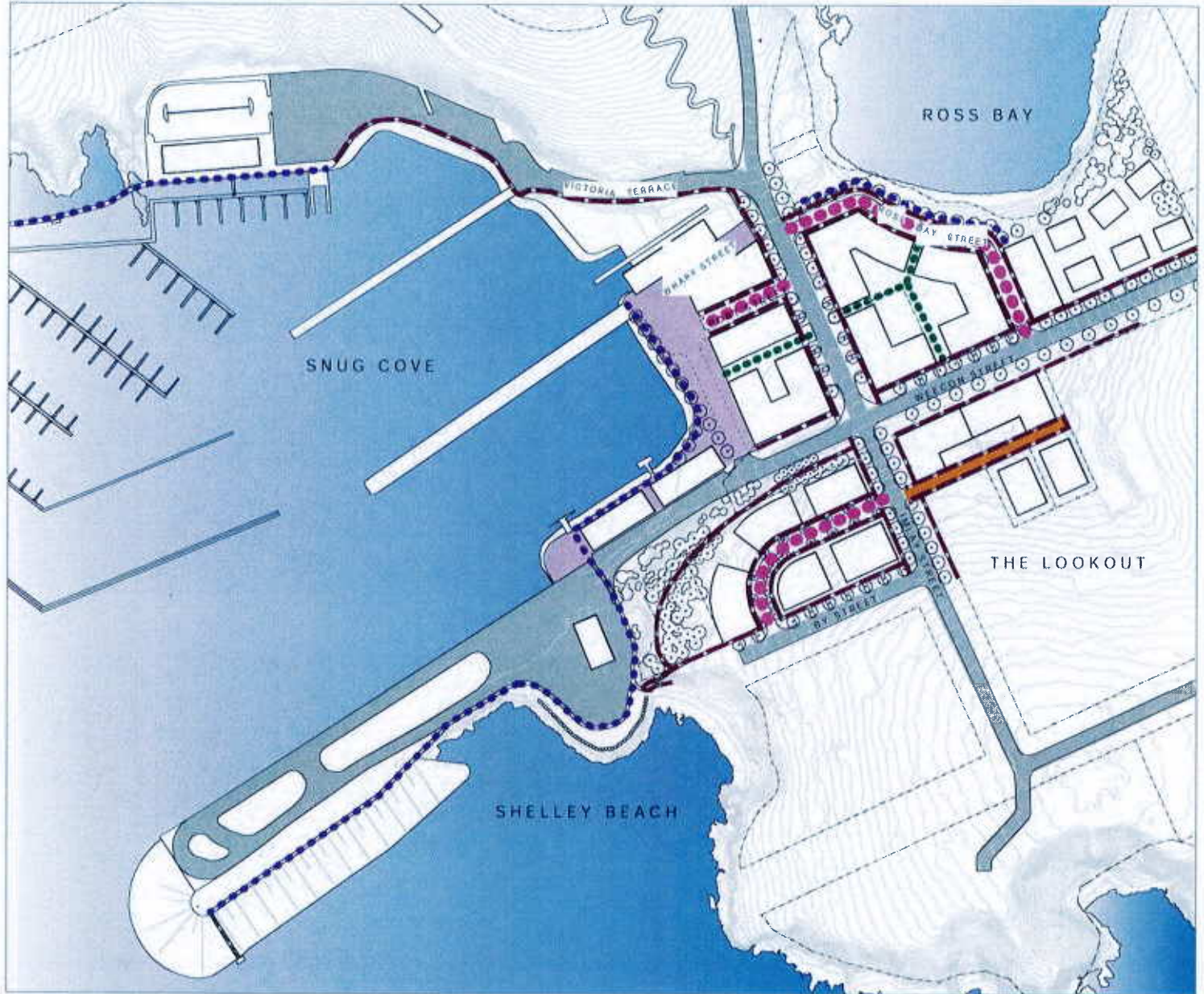
-  Indicative building footprints
-  Indicative street structure
-  Shared port access / public access / civic festival area
-  Regional access route to Port for all traffic
-  Main mixed use / residential streets
-  Local access streets
-  Laneways



0 40 80 160m

Pedestrian Access and Circulation

PRINCIPLES PLAN



KEY

- Indicative building footprints
- Indicative street structure
- Existing contours
- Footpath locations
- Major pedestrian foreshore walks
- Shared port access / public access /civic festival area
- Desirable pedestrian paths
- New streets
- New access laneways



APPENDIX B

IMAGES OF ACCESS ROADS



© 2015 Google

Flinders St

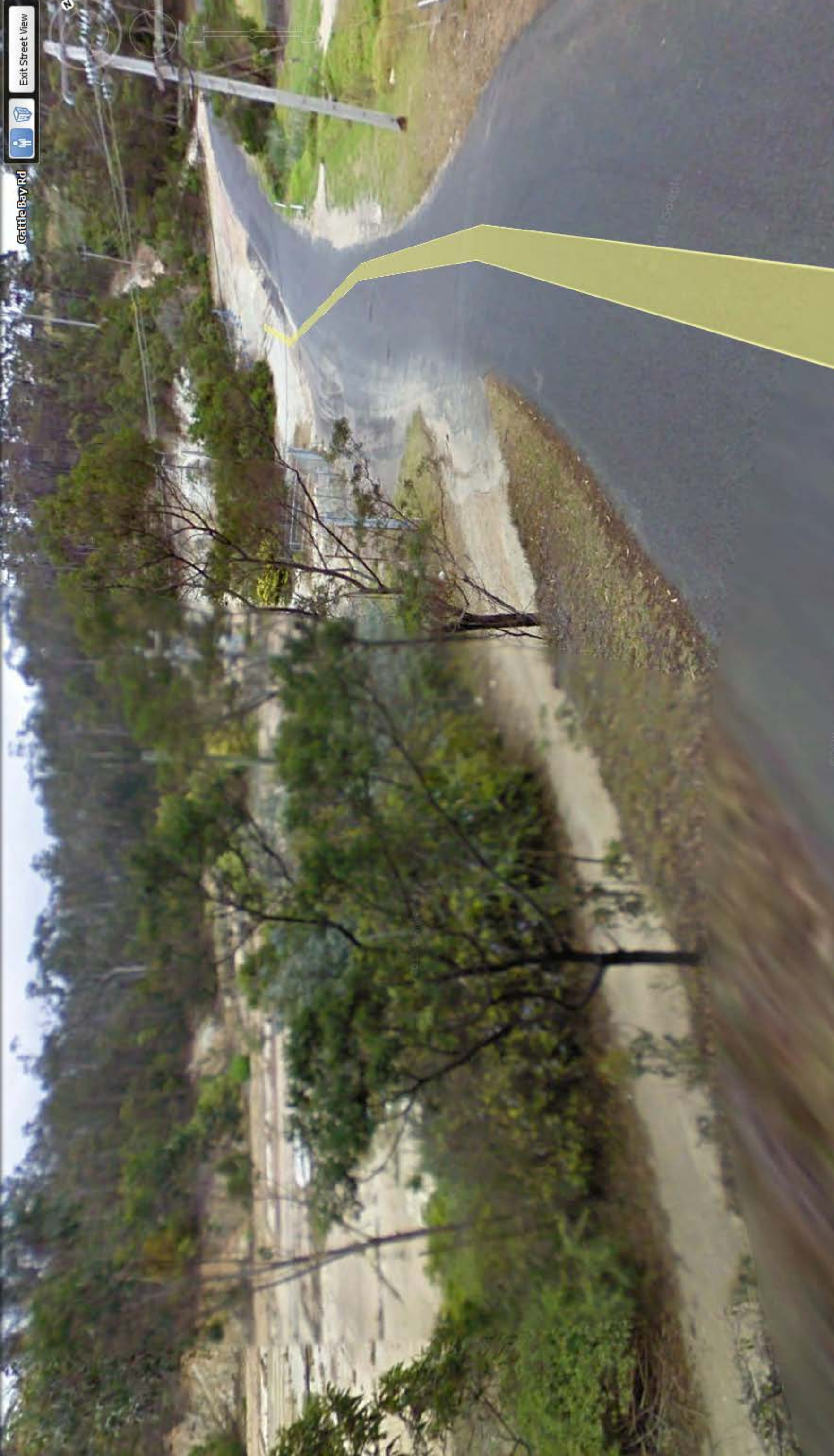






© 2014 Google







Cattle Bay Rd



Exit St



Flinders St





© 2012 Google

© 2012 Google

© 2012 Google

© 2012 Google



© 2013 Google

© 2013 Google

© 2013 Google



APPENDIX C

HALLAM REPORT

**THE TRAFFIC AND PARKING
IMPLICATIONS OF MARINA
DEVELOPMENTS**

NOVEMBER 2008

**CHRISTOPHER HALLAM & ASSOCIATES PTY LTD
226 GLEBE POINT ROAD,
GLEBE NSW 2037
DX 23908 GLEBE
Telephone: 02 9571 7322
Fax: 02 9571 7323
E-mail: hallamc@bigpond.net.au**

CONTENTS

	Page
1.0 INTRODUCTION	1
2.0 SURVEYS OF BOAT USAGE AND PARKING DEMAND	
2.1 Standards and Guidelines	2
2.2 Boat Usage Surveys	4
2.3 Implications of Boat Length	11
2.4 Seasonal and Other Factors	14
2.5 Land & Environment Court Proceedings – Rose Bay Marina	17
2.6 Review	18
3.0 CONCLUSIONS	20

1.0 INTRODUCTION

We prepared the report dated April 2001 and titled "*The Car Parking Implications of Marina Developments*", for the Boating Industry Association of NSW.

We subsequently prepared in September 2006 a report titled "*Traffic and Parking Assessment of Proposed Modifications to Rose Bay & Point Piper Marinas*" plus "*Supplementary Report on Traffic and Parking Implications of Proposed Modifications to Rose Bay and Point Piper Marinas*", in May 2007. We also undertook surveys of Rozelle Bay Marina over Summer 2007/2008.

Section 2 repeats information set out in our September 2006 report on surveys of boat usage and parking demand and expands the information using survey data collected between September 2006 and January 2008. This provides extensive background information on the traffic and parking characteristics of marina developments, with a particular emphasis on the implications of replacing swing moorings with marina berths.

Section 3 summarises the results and recommends parking rates.

2.0 SURVEYS OF BOAT USAGE AND DEMAND

2.1 Standards and Guidelines

Australian Standard 3962

We have previously undertaken detailed surveys of marinas in the Sydney region. In April 2001 we prepared a report for the Boating Industry Association of New South Wales on the subject "*The Car Parking Implications of Marina Developments*".

This research for the Boating Industry Association concluded that there was not a significant difference between the parking demands of swing moorings and marina berths. General findings included:

- Swing moorings are used more for yachts, with owners more likely to use their boats than those on marina berths
- On marina berths, there is some potential for larger group size per boat, but this is tempered by a lower usage rate

The research recommended that when a new marina or a change in the configuration of an existing marina is proposed, the best method of analysis is to survey a similar, or the same marina, to assess current usage patterns and car parking demands. Where comparisons cannot be drawn, the recommendation was:

- Wet marina berths & swing moorings 1 space/3 boats
- Dry berths 1 space/5 boats
- Employees 1 space/2 employees

The results of this research were forwarded to Standards Australia, with a request to review the parking requirements in AS3962-1991. This Standard was revised in 2001, with AS3962-2001 recommending the following car parking rates:

- Wet berths 0.3-0.6 spaces/berth
- Dry berths 0.2-0.4 spaces/berth
- Swing moorings 0.3-0.6 spaces/berth
- Employees 0.5 spaces/employee

The key point is that the Standard has the same parking requirement for swing moorings as it does for wet marina berths. It follows that the replacement of swing moorings with wet marina berths would not change traffic generation and parking demands.

The Roads & Traffic Authority's *Guide to Traffic Generating Developments*

This Guide recommends that surveys be undertaken of similar developments, but in the absence of such a survey, parking be provided at the following rates:

- 0.6 spaces per wet berth
- 0.2 spaces per dry storage berth
- 0.2 spaces per swing mooring
- 0.5 spaces per marina employee

These rates were inserted in the RTA Guide based on the current Australian Standard of the time, the 1991 version of AS3962, with the only difference being that this Standard had ranges in parking rates for wet berths, averaging out at about 0.6 spaces per berth. The following comment is made:

“Parking demands at marinas vary substantially depending on the season, the type of berth or mooring and the type of boat. Ideally, surveys should be undertaken of similar developments, over summer weekends. Boats parked in wet marina berths are more accessible and therefore more likely to be used than boats in dry berths or on swing moorings. Use also varies with boating purpose. While a typical marina might have 30% of boats used on a summer weekend, racing yachts are more highly utilised with an average of over 60% at one club surveyed. The size of the boat affects the number of crew or passengers, while the location of the marina affects the crew’s transport mode.”

The section of the RTA Guide dealing with traffic generation suggests daily vehicle trips of 2.7 per fixed berth and 1.4 per swing mooring *“based on a marina with a mix of boat types (both power boats and yachts); the design is based on a summer weekend day. These rates also include an allowance for shore-based facilities such as boat sales and repairs.”* This section repeats the general comments made in the parking section:

“The two key factors in the traffic generation of marinas are the level of usage and the transport mode of boats [boat users presumably]. Boats that are more accessible (in wet marina berths) are more likely to be used than boats in dry berths or on swing moorings. Use also varies with boating purposes. For example, yachts which engage in regular racing, are used more often than yachts used only for social outings. Surveys of four marinas in Pittwater in 1978 over the summer weekend/public holidays found an average utilisation of 30% over all berths. Surveys of racing yachts at one club on Middle Harbour in 1990/91 found an average utilisation on summer racing days of 65%.

Traffic generation also varies with the boat crew numbers. Larger boats, that are often in wet marina berths, can accommodate larger numbers of crew/passengers than smaller boats that might be stored in dry berths or on swing moorings.”

The basis of the above traffic generation rates is not clear. We have reviewed the survey data that is quoted. The Pittwater boat usage data was collected for Sunday 15/1/78, Saturday 21/1/78 and Monday 30/1/78, the Australia Day public holiday. As such, they are peak usage days. The overall boat usage rate of 30% is for marina berths only. Swing moorings were not separately assessed. Car usage was not surveyed. This information was presented in a Marina Development Seminar in 1985.

The survey of the Middle Harbour Yacht Club in 1990 (by Stapleton & Hallam – Chris Hallam) covered the usage of racing yachts only, since the objective of the commission was to recommend additional parking for the extension of a hardstand area used for storing racing yachts. As such, the data was only relevant for such a use, where racing yachts, whether on hardstands, wet berths or moorings, were very highly utilised on race days. This survey did not cover recreational boating, or other uses at Middle Harbour.

As a check, if there were 100 boats in a marina, with 30% used on a peak day, and say 1.5 cars per boat, there would be 0.9 car movements per berth per day. For 100 boats on swing moorings, if 30% were used on a peak day, and say 1.0 car per boat, there would be 0.6 car movements per mooring per day. The rates of 2.7 and 1.4 cannot be substantiated. Even the relativities are wrong, if the assumption is that boats on moorings only attract one third the number of cars parked compared with boats in berths.

The key issue is that where there is no actual survey data available, surveys should be undertaken of other similar marinas. Data collected on boat usage over three days some 30 years ago, and on racing yacht usage at Middle Harbour Yacht Club some 16 years ago, does not provide adequate data for assessing the impact of replacing swing moorings with marina berths. The surveys undertaken in 2000/2001 and 2006-2008 of marinas in the Sydney region is vastly more comprehensive.

Marinas are like any land uses. There are expectations about user behaviour. Compared to the actual survey data, the most obvious miscomprehension is that boats on marina berths are used more than boats on swing moorings, because the berths makes them more accessible. This is simply not true, as is further discussed in detail. People use their boats for a number of reasons, including the time of year, the weather on the day and the owner's time availability on the day. When boats are in a marina berth, the owner and friends walk along the wharf to their berth and get on. When boats are on a swing mooring serviced by a commercial marina, the owner and friends walk along the wharf and transfer into a tender, to be taken out to their boat. On return, they ring up the marina and request tender pick up. Note that the discussion in this Section only deals with swing moorings that are attached to commercial marinas. It does not deal in any way with "private" moorings. Based on the extensive surveys and analysis discussed in the following Section, we are strongly of the opinion that the convenience factor of berths compared to moorings is a minor factor in the decision of the boat owner to use their boat on a particular day.

2.2 Boat Usage Surveys

Details of previous surveys of marinas are set out in the original research report for the BIA. In our recent surveys, we employed the same approach. On each day surveyed, details of time, boat name, group size and cars parked were recorded. The surveys of Double Bay Marina were undertaken at Easter 2006 and in early December 2006. The surveys at Rose Bay and Point Piper Marinas were initially undertaken over the two month period 1st July to 3rd September 2006. A parallel survey was undertaken at the Royal Motor Yacht Club, over the period 26th June to 27th August

2006. Further surveys at Rose Bay and Point Piper Marinas were subsequently undertaken over the Spring period 4th September to 19th October 2006, and then from 20th October to 13th December 2006. In addition, surveys were undertaken at Rozelle Bay Marina in Summer 2007/2008. Double Bay, Rose Bay and Point Piper Marinas have proposed alterations to provide additional wet berths. The data collected at these marinas is relevant to all marinas. With the substantially greater data base for the Rose Bay/Point Piper Marinas, these surveys are first discussed.

Over the Winter survey period, at Rose Bay and Point Piper Marinas, there was full occupancy in the berths, with 29 boats at Rose Bay and 23 boats at Point Piper. There were vacancies in the swing moorings. All of the following analysis is based on the actual berths/moorings occupied. A lower rate of boat usage would be calculated if the total mooring capacity was used.

We have combined both marinas in the analysis, since they are side by side and part of the same proposal. Improved accuracy follows from a larger sample size. The results for boat usage were:

**TABLE 2.1 ROSE BAY AND POINT PIPER MARINAS
BOAT USAGE PER DAY**

WINTER 2006			SPRING-SUMMER 2006		
Day	Moorings	Berths	Day	Moorings	Berths
Weekdays (45)	0.026 boats/mooring/ day	0.011 boats/berth/ day	Weekdays (75)	0.039 boats/mooring/ day	0.005 boats/berth/ day
Weekend days (20)	0.068 boats/mooring/ day	0.055 boats/berth/ day	Weekend days (28)	0.072 boats/mooring/ day	0.036 boats/berth/ day

Table 2.1 shows the patterns found in previous surveys at these and other marinas, of a higher usage of boats on swing moorings than in berths. Weekend usage was of course higher than weekday usage. On weekdays, the usage rate of boats on moorings was over twice that of boats in berths. The relativities are also of interest. If the data for Winter and Spring-Summer is averaged, on moorings, the weekday boat usage rate is 49% of the weekend usage rate. For berths, the ratio of 17% on weekdays compared to weekend use.

Looking at the Weekend days, the Spring survey found an increased use of boats on moorings, compared with the Winter survey. The Spring figures for boats in berths showed a reduced usage.

At the Royal Motor Yacht Club there are 90 berths and 18 swing moorings. As with the other marinas, there is a low level of usage on weekdays. Over the 18 weekend days surveyed, the overall usage rate for all 108 of their berths and moorings was:

* RMYC Saturday & Sunday (18 days) 0.045 boats/berth/day used

Looking at the influence of the cars parked, Table 2.2 sets out the results over the three marinas, for all days surveyed, both weekday and weekend, for Winter 2006. This data is relevant to the question of the number of cars per berth type, with a reflection on group size.

TABLE 2.2 ROSE BAY, POINT PIPER AND RMYC MARINAS – WINTER 2006

Marina	Avg Group Size	Avg Cars/Berth or Mooring	Avg Cars/Person	Days Surveyed
RMYC Berth	3.79	1.08	0.32	114
RB/PP Berth	4.01	1.22	0.34	77
RB/PP Mooring	2.56	1.04	0.55	242

Table 2.2 indicates that the average group size – the number of people on each boat used - is lower for boats on swing moorings compared to boats in berths. The influence of boat length is further discussed in Section 2.3. However the cars used per person reduces with increases in group size. This can be explained simply. An average group size of 2.56 would include many groups of two, arriving in one car. As group size increases, there is a trend towards car sharing, or perhaps family groups arriving in the one car. Looking at the figures for Rose Bay and Point Piper, while the average group size for moorings is substantially lower than that for berths, with berths having a lower rate of cars per person, the difference between the cars/mooring used and cars/berth used is reduced. Note that the average cars/person has been calculated as the average over all boats in the survey, from the original survey data and does not necessarily give the same answer if working across the Table. The difference is not an issue because the figures for average cars/person are given as illustrations of patterns. The figures that are ultimately used in the analysis are the cars per berth/mooring, combined with the usage rates for each.

Table 2.3 presents equivalent information for the Spring-Summer 2006 survey.

**TABLE 2.3 ROSE BAY AND POINT PIPER MARINAS
SPRING-SUMMER 2006 (8/9/06 – 15/12/06)**

Type	Avg Group Size	Avg Cars/Berth or Mooring	Avg Cars/Person	Days Surveyed
Berth	4.51	1.41	0.31	103
Mooring	2.61	0.94	0.36	103

Table 2.3 shows similar trends to Table 2.2, with the average group size for the users of boats on berths being higher than the users of boats on moorings, but with this difference not fully reflected in the cars per berth or mooring because car usage decreases with increasing group size.

Putting these rates together, the parking demands for the critical weekend days are:

**TABLE 2.4 PARKING DEMAND PER MOORING/BERTH – WINTER 2006
POINT PIPER & ROSE BAY: SATURDAYS AND SUNDAYS**

Marina	Berth/Mooring	Boat Usage/Day	Cars/Boat Used	Cars/Mooring or Berth
Pt Piper + Rose Bay	Mooring	0.0679	1.04	0.071
Pt Piper + Rose Bay	Berth	0.0548	1.22	0.067
RMYC	Berth	0.0448	1.08	0.048

Table 2.4 indicates that while berths have a higher number of cars per group using berthed boats, when the boat usage is taken into account, the effect is that moored boats have a higher parking demand than berthed boats. The parking demand rates for the RMYC berths were lower again. The Spring-Summer 2006 figures show similar car parking demands per berth if the Table 2.4 berth figures are averaged. Just for Pt Piper + Rose Bay, the parking demand per berth is lower because of lower boat usage. The figures for moorings are similar.

**TABLE 2.5 PARKING DEMAND PER MOORING/BERTH
SPRING-SUMMER 2006: POINT PIPER & ROSE BAY
SATURDAYS AND SUNDAYS**

Berth/Mooring	Boat Usage/Day	Cars/Boat Used	Cars/Mooring or Berth
Mooring	0.0720	0.959	0.069
Berth	0.0364	1.472	0.054

Peak Period Surveys at Rose Bay and Point Piper Marinas

The surveys at Point Piper and Rose Bay Marinas have been on-going, with currently available data extending to 31 January 2007. In December 2006 there were 12 days that were either weekends or public holidays. In January 2007 there were 10 days that were either weekends or public holidays. These days are typically considered to be the peak times of the year of boat usage. Table 2.6 gives the equivalent data to Tables 2.4 and 2.5, for the weekend days and public holidays in December 2006 and January 2007. Note that there is some overlap of days with Table 2.5.

**TABLE 2.6 PARKING DEMAND PER MOORING/BERTH USED
1 DECEMBER 2006 to 31 JANUARY 2007:
POINT PIPER & ROSE BAY
SATURDAYS, SUNDAYS, PUBLIC HOLIDAYS**

Berth/Moorings	Boat Usage/Day	Cars/Boat Used	Cars/Moorings or Berth Used
Moorings	0.0814	1.060	0.0864
Berth	0.0700	1.338	0.0935

These figures show a higher boat usage than for Winter and Spring periods. The differences in the cars used per boat are similar to those earlier in the year. While the usage of boats on moorings was higher than that in berths, the differences in the Cars/Boat Used mean that the Cars/Moorings or Berth were marginally higher for the berths, a relationship not evident in the earlier surveys.

Peak Period Surveys at Double Bay Marina

The Easter 2006 surveys at the Double Bay Marina provide information on the nominally peak time of Easter at the subject Marina. This marina currently has 40 marina berths and 25 swing moorings. The same type of surveys conducted in Rose Bay were conducted in Double Bay. Table 2.7 summarises the results.

TABLE 2.7 SURVEY OF USE OF DOUBLE BAY MARINA, EASTER 2006

Factor	Friday	Saturday	Sunday	Monday	Mean
Boats used/berth	20%	7.5%	10%	7.5%	11%
Avg Group size/berth	4.13	8.67	4.50	6.00	5.82
Cars/Berth Used	1.62	2.33	2.00	2.00	1.99
Cars/Berth Overall	0.325	0.175	0.200	0.150	0.212
Boats used/moorings	40%	20%	40%	32%	33%
Avg Group size/moorings	2.70	2.60	2.40	3.88	2.90
Cars/Moorings used	1.00	1.20	1.00	1.38	1.14
Cars/Moorings Overall	0.400	0.240	0.400	0.440	0.370

At this marina the trend in the figures is consistent with Rose Bay/Point Piper results for Winter and Spring/early Summer:

- Boats on moorings are used more than boats in berths.
- Average group sizes: 5.8 on berths, 2.9 on moorings.
- Cars per berth a bit higher, but tempered by lower usage per berth.
- Cars per berth overall are lower than cars/mooring overall
- If more highly used boats on moorings are replaced with the more typically less used boats in the berths, the traffic generation and parking demand will reduce.

Surveys were also undertaken at Double Bay Marina in December 2006, with Table 2.8 setting out the results. Note that the Mean rates have been calculated directly from the survey data and are not necessarily the averages of the daily figures.

**TABLE 2.8 SURVEY OF USE OF DOUBLE BAY MARINA
DECEMBER 2006**

Factor	Sat 2nd	Sun 3rd	Sat 9th	Sun 10th	Mean
Boats used/berth	0.250	0.125	0.100	0.125	0.150
Avg Group size/berth	1.50	2.80	1.75	4.00	2.33
Cars/Berth Used	0.70	1.00	1.00	1.40	0.96
Cars/Berth Overall	0.175	0.125	0.100	0.175	0.144
Boats used/mooring	0.080	0.200	0.200	0.320	0.200
Av Group size/mooring	1.00	2.40	3.80	5.75	3.95
Cars/Mooring Used	0.50	0.80	1.60	1.50	1.20
Cars/Mooring Overall	0.040	0.160	0.320	0.480	0.240

Putting together all of the survey results from both the 2006 surveys and the previous surveys, Table 2.9 sets out the results.

**TABLE 2.9 SUMMARY OF MARINA BOAT USAGE AND PARKING
DEMAND – SATURDAYS AND SUNDAYS**

Marina	Season	Boats Used per Berth	Parking Demand per Berth	Boats Used per Mooring	Parking Demand per Mooring
RB	Autumn 2000	0.143	0.175	0.193	0.295
RB	Summer 2000/1	0.153	0.238	0.225	0.362
PP	Autumn 2000	0.111	0.114	0.083	0.121
RB+PP	Winter 2006	0.055	0.067	0.068	0.071
RB+PP	Spr-Summ 2006	0.036	0.054	0.072	0.069
RMYC	Winter 2006	0.045	0.048	-	-
DB	Easter 2006 *	0.11	0.212	0.33	0.37
DB	December 2006	0.150	0.144	0.200	0.240
RB+PP	1/12/06 to 31/1/07 + hols	0.070	0.094	0.081	0.086
RB+PP Mean Summer		0.111	0.166	0.153	0.224

* 4 days, Friday-Monday

Table 2.9 generally indicates a trend to a higher parking demand for moorings compared to marina berths, although in the December 2006/January 2007 RB + PP data the parking demand per berth is marginally higher. The Mean Rates are simple averages of the rates for Summer at Rose Bay and Point Piper Marinas. They reflect the trend of higher parking demands for boats on moorings compared with boats in berths, for the subject site in Summer.

The results in Table 2.9 reflect a number of factors, including boat usage, mode split, group size. The survey results for the period 20th October 2006 to 31st January 2007 were also reviewed to see trends in mode split. Table 2.10 summarises the results.

**TABLE 2.10 Transport Mode of Rose Bay & Point Piper Marina Patrons
20th October 2006 – 31st January 2007**

Mode	Car	Taxi	Bus	Bike/Scooter	Walk
Moorings	82.2%	7.5%	0.7%	1.1%	8.5%
Berths	91.3%	6.7%	0%	0.1%	1.9%
All	84.7%	7.3%	0.5%	0.8%	6.7%

The total number of people sampled in Table 2.10 was 2854, so the results are statistically valid. The proportion walking suggests that many people are local residents. Overall, some 15% of boat users do not arrive by private car and hence do not seek parking in the area.

The data also gives the numbers of cars in each group. This indicates that for mooring users, the average car occupancy is 2.39 persons, while for berth users, the average car occupancy is 3.04 persons, with the overall average being 2.55 persons per car. Table 2.10 indicates that users of boats in berths have a slightly higher car usage than users of boats on swing moorings. However this difference is tempered with the higher car occupancies for marina berth boat users. This can be seen:

- Berths 0.300 cars/user (3.33 users per car parked)
- Moorings 0.345 cars/user (2.90 users per car parked)

The data collected reflects the boats that were used over the three month period. This data indicates that the average length of boats on moorings that were used was 33.24 foot. The average length of boats in marina berths that were used was 33.16 foot, a figure insignificantly different to those on moorings. This does not necessarily mean that boats on moorings and in berths are of a similar length, but that of the boats on moorings/berths, the average length of boat actually used is similar, and with the rate of car usage higher for mooring users than for berth users.

2.3 Implications of Boat Length

The BIA report presented an analysis of the influence of boat length on parking demand, with the theory being that the bigger the boat, the more people and hence the higher parking demand. The shortfall in the analysis was due to the fact that there were not enough boats in the longer category – over 50 foot – to draw firm conclusions about larger boats.

This issue was addressed in the recent surveys, particularly for boats at RMYC. Table 2.11 presents the results for boats at RMYC, by boat length.

TABLE 2.11 ANALYSIS OF EFFECT OF BOAT LENGTH – RMYC, WINTER 2006 (90 Berths + 18 Swing Moorings)

Length (foot)	Mean Length(ft)	Sample Size	Avg Group	Cars/Boat	Cars/Person in Group
0-29	25.0	4	1.25	1.00	0.88
30-39	35.2	22	3.77	1.09	0.28
40-49	42.5	59	3.78	1.17	0.34
50-59	50.9	22	4.14	0.96	0.25
60-69	61.3	4	4.00	0.75	0.18
70 +	72.7	3	4.67	0.67	0.22
All	-	114	3.79	1.08	0.32

The Cars/Boat column is the key. While group size increases with boat length, the Cars/Person reduces, with the effect that the Cars/Boat remains relatively constant but with a downward trend with larger boats.

Tables 2.12 and 2.13 present equivalent data for Rose Bay + Point Piper Marinas, for marina berths and for swing moorings respectively.

TABLE 2.12 ANALYSIS OF THE EFFECT OF BOAT LENGTH – POINT PIPER + ROSE BAY – BERTHS - WINTER 2006

Length (foot)	Mean Length(ft)	Sample Size	Avg Group	Cars/Boat	Cars/Person in Group
0-29	24.4	28	3.82	1.14	0.30
30-39	33.7	29	3.79	1.24	0.41
40-49	44.3	18	4.17	1.06	0.29
50-59	50.0	2	8.5	3.5	0.42
All	-	77	4.01	1.22	0.34

Apart from the 50-59 foot category, where the sample size was only 2, the trends are similar to those at RMYC.

**TABLE 2.13 ANALYSIS OF THE EFFECT OF BOAT LENGTH –
POINT PIPER + ROSE BAY – MOORINGS - WINTER 2006**

Length (foot)	Mean Length(ft)	Sample Size	Avg Group	Cars/Boat	Cars/Person in Group
0-29	24.4	111	2.47	1.03	0.56
30-39	32.4	96	2.72	1.10	0.54
40-49	46.1	25	1.80	0.72	0.55
50-59	53.8	10	4.00	1.40	0.59
All	-	242	2.56	1.04	0.55

The critical Cars/Boat results show some variations, although not linear. Putting all results together, with the combination of Tables 2.11-2.13, gives the summary results shown in Table 2.14.

**TABLE 2.14 SUMMARY OF THE EFFECT OF BOAT LENGTH
RMYC + POINT PIPER + ROSE BAY – WINTER 2006
ALL BERTHS AND MOORINGS**

Length (foot)	Mean Length(ft)	Sample Size	Avg Group	Cars/Boat	Cars/Person in Group
0-29	24.4	143	2.70	1.05	0.52
30-39	33.1	147	3.09	1.13	0.48
40-49	43.7	102	3.36	1.04	0.38
50-59	51.7	34	4.35	1.24	0.36
60 +	66.1	7	4.29	0.71	0.20

There is a consistent trend in an increasing group size with increasing boat length. At the same time, the number of cars per person in the group reduces consistently with increasing boat length. As noted previously, the Cars/Person in Group averages are taken from the individual survey results, rather than across the page in this table. The key output is the Cars/Boat. While there is a small increase for 50-59 foot, the 40-49 foot figure is lower than the 30-39 foot figure, while the 60 + figure is the lowest of the lot. A sample size of 7 is not as high as the others, but is still of some significance. In summary, there is not a clear pattern of increasing parking numbers with increasing boat length. The difference between the lowest rate – 1.05 cars/boat – and the highest rate – 1.24 cars/boat – is 18%. Even though the rate for boats in excess of 60 foot is lower, a conservative assumption would be for boats in the larger length category to have +18%, say +20% parking demands.

With the surveys undertaken at Rose Bay and Point Piper marinas over the busier period of 20th October 2006 to 31st January 2007, a further analysis of the influence of boat length has been undertaken. The results are set out in Tables 2.15-2.17.

**TABLE 2.15 IMPACT OF BOAT LENGTH AT ROSE BAY & POINT PIPER
MARINAS, 20th OCTOBER 2006 TO 31st JANUARY 2007
BOATS ON SWING MOORINGS**

Factor	<25 ft	26-30	31-35	36-40	41-45	46-50	51-55	56-60	>60
Sample size	151	187	154	51	50	43	0	64	1
Avg length(ft)	22.4	27.7	32.1	36.8	43.1	48.3	-	56.7	68
Group size	2.675	2.818	3.169	3.725	3.400	1.721	-	3.422	2
Cars parked	0.881	0.963	1.084	1.196	1.240	0.953	-	0.906	1

**TABLE 2.16 IMPACT OF BOAT LENGTH AT ROSE BAY & POINT PIPER
MARINAS, 20th OCTOBER 2006 TO 31st JANUARY 2007
BOATS IN MARINA BERTHS**

Factor	<25 ft	26-30	31-35	36-40	41-45	46-50	51-55	56-60	>60
Sample size	26	58	15	42	23	14	0	0	0
Avg length(ft)	23.2	27.7	32.7	37.0	42.9	47.6	-	-	-
Group size	3.923	3.155	4.867	4.738	4.957	6.929	-	-	-
Cars parked	1.269	0.983	1.600	1.452	1.478	2.143	-	-	-

**TABLE 2.17 IMPACT OF BOAT LENGTH AT ROSE BAY & POINT PIPER
MARINAS, 20th OCTOBER 2006 TO 31st JANUARY 2007
ALL BOATS ON MOORINGS & BERTHS**

Factor	<25 ft	26-30	31-35	36-40	41-45	46-50	51-55	56-60	>60
Sample size	177	245	169	93	73	57	0	64	1
Avg length(ft)	22.5	27.7	32.2	36.9	43.1	48.1	-	56.7	68
Group size	2.859	2.898	3.320	4.183	3.890	3.000	-	3.422	2
Cars parked	0.944	0.967	1.130	1.312	1.315	1.246	-	0.906	1

There is a general trend to larger group sizes and car numbers up to 45 foot, but above that, average group sizes reduce as do car numbers. The size range of 56-60 foot has the lowest car usage, even with a sample size of 64 boats.

If the length ranges are aggregated, the following general trends are evident:

<u>0-30 foot</u>	<u>31-40 foot</u>	<u>41-50 foot</u>	<u>51-60 foot</u>	<u>Over 60 foot</u>
0.96 cars/ boat	1.20 cars/ boat	1.29 cars boat	0.91 cars boat	1.0 cars/boat

Again it cannot be assumed that marina changes that result in longer boats will necessarily result in more cars parked, although there is a trend for up to 45 foot lengths. The data is inadequate to make any comments about boats in excess of 60 foot in length, although Table 2.14 reflects the lower parking demand of boats in excess of 60 foot that Table 2.17 suggests for boats over 55 foot.

Surveys of larger boats were undertaken at Rozelle Bay Marina by Christopher Hallam & Associates (CHA) , and by Sinclair Knight Merz(SKM), in Summer 2007/2008. The CHA surveys went from 26th December 2007 to 28th January 2008. The results can be summarised:

Cars Parked per Berth – Peak Summer Weekends & Public Holidays

- (a) Boats < 20m 0.1282 Boats/Berth x 1.200 Cars/Boat = 0.1538 Cars/Berth
- (b) Boats > 20m 0.1204 Boats/Berth x 1.361 Cars/Boat = 0.1639 Cars/Berth

Surveys by SKM focussed only on boats at least 20m in length. The conclusions SKM drew were:

<u>Survey Period</u>	<u>Total Parking Demand per Berth</u>
August-September 2007 (11 days)	0.266 Cars/Berth
December 2007 & February 2008 (8 days)	0.420 Cars/Berth

CHA considered the combined survey results at Rozelle Bay Marina for the Summer surveys, with 8 days of data collected by SKM and 13 days of data collected by CHA, for a total of 21 days of Summer weekend data. CHA concluded that the average Summer weekend parking demand rate for boats on marinas of at least 20m in length was 0.2234 Cars/Berth.

2.4 Seasonal and Other Factors

Seasonal Factors

We have reviewed all of the boat usage data for both Point Piper and Rose Bay Marinas, for the period 1st July 2006 to 31st January 2007. Table 2.18 shows the total boats used each day, with figures for both marinas added.

TABLE 2.18 BOAT USAGE AT POINT PIPER & ROSE BAY MARINAS
(TOTAL BOATS USED PER DAY)

242
77 mooring
berths

Date	July	August	September	October	November	December	January
1	15	4	4	8	5	7	17
2	8	4	4	9	6	23	13
3	3	4	12	5	3	3	11
4	0	4	5	4	12	4	13
5	1	7	6	6	7	8	17
6	4	6	4	12	4	6	17
7	4	2	3	24	4	8	14
8	26	3	6	8	4	14	15
9	23	7	11	5	3	14	6
10	3	5	7	3	5	17	9
11	1	3	2	4	13	2	8
12	7	3	3	4	10	4	4
13	3	9	3	4	6	4	4
14	2	4	3	8	5	4	20
15	2	3	2	8	5	9	9
16	6	5	14	4	4	11	6
17	3	5	10	2	6	20	7
18	3	5	4	3	8	13	6
19	5	15	8	4	4	13	6
20	2	12	7	4	5	17	8
21	4	5	9	10	4	10	5
22	7	5	12	14	6	16	3
23	17	6	16	2	4	16	5
24	3	6	9	7	5	13	3
25	2	5	8	3	8	0	5
26	1	11	8	2	9	23	9
27	4	11	6	6	6	9	13
28	3	4	7	11	5	7	12
29	9	5	7	14	5	14	8
30	17	4	6	4	2	12	6
31	4	3		4		24	6
Mean	6.2	5.7	6.9	6.9	5.8	11.6	9.2

It is interesting to note that there is no strong trend towards increasing boat usage as Summer approaches, but the December and January usages clearly stand out as the peak months of the year. However there can still be days in other months where usage can be high, for various reasons. The peak days were:

- 8 July 2006 26 boats used
- 7 October 2006 24
- 31 December 2006 24
- 9 July 2006 23
- 2 December 2006 23
- 26 December 2006 23

We have further reviewed in detail the peak days, in regard to the numbers of cars parked. We have gone beyond the approach followed in all of the previous data analysis and have considered the length of stay of all cars associated with the marinas. This has been done by using the survey results for Time OUT and Time IN, allowing a 15 minute leeway for drivers to access their cars. We have considered all of the existing 172 boats at both marinas, combined, and determined in each hour how many cars were parked near the marinas. Table 2.19 summarises the results.

TABLE 2.19 PARKING LENGTH OF STAY ANALYSIS FOR PEAK MARINA USAGE DAYS

Date	Boats Used	Total Cars	Peak Cars at One Time	Cars/Berth or Mooring Used
8/7/06	26	44	44	0.256
31/12/06	24	34	27	0.157
7/10/06	24	26	23	0.134
2/12/06	23	28	21	0.122
26/12/06	23	28	27	0.157
9/7/06	23	30	28	0.163
Mean	24	32	28	0.165

Table 2.19 indicates that the parking demand rates shown in Table 2.9 will be generally higher than actual rates because of the time distribution of boat usage over the day, with the one exception being the peak day of the year. Over these six peak days, the ratio of Peak Cars to Total Cars had a mean of 0.888. For these peak days, the mean Cars/Berth or Mooring Used was 0.165.

While this rate reflects the peak six days over seven months, an arguably more correct approach is to consider the 85th percentile demand day. The Roads & Traffic Authority, in its *Guide to Traffic Generating Developments*, generally recommends peak parking rates based on the average of the peak demands on the days surveyed. To put this into context, for shopping centres, the peak days of the week are Thursday, Friday and Saturday. The RTA took the peak parking demands on these days surveyed, at each site, and calculated the mean peak parking demand, irrespective of the seasonal variations. However it recognised that where adequate data was available, parking rates based on the 85th percentile demand day were more appropriate. As stated on page 5.12 of this Guide (referring to shopping centres):

“The above car parking provisions reflect the mean results of the centres which were surveyed, for the peak parking demand on either Thursday, Friday or Saturday. There may be situations where parking provision at these levels would be inadequate. However, provision based on the 85 percent level of demand must be considered.”

Over all of the 215 days over seven months covered in Table 2.18, the 85th percentile demand was 13 boats used, or 7.5% of the occupied berths/moorings.

In terms of the RTA methodology, the most correct approach is to consider the peak days only, being Saturdays, Sundays and Public Holidays. Over the period 1/7/06 to 31/1/07 there were 67 days of this type. For these peak days, the 85th percentile demand was 17 boats, or 9.9% of the occupied berths/moorings. Thus, the design day will have just 10% of boats actually used.

Other Factors

Whenever there are work boats, such as Waterways boats and dive boats, their levels of utilisation are consistently higher, as would be expected. The Appendix also indicates that yachts have a higher level of use than power boats, with Table 3.15 in the Appendix indicating a Summer weekend average rate of usage for yachts of 0.21 boats per berth/mooring, compared with 0.16 boats per berth/mooring for power boats. There are typically a larger proportion of yachts on swing moorings than in marina berths, which is part of this trend. There can also be peak usage situations with yachts involved in racing. Our view on these patterns is that keen yachties prefer to put their money into their boats instead of into their monthly berthing cost.

The location of the marina can also affect boat usage patterns.

2.5 Land and Environment Court Proceedings – Rose Bay

Addenbrooke Pty Ltd applied to Woollahra Municipal Council (Council) for consent to alter and extend the Rose Bay and Point Piper Marinas. Following refusal by Council, an appeal was lodged with the NSW Land & Environment Court (LEC Proceedings 11179 of 2007). While the appeal was refused, the discussion on parking did provide some guidance on marina parking issues.

The proposal was to replace the existing 52 marina berths (all boats < 20 metres) and 172 swing moorings, with 159 marina berths, of which 21 berths would cater for boats over 20 metres in length.

On the question of the appropriateness of using published guidelines and codes to assess parking needs, the experts for the applicant (Chris Hallam) and for the Council (Alastair Burns) drew the following conclusions, which were quoted in the Judgement:

“The Contentions rely on parking calculations based on the NSW Roads & Traffic Authority Guide to Traffic Generating Developments and on Woollahra Municipal Council’s Development Control Plan for Off-Street Parking Provision and Servicing Facilities. [The experts] both agree that these documents provide a guide only and should only be considered if surveys were not undertaken at other appropriate marina developments. [The experts] both agree that there have been adequate and sufficient surveys undertaken of parking demand at other appropriate marinas. [The experts] agree that the results and analysis of these surveys should be used in the assessment of parking issues, rather than the RTA and Council guidelines.”

Based on peak Summer weekend boat usage, for boats of up to 20 metres in length, the experts both agreed that the design parking rates to apply are:

- Swing moorings 0.224 cars/mooring
- Marina berths 0.166 cars/berth

For boats in excess of 20 metres in length, surveys at Rozelle Bay Marina by both experts gave a range in parking rates, with one expert (C Hallam) recommending a rate of 0.2234 cars/boat, while the other expert (A Burns) recommended a rate of 0.420 cars/boat.

The judgement concluded:

“Based on the evidence of the traffic experts, the proposal will not generate an unacceptable demand for parking which cannot be met by the availability of on street parking...”

2.6 Review

This Section sets out the results of extensive surveys of marinas, particularly Rose Bay and Point Piper Marinas. The usage rates vary from season to season, as do the car parking demands per berth or mooring. There is a very strong trend for the parking demand per mooring to be higher than the parking demand per berth, with the main reason being that boats on swing moorings are used more than boats in berths. This trend is consistent over all survey periods, as indicated in Table 2.9. There is also a trend for boats in berths to attract larger groups, with consequent higher parking demands. With the exception of Summer 2006/2007, parking demands are still higher with moorings. In Summer 2000/2001, the differences were marked, and the boat usage rates were the highest observed, giving the peak parking demand of about one car per four marina berths, and one car per three swing moorings. In Summer 2006/2007, both rates were substantially lower, and quite similar.

The seasonal variations are not as great as might have been anticipated, in terms of peak days. There are clearly average monthly boat usage variations that are consistent with the logical view that Summer is busiest, but without increases in boat usage in Spring, compared with Winter. A very interesting observation is that the peak day of boat usage over the seven months of surveys was in July and was not Boxing Day, or Australia Day. Over the weekends and public holidays in the seven month period July 2006 to January 2007 the 85th percentile boat usage was 10% of all boats berthed/moored, a relatively low figure.

The analysis of boat length found a small trend towards increasing group size and parking demands with increasing boat lengths, but not in a linear manner and only up to about 45-50 foot in length. Based on the Winter surveys, the difference in the cars/boat for the longest boat length range and for boats in the 0-29 foot category was just + 18%. This suggests a parking increase factor for new marinas with larger boats

of say + 20%. The Summer 2006/2007 data shows an increasing trend up to 45 foot, but with lower numbers beyond this length.

The surveys at Rozelle Bay Marina covered large boats of at least 20m in length. It was concluded that boats of at least 20m in length have a higher overall parking demand, with the Summer weekend rate of 0.2234 Cars/Boat recommended.

A sensitivity analysis of current and proposed average boat length could be undertaken, based on these results.

For the assessment of current and proposed marina parking demands, the average of the rates for Rose Bay + Point Piper for Summers in 2000/2001 and 2006/2007 is suggested, with the Rozelle Bay Marina rates used for boats 20m or longer in length. This is summarised in Section 3.

3.0 CONCLUSIONS

The recommended parking rates for marinas, based on Summer weekend boat usage and parking demand are:

- Boats on swing moorings 0.224 cars/mooring
- Boats in wet marina berths, <20m in length 0.166 cars/berth
- Boats in wet marina berths, >20m in length 0.223 cars/berth