Better Transport Futures

Mark Waugh Pty Limited
ABN 67 106 169 180
Transport Planning & Engineering

# Proposed Residential Development, Hearnes Lake, Sandy Beach NSW

## Sandy Shores Developments Pty Ltd

## Traffic Impact Assessment

### August 2008

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# 1. Introduction

Better Transport Futures was commissioned by Sandy Shores Development Pty Ltd to prepare a Traffic Impact Assessment for the proposed residential development for Lot 22 Deposited Plan located on the northern boundary of Sandy Beach, NSW. This report is required to accompany the development application for subdivision of the land under Part 3A of the Environmental Planning Assessment Act, 1979 and submitted to the Minister of Planning as consent authority.

This report presents the findings of the traffic investigations and assessment of the proposal. It is structured as follows:

- **Chapter 2** outlines the existing situation in the vicinity of the subject site, including discussion on the planned development growth within the vicinity and road network changes to support it.

- **Chapter 3** describes the traffic and parking features of the proposal.

- **Chapter 4** details the assessment of traffic operations related to the proposal.

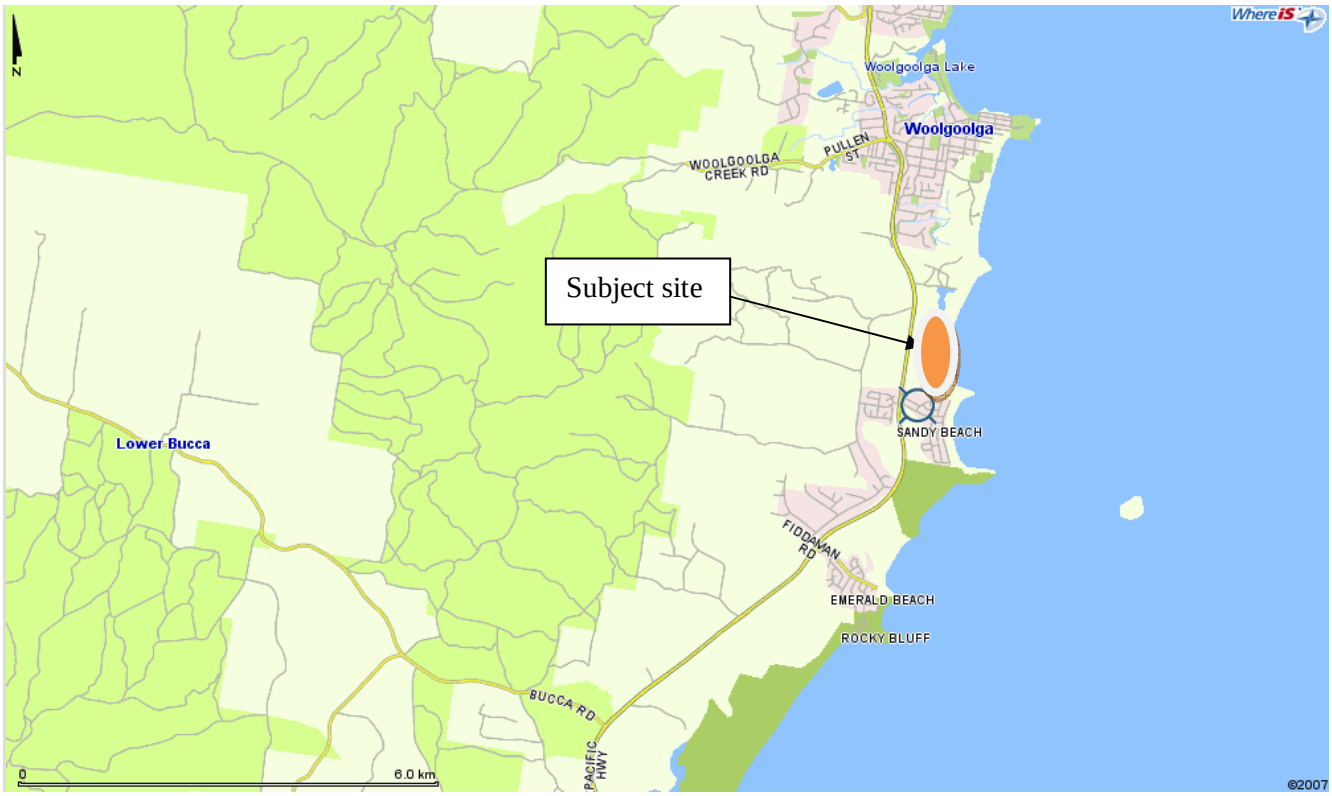
- **Chapter 5** summarises the findings of this investigation, outlining conclusions and recommendations for the traffic operations of the site to support the development application for the proposal.

# 2. Existing Situation

## 2.1 Background and Site Location

The subject site is located on a parcel of land to the north of the existing township of Sandy Beach, some 20 kms north of Coffs Harbour. It is bounded to the south by Sandy Beach, to the west by the Pacific Highway and by the beach to the east. The site is currently vacant. Access to the site is available via an existing entry point to the south of the site.

The location of the site is shown below in **Figure 2.1**.




**Source: WhereIS**

**Figure 2.1 – Site Location**

## 2.2 Local Road System

### 2.2.1 Road Characteristics

The Pacific Highway is the main road through the general locality of the subject site. The Pacific Highway provides a vital link along the east coast of Australia and provides a link between Grafton and beyond to the north and Coffs Harbour and beyond to the south. It is a classified road (State Highway number 10) and any works on or adjacent to it require consent from the Council (the road authority) and concurrence from the Roads and Traffic Authority for NSW (RTA).

The Pacific Highway in the general locality of the site provides a mixture of one and two lanes of travel in both directions and has a posted speed limit of 90 km/h. At the key intersections, there are turn lanes to increase the capacity of the intersections. The majority of intersections provide a sheltered right turn storage lane for traffic as well as right turn acceleration lanes for traffic exiting the side roads. To the immediate north of the site, the Pacific Highway connects with Graham Drive via a three way intersection. Graham Drive links around to the south and west to connect again with the Pacific Highway to the south of the site and Sandy Beach.

The Pacific Highway provides a reasonably straight alignment in the general vicinity of the subject site. It provides travel lanes in the order of 3.5 metres wide, with 2 lanes provided southbound and a single lane northbound. There are no footpaths provided along this length of the Pacific Highway and there are minimal shoulders in this location.

Access to the subject site is available via a number of local residential roads. All of these roads provide a similar road layout and all connect with existing residential roads. As part of the development, two new road connections will be made, to allow dispersal of trips as well as ensuring good connectivity to the existing residential development surrounding the site.

All of these local roads provide a single lane of travel with an overall road width in the order of 7-8 metres. Footpaths are generally not provided, due to the combination of low traffic flows and pedestrian movements. The development will connect to Pine Crescent and Ti-Tree Road.

Pine Crescent is a local residential road, providing a single lane of travel in both directions. It operates under the blanket 50 km/h residential zone of Sandy Beach. It provides access to a number of residential lots and forms a loop, connecting with Diamond Head Drive to the south-west and Maple Road to the east.

**Photo 1 – View east along Pine Crescent showing typical cross section**

The second access to the subject site is via an extension to Ti-Tree Road. Ti-Tree Road provides a single lane of travel in both directions with an overall width in the order of 7 metres. Ti-Tree Road provides access to a number of residential lots and is currently a cul-de-sac with no through traffic movements.

**Photo 2 – View north along Ti-Tree Road showing typical cross section**

Vehicle access to the main road network will then be via Diamond Head Drive and Graham Drive. Diamond Head Drive provides a single lane of travel in both directions with an overall width in the order of 8 metres. There is a constriction to its width where it passes over the Pacific Highway but retains a single lane of travel in both directions. This road provides collector road function, connecting the local residential roads with Graham Drive.


**Photo 3 – View west along Diamond Head Drive showing typical cross section on road bridge over the Pacific Highway**

Diamond Head Drive connects with Graham Drive at its western end. Graham Drive performs the function of a major collector road providing a connection to the north and south with the Pacific Highway. It provides a mixture of 60 km/h through the residential area of Sandy beach and 80 km/h at its northern end.


**Photo 4 – View north showing typical cross section of Graham Drive in the locality of Sandy Beach.**

## 2.3 Traffic Volumes

### 2.3.1 Traffic Data

No specific traffic surveys have been completed for this project. Data has been obtained from the Roads and Traffic Authority for the project. The data has been obtained from the "Detailed Traffic and Transport Assessment, Pacific Highway Upgrade – Sapphire to Woolgoolga" dated 9th August 2007. This document provides traffic count data at the main intersections in the vicinity of the subject site. These surveys were completed in 2006 and are relevant for the current situation.

The results from the traffic survey indicate that during the surveyed morning peak period the two-way traffic flow along Graham Drive were 216 at its southern end and 258 at its northern end. The corresponding afternoon peak period shows that the two-way flow at the southern end was 332 and 296 at its northern end. The traffic patterns show that drivers wishing to head north from the Sandy Beach locality use the northern intersection of Graham Drive and the Pacific Highway whilst those heading south use the southern intersection.

The traffic flows indicate that the typical two-way traffic flow along Graham Drive is in the order of 260 vehicles per hour in the morning peak and 340 vehicles per hour in the afternoon peak. Whilst no traffic surveys have been completed on the local residential roads within the general locality of Sandy Beach, observations completed on site during peak hours indicate that the traffic flows are much lower, with typically less than 100 vehicles per hour two-way. Flows on the local residential roads such as Pine Crescent and Ti-Tree Road would be in the order of 20-30 vehicles per hour two-way.

### 2.3.2 Road Classification

It is usual to classify roads according to a road hierarchy, in order to determine their functional role within the road network. Changes to traffic flows on the roads can then be assessed within the context of the road hierarchy. Roads are classified according to the role they fulfil and the corresponding volume of traffic they should carry. The Roads and Traffic Authority of New South Wales (RTA) has set down the following guidelines for the functional classification of roads.

**Arterial Road**

Typically a main road carrying over 15,000 vehicles per day and fulfilling a role as a major inter-regional link with over 1,500 vehicles per hour during the peak hours. The Pacific Highway is classified as an arterial road.

**Sub-arterial Road**

Defined as secondary inter-regional links, typically carrying volumes between 5,000 and 20,000 vehicles per day with between 500 and 2,000 vehicles per hour during the peak hours.

**Collector Road**

Provides a link between local areas and regional roads, typically carrying between 2,000 and 10,000 vehicles per day. At volumes greater than 5,000 vehicles per day, residential amenity begins to decline noticeably. Peak hour flows would be between 250 to 1,000 vehicles per hour. Graham Drive would be classified as a collector road.

**Local Road**

Provides access to individual allotments, carrying low volumes, typically less than 2,000 vehicles per day with peak hour flows up to 250 vehicles per hour. All of the residential roads within Sandy Beach would be classified as local roads.

Peak hour volumes on all types of roads are typically within the range of eight to twelve per cent of the daily flows.

Using Table 4.5 from the RTA Guide to Traffic Generating Developments (reproduced below), it can be seen that the ultimate capacity for Graham Drive in this location is around 2,800 vehicles per hour two-way and 1400 in the single lane locations

**Table 2.1 - Urban Road peak hour flows per direction**

| Level of service | One Lane (vehs per hour) | Two Lanes (vehs per hour) |
|---|---|---|
| A | 200 | 900 |
| B | 380 | 1400 |
| C | 600 | 1800 |
| D | 900 | 2200 |
| E | 1400 | 2800 |

*Source: RTA Guide to Traffic Generating Developments, version 2.2 dated October 2002.*

For the current traffic flows along Graham Drive, the current level of service would be A / B during the peak periods. The peak directional flow is currently 203 with all other flows substantially less than this. All of the local residential roads within Sandy Beach would be operating at a level of service of A.

## 2.4 Intersection Control and Operation

The minor intersections in the general locality of the site are controlled by simple give way controls. There are a couple of mini roundabouts installed along Diamond Head Drive to aid turning movements. These mini roundabouts have been designed to accommodate the turning movements of larger vehicles e.g. school buses that operate along this road. The intersection of Diamond Head Drive and Graham Drive is also a give way control, reflecting the low overall traffic volumes along this section of the road.

The two intersections of Graham Drive and the Pacific Highway are both controlled by give way, with a seagull type intersection to maximise turning capacity as well as ensuring maximum safety for all road users provided at the southern intersection. The northern intersection with Graham Drive has a sheltered right turn lane for traffic turning off the main road, but there is no central turn lane for traffic turning right out of the side road.

A review of the traffic data for these two intersections shows that there is a high right turn demand out of Graham Drive (south) on to the Pacific Highway, with 15 in the AM peak and 110 in the PM peak. The corresponding flows for the northern intersection are 3 and 2 vehicles per hour. Drivers obviously use the southern intersection more, due to the shorter route but also as a reflection of the different intersection layouts.

## 2.5 Road Network Improvements

It is understood there are no major road network improvements planned in the local vicinity of the subject site, apart from normal road maintenance performed by Council. However, the RTA is currently reviewing the southern intersection of Graham Drive and the Pacific Highway to increase the length of the right turn storage for traffic exiting the side road. This should improve the operations for the right turn out of the side road and reduce the delays for this movement.

The major road network change is the proposed upgrade to the Pacific Highway. The RTA have identified that the Pacific Highway in this location will be operating at capacity by the year 2011, with delays and congestion expected beyond this timeframe due to continual development to the north and south of Sandy Beach. The RTA have determined a number of options for upgrading the Pacific Highway in this location and the preferred option is to upgrade along the current alignment to provide two lanes in each direction. There will be a central median provided along the length of the upgrade to stop right turn movements except at key locations. This option will provide a grade separated intersection to the immediate north of the subject site that will provide a connection to Grahams Drive (north) and Hearnes Lake. There will be an overpass for local traffic movement and slip ramps, allowing for all turning movements at this location.

## 2.6 Public Transport, Pedestrians and Cyclists

Public transport is limited in the general vicinity of the site. There is a couple of school bus runs operated in the general locality of Sandy Beach by Ryans Bus Service. These provide a service to Woolgoolga and Grafton to the north and Coffs Harbour to the south. These routes provide a regular bus service for the school bus runs and limited runs Monday to Friday. The Saturday service is less frequent and there are no services Sundays or public holidays.

There are limited facilities provided for pedestrians and cyclists in the general vicinity of the site. However, due to the low traffic volumes it can be seen that cyclists are able to use the public roads in the vicinity of the site. There are generally no footpaths within Sandy Beach. Pedestrians are able to walk on the edge of the residential roads or use the verges. Given the relatively remote nature of Sandy Beach it is considered that there would be little demand for external cyclist and pedestrian trips to centres north and south of the site.

# 3. Proposed Development

## 3.1 Development and Access Arrangements

The proposal for the subject site is to develop the site for residential purposes. A preliminary lot layout has been prepared, indicating the creation of 280 residential lots.

Access will be provided via a number of connections to existing residential roads. During the initial stages of the development, there will be two access points along the southern boundary that will connect with Pine Crescent and Ti-Tree Road. A future third access will be provided at the northern edge of the site that will connect with the future road upgrade of the Pacific Highway. The timing of this third access point will be dependent upon the timing of the Pacific Highway upgrade.

There will be a network of internal roads that will provide access to the proposed individual residential lots. As well, a network of footpaths and cycleways will provide access through the site and connections between the adjacent existing residential roads within Sandy Beach and access to the beach and Hearnes Lake.

## 3.2 Traffic Generation

The level of traffic generation from the development proposal has been assessed using the standard rates available from the RTA guidelines for Traffic Generating Developments. These Guidelines indicate a range of traffic generation rates depending on the type of land use activity including residential development.

The RTA guidelines indicate the critical movement periods for residential development are during the morning and afternoon peak periods. These movements are associated with work and school trips. Morning peak flows are generally more critical, as the afternoon peak flows often occur over a longer time frame with less of a peak. For the purposes of this assessment, it has been assumed that the morning and afternoon traffic flows are similar.

The RTA Guide to Traffic Generating developments indicates that typical traffic generation rates for residential subdivisions such as the subject site are 0.85 trips per dwelling during the peaks and 9 trips per dwelling per day.

For the full potential residential development of 280 residential lots, the peak hour flows could be in the order of 238 vehicle movements per hour and 2,520 vehicle movements per day. These are considered a worst case scenario and does not allow for lower rates associated with older people living in this locality. It is considered that this development would appeal to early retirees due to its location and design. The traffic generation rates associated with retirement use is much lower, typically in the order of 0.2 vehicle trips in the peak hours. This is less than a quarter of the typical rate for a residential unit and would reduce the traffic generation significantly from the development.

The flow rates for a typical residential use have been applied in the traffic analysis for these investigations i.e. 238 vehicles during the peak hours, to ensure robustness of design.

## 3.3 Site Access

Vehicle access to the development will be via a number of new access roads, connecting to the existing road network. At the southern end of the site, there will two new road access points created. A new road will be provided off Pine Crescent that will connect near the right hand bend

at the western end of Pine Crescent. A second new access to the site will be provided via an extension of Ti-Tree Road. During the initial stages of the development, these access points will be the sole access to the site and a circular road will be provided connecting these two access points to allow trips to be dispersed.

Discussion has been held with the RTA (meeting 8th November at RTA Grafton office – meeting notes attached Appendix A). A third access will be provided during the later stages of the development to provide access to the north. This third access will connect with the future on-ramp that will be constructed as part of the Pacific Highway upgrade. The timing of this third access point is dependent upon the construction of the Pacific Highway. The RTA have accepted this third access, subject to detail design issues and will require a developer agreement to fund any additional works required to alter and extend the southbound on-ramp to facilitate this access.

## 3.4 Traffic Distribution

A review of the traffic data within the report for the Pacific Highway upgrade shows that the traffic is reasonably equally split between destinations to the north and south of this locality. There is a slight bias towards the south. For the purposes of this assessment it has been assumed that 55% of the trips have an origin/destination to the south and 45% have an origin/destination to the north of the site.

With the two access points along the southern boundary, it is considered that the traffic will be reasonably evenly split between these two access points. As per normal residential development, it is assumed that 85% of the flows would be outbound in the AM peak and 15% inbound. During the afternoon peak the flows would be opposite, with the majority of flows being inbound.

When the third access to the north is constructed, it is considered the majority of the traffic would use this northern access. All traffic to and from the north would use this access, as there will be slip ramps on both sides of the Pacific Highway to cater for these movements. In addition, south bound traffic would also use this intersection, as they can use the southbound on-ramp to access the Pacific Highway. It can also be seen that traffic to and from the south could use this intersection, using the ramps provided. Once this link is provided, it is considered that some 75% of traffic movements associated with the subject development would use this northern access point.

## 3.5 Pedestrian Access

Pedestrian access to the site would be via existing facilities along the adjacent road network. As part of the development, footpaths will be provided along the new residential roads in accordance with Council design requirements. There will also be a system of combined footways/cycleways around the site that will allow for internal movements. These new internal paths will connect with the existing roads in the locality as well as provide a connection to the beach side. In addition, a walkway is proposed around Hearnes Lake.

## 3.6 Public Transport Facility

The development has the potential to increase public transport demand. The design of the main spine road will allow for the movement of future buses. By providing two access points along the southern boundary, a bus will be able to circulate through the site during the initial stages.

## 3.7 Site Operations and Access Arrangements

Overall access geometry will meet the requisite Council standards for residential subdivision. The internal road layout will be designed in accordance with Council residential subdivision code taking into account intersection controls, pedestrian requirements as well as road geometry requirements such as carriageway width etc. The road design will also cater for the movement of service vehicles such as refuse collection vehicles, buses and removal trucks, etc.

The technical analysis for the development of the site is discussed further in **Section 4.**

## 3.8 Parking Requirements

It can be seen that the new development will require parking for the residents but that it can be contained within the site. As per Council design requirements, there will be garage requirements for the future development as well as driveway requirements etc. It is considered that all future parking for the development can be contained on site and that there is no further requirement to review parking for the development.

# 4. Assessment of Transport Operations

## 4.1 Site Access Operations

During the initial stages of the development, it can be seen that all traffic associated with the development will gain access to the road network via the two new road connections to the south of the site via Pine Crescent and Ti-Tree Road. Traffic will then use Diamond Head Drive to access Graham Drive and the greater road network.

## 4.2 Road Network Performance and Capacity

From **Section 2.3** above, it can be seen that the current peak hour traffic flows along the local roads in the general vicinity of the subject site are very low, typically less than 100 vehicles per hour on Diamond Head Drive and under 50 on the residential roads. From Table 4.5 of the RTA Guide to Traffic Generating Developments it can be seen that the level of service for the current flows is A. This table shows that the cut off point for this level of service is some 200 vehicles per hour one-way.

Upon completion of the full development of 280 residential lots on the subject site, there could be up to 238 vehicles per hour generated by the development during the critical morning and afternoon peak periods. It is understood that the proposed development will be built over six (6) stages and completed over a number of years, dependent upon the market demands. The current program for the development (assuming all the approvals are in place in a timely fashion) is for construction of the road network and infrastructure to commence in mid 2009 with land sales occurring in late 2009. The development will then be fully developed over a 4 or 5 year timeframe.

Assuming an even staged development, there would be some 50 residential lots developed per stage and some 70-80 lots per year. The traffic flows would therefore increase over the timeframe to the peak total flows of 238 vehicles two-way during the peak periods.

The timing for the Pacific Highway has not yet been determined by the RTA. As a worst case scenario, it has been assumed that the full development would be completed before the third access point to the north is provided. Assuming the distribution detailed in **Section 3.4**, this would give a peak directional flow of 102 vehicles per hour on each of the intersections.

This would increase this peak directional flow in the peak on Ti-Tree Road and Pine Crescent from the current peak directional flows in the order of 30 vehicles per hour to some 132 vehicles per hour. In the PM peak, the peak directional traffic flow would increase in a similar manner.

This would mean that the level of service for the traffic movements along both Pine Crescent and Ti-Tree Road would remain at a level of service of A. Level of service A is defined as "*this, the top level is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent*".

The RTA Guide to Traffic Generating Developments also provides advice on environmental limits for residential roads. Table 4.6 from the RTA guide is reproduced below.

Table 4.6
Environmental capacity performance standards on residential streets

| Road class | Road type | Maximum Speed (km/hr) | Maximum peak hour volume (veh/hr) |
|---|---|---|---|
| Local | Access way | 25 | 100 |
| | Street | 40 | 200 environmental goal |
| | | | 300 maximum |
| Collector | Street | 50 | 300 environmental goal |
| | | | 500 maximum |

**Note:** Maximum speed relates to the appropriate design maximum speeds in new residential developments. In existing areas maximum speed relates to 85th percentile speed.

For a local residential street, it can be seen that the environmental goal is 200 vehicles per hour with the maximum desirable environmental limit being 300 vehicles per hour. For the full development and the third access to the north not built, it can be seen that the additional traffic flows generated by the subject development will not adversely impact upon the desirable environmental limits. The limits provided above will not be exceeded and the impacts are therefore considered acceptable.

The key issue will be the operation of the various intersections within Sandy Beach as well as the operation of the key intersections of Graham Drive and the Pacific Highway.

## 4.3 Intersection Operation, Ti-Tree Rd and Diamond Head Dr.

The additional traffic associated with the proposed development has been determined above to assess the impact of this traffic on the local road network. From a review of the local road network, it has been determined that the impact of the development will be split between the two southern access points. The vast majority of traffic movements would then require a right turn out of Ti-Tree Road and left turn into Ti-Tree Road.

It is useful to consider the Austroads threshold levels for intersection capacity under uninterrupted flow conditions. **Table 4.1** below presents these thresholds. Where traffic flows fall within these limits intersection operation is essentially at no delay or interruption for approaching drivers other than to obey the requisite road rules.

**Table 4.1 Intersection Capacity – Uninterrupted Flow Conditions**

| Road Type | Light Crossing or turning volumes Maximum Design Hour Volumes, Two-way (vph) | | |
|---|---|---|---|
| Two Lane through Roadway | 400 | 500 | 650 |
| Cross Road | 250 | 200 | 100 |
| Four Lane through roadway | 1000 | 1500 | 2000 |
| Cross road | 100 | 50 | 25 |

Source: Austroads Guide to Traffic Engineering Practice - Part 5, 1988

It can be seen that with the current traffic flows, at this intersection do not reach these threshold limits and therefore traffic operates well with little if any delay, except for the requirement to slow down to negotiate the intersection. This confirms on-site observations. The two-way flow along Diamond Head Drive is less than 400 vehicles per hour and the side road flow on Ti-Tree Road would be less than 250 vehicles per hour.

The other important factor for the operation of an intersection is road safety. One of the key issues for road safety is sight visibility, so that drivers on the priority road (Diamond Head Drive) can observe any vehicle pulling in or out of the side road as well as drivers on the side road being able to judge a suitable gap to pull out of the side road.

The visibility has been checked on site and it is considered that adequate visibility is provided in both directions along Diamond Head Drive. Diamond Head Drive in this location provides a relatively straight alignment and offers acceptable visibility for the posted speed limit of 50 km/h.

**Photo 5 – View to left (east) for traffic exiting Ti-Tree Road**


**Photo 6 – View right (west) for traffic exiting Ti-Tree Road**

It is considered that the additional total development flows will have an acceptable impact upon the operation of this intersection. With the provision of the future third intersection to the north of the site, the additional development traffic flows using this intersection would decease considerably. It is considered that less than 30% of the development flows would use this intersection once the third northern access is constructed.

## 4.4 Intersection Operation, Pine Crescent and Diamond Head Dr

The impact of the additional traffic associated with the development has been assessed for the intersection of Pine Crescent and Diamond Head Drive. Again, it is considered that the thresholds shown in **Table 4.1** above are not met. The traffic flows on Pine Crescent are less than 100 vehicles per hour and the flows on Diamond Head Drive would be less than 400 vehicles per hour. It can be seen that with the current traffic, flows at this intersection do not meet the threshold limits from Table 4.1 and therefore traffic operates well with little if any delay, except for the requirement to slow down to negotiate the intersection.

Again, the safety implications have been observed on site. Diamond Head Drive provides straight alignment in this location. To the west of the intersection, there is a width restriction on Diamond Head Drive created by the bridge over the Pacific Highway. This restriction acts as a slow point, encouraging drivers to proceed at a speed less than the posted speed limit of 50 km/h.

The sight visibility has been checked on site and it is considered that this intersection provides a safe and appropriate layout.


**Photo 7 – View to right (west) for traffic exiting Pine Crescent**

**Photo 8 – View left (east) for traffic exiting Pine Crescent**

## 4.5 Intersection of Diamond Head Drive and Graham Drive

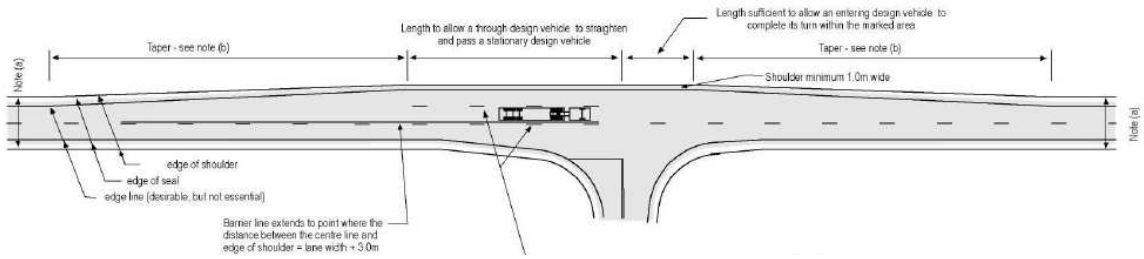
During the initial stages of the development, before the northern access is constructed, all of the traffic associated with the development will use the intersection of Diamond Head Drive and Graham Drive. This intersection provides a simple give way controlled layout, with Graham Drive being the priority road. Graham Drive at this location operates with a sign posted speed limit of 60 km/h.

It is considered that the peak hour two-way traffic flows at this location would be in the order of 250-300 maximum vehicles per hour along Graham Drive. The flows along Diamond Head Drive would be considerably less than this, at fewer than 200 vehicles per hour. With the additional traffic movement associated with the development, these flows could increase by up to 251 vehicles per hour along Diamond Head Drive. Allowing for 55% of these vehicles having an origin/destination to the south, the two way flow on Graham Drive to the south of this intersection could increase by some 131 vehicles to 400-450 vehicles per hour.

It can be seen that the future total flows at this intersection could exceed the threshold limits identified by the RTA for a simple give way intersection. Therefore the intersection would benefit from being upgraded, to decrease delays and congestion for traffic. In particular, it would be desirable to increase the capacity of the road for traffic turning right into Diamond Head Drive. A review of the intersection layout shows that currently, the intersection provides a simple give way layout with no shoulder widening to allow for right turning traffic.

It is considered that this intersection should be upgraded as part of the development of the subject site, to cater for the increased demand for traffic turning right into Diamond Head Drive during the afternoon peak period. This intersection will require being upgraded to a RTA Type AUR that will provide a sealed shoulder through the intersection to provide a minimum width for the northbound movement on Graham Drive of 6.0 metres between the centre line and the edge of the seal. This will allow a through traffic movement to continue along Graham Drive without being delayed by a vehicle waiting to turn right into the side road (Diamond Head Drive). This would be assessed and detailed during the development application stage of the process for the project.

A diagrammatic layout of this upgrade is provided below:




*Source: Austroads Guide to Intersections at Grade.*

Grahams Drive in this location provides straight alignment maximising visibility in both directions. The visibility has been checked on site and exceeds the requirement for the posted speed limit of 60 km/h.


**Photo 9 – View to right (north) for traffic exiting Diamond Head Drive**

**Photo 10 – View to left (south) for traffic exiting Diamond Head Drive**

## 4.6 Intersection of Graham Drive and the Pacific Hwy

During the initial stages of the development, before the Pacific Highway upgrade occurs and the third access is constructed, all vehicles to and from the subject site will access the greater road network via the two intersections of Graham Drive and the Pacific highway.

A review of the road network would indicate that those drivers heading south would use the southern intersection of Graham Drive and drivers heading north would use the northern intersection of Graham Drive and the Pacific Highway. This also reflects the current traffic patterns along Graham Drive.

From the report prepared by Connell Wagner for the upgrade of the Pacific Highway in this location, this intersection currently operates at a level of service of C during both the AM and PM peak periods. This indicates there is some spare capacity for additional traffic. Whilst there may be some additional delays for traffic turning right out of Graham Drive, the future upgrade of the Pacific Highway in this location will substantially reduce these delays.

It can be seen that the critical movements will be the southbound exit movement in the AM peak (requiring a right hand turn from the southern Graham Drive intersection into the Pacific Highway southbound) and the southbound entry movement in the PM peak (right hand turn from the Pacific Highway into Graham Drive at the northern end).

The RTA have identified that the right turn out of Graham Drive onto the Pacific Highway at the southern end requires an upgrade and are currently working on an interim solution to increase the capacity of this right hand turn. This will involve increasing the length of the central right turn acceleration lane, creating increased capacity for vehicles turning right out of Graham Drive.

For the full development there could be in the order of 110 vehicles maximum turning right out of this intersection. However, it is expected that the Pacific Highway will have been upgraded towards the later stages of this development, therefore the amount of traffic associated with the development turning right out of Graham Drive south will be much lower.

It is considered that the additional traffic associated with the development will have an acceptable short term impact upon the operation of this intersection. There will be some additional delays created for the traffic turning right out of Graham Drive but these will be eliminated once the Pacific Highway upgrade is constructed. The layout provides a safe control for vehicle movements and the current capacity will increase with the works proposed by the RTA.

This intersection is located on a relatively straight section of the Pacific Highway offering good visibility for drivers. It is considered that this intersection provides a safe layout and can accommodate the additional traffic from the development. The accident history for this length of the Pacific Highway does not highlight this intersection as having a high accident rate.

**Photo 11 – Graham Drive (southern) intersection with Pacific Highway. Note seagull type intersection layout.**

For the northern intersection of Graham Drive and the Pacific Highway, the major movement will be left out in the AM peak and right in to Graham Drive from the Pacific Highway in the afternoon. The critical movement will be the right turn into Graham Drive in the PM peak.

From the report prepared by Connell Wagner for the upgrade of the Pacific Highway in this location, this intersection currently operates at a level of service of A during both the AM and PM peak periods. This indicates there is considerable spare capacity for additional traffic. Whilst there may be some additional delays for traffic turning right into Graham Drive in the PM peak, the future upgrade of the Pacific Highway in this location will substantially reduce these delays

This intersection is located on a relatively straight section of the Pacific Highway offering good visibility for drivers. It is considered that this intersection provides a safe layout and can accommodate the additional traffic from the development. The accident history for this length of the Pacific Highway does not highlight this intersection as having a high accident rate

For the full development there could be in the order of 91 vehicles maximum turning right into Graham Drive at this intersection. However, it is expected that the Pacific Highway will have been upgraded towards the later stages of this development, therefore the amount of traffic associated with the development turning right at this location will be much lower. With the future upgrade this intersection will be replaced with a grade separated interchange.

**Photo 12 - Graham Drive (northern) intersection with Pacific Highway. Note right turn lane for traffic turning off Pacific Highway**

## 4.7 Future Third Access via On-ramp to Pacific Hwy Upgrade

An initial assessment has been completed with regard to the proposed future site access to the on-ramp to the Pacific Highway at the northern edge of the site. The RTA has provided projected traffic volumes for this ramp and intersection, to allow for an assessment of the operation of this access. An initial assessment for this access indicates that a 3-way roundabout controlled intersection could be provided on this ramp that would allow for two-way movements on this ramp between the roundabout and Hearnes Lake Drive to the north. Traffic would remain one-way southbound from this roundabout on the slip to merge with southbound movements on the Pacific Highway.

An alternative access arrangement in this location would be to allow for a left in and left out only to and from the site onto the on-ramp to the Pacific Highway. This would still cater for the majority of traffic movements and would have the minimal impact upon the operation of this on-ramp.

A detailed assessment has not been completed on this intersection at this stage, as there are no plans available from the RTA. The RTA has indicated that an access at this location will be acceptable to them, subject to detailed design and traffic modelling. The RTA also indicated that the alterations to the on-ramp layout would need an alteration to the Environmental Impact Statement completed for the Pacific Highway in this location.

A detailed assessment of this access point will be completed to RTA requirements during the detailed design of the development.

## 4.8 Pedestrian and Cyclist Facilities

It can be seen that the future pedestrian movements associated with the proposed development will be relatively low. It is considered that the proposed development will not require any additional pedestrian facilities to be provided in the general locality of the site. The development will provide a network of off road dual use paths that will provide for pedestrian and cyclist connections around and through the site. This will cater for connections to the existing Sandy Beach development to the south of the site as well as connections around Hearnes Lake and to the beach foreshore.

## 4.9 Public Transport

It can be seen that the proposed development will have a minimal impact in terms of public transport demand and no additional facilities or routes will be required as part of this development. There could be increased demand for the school bus run and the layout of the site has catered for bus use, with the main north-south spine road designed to cater for bus movements. During the initial stages of the development, buses will be able to proceed through the site via a one-way circulation, entering for example via Ti-Tree Road then exiting via Pine Crescent (or vice versa). The extent of modifications (if any) to the bus services to Sandy Beach will need to be determined at construction stage and will require discussion with the bus company. During the initial stages, it is considered that the school bus service would not need to be altered from the existing route, as the initial stages will be within 400 metres of the existing school bus run along Diamond Head Drive.

## 4.10 Internal Road Network

All of the internal roads will be designed in accordance with Council requirements and will operate under a posted speed limit of 50 km/h. All of these roads will be under the control of Council and as such will comply with Council's standards for residential estate roads. All roads will allow for two way traffic movements. The major north-south spine road is designed to accommodate a future bus route and will be designed as a collector type road. The roads off this collector road will be designed as residential roads with reduced width to discourage drivers from speeding. All roads and intersections must be able to accommodate swept path movements associated with a large rigid vehicle such as a Council refuse collection truck or a removalist van.

# 5. Summary and Conclusions

## 5.1 Summary

From the study work, the following summary is provided:

1. The proposed development is to provide a residential subdivision of 280 lots, which would be developed over a number of stages. This assessment has been completed for the full development of 280 lots.
2. The site is located to the north of Sandy Beach, some 20 kms north of Coffs Harbour. The site is bounded to the west by the Pacific Highway which is the main road in the locality. The Pacific Highway provides the major arterial link along the east coast of Australia and is under the control of the Roads and Traffic Authority of NSW (RTA). The RTA has provided traffic data for use in this study.
3. The RTA has identified that the Pacific Highway in this location will reach capacity by 2011 and they have identified that the Pacific Highway in this location will require an upgrade to two lanes in each direction. There will be a grade separated intersection provided to the immediate north of the site to connect with Grahams Drive north and Hearnes Lake Drive.
4. It has been assumed that the standard rates for residential developments from the RTA Guide to Traffic Generating Developments could apply, giving some 238 vehicles per hour two-way during the peak hours for the full development of 280 lots. It has been determined that some 55% of the traffic would have an origin / destination towards the south and the balance to the north, based upon existing traffic movements in and out of Graham Drive.
5. The vehicle access to the site is proposed via two new access points to the south of the site, that will tie-in with the existing local road network. The new access points are via Pine Crescent and Ti-Tree Road. These access points will be the sole access points until the third access is provided to the north to link with the on-ramp for the Pacific Highway upgrade in this location.
6. The impact of the additional traffic associated with the full development has been assessed on these local residential roads and it can be seen that even without the third access to the north, the impact of the development upon these local residential roads is acceptable. The future total vehicle flows along these roads will remain within acceptable environmental limits for their classifications.
7. The operation of the local intersections has been assessed. It is considered that the intersections along Diamond Head Drive provide adequate capacity to cater for the additional traffic flows and that the two key intersections impacted upon by the development flows will provide an acceptable and safe operation for all road users.
8. The intersection of Graham Drive and Diamond Head Drive has been assessed and it is considered that this intersection will need to be upgraded as part of the development. It is considered that the intersection should be upgraded to an RTA Type AUR to allow for increased right turns into Diamond Head Drive. This upgrade will ensure that there will be minimal delays for northbound traffic movements on Graham Drive. This would be further assessed and conditioned during the development application stage of the process.
9. The RTA has indicated that they would accept a third access to the development site via the on-ramp to the future Pacific Highway upgrade, subject to detailed design and traffic modelling. An initial assessment indicates that an access can be provided at this location. The access at this location will need to be designed and approved by the RTA.

10. The internal road network, together with the new connections to the existing road network will be designed in accordance with the Council road design guide. All road works will need to be approved by Council.
11. Existing pedestrian, cyclist and public transport facilities in the general vicinity of the subject site will be adequate for the proposed development. A network of internal off-road paths will cater for pedestrian and cyclist movements. The internal road system has been designed to cater for future bus routes (to be determined in consultation with the local bus company).

## 5.2 Conclusion

From the study, it is concluded that the existing road system is able to cater for the traffic demands of the proposed residential development subject to the necessary road infrastructure requirements and it is recommended that the development be approved on traffic grounds.

As part of the development, the following road upgrade will be required:

- Upgrade of the intersection of Grahams Drive and Diamond Head Drive to a RTA Type AUR intersection.

# Appendix A Meeting Notes

Notes from meeting with RTA of 8th November 2007.

These notes are provided from the meeting held at the RTA Grafton meeting on Thursday 8th November 2007.

RTA representatives: Greg Sciffer (Development Assessment Officer), Chris Clark (Project Manager, Pacific Highway upgrade)– RTA Grafton

The following points were raised and discussed at the meeting:

- The interim option for providing a left in and left out access to the subject site was discussed with the RTA. The RTA indicated that they would resist any new direct access to the Pacific Highway, as they actively seek to reduce the number of intersections along the Pacific Highway. Where access is available via the existing road network they will not allow a new access to be provided.

- Discussion was held with Chris Clark with regard to access to the future on-ramp located to the immediate north of the site. This ramp will be provided as part of the future road upgrade of the Pacific Highway in this location. Chris indicated that in principle he did not have any objection to access being provided via this ramp. However, the current RTA Environmental Impact Statement (EIS) for the proposed upgrade does not allow for this connection, therefore a separate EIS would be required for this connection. Chris also indicated that the traffic flows would need to be reviewed to ensure that the access would work and that there would be acceptable impacts for traffic created by the development.

- The preferred route upgrade for the Pacific Highway was discussed. The RTA indicated that the Pacific Highway in this location would be at capacity in 2011 and that in the order of 90% of the traffic on the Pacific Highway in this location was local traffic. Whilst other options are still being discussed for the Pacific Highway, it can be seen that even with an inland route to the west the Pacific Highway in this location will need to be upgraded to a minimum of 2 lanes in each direction. The RTA plans indicate that this future widening will occur along the western side of the highway.

- The timing for the road upgrade was discussed with the RTA. The RTA indicated that there is no firm date for any works, and that the timetable could alter dependent upon the upcoming Elections. However, the minimum start date would be post 2009.

- Discussion was held with regard to the timetable for the proposed Hearns Lake development. Study team indicated that construction could possibly start in mid 2009, if the planning and design remained on target.

- A proposed staging of the development was discussed with the RTA, with regard to partially developing the site form the southern end and providing access via the existing local road network. It is noted that the development has two points of access to the local road network at the southern end of the site. It was indicated that as development would take a number of years to develop that access to the north could be delayed until later in the project when access could be provided to the future ramp access to the Pacific Highway (subject to RTA approval).

**Outcomes**

A. RTA will NOT approve an interim access to the site directly off the Pacific Highway.
B. RTA to provide traffic data for the future flows on the ramp access to the Pacific Highway. This has been received (13th November 2007).
C. Whilst the upgrade options for the Pacific Highway could include the western inland route upgrade, the Pacific Highway in this location will still need to be upgrade to 2 lanes in each direction to cater for the local traffic needs. Therefore the future ramp access will be constructed.
D. RTA will accept a connection to the future ramps onto the Pacific Highway; subject to the preparation of an EIS for the connection and alteration to the current ramp arrangements and that the proposed alterations will have an acceptable impact upon the ramp operation. All additional costs to adjust the on-ramp will be borne by the developer.
E. Access to the local roads will need to be addressed to Council satisfaction.

# Appendix B Preliminary Site Plans