BROOME
INTERNATIONAL
AIRPORT

Airport Development Plan

Prepared on Behalf of,
and with Input from

BIA GROUP

For Submission to

SHIRE OF BROOME

February 2012

■ Land Use ■ Design ■ Strategy ■ Economics ■ Research

SHRAPNEL URBAN PLANNING

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ENDORSEMENT

This structure plan is prepared under the provisions of the Shire of Broome Town Planning Scheme No. 4

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

10 OCTOBER 2012

In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning and Development (Local Planning Schemes) Regulations 2015.*

Date of Expiry: **15 OCTOBER 2028**

BROOME AIRPORT DEVELOPMENT PLAN

1. This Broome Airport Development Plan (ADP) has been prepared generally in accordance with Clause 4.25 of the Shire of Broome Town Planning Scheme No. 4.
2. The main purpose of the ADP is to provide an appropriate statutory planning framework to facilitate the effective continued operation and expansion of the Broome International Airport at its current location, until such time as aviation demands and/ or airport impacts on the Broome community necessitate the airport's relocation.
3. This front section contains what is considered to be ***the ADP itself,*** and is intended to become the main administrative document. It contains:
   - This page;
   - Land Use and Zoning Schedule for Plan A;
   - Plan A: Airport Development;
   - Plan B: Future Urban Development;
   - Adoption page.
4. The balance of this document comprises a ***Planning Report***, which sets out in some detail the background, rationale and context for this ADP. It provides more detailed descriptions of some of its features and discusses various relevant factors such as amenity and safety, roads, traffic, and the environment.
5. The ADP is a two-phase plan. ***Plan A*** is the Airport Development plan, which is intended to be used to control development within the airport area, while the airport is operational at its current location.
6. It is intended that airport land will be developed and/ or existing facilities modified and/ or expanded in accordance with the Plan A framework on an "as-required" basis in accordance with demand.
7. All development within the ADP area under Plan A is intended to remain in service only until the existing airport ceases operations.
8. As soon as the existing airport's operations cease, Plan A will immediately become obsolete, and ***Plan B*** will replace it; except that Plan B shall apply during the currency of Plan A to any land not covered by an airport development zone in Plan A.
9. As indicated on Plan B, at that time the area west of an extended Jigal Drive, which is covered by Plan A but not by Plan B, will need to be the subject of an additional development plan. At that time it may also be advisable to review Plan B to ensure that it accords with the objectives and other requirements pertaining at the time.

Schedule of Proposed Zones and Associated Land Uses for PLAN A: AIRPORT DEVELOPMENT

Zone	Existing Uses	General Policy	Proposed or Potential Uses
A1	Runway; taxiways; aprons; aircraft parking; safety and service/ refuelling facilities; air traffic services	**Airside 1:** To retain, maintain and (to the extent required to satisfy the future demand) expand the existing uses and extend the taxiways and aircraft parking areas.	Existing uses; any legally required or otherwise appropriate aviation or aviation service use.
A2	Vacant land	**Airside 2:** To the extent required to satisfy the future demand, extend the A1 uses into this zone.	Taxiways; aprons; aircraft parking; safety and service/ refuelling facilities; air traffic services.
AS1	Aircraft hangars; fuel storage; airport operation related general and light industry; light aircraft passenger terminal; communications facilities.	**Aviation Service 1:** To retain, maintain and (to the extent required to satisfy future demand) redevelop and/ or expand the existing uses.	Existing uses and any airport operation related use compatible with or complementary to the existing uses; air traffic services; airport rescue and fire fighting service; access roads.
AS2	Vacant land; fuel storage; airport rescue and fire fighting service	**Aviation Service 2:** To the extent required to satisfy the future demand, extend the AS1 uses into this zone.	Existing uses; aircraft hangars; airport operation related general and light industry; communications facilities; car hire & associated cleaning services; access roads and any other airport operation related uses compatible with or complementary to these uses.
AS3	Bureau of Meteorology; aircraft navigation aids; airport operation related service and light industry	**Aviation Service 3:** 1. To retain the existing Bureau of Meteorology and aircraft navigation aids in this zone. 2. To facilitate airport operation related service and light industrial uses.	Additional aircraft navigation aids; associated aviation and meteorological service facilities; car hire support facilities; airport related service and light Industry.

Zone	Existing Uses	General Policy	Proposed or Potential Uses
AS4	Vacant Land.	**Aviation Service 4:** To facilitate airport operation related service and light industrial uses, as well as temporary warehousing and storage uses, which need not be aviation-related.	Aircraft navigation aids; associated aviation and meteorological service facilities; car hire support facilities; airport related service and light Industry; temporary non-aviation related warehousing and storage.
TA	Passenger terminal and related uses including customs, immigration, quarantine and other international and domestic passenger processing facilities; bar and coffee shop; offices; car hire and associated cleaning services.	**Terminal Area:** To retain, maintain and (to the extent required to satisfy future demand) expand and/ or redevelop existing uses and establish additional uses that are normally or reasonably associated with the terminal complex of an international airport.	Expansion of passenger terminal and related uses including customs, immigration, quarantine and other international and domestic passenger processing facilities; bar and coffee shop; offices; car hire and associated cleaning services; tourism displays and any other uses that are normally or reasonably associated with the terminal complex of an international airport.
TS	Car parking; car hire and associated cleaning services; tourism services; airport operation related light industry and offices; caretaker's house and vacant land.	**Terminal Area Support:** 1. While retaining the potential to develop the zone for car parking to accommodate future demand, facilitate the continuation and expansion of existing land uses, such as passenger transfer facilities.	Expansion of existing uses; car parking and drainage.
B	Vacant land	**Buffer:** To retain as a natural and/ or landscaped buffer between the airport and adjoining land uses.	Landscaping.

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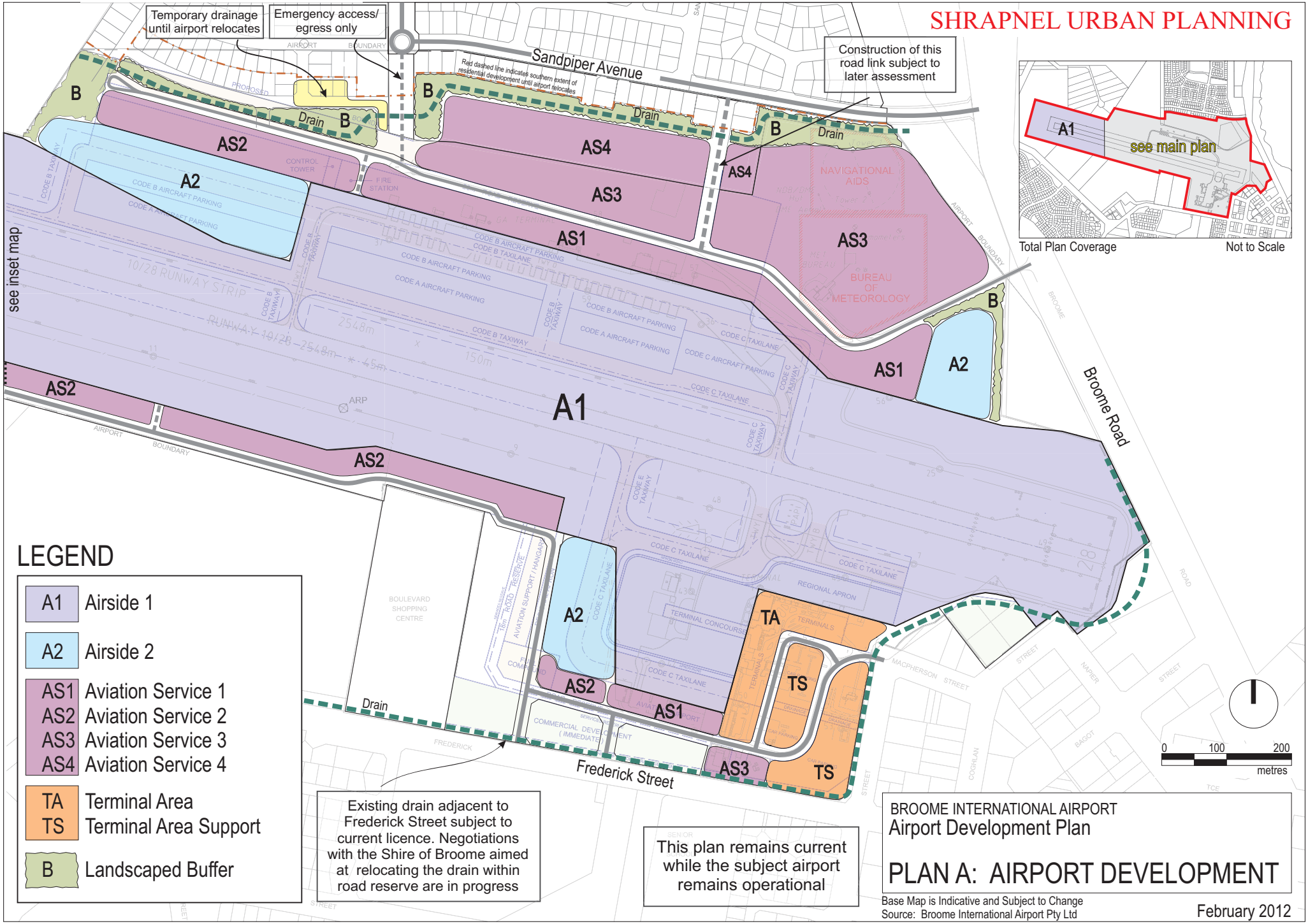

LEGEND

A1	Airside 1
A2	Airside 2
AS1	Aviation Service 1
AS2	Aviation Service 2
AS3	Aviation Service 3
AS4	Aviation Service 4
TA	Terminal Area
TS	Terminal Area Support
B	Landscaped Buffer

BROOME INTERNATIONAL AIRPORT
Airport Development Plan

PLAN A: AIRPORT DEVELOPMENT

Base Map is Indicative and Subject to Change
Source: Broome International Airport Pty Ltd

February 2012

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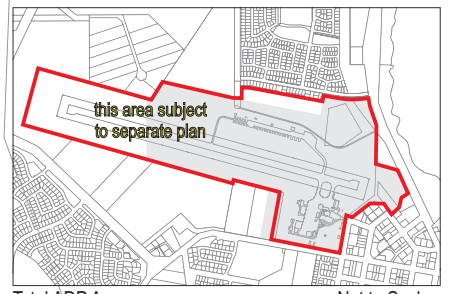

Total ADP Area Not to Scale

see inset map

This area is to be the subject of a separate (urban) Development Plan

Sandpiper Avenue

Drain

Drain

Drain

Jigal Drive

Broome Road

AIRPORT BOUNDARY

BOULEVARD SHOPPING CENTRE

Drain

FREDERICK

Frederick Street

MACPHERSON STREET

NAPIER STREET

BAGOT

COGHLAN STREET

SENIOR HIGH SCHOOL

0 100 200 metres

LEGEND

- Residential
- Mixed Uses
- Parks and Drainage

This plan becomes current when the subject airport ceases operations.

NOTE: Most road alignments are indicative only, and subject to review and possible change during detailed design prior to subdivision.

BROOME INTERNATIONAL AIRPORT

Airport Development Plan

PLAN B: FUTURE URBAN DEVELOPMENT

Layout is Indicative and Subject to Change

February 2012

ADOPTION OF DEVELOPMENT PLAN

THE BROOME AIRPORT DEVELOPMENT PLAN

WAS ADOPTED BY

RESOLUTION OF THE COUNCIL OF THE SHIRE OF BROOME ON

.....Date

AND THE SEAL OF THE MUNICIPALITY WAS PURSUANT

TO THE COUNCIL'S RESOLUTION HEREUNTO AFFIXED IN THE

PRESENCE OF:

President, Shire of Broome

Chief Executive Officer, Shire of Broome

.....Date

AND BY

RESOLUTION OF THE WESTERN AUSTRALIA PLANNING COMMISSION ON

.....Date

an officer of the Commission duly authorized by the Commission pursuant to Section 57 of the Western Australian Planning Commission Act 1985 for that purpose,

..... in the presence of:

.....Witness

.....Date

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INTERNATIONAL
AIRPORT

AIRPORT DEVELOPMENT PLAN

Planning Report

February 2012

Land Use Design Strategy Economics Research

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1 INTRODUCTION

The Broome International Airport is the main gateway into the Kimberley Region of Western Australia. An airport has existed in some form on its present alignment since 1935. In 1942, during the Second World War, it was attacked by the Japanese in a bombing and strafing raid, with the loss of some 100 lives, and 24 aircraft. Since then Broome has grown up in intimate proximity to its airport; slowly at first, but more recently with increasing pace.

Although there has for some time been an expectation that one day the airport would be relocated, a large part of Broome's fascinating and seductive character involves the airport – both its history and current operation. The daily arrival and departure of jets and many other types of aircraft are a constant positive reminder to the residents of this attractive yet isolated town that they are not only connected to, but play an important role in, the much larger scheme of the things.

If Broome continues to grow as predicted, it will at some stage almost certainly become practicable to relocate the airport to a site already identified for the purpose some 13 kilometres out of town. Until that time, however, it is essential that the airport's valuable role in Broome and the wider region continues to be facilitated in a manner consistent with Broome's best interests. This will certainly involve some expansion of the existing airport in line with growth in Broome's population and the region's economy, particularly the tourism component and, increasingly, the oil and gas industry.

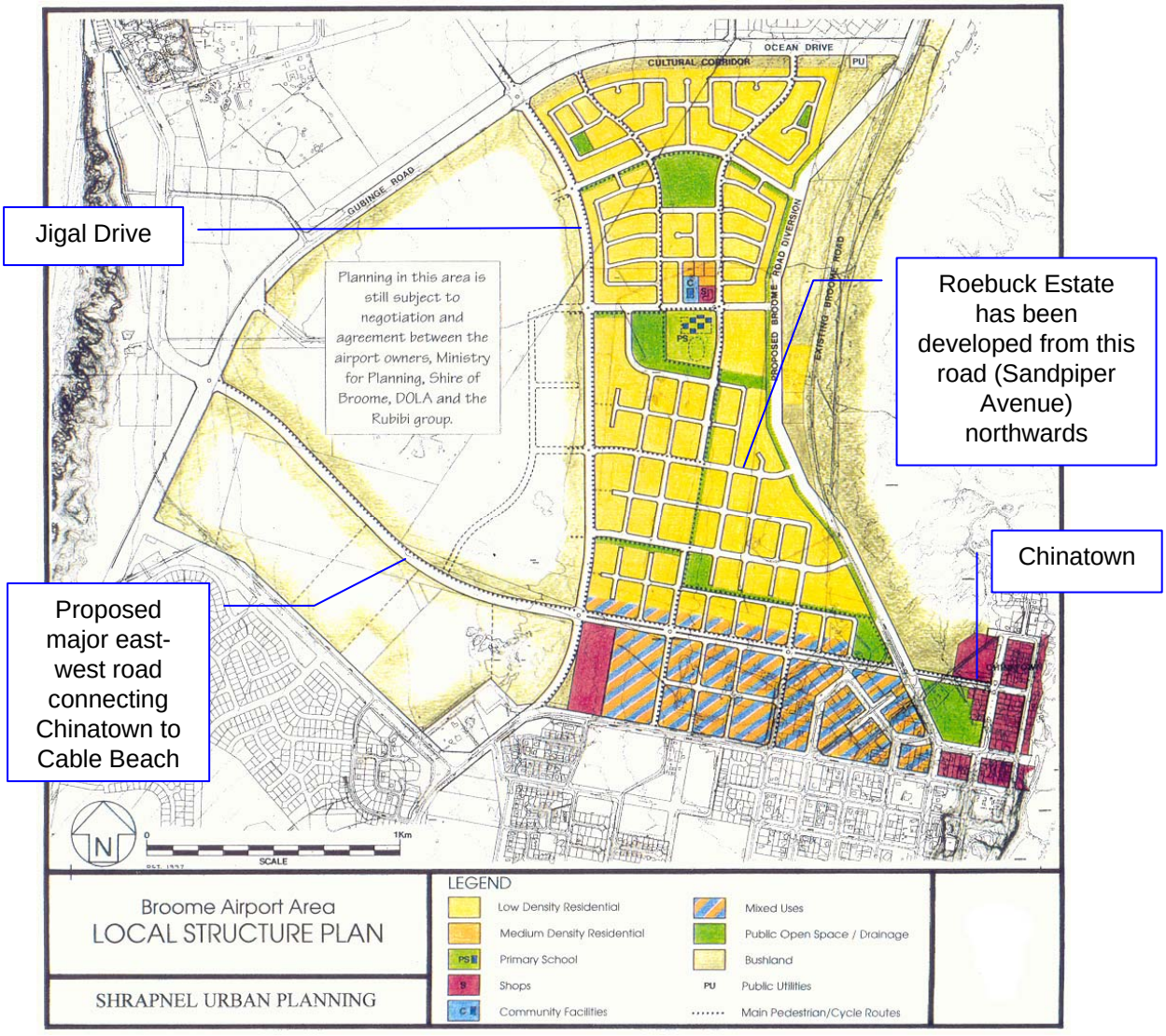
In order to facilitate this growth in a thoroughly considered and orderly manner, the Airport Development Plan (ADP) has been created. It is intended that this plan will be accepted by the Shire of Broome and endorsed by the Western Australian Planning Commission, after which it will serve as a soundly-based framework to guide future development on the existing airport until such time as its relocation becomes practicable.

2 BACKGROUND & RATIONALE

After a lengthy planning process the Broome Airport Area Local Structure Plan (LSP)[1] was eventually finalised in November 1998 and subsequently endorsed by the Shire of Broome and the Western Australian Planning Commission (Figure 1). The main purpose of the LSP was to provide a planning framework to guide the staged development for urban purposes of all the land occupied or owned by the Broome International Airport.

As indicated in Figure 1, two of the main features of the LSP were the provision of a major east-west road link between Chinatown and Cable Beach, and a north-south spine road connecting Gubinge Road and Port Drive. This road (now named Jigal Drive) has since been constructed between Gubinge Road and Sandpiper Avenue.

Figure 1 Original Airport Area LSP Map



[1] Broome Airport Area Local Structure Plan (Final Report); SHRAPNEL URBAN PLANNING; November 1998.

Development of the area north of Sandpiper Avenue, in what has become known as ***Roebuck Estate***, was able to commence immediately, without interfering with the operation of the existing airport. This estate proved to be highly successful and, following numerous staged subdivision applications, some 970 residential lots, seven group housing sites, parks, a primary school and a village centre were produced. With development of the estate north of Sandpiper Avenue thus having, for all practical purposes, been completed, the Shire of Broome recently adopted a Town Planning Scheme Amendment[2] to bring this land from the temporary "Development" zone into the more specific Scheme Zones and Reserves appropriate to an established urban area.

At the time the LSP was prepared it was anticipated that the plan would be fully implemented in the short to medium term, and that the Airport would be relocated to a new site some 13 kilometres to the north-east of Broome. Considerable work and expense was incurred by BIA to achieve this relocation objective including:

- Extensive consultation with the community, native title claimants, the State Government and the Shire of Broome to determine the appropriate new airport site;
- In depth engineering, meteorological and aeronautical analysis and investigations to confirm the suitability and requirements of the site;
- Obtaining the necessary Environmental approvals from the Federal and the State Authorities.

In December 1999 the State Government gave notice of its intention to take the land comprised in the new site, and negotiations with the native title claimants began in earnest. Despite extensive discussions and meetings (primarily with the Kimberley Land Council (KLC) and traditional owners), and substantial compensation being offered to the native title claimants, no agreement was able to be reached. Proceedings were then commenced before an Independent Person under section 24MD(6B) of the Native Title Act 1993 (Cth) between the State Government, BIA and the native title claimants represented by the KLC to determine if the resumption could go ahead and what compensation should be paid.

The Independent Person set the matter down for a hearing in the later half of 2002. However, in March 2002 the State Government requested BIA to agree to the withdrawal of the notice of intention to take the land for the new site to assist the State's attempt to negotiate a settlement of all native title claims in and around Broome. In the interests of the State and the community, BIA felt obliged to comply with the State government's wishes, and agreed to the State's withdrawal of the notice of intention to take the land. This decision prompted significant necessary new investment in existing airport facilities.

[2] Shire of Broome TPS 4; Amendment No. 32

2.1 Non-Conforming Use

The original LSP still covers the airport, which is therefore considered to be a non-conforming use in statutory planning terms. This is an unsatisfactory situation, which needs to be rectified if the airport is to continue to effectively fulfil its increasingly important role. It is clearly in the public interest for the airport to remain fully operational and responsive to market conditions and aviation regulations for as long as it remains at its current location. Therefore, the airport must once again become a conforming use in statutory planning terms[3]. There are two main reasons for this:

1. Even though Council may at its discretion permit the expansion of non-conforming uses, there is always some degree of presumption against it, which results in a short-term view and on-going uncertainty for all concerned. However, the existing airport is highly likely to require considerable further expansion in the short, medium and longer terms, so it is important to remove the uncertainties and clarify the ground rules.

2. As a non-conforming use, every application for development at the airport, even for minor additions, alterations, etc, is *ad hoc*, and requires special consideration by the Council after first being advertised in accordance with Clause 9.4 of the Scheme. There will be a need for many development applications in the short to medium term, in order to expand and properly maintain airport operations. However, there is also no planning framework within which development applications can be properly considered and the current development approval procedures are unnecessarily cumbersome and inconvenient for both the Council and BIA.

Although the airport will need to be relocated at some point in the future, the Shire of Broome has nevertheless recognised the impracticability of the airport's current non-conforming use status, and has therefore indicated its willingness to support the preparation of this ADP, provided several matters such as potential traffic and amenity issues are satisfactorily addressed. These are discussed in a later section.

In its December 2005 report (also discussed later) the Broome Planning Steering Committee also recognised the need for a development plan to manage development on airport land until such time as the airport has been relocated. Planning proposals presented in the Committee's report envisage accommodation of Broome's population growth some fifteen years into the future, with the existing airport in place.

2.2 Broome's Growth

Strongly underpinning the need for the airport to become an expanding conforming use under the town planning scheme, is the anticipated growth in its operations. Broome has been booming for several years, a situation which is likely to continue.

[3] Prior to a 1996 Scheme Amendment (Amendment 132 to TPS 2) the airport was within a Local Reserve called "Airways Ground Facilities Including Airstrip"

2.2.1 Population Projections

Figure 2 presents the most recent population projections for Broome prepared by the Western Australian Planning Commission.

Figure 2 Shire of Broome Population Projections 2004 - 2021

4.13 Broome

	2004	2006	2011	2016	2021
0 to 4	1 400	1 600	1 700	1 800	1 900
5 to 9	1 400	1 500	1 700	1 800	2 000
10 to 14	1 100	1 200	1 500	1 700	1 900
15 to 19	960	1 000	1 200	1 500	1 800
20 to 24	1 100	1 100	1 200	1 500	1 800
25 to 29	1 300	1 300	1 400	1 600	1 900
30 to 34	1 500	1 500	1 500	1 600	1 800
35 to 39	1 400	1 500	1 600	1 600	1 700
40 to 44	1 200	1 300	1 500	1 700	1 700
45 to 49	1 000	1 100	1 400	1 600	1 800
50 to 54	780	910	1 100	1 400	1 600
55 to 59	540	620	870	1 100	1 400
60 to 64	360	380	540	780	990
65 to 69	230	260	300	460	670
70 to 74	160	160	220	260	400
75 to 79	95	100	120	170	220
80 to 84	50	60	75	100	140
85 plus	25	30	50	70	95
Total	14 500	15 600	18 000	20 700	23 800

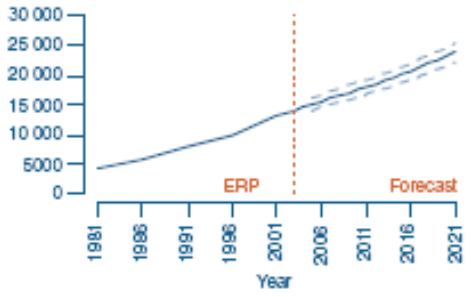


Chart 4.13.1 Expected accuracy

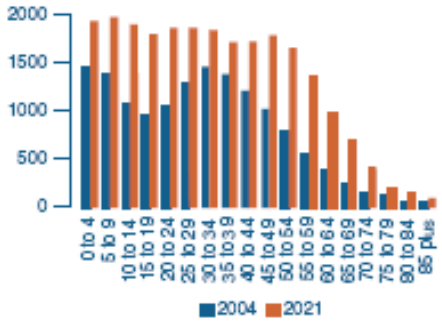


Chart 4.13.2 Age distribution

Source: Western Australia Tomorrow; WAPC; November 2005

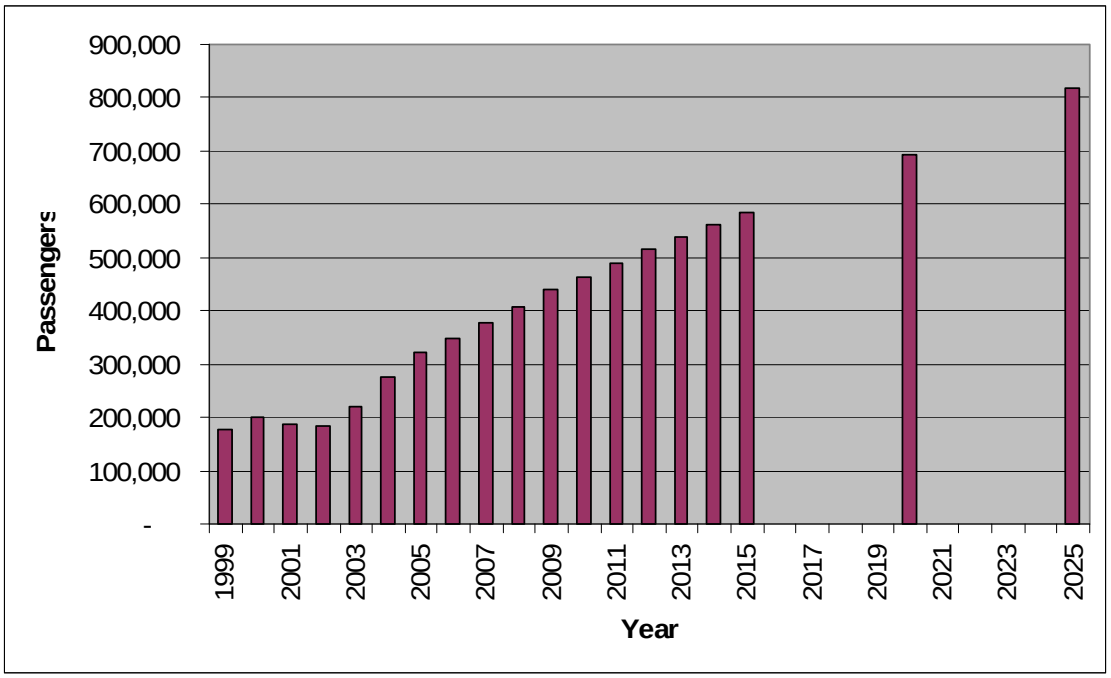
As indicated in Figure 2, the Estimated Resident Population (ERP) of Broome is expected to increase by 8,200 permanent residents from 15,600 in 2006 to 23,800 persons by 2021. This represents an average annual growth rate over the period of 2.86%, which is somewhat higher than the projected WA average of 2.11%. It is, however, considerably lower than the 4.7% growth rate recorded over the past fifteen years[4].

2.2.2 Air Traffic and Passenger Projections

Air traffic and passenger growth into Broome has grown considerably in recent years reflecting the growth in population and the economy of the region, with the major growth factor being the tourism industry. In 1991, the airport had 42,698 passengers, and these have increased to about 380,000 in 2007. Figure 3 presents recent data and the forward projections of the number of passengers flying into and out of Broome.

[4] This calculation assumes that the DPI projected ERP of 15.600 persons as at 2006 proves to be correct

Figure 3 Broome Airport Passenger Numbers and Projection



Source: BIA Holdings Pty Ltd

Figure 3 clearly shows that, although there have been a few flat or negative passenger years before 2003, the recent and overall trend is positive and is expected to continue. However, air traffic is periodically subject to adverse influences. The events of September 11th in the USA and the immediate collapse of Ansett in 2001 had a major effect on air traffic at Broome, which took some time to recover. In 2002/ 03, the terrorist attack in Bali, the conflict with Iraq, and the outbreak of SARS in South East Asia appeared to focus more interest on Broome as a lower risk tourist destination, which was partly responsible for the resurgence in its passenger numbers.

This resurgence and traffic growth was substantially due to the introduction of new carriers (Virgin Blue and Skywest), which provided competition into Broome with more available seats and lower fares and this paradigm has continued. There has been a slight trend towards an increase in passengers travelling for business and an increase in local resident travel, but Broome airport passengers remain predominantly tourist. Recent passenger surveys by BIA show the simple annual traffic split into tourist and non-tourist traffic is 60% associated with tourism, and 40% associated with business and local residents. In 1992, the split was 70-30.

Long term passenger forecasts have been developed by BIA by combining models from historical time series with models of econometric and tourism growth. The forecasts are based on 2007 conditions which are expected to vary over time. Aviation traffic growth is driven primarily by economic demand: GDP, business revenues, disposable income, etc. As long as these rise, the demand for air travel increases. However if GDP growth lessens, or the economy goes into recession, aviation will be disproportionately affected. A key element for maintaining passenger growth and discount ticketing will be future business passengers, provided the developers of the Browse Basin oil and gas production facilities use Broome as their aviation hub.

Air traffic movements have also shown growth over the past few years. Medium and large narrow body regular passenger transport jet (e.g. Boeing 737 and 717, Embraer 170 and 190, and Fokker F100) movements have increased. However, the number of aircraft movements tends to increase at a lesser rate than passenger numbers due to the ongoing transition to larger, quieter and more efficient aircraft by the carriers, a trend which is predicted to continue into the future.

There has been substantial growth in general aviation since 1999 (smaller propeller aircraft, including Surveillance Australia, RFDS, various regional operators and private owners), with a significant jump in general aviation traffic in 2006/ 07 due partly to increased oil exploration activity. This contrasts with general aviation in Australia as a whole, which is declining slightly. The general aviation movements at Broome are forecast to grow at 20% per annum in the short term, dropping to an econometric growth rate of 3% per annum in the longer term.

Operations by heavy helicopters, such as the Super Puma and Sikorsky S-92, are increasing as Broome becomes the base for exploration and product well drilling in the Ichthys and Torosa gas fields, and other fields in the Browse Basin. Heavy helicopter usage at the airport is likely to peak in 2008 – 2015.

There is no question that projected growth in both aircraft and passenger movements can be accommodated at the existing airport for the foreseeable future, and must be properly planned and catered for. One important element of this essential planning is the ADP.

2.3 The Purpose of the ADP

The main purpose of the ADP is therefore to provide an appropriate statutory planning framework to facilitate the effective continued operation and expansion of the Broome International Airport at its current location, until such time as aviation demands and/ or airport impacts on the Broome community necessitate the airport's relocation.

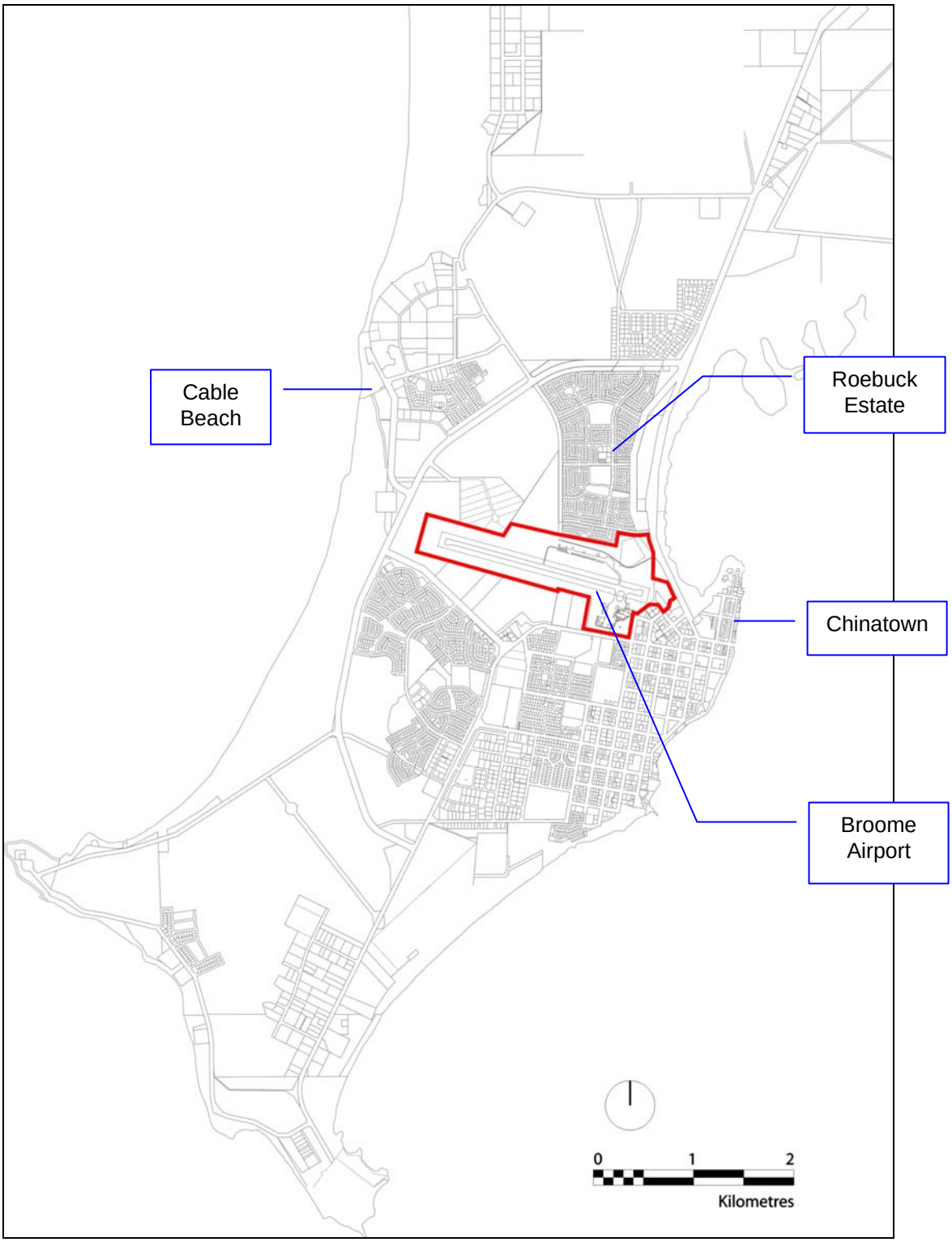
Any staging and timing issues in the urban development of Broome can be managed. The ADP recognises that the continued operation and expansion of the existing Broome Airport needs to be facilitated in a manner which will ensure that the overall net effect of the airport's continued presence within Broome remains the very positive force that it has been historically and in recent times.

3 THE ADP AREA

3.1 Location

The approximately 154 hectare area the subject of this ADP is illustrated within its wider Broome context in Figure 4.

Figure 4 ADP Area within Wider Broome Context

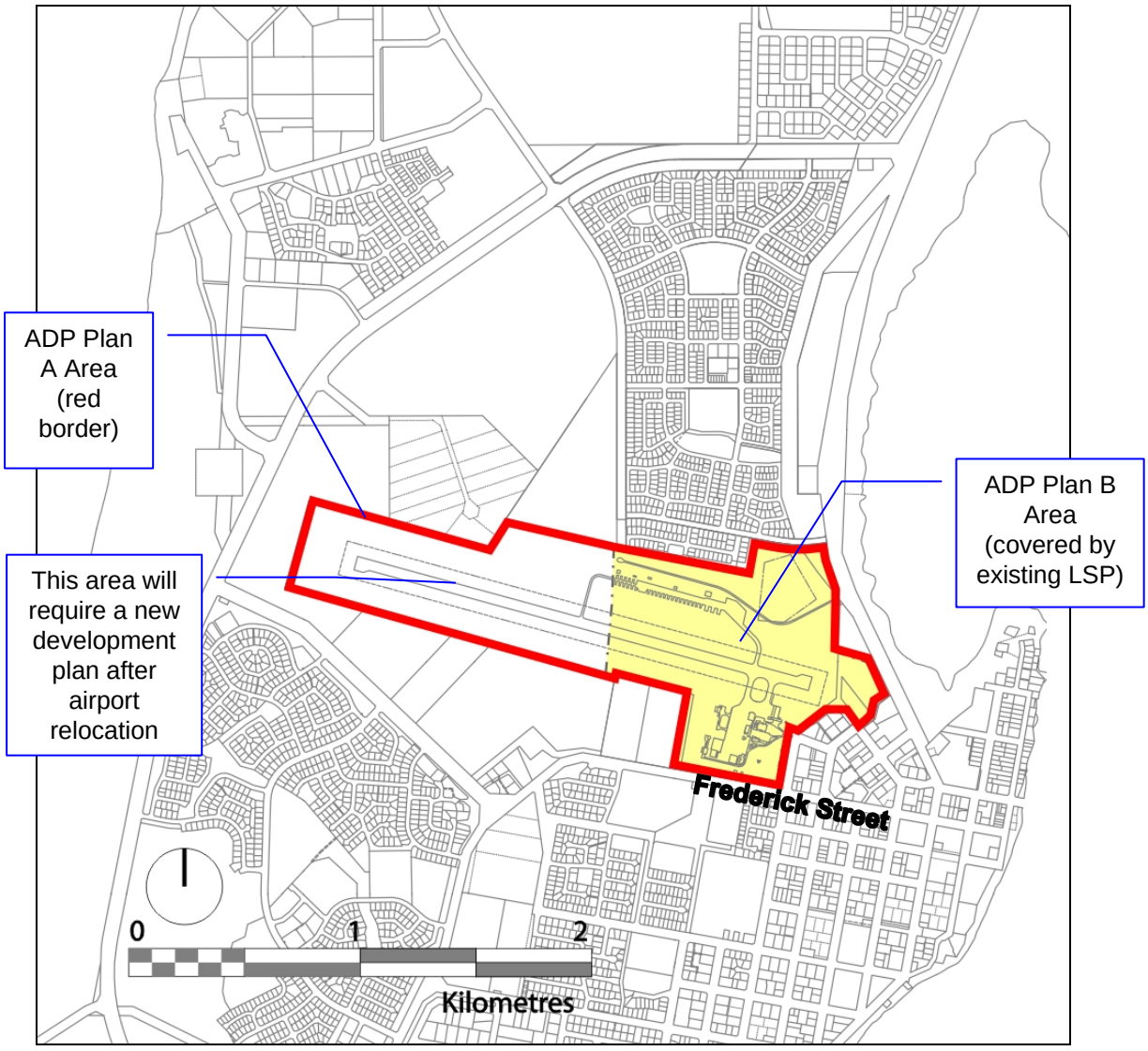


3.1.1 Plan Phases

The ADP is a two-phase plan. ***Plan A*** is the Airport Development Plan, which will be used to control development within the subject area, while the airport remains at its current location. The total area covered by Plan A is bounded by the red border in Figure 4 and Figure 5.

When the existing airport's operations eventually cease, Plan A will become obsolete, and ***Plan B*** – the Future Urban Development Plan – will replace it. The existing Plan B area is illustrated by the yellow shading in Figure 5.

Figure 5 ADP – Planning Areas, Phases 1 and 2



As indicated in Figure 5, Plan B covers only part of the Plan A area – i.e. the land currently covered by the existing LSP. The section of the airport that is not covered by Plan B will therefore need to be the subject of a separate new development plan at the appropriate time. A review and update of Plan B may also be considered desirable at that time.

3.2 Zoning

All of the Plan A area is within the "Development" zone under the Shire of Broome TPS No. 4. It is intended that the land will remain within this zone until such time as Plan B is implemented. At that time a scheme amendment will be needed to bring the developed area into more appropriate and specific Scheme zones and reserves.

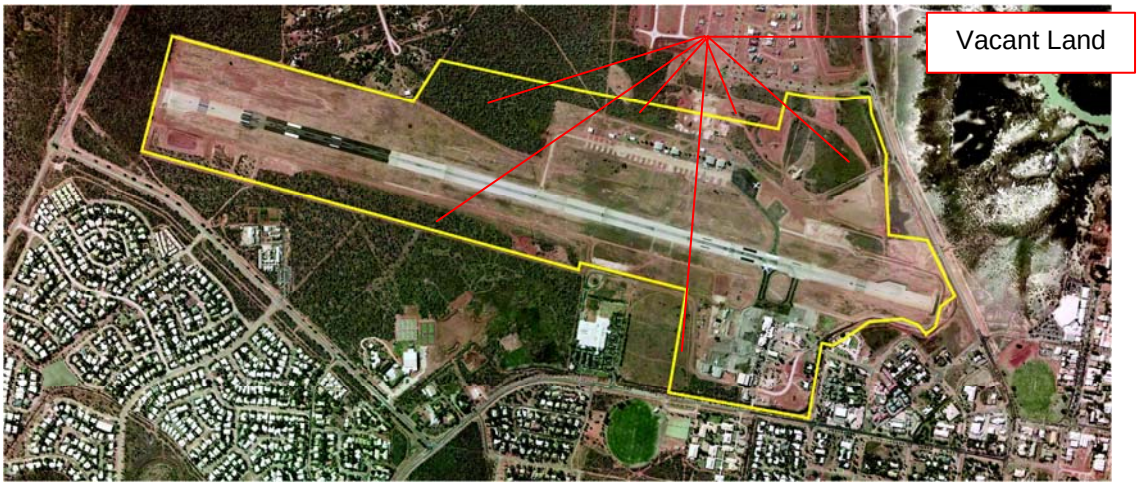
3.3 Existing Land Use

Existing land use comprises the airport, with its associated infrastructure and services; as well as vacant land. Figure 6 shows the eastern end of the airport, with the main terminal, hangars and aviation support services on the southern side of the runway. The general aviation area, hangars, meteorological facilities and navigation aids are to the north of the runway.

Figure 6 Broome Airport – Eastern End; Primary Use Areas

Reasonably large parcels of vacant land are evident both north and south of the runway. These, together with other vacant areas are shown in Figure 7. Most of the vacant land has been designated for the potential expansion of airport and aviation-related land uses in this ADP.

Figure 7 Broome Airport Showing Vacant Land



3.4 Accessibility

The existing airport is highly accessible to residents and tourists alike – less than 10 minutes drive from anywhere within urban Broome. Uniquely, one can easily walk to the airport terminal from the town centre (Chinatown) as well as from tourist accommodation in the mixed use area bounded by Frederick and Hamersley Streets.

The airport entrance is on the southern side, off MacPherson and Coghlan Streets. The latter joins Frederick Street, which is a section of Broome's main route between Cable Beach and Chinatown. The existing and future road system is considered in detail in the Traffic Study (Appendix A), which is summarised in the section of this report starting on Page 33.

3.5 Utility Services

3.5.1 Sewerage

The majority of the existing Broome town is provided with reticulated sewerage, which discharges via a combination of gravity and pressure sewers into the only existing waste water treatment plant located south of Clementson Street between the Town and the Port. A second waste water treatment plant is currently being planned approximately 13 km from Broome, near the Broome/ Derby Road.

The high use areas, such as the departure and arrival terminals, the café/ bar and some of the landside aviation support area on the southern side of the airport, are connected by gravity to the Water Corporation sewers in McPherson and Frederick Streets. Development on the northern side of the airport, including hangars and aviation related businesses, are presently connected to septic tanks in the absence of the close proximity of Water Corporation's sewers.

3.5.2 Water Supply

Development on the southern side of the airport is supplied with water from the Broome Townsite system, under the control of the Water Corporation. Development on the northern side of the airport is also provided with water from the Water Corporation mains, connected to the bore main along Broome Road, which delivers water from the bore field to the town. The water pressure from this system fluctuates because it is not on the higher pressure side of the Water Corporation system.

3.5.3 Electricity

The airport is supplied with electricity from the Horizon Power (formerly Western Power) generation and distribution system, with connections off McPherson Street (southern side of airport) and the Gus Winkle Drive/ Broome Road intersection on the northern side.

The airport also has its own 500 Kva standby and 165 Kva emergency generators supplying power to essential lighting and power circuits to maintain the airport in an operational condition throughout the periods of power outage that occur from time to time in Broome.

3.5.4 Telecommunications

Telecommunications into and out of the airport are via the Telstra land line system, supplemented by the mobile network.

4 PLANNING CONTEXT

4.1 TPS 4

The ADP area is zoned "Development" under the current Town Planning Scheme, TPS No. 4. The Scheme requires that any development within the "Development" zone shall be in accordance with an adopted development plan (Clause 4.25.2.1). Accordingly, this ADP has been prepared generally in accordance with Clause 4.25 of the Scheme, which sets out requirements for the content and procedures for the preparation and approval of development plans for land in the Development zone.

Clause 4.25.3.1 of the Scheme sets out the matters that must be addressed in the preparation of a development plan. Most of the listed matters are relevant in the preparation of a "normal" development plan aimed at facilitating new urban development, which is the main function of the Development zone. However, in the current somewhat unusual situation of preparing a development plan for the continuation and potential expansion of an existing major land use (i.e. the airport) some of the items listed in Clause 4.25.3.1 are not considered relevant to the preparation of this ADP.

4.2 Local Structure Plan (LSP)

The existing LSP (which was prepared in full accordance with Clause 4.25 in 1998) will be superseded by the ADP. ***The proposed urban form and land use in Plan B will be identical to that currently proposed in the existing LSP document.*** The LSP still represents the most appropriate vision for the long term development of Broome, and it is firmly intended to resume its implementation immediately upon the cessation of operations at the existing airport, whenever that might occur in the future.

4.3 Broome Planning Steering Committee Report

The Broome Planning Steering Committee was convened by the Minister for Planning and Infrastructure in November 2003 to address land use issues facing Broome and provide a strategic direction to assist the Shire in managing the town's growth over the next 10 to 15 years. The Committee's investigations are fully described in its report dated December 2005, the main outcome of which is a land use framework capable of accommodating the expected population growth. This report is the most significant recent planning study carried out for Broome, so the aspects of it most relevant to this ADP are summarised below in some detail.

4.3.1 Local Planning Context

Section 1 of the Committee's report provides relevant background information, including an outline of the documents which have most directly influenced Broome's present local planning context. According to the Committee's report, these are:

The Broome Planning Strategy (DPUD 1993) – aimed at providing a long term planning framework for the town, with several of its recommendations being subsequently incorporated into TPS4.

The Shire of Broome Town Planning Scheme No 4 (gazetted 1999) – identified as the principle land use planning control currently affecting Broome and the area north to Willie Creek and east to the Skuthorpe horticultural area.

The Waterbank Structure Plan (DOLA 2000) – which set out a broad land use framework for Waterbank station, an area of 315,500 ha to the north of Broome acquired by the State in 1996 for the town's future expansion.

4.3.2 Issues

Section 2 of the report identifies the key planning issues, opportunities and constraints associated with the ongoing evolution of Broome from small town to growing regional centre. Issues are covered under a wide range of headings – those most relevant for the purpose of this ADP are summarised as follows:

Aboriginal Interests and Culture

- The Rubibi combined native title claim covers an extensive area in and around Broome and Roebuck Bay, such that many development proposals involve land where native title applies – including the site earmarked for the relocation of Broome airport and areas of potential future residential and industrial growth.
- Unresolved native title matters are affecting implementation of land use plans for the town, the capacity to manage growth and provide for both the local community and visitors.

Population and Housing

- DPI population projections were presented on Page 5 of this ADP report. The Committee regarded the DPI projections (average annual growth rate around 3%) as conservative and considered a growth rate closer to 5% more likely. This would result in a Shire population of 35,000 by 2021, with about 85% (29,740) likely to reside in the town. Based on a population growth rate of 5%, there would be a demand for 200 residential lots per annum in the town to 2010.
- Broome has one of the state's highest median house prices outside Perth due to high building and construction costs and the small amount of land available for residential development relative to the growing demand generated by high population growth rates and strong investor interest.

- The principal area designated to accommodate future residential development in Town Planning Scheme No 4 is the area containing Roebuck Estate and the Broome Airport, however, the Committee clearly acknowledged the unlikelihood of the airport land being available for residential development in the short to medium term (i.e. the next 15 years).

Economy, Commerce and Employment

- Tourism is a major industry in Broome, with the number of visitors steadily increasing (244,000 in 2002) to the point that there is a need for further accommodation and related services to cater for peak season demand.
- Industry seasonality, however, affects investment in tourist related infrastructure and services, and there needs to be greater emphasis on building visitor numbers in the shoulder season.
- The town's commercial and retail sectors will need to expand in response to growing resident and visitor populations. It has been the long-term intention to create a mixed use zone between Chinatown and the Broome Boulevard once the airport is relocated, however, as the relocation is unlikely to occur for some time, other land needs to be made available for commercial use in the interim.

Traffic and Transport

- The extension of Gubinge Road (north and south), which is now complete, has significantly improved traffic management opportunities for Broome.
- The recent construction of Jigal Drive to the west of Roebuck Estate and north of the airport has assisted with traffic circulation and removed some pressure from Frederick Street.
- A site for a new airport on Broome Road 13 km north-east of town has been selected and the necessary environmental and other approvals have been obtained. However, action to extend native title negotiations on the new site and the upgrading of the existing airport have reduced the likelihood of relocation within the next 15 years.
- The selected long-term site for the airport, and its associated flight path, will still need to be protected from conflicting land uses until such time as relocation becomes practicable.
- The continued operation of the airport on its present site means that alternative development strategies for the town are needed to accommodate the community's needs in the short to medium term.
- The current airport is a non-conforming use which requires further development in order to respond to increasing demand. ***The preparation of this Airport Development Plan is the most appropriate way to establish a context to assist with planning decisions with respect to the site***.

Growth Along Broome Road

- Broome Road, between the Broome-Cape Leveque Road and Great Northern Highway, is likely to emerge as an activity corridor in the longer

term, with planned development including the future new airport, a general and transport-related industry site, new wastewater treatment plant and expansion of the Skuthorpe horticultural area. The possibility is also raised of also establishing a new urban centre comprising residential, commercial and ancillary uses to provide for future growth outside the Broome Townsite.

4.3.3 Land Use Framework

In addressing these issues the Steering Committee devised a composite land use framework in which a range of land uses are based around four "core areas" – Regional Open Space and Rural Areas; Transport Networks and Infrastructure; Housing and Community Areas; and Employment and Economic Areas. These are explained in Section 4 of the report and the framework is illustrated in plan form in Figures 1a and 1b, which are reproduced overleaf. Relevant aspects of the land use framework, and associated recommendations, are outlined as follows.

Transport Networks and Infrastructure

- Although the Steering Committee's view is that the relocation of the airport should be maintained as a long term proposition, the presented land use framework assumes retention of the airport on its current site for the next 15 years[5].
- The existing airport should retain its present classification in the local town planning scheme (Development Zone) and an Airport Development Plan should be prepared to determine how further development of the operational area can occur without compromising the needs of the surrounding community.
- The land use framework also suggested the possibility of establishing a hitherto unplanned east-west road between Cable Beach and Chinatown while the airport remains in its present location. The indicated road (the requirement for which the Committee recognised would need to be confirmed by vehicular traffic modelling)[6] is shown traversing the proposed housing expansion area west of Roebuck Estate, and the area south of Sandpiper Avenue, with a connection to Broome Road near the existing Sandpiper Avenue/ Broome Road junction.

Housing/ Urban Expansion

- Until 2010 residential land demand in Broome will be met through the remaining areas of Roebuck Estate and Sunset Rise, as well as lot release in the approved Herbert Street development and the planned release of Cable Beach 5B and 5C residential neighbourhoods. Collectively these areas will generate in the order of 800 additional lots and provide for approximately 2000 residents. Beyond 2010 residential demand will be met within three main "urban expansion areas", generating a total of 2,500 lots and housing 8,000 permanent residents. The three areas are:

[5] It should be noted, however, that the BIA Airport Master Plan has a planning horizon of 2025 (refer to page 18)
[6] The detailed traffic study carried out for the purposes of this ADP demonstrates that this road will not be required

1. Lot 833 – comprises 80 ha of housing (62% standard and 38% Aboriginal needs), accommodating approximately 925 dwellings and 2,760 persons. The area will also include primary and high schools, a district shopping centre and mixed business area capable of providing for an additional 300 residents[7].
2. West of Roebuck Estate – comprises 48 ha of housing (30% standard and 70% Aboriginal needs) accommodating approximately 730 dwellings and 2,660 persons.
3. North of Fairway Drive – comprises 71 ha of standard housing accommodating 880 dwellings and 2,200 persons. Also to include primary and high schools and a local shopping centre.

- It is estimated that these areas will provide an adequate supply of residential land for the next 10 to 15 years. In the longer term, housing locations beyond the Broome Townsite may need to be considered.

Employment/ Economic Areas

- With regard to tourism, the land use framework identifies the unallocated Crown land adjacent to Murray Road and Cable Beach Road as a potential entry statement site for the Cable Beach tourist node – it is recognised as one of the few locations near the coast that is large enough to accommodate a second five star resort and associated multi-purpose cultural centre. A future tourism node of up to 100 ha has also been identified at Willie Creek.
- Within the town centre it is proposed to cater for commercial growth largely by allowing "mixed-use commercial activities" to extend along the south side of Frederick Street and south down Hamersley Street radiating away from the present commercial core. It is also recommended that the Hunter Street light industrial area be rezoned to allow for a greater diversity of activities.
- Outside the town centre, the principal commercial development is the new district centre planned for the Lot 833 urban expansion area. This centre would cater for the new residential communities emerging to the north including Lot 833, Sunset Park, parts of Roebuck Estate and the proposed expansion area to its west.

4.3.4 Conclusion (Steering Committee Report)

The Steering Committee's report and integrated future urban development proposals indicate that, with the airport being retained at its current location, there is sufficient potential urban land available in Broome to adequately accommodate the town's likely population, tourism and other commercial growth requirements for the next fifteen years. If actual population growth rates prove to be more in line with current DPI projections this timeframe would be extended. Beyond that, other opportunities for additional urban development clearly exist on the Broome peninsula. Although such

[7] It should be noted that Lot 833 has an area of approximately 200 ha which could yield greater than 80 ha for housing when requirements for a district centre, schools and cultural corridors are finalised.

opportunities will require considerable lead time to realise, such lead time is clearly available.

4.4 Waterbank Structure Plan

The Waterbank Structure Plan 2000 represents the final phase of a study undertaken by the Waterbank Co-ordinating Committee aimed at identifying land use and development options for Waterbank Station, a former pastoral lease of 315,512 ha which extends approximately 60 km along the north coast of the Broome Townsite and 80km inland. The station was purchased by the State Government in 1996 ***primarily because of its potential to accommodate the future expansion of the Townsite and the relocation of some existing Townsite uses***. With regard to future urban development, the structure plan identified two potential satellite settlements within the Waterbank study area:

1. East of Coconut Well – this proposal involves a substantial eastward extension of Coconut Well, which is located some 13km from the Broome town centre. An indicative plan shows two development nodes to the east of Lawrence Road, with a total area of approximately 800ha. The nodes would comprise residential, rural-residential and tourist uses and would initially be planned to accommodate about 4,000 residents.
2. North of Willie Creek – an urban development area of approximately 1000ha is proposed at the intersection of the Broome-Cape Leveque Road and a realigned Manari Road, approximately 30km from the Broome town centre. It is envisaged that this settlement – to be planned initially for 4,000 residents – would comprise a range of residential lot sizes from medium density to rural-residential (including Aboriginal housing), together with tourism development, retail, commercial and light industrial uses.

The structure plan report suggests that planning for new settlements beyond the Broome Townsite will offer the opportunity to provide a greater range of housing and lifestyle alternatives, as well as easing development pressure in the town and enabling its growth to extend over a longer period. Nevertheless, it is indicated in the report that the timing of the Willie Creek and Coconut Well settlements is “long term” and that the cost of supplying essential services to the centres is likely to be a constraint. Notwithstanding these concerns, it is clear that there are opportunities available for substantial additional urban development in close proximity to Broome for the very long term.

Nothing in the Broome Planning Steering Committee Report, or the earlier Waterbank Co-ordinating Committee Report suggests that the relocation of Broome airport needs to be considered as a high priority in terms of timing.

4.5 Airport Master Plan

The Broome International Airport Group (BIAG) has the responsibility to prepare, maintain and review a Master Plan for the ongoing development at

Broome International Airport. The Master Plan is a working document with a planning horizon to 2025 prepared generally in accordance with the provisions and recommendations of the Council of the International Civil Aviation Organisation (ICAO). It outlines the planning system and the development of long term forecasts covering aviation operations, economic factors and other considerations involved in the master planning.

The Master Plan addresses issues such as the capacity of individual facilities, the planning of runway, taxiway and apron configurations, passenger buildings, ground transport links and internal roads, car parks and cargo areas to manage phased development of the Airport.

The Airport Master Plan does not form part of this ADP, however, a new Master Plan was released in August 2008 and is in harmony with this ADP. The new Master Plan was distributed widely throughout the Kimberley and to government agencies. A public comment period closed on 10th October 2008, with one written submission having been received.

5 THE ADP

The ADP itself comprises:

1. A Summary Page.
2. Schedule of policies and proposed uses for the ADP zones depicted on Plan A.
3. Plan A: Airport Development.
4. Plan B: Future Urban Development.

These documents are likely to be referred to quite frequently during on-going administration of the ADP. For this reason they have been conveniently located in a separate section at the beginning of this document. The following sub-sections present a general description of the key features of the ADP.

5.1 Plan A: Airport Development

5.1.1 Land Use

Plan A shows the various land use zones proposed by the ADP, while the airport remains at its current location. They fall into two main categories:

1. Airside Aviation Zones; and
2. Landside Aviation Zones.

5.1.1.1 Airside Aviation Zones

Airside 1 (A1) includes all current existing airside development, including the main runway, taxiways, aircraft parking areas, etc. It is intended that the uses in this zone will be retained, maintained and, if necessary, extended. Any legally required or otherwise appropriate aviation use is permitted in this zone.

Airside 2 (A2) defines airside vacant land suitable for the future development of additional A1 uses should increased demand or other operational matters require it. The A2 areas total approximately 6.3 hectares.

5.1.1.2 Landside Aviation Zones

Aviation Service 1 (AS1) includes existing aircraft hangars, fuel storage facilities, various aviation-related industrial uses, communications facilities, etc. It is intended that the uses in this zone will be retained, maintained and, if necessary, extended. Any airport operation related use that is compatible with or complementary to the existing uses is permitted in this zone.

Aviation Service 2 (AS2) includes vacant land suitable for the future development of additional AS1 uses should increased demand or other operational matters require it. The AS2 areas total approximately 5.3 hectares.

Aviation Service 3 (AS3) areas do not have a common boundary with an A1 or A2 area and include the Bureau of Meteorology, aircraft navigation aids, airport operation related service industry and vacant land suitable for various additional airport operation related service and light industries. The AS3 areas total approximately 11.6 hectares.

Aviation Service 4 (AS4) areas are similar to AS3 areas, except that the land can also be used for temporary non-aviation related warehousing and storage purposes, if required. The AS3 areas total approximately 3.3 hectares.

Terminal Area (TA) includes the passenger terminal and all related security, immigration, customs and catering services and facilities. It is intended that the uses in this zone will be retained, maintained and, if necessary, extended in response to future demand.

Terminal Area Support (TS) includes existing car parks, car hire and associated cleaning services, caretaker's house and various other uses. It is intended that the uses in this zone will be retained, maintained and, if necessary, extended in response to demand.

Buffer Area (B) includes vacant land intended to be a natural and/ or landscaped buffer between the airport and some other uses. The B area totals approximately 3.3 hectares.

5.1.2 Major Roads

No new major roads are proposed under Plan A. Existing internal access roads on the northern and southern sides of the A1 area will be extended along the alignments indicated in Plan A when required to provide access to any new developments within the designated AS2 areas.

5.1.3 Utility Services

5.1.3.1 Sewerage

Wherever feasible, future developments on the northern and southern sides of the airport which require a sewer connection will be connected to the Water Corporation system via the progressive extension of the internal gravity mains. Septic tanks may be installed as an interim arrangement until internal gravity mains have been extended to the new development.

5.1.3.2 Water Supply

The capacity of the Water Corporation water mains providing connections to developments on the southern side of the airport is adequate for all potential development requirements. On the northern side of the airport the water supply will ultimately be upgraded to connect to the Water Corporation's

mains in Roebuck Estate, thus alleviating the fluctuations in supply and pressure of the existing system.

5.1.3.3 Electricity

In recent times there have been major upgrades to the provision of electrical power on both the southern (RPT) and northern (GA) sides of the airport.

On the southern side, there are two 500kVa transformers and a reticulated low voltage network with sufficient capacity for the foreseeable future. Orderly upgrades are proposed if and when the capacity approaches its maximum.

On the northern side, two new transformers (each 1000kVa) have been installed, one as part of the progressive addition and upgrade of GA hangars and the other to service the recently constructed Heavy Helicopter Facility and the eastern end of the airport. There is adequate capacity in the transformers and low voltage network to permit significant expansion of facilities in the vicinity of these transformers.

There may be a need for an additional transformer at the western end of the GA area depending upon the nature of any future facility and the electrical load requirements. The high voltage connection to this transformer is available from the residential supply immediately north of the airport.

5.1.3.4 Telecommunications

It is anticipated that there should be no difficulties in extending the existing telecommunications network, providing Telstra continues to upgrade the Broome Townsite network commensurate with the unprecedented rate of development over the last five years.

5.1.4 Plan A Development

All development within the ADP area under Plan A is intended to remain in service only while the airport remains in its current location. It is unnecessary and impracticable, when considering development proposals presented under Plan A, to also try and evaluate their potential use beyond the life of the existing airport.

After the airport has been relocated there may be opportunities to adapt and re-use some airport buildings for urban purposes. Any such potential is unknown at present and is certain to be limited. For all practical purposes, therefore, once the existing airport has ceased operations, it may be regarded as a “greenfields” site in terms of its urban development potential.

5.2 Plan B: Future Urban Development

The longer term development of the ADP area may take the form envisaged in the existing LSP. After the airport ceases operations at the current site, the strong basic rationale of the former LSP will reassert itself through Plan B.

5.2.1 Major Roads

At this time the transport framework for central Broome will be able to be completed, with the construction of a major east-west boulevard on an alignment which will directly connect Chinatown and Cable Beach. Jigal Drive will also be able to be completed southwards to Port Drive, thus providing Broome with a central north-south road, as well as the proposed east-west boulevard. The traffic study carried out for the purpose of this ADP indicates that, while the airport remains at its current location, no east-west road is required.

5.2.2 Land Uses

5.2.2.1 Residential

As per the existing LSP, it is proposed to extend residential development southwards from Roebuck Estate to the rear boundary of the future Mixed Use area which will front the Chinatown/ Cable Beach Boulevard (a boundary which in reality could be quite flexible and thus not sharply defined). It is clear that the density of these new residential areas should be higher than those implemented in the Roebuck Estate, but it is recommended that the actual residential densities be determined during the process of relocating the existing airport in the light of circumstances and thinking pertaining at that time.

5.2.2.2 Mixed Use

The extent of the proposed Mixed Use area is exactly the same as envisaged in the existing LSP. The area, with major frontages to Frederick Street and the future Chinatown/ Cable Beach boulevard, is intended to accommodate a wide range of business and residential uses in a compatible and lively urban mix.

5.2.3 Western Development Plan

As discussed previously, the section of the ADP area west of the alignment of the southern extension of Jigal Drive, is not covered by the existing LSP. This area will therefore need to be the subject of an additional development plan, prior to its development for urban purposes. It is suggested that the appropriate time for the preparation of such a plan would be between the time a firm decision is made to relocate the existing airport and its actual relocation. It would be prudent to also review and if necessary modify Plan B at the same time.

6 LAND USE, AMENITY & SAFETY

While supporting the preparation of this ADP, the Shire of Broome is nevertheless concerned about the effects that retaining the airport at its current location might have upon issues such as community amenity and safety; traffic and transport networks; and interim land use management. This section briefly discusses amenity and land use issues, most of which are effectively addressed within the ADP itself and/ or various other sections of this report. For example, the Traffic Study, which is presented in full in Appendix A and summarised in the next section, examines the roads and traffic situation in some detail, which also has implications for amenity. The Environment Report, which is presented in full in Appendix B and summarised in a later section addresses the amenity issue of noise, as well as a range of other environmental factors.

6.1 The Existing Airport

It is acknowledged that the 154 hectares of Broome Airport land is strategically located, and if Broome was being planned from scratch today, the town's airport would not be located on its current site.

It needs to be fully acknowledged that the airport already exists where it is for historical reasons. The primary land use and amenity issue is therefore not so much whether or not there should be an airport in the heart of Broome. The main issue is the economics, necessity and timing of the airport's relocation; and how the existing situation can continue to be effectively managed, as it has been from the airport's beginning until now.

6.1.1 Attitudes Towards the Airport

It should also be acknowledged that there are many positive aspects associated with the airport remaining at its current location. There is a considerable amount of anecdotal evidence that many of Broome's residents quite like the airport where it is. This anecdotal evidence is supported by on-going passenger surveys carried out by the airport owners in the departure lounge since 2004 that indicate between 71% and 84% of Broome's residents and visitors prefer the airport to remain where it is now, rather than be relocated out of town.

Furthermore, the Broome tourism industry has a strong preference for the retention of the airport at its existing location rather than at the future location to the north and inland from the coast. Visitors flying in to Broome today have a sense of arriving at an island destination with both east and west approaches over-flying the ocean. This perspective would be lost at the new site. There are also tourism-related concerns about the potential for a poor first impression of Broome because of the drive into town from the future airport site through what is a very uninspiring landscape.

These positive attitudes towards the airport are not surprising. The daily coming and going of passenger jet and other aircraft adds an unusual and quite remarkable element of interest and excitement to Broome that is consistent with the town's role as a tourist destination. One is constantly reminded that this otherwise very remote town is connected to and plays an important role in the wider scheme of things. There is no doubt that, after the airport has eventually been relocated, some aspects of Broome will appear much less lively.

6.1.2 Amenity and Noise

The main amenity issue associated with an airport in an urban setting concerns residential development and noise. Some non-residential developments are also sensitive to noise (e.g. schools).

In Broome the majority of aircraft movements occur with relatively few adverse noise impacts because the runway approaches are over Roebuck Bay and the Indian Ocean, rather than existing or planned residential development (see the Australian Noise Exposure Forecast (ANEF) contour diagram on the following page). The exceptions are Chinatown, the mixed-use area to the immediate west of Chinatown and the southern half of the Bilgungurr Aboriginal Community, portions of which are covered by the 20-25 ANEF or 25-30 ANEF contours.

It can be seen on the ANEF contour diagram that, in 2025, most urban residential areas will fall outside the 20 ANEF contour which, according to Statement of Planning Policy (SPP) 5.1 is regarded as the contour beyond which no zoning or development restrictions due to noise are required[8]. There are three instances where the 2025 forecast envisages small areas of urban residential land falling within the 20-25 ANEF contours:

- At the western end of the airport south of Cable Beach Road East;
- South of Frederick Street near its intersection with Herbert Street; and
- The southern edge of Roebuck Estate and the "Western Triangle".

According to SPP 5.1, most building types are considered to be "Acceptable" or "Conditionally Acceptable" within the 20-25 ANEF contour, with houses, home units and flats being considered conditionally acceptable.

In some cases within the 20-25 ANEF contour, a local government may at its discretion require incorporation of noise control features within some new buildings, including residences and schools. It is therefore possible that at some point prior to 2025, occupants of affected dwellings may experience an impact as the houses move into the conditionally acceptable category. It is possible that any such noise impact may extend marginally beyond the 20 ANEF contour because, although the 2025 ANEF diagram has been endorsed for technical accuracy by Airservices Australia, the actual location of the 20 ANEF contour is in fact difficult to define exactly (SPP 5.1 Appendix 1).

[8] Source: WAPC Statement of Planning Policy (SPP) 5.1: Land Use Planning in the Vicinity of Perth Airport; Feb 2004.

BROOME AIRPORT ANEF 2025

AIRCRAFT	INM	MOVEMENTS ANNUAL	24HR	DAY/ NIGHT SPLIT		Arrival RWY 10 TRACK EF02	TRACK H-EF02	RWY 28 TRACK WF02	TRACK H-WF02	RWY10 TRACK EF01	TRACK H-EF01	Departure RWY 28 TRACK EF03	TRACK WF01	TRACK H-WF01	TRACK WF03	TRACK WF04
Mid widebody	A330	1096	3	day	100	0.6		0.9		0.3		0.3	0.45		0.45	
				night												
Small narrowbody	737700	2190	6	day	70	0.44		1.26		0.21		0.63			0.95	0.32
				night	30	0.16		0.54		0.09		0.27			0.41	0.14
Large narrowbody	737800	3650	10	day	70	1.4		2.1		0.14		1.26	0.21		1.89	
				night	30	0.6		0.9		0.06		0.54	0.09		0.81	
Dash 8	DHC83C	2190	6	day	50	0.6		0.9		0.6			0.9			
				night	50	0.6		0.9		0.6			0.9			
Heavy helicopters		4380	12	day	100		2.4		3.6		2.4			3.6		
				night												
GA twin	BECSBP	6000	16.44	day	90	2.96		4.44		1.48		1.48	0.22		2	2.22
				night	10	0.13		0.49		0.16		0.16	0.02		0.22	0.25
GA single	GASEPF	42810	117.29	day	90	21.11		31.67		10.56		10.56			15.83	15.83
				night	10	2.15		3.52		1.17		1.17			1.76	1.76
GA single	GASEPV	12000	32.88	day	90	5.92		8.88		2.96		2.96			4.44	4.44
				night	10	0.66		0.99		0.33		0.33			0.49	0.49
TOTALS		74316	203.61			38.33	2.40	57.49	3.60	18.66	2.40	19.66	2.79	3.60	29.25	25.45

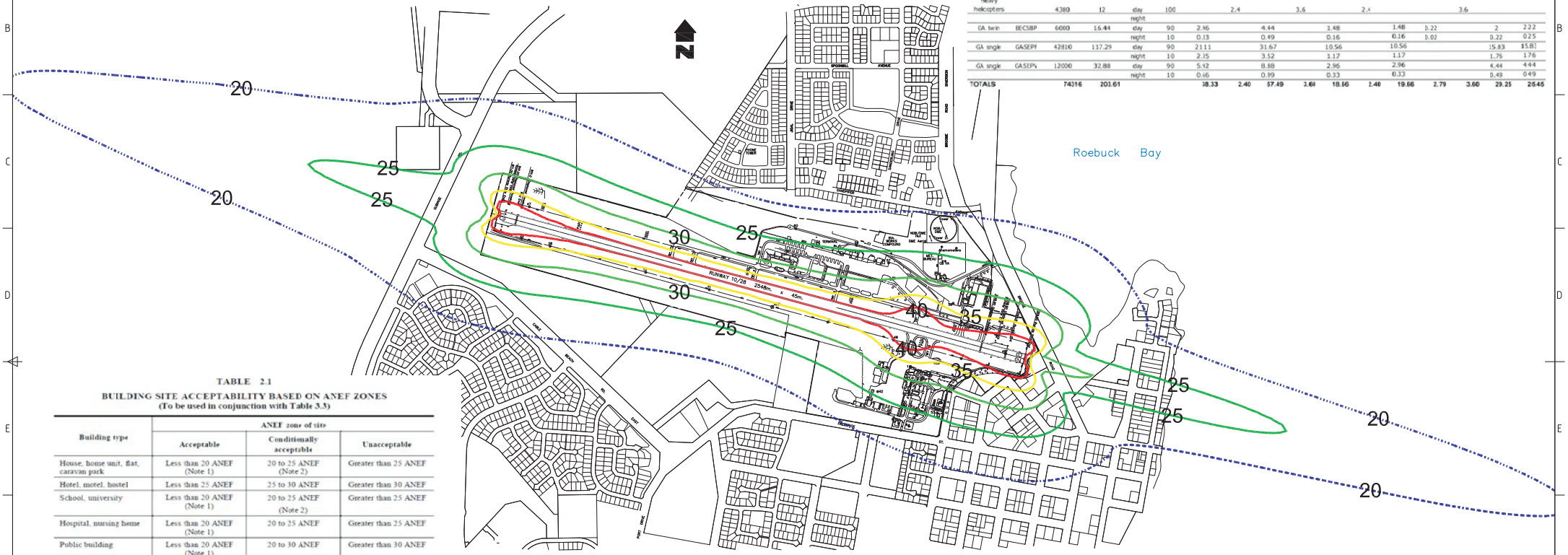


TABLE 2.1

BUILDING SITE ACCEPTABILITY BASED ON ANEF ZONES
(To be used in conjunction with Table 3.3)

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF (Note 1)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1)	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

NOTES:

1 The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of Clause 2.3.2 may be followed for building sites outside but near to the 20 ANEF contour.

2 Within 20 ANEF to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate (see also Figure A1 of Appendix A).

3 There will be cases where a building of a particular type will contain spaces used for activities which would generally be found in a different type of building (e.g. as office in an industrial building). In these cases Table 2.1 should be used to determine site acceptability, but internal design noise levels within the specific spaces should be determined by Table 3.3.

4 This Standard does not recommend development in unacceptable areas. However, where the relevant planning authority determines that any development may be necessary within existing built-up areas designated as unacceptable, it is recommended that such development should achieve the required ANR determined according to Clause 3.2. For residences, schools, etc., the effect of aircraft noise on outdoor areas associated with the buildings should be considered.

5 In no case should new development take place in greenfield sites deemed unacceptable because such development may impact airport operations.

0 100m 200m 300m 400m 500m

RevNo	Revision note	Drawn	Checked	Date
C	Revised to include qualifications and other notes	LW	BC	19 DEC 2011

Qualifications
Factors taken into account in this ANEF are:
- Aircraft Flight Tracks.
- Where figures have been rounded discrepancies may occur between totals and the sums of items.
- Stage length for departures(representing distance to destination)
- ANEF contour modelled with INM7.0b, not incorporating terrain data.

Legend
- 40-45 ANEF
- 35-40 ANEF
- 30-35 ANEF
- 25-30 ANEF
- 20-25 ANEF

Datum:MGA 51

Broome International Airport

2025 Australian Noise Exposure Forecast

Scale	DWG Title	Rev No.
1:9000 @ A1 , 1:18000 @ A3	11046 ANEF 2025	C

Data Source
INM 7.0b Movement Data / Flight Paths supplied by BIA

Most of the ANEF-affected sections of Chinatown and the mixed-use zone are covered by the 20-25 ANEF contour. A smaller area, including a relatively narrow band focussed on Short Street, falls within the 25-30 ANEF contour. Hotels, motels, hostels, public and commercial buildings are considered to be conditionally acceptable within the 25-30 ANEF contour, whereas residences, schools, hospitals and nursing homes are considered to be unacceptable.

However, in existing appropriately zoned areas, a local government may still permit development that would be considered unacceptable in terms of the ANEF contours, provided suitable noise insulation was a condition of development. For example, mixed use residential developments in Chinatown have been required to have additional acoustic insulation and a Section 70A notification on the title to acknowledge and alleviate the noise impact of the Chinatown entertainment precinct. Therefore, although the ANEF contours impact on the development potential of parts of Chinatown and the mixed-use area to some extent, most desired and appropriate developments are not likely to be refused as a result. It is fortunate in this regard that most existing development in the affected areas is commercial, not residential, in nature.

6.1.2.1 Beyond the 20 ANEF

Although the ANEF contours remain the primary basis for defining acceptable zoning and development requirements in the vicinity of airports, it is increasingly being recognised that the impact of aircraft noise on residents in proximity to airports is subjective and is influenced by a number of factors including attitudes towards the aviation industry and personal sensitivity to noise. For this reason, some proportion of residents living outside the 20 ANEF contour will complain about aircraft noise from time to time. Also, some highly variable sources of airport noise, such as helicopter operations and light aircraft circuits and engine run-ups, may not be consistently accounted for in the definition of the ANEF contours.

In order to reduce the impact of noise outside the 20 ANEF contour, and other non-ANEF noise, BIA is currently implementing a Noise Abatement Program (NAP) and carrying out ongoing monitoring of noise levels in sensitive areas. As part of its NAP, BIA will prepare an Airport Noise Management Plan (NMP) in conjunction with the Shire. Although it is not possible to completely remove the impact of aircraft noise, the NMP will address noise issues on an on-going basis. BIA will work with the Shire on reporting and performance measures, as well as with airport operators on arrival and departure procedures, and this should ensure that future increases in noise levels are kept to a minimum.

6.1.3 Airport Safety

The aviation industry is particularly safety conscious, and its already excellent safety record continues to improve, worldwide. No accidents causing death or serious injury have occurred at the Broome airport since World War 2, so there are considered to be no safety-related negative “impacts” on the Broome community associated with the airport’s existing location.

6.1.3.1 Regulations

Broome International Airport meets all Australian and International standards on safety including requirements governing flight path approach and departure procedures; and operational procedures within the vicinity of the aerodrome. The airport owner's obligations to comply with the Civil Aviation Act, Regulations and Orders; and any other directives, aeronautical information and notices issued by the Civil Aviation Safety Authority (CASA) and/ or Airservices Australia (AA) are audited each year by these regulatory authorities.

6.1.3.2 Safety Management System

In July 2005, BIA established a Safety Management System (SMS) in accordance with guidelines set out by CASA. Under these guidelines aerodrome operators are expected to be able to demonstrate through documentation and procedures that the elements of the SMS have been incorporated in the management and operation of their aerodrome. Safety management is a subset of risk management and BIA has adopted the risk management processes set out in Standard AS/NZS 4360:2004. The SMS has been developed to cover three facets of BIA's business:

1. Aircraft operations.
2. All activities taking place on the aerodrome involving employees, contractors, customers, passengers and visitors.
3. The provision of a safe place of work for employees and contractors wherever that may be.

6.2 Availability of Land

Broome International Airport currently occupies land zoned "Development" in TPS 4. Under the current LSP (also reflected in "Plan B" of this ADP), the airport land is intended for future residential and mixed use development. In recognising the indeterminate timeframe for the relocation of the airport, the Broome Planning Steering Committee (BPSC) report called for development plans for the airport operational area to address, amongst other things, the following issue, reflecting concerns about the current limited availability of unencumbered, appropriately zoned land on the Broome peninsula:

"the ability to reallocate land uses which were to occur on airport land to other areas and ensure the orderly growth of Broome is not compromised"

While the issue of land availability needs to be addressed, it is considered that the BPSC assumption that the answer lies in *"reallocating land uses which were to occur on airport land"* is incorrect and, in any event, would only be partly achievable. It is considered that the current longer term planning framework envisaged for Broome by the BPSC and "Plan B" of the ADP is fundamentally sound and should be retained for the foreseeable future.

It is therefore recommended that, for the foreseeable future, the issue of land availability should be addressed through managing land use and development potential ***within* the current longer-term planning framework, rather than "reallocating land uses" as such.**

The BPSC's work demonstrated that, with the airport at its current location, there is in fact sufficient potential residential and commercial land available to accommodate quite optimistic estimates of Broome's growth for up to fifteen years. If these optimistic estimates don't eventuate, then this timeframe could potentially be extended for many more years. Normal planning reviews in (say) five to eight years time will enable the BPSC estimates to be re-evaluated in the light of experience.

The Committee identified areas for potential expansion of commercial uses to the south of Chinatown. Proper land use planning and development control could ensure that both residential and commercial uses in this area, and the area between Chinatown and the airport, are developed at a higher level of intensity than might otherwise occur.

Implementing such efficiency measures within the general land use framework defined by the BPSC will ensure more efficient development of the available land, requiring fewer actual hectares to achieve given levels of floorspace than if these constraints did not exist. Ways in which this could be achieved include:

- Implementing the land use plan proposed in the BPSC report, (some consideration could perhaps be given to reviewing the amount of land earmarked exclusively for future Aboriginal needs housing in the BPSC report);
- Increasing residential densities wherever practicable, particularly in new residential areas;
- Increasing building height limits to accommodate up to four-storey buildings in both the Chinatown zone and the Mixed Use zone, where OLS limitations permit.

These, and other similar measures, could go a significant way towards minimising the land supply impact of maintaining the airport at its current location, at least for the indicative timeframe of the BPSC plan, and potentially beyond. It is nevertheless possible that the following impacts could still occur in the longer term:

- Greater increases in central area land values than would otherwise occur, resulting in increased development costs and commercial rentals;
- Increased pressure on industrial areas as commercial development competes for locations with light and service industries;
- Some businesses needing to locate in more suburban locations than would otherwise be the case, which could lead to pressure to expand suburban centres;

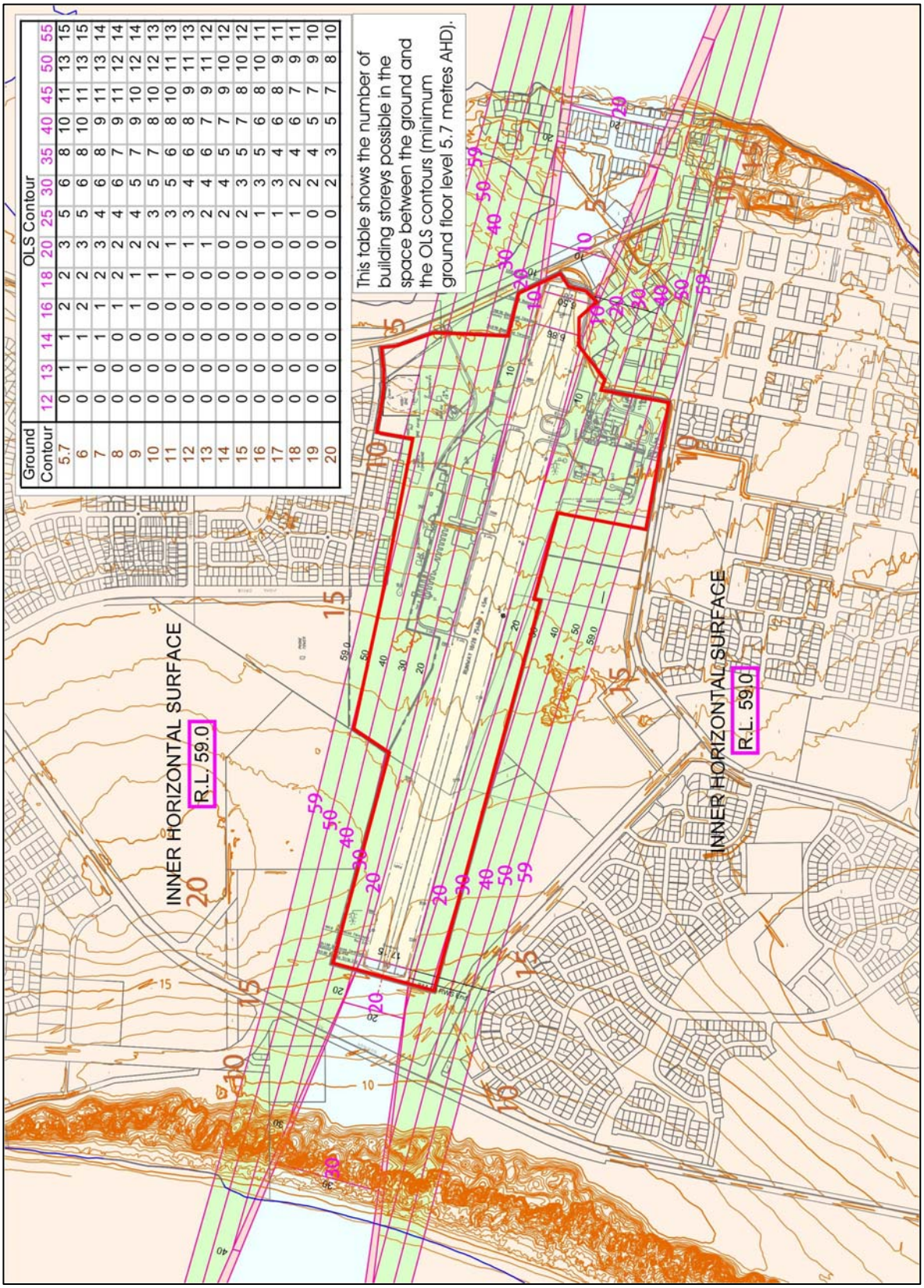
- Reduced opportunities for centrally-located tourism and residential developments.

Should these potential longer term impacts actually occur, the findings of the Waterbank Structure Plan, which identified significant areas of potential urban land to the north of Broome, would assume greater significance:

6.3 Obstacle Limitation Surface

One of the key management processes for an aerodrome is the management of the Obstacle Limitation Surface (OLS), which is prepared in accordance with the requirements of The Civil Aviation Safety Authority's (CASA) "Manual of Standards Pt 139 – Aerodromes". The OLS is a virtual surface associated with an airport runway, which identifies the lower limits of the aerodrome airspace above which objects become obstacles to aircraft operations, and must be managed in accordance with the guidelines set down by CASA. The portion of the surface of relevance to this ADP is illustrated in Figure 8.

Figure 8 Broome Airport Obstacle Limitation Surface (OLS) in Vicinity of Airport



Source: Prepared by Westralian Airports Corporation, BIA and SHRAPNEL URBAN PLANNING.

In Figure 8 the green-shaded areas identify OLS contours at 10 metre AHD intervals ranging from natural ground level along the edge of the flight strip (75 metres from runway centerline) up to 59 metres, at which point the surface extends elliptically around the wider airport covering. The white areas at each

end of the runway are the approach and departure gradients, which are also contoured surfaces.

The objective of the OLS is to define the airspace around aerodromes to be maintained free of obstacles to permit the intended aircraft operations at the aerodrome to be conducted safely. The guidelines clearly provide for the aerodrome operator to manage and monitor the OLS and to report to CASA any infringement or potential infringement of the OLS. This role also includes arrangements with Commonwealth, State and Local Government instrumentalities to be notified of any proposal to place tall structures in the vicinity of the aerodrome. A copy of the OLS has been lodged with the Shire of Broome for these purposes.

The Shire of Broome's Town Planning Scheme No. 4 contains suitable provisions to control development within close proximity to the airport. Property owners or developers are required to give formal notice of any proposed structure which may penetrate an obstacle limitation surface. The Shire cooperates with the airport operators to ensure that the measures taken provide the greatest possible degree of safety and efficiency for aircraft operations.

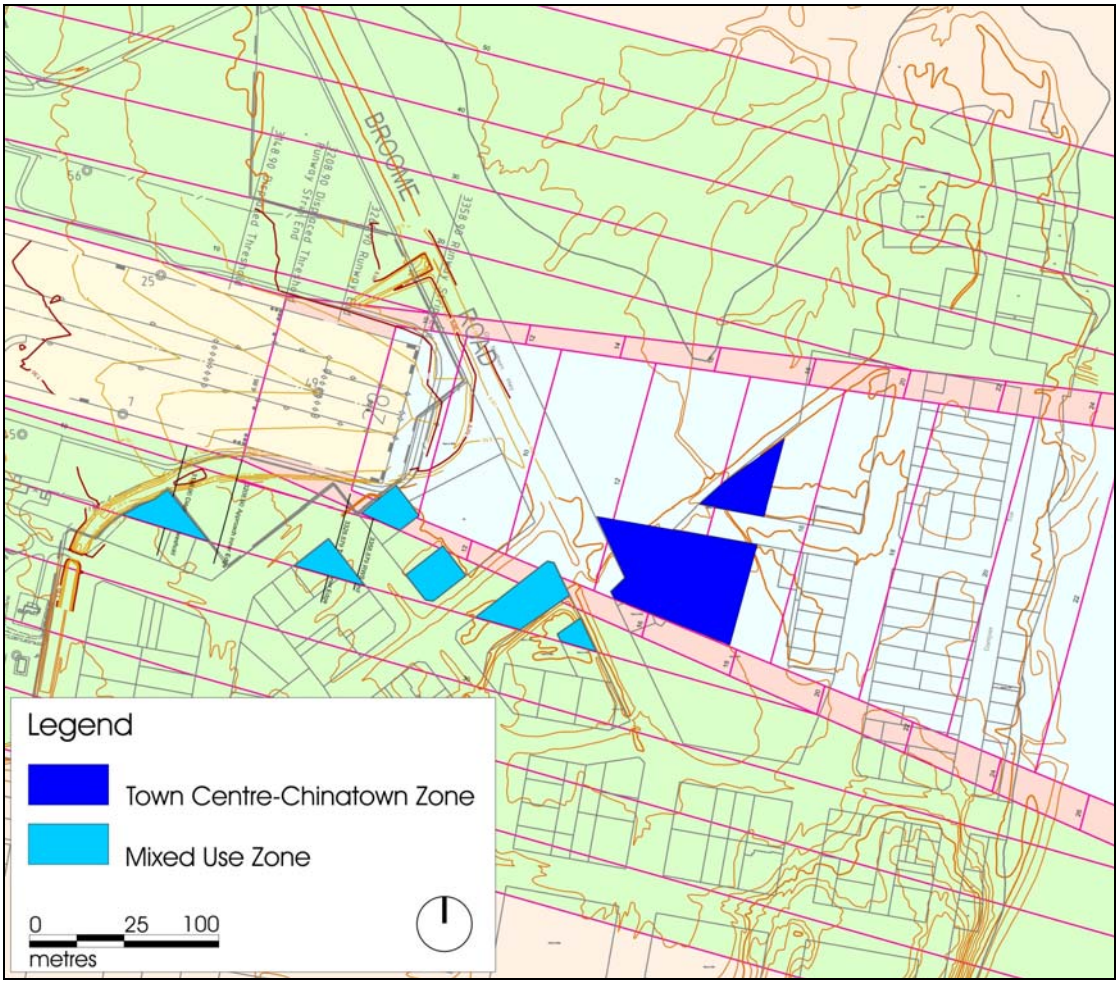
As indicated in Figure 8, land within Chinatown appropriately zoned for development is under the OLS contours between 12.5 AHD and 20 AHD. Minimum floor level established by the Shire within Chinatown for tidal considerations is RL 5.7m AHD. Therefore, the OLS height limitation for building within Chinatown ranges from 6.8 metres (sufficient for a single storey building) under the 12.5 m OLS contour to 14.3m (sufficient for a three storey building) under the 20m OLS contour[9].

At present, buildings in most of the Chinatown zone are effectively limited to two storeys in height for urban design and heritage reasons. Two storey buildings are generally feasible where the distance between ground level and the OLS is 9.5 metres or greater. With a minimum ground level established at 5.7 metres AHD, the minimum feasible OLS for a two storey building would be 15.2 metres. This would leave most of the Chinatown zone capable of accommodating buildings of at least two storeys, and thus largely unaffected by the OLS.

Figure 9 shows the estimated ***OLS Impact Area*** affecting building height potential in both Chinatown and the Mixed-Use zone. The OLS Impact Area is defined as *the area within which the development potential applying to a Scheme zone cannot be fully realised due to OLS restrictions.*

[9] Assumptions for building heights: 1st level – 3.5 metres; each subsequent level – 3 metres; Roof – 3 metres

Figure 9 Estimated OLS Impact Area



As indicated in Figure 9 the area potentially affected is a relatively small area on the western side of Chinatown where (except for the western-most tip where no building could occur) building height would be limited to one storey. Therefore, although there is potential for impacts as a result of the OLS, the potential is also considered to be relatively small. The following is a list of the known recent negative impacts of the OLS restrictions on development to date:

- After the eastern end of the runway was extended, power lines on Broome Road had to be lowered and lighting for the Male Oval had to be modified.
- The optimum lighting for the Broome Recreation and Aquatic Centre had to be modified to comply with the OLS and other aviation safety requirements.
- The new Visitors Centre could only be developed to one storey.

7 ROADS AND TRAFFIC

When the airport has been relocated, the construction of more direct north/ south and east/ west road links will be possible. In the meantime, some north/ south and east/ west vehicular trips need to be less direct than would otherwise be the case, as it is necessary for all non-airport traffic to navigate around the airport. Although the majority of residents living south of the existing main east/ west route (Cable Beach Road East and Frederick Street) will be unaffected most of the time, there may be some impact on other residents and visitors. Should traffic congestion increase on a particular road link or intersection in the future, then some road and/ or intersection works may be necessary.

To examine a range of road planning and traffic issues of concern to the Council and the WAPC, including the capacity of Broome's road network to accommodate projected future growth with the airport at its current location, Uloth & Associates was commissioned to undertake a traffic study. The entire study is attached at Appendix A. The following sub-sections summarise the main points of the study

7.1 Study Objectives

The overall objectives for the Traffic Study are:

- Further investigate and refine the DPI traffic forecasts, to ensure that the overall plans for Broome are adequately represented.
- Reassess the future traffic flows on Sandpiper Avenue to either confirm or refute the DPI recommendations regarding driveway access.
- Prepare a detailed traffic assessment as input to the proposed Broome Airport Development Plan.

7.2 DPI Traffic Modelling

Although a traffic modelling report prepared by DPI states that the traffic model was sufficiently calibrated against the existing situation, a comparison of model calculations with traffic counts demonstrates that the DPI traffic model overstated the amount of through traffic travelling along Jigal Drive and Sandpiper Avenue, and understated the amount of traffic generated by Roebuck Estate.

This overstating of through traffic between the Cable Beach Tourist Precinct and Chinatown could therefore result in a significant overestimation of future traffic flows on both Jigal Drive and Sandpiper Avenue, and it was therefore decided that the traffic model could be refined, and an improved calibration process could be carried out.

7.3 Refined Traffic Model and Calibration

In order to fully calibrate the traffic model to the existing situation, a series of traffic counts was carried out within and around the overall study area during the school holiday period of April 2006. This exercise included a number of key intersection physical car counts as well as comparisons of actual cars on site with occupation levels at all Cable Beach accommodation premises. Detailed land use data was also obtained from DPI and the various trip matrices were modified to represent the refined land use zones. Additional data was then also sought in regard to existing and future development within both the Cable Beach Tourist Precinct and Roebuck Estate, and the 'existing' traffic model was calibrated in accordance with the existing data.

The resulting 2006 high season traffic forecast shows that the traffic flows and travel patterns within both Roebuck Estate and the Cable Beach Tourist Precinct are in line with the detailed existing weekday traffic, and that traffic flows on Broome Road and to/ from Chinatown are also well represented. Traffic forecasts were also produced for the 2011 high season and the 2031 high season, together with an alternative 2031 scenario that includes a connection of Lorikeet Drive to Broome Road.

7.3.1 Traffic Model Forecasts

The model predicts that traffic generation of Roebuck Estate will increase from 5,220 vehicles per day in the 2006 high season to 10,920 vehicles per day in 2011 and 10,860 vehicles per day in 2031. Traffic travelling to and from the Cable Beach Tourist Precinct will increase from 12,620 vehicles per day during the 2006 high season to 15,270 vehicles per day in 2011 and 25,800 vehicles per day in 2031. However, it is important to note that the external distribution of this traffic will change, due to increased residential development north of Gubinge Road.

Weekday traffic on Sandpiper Avenue west of Broome Road will increase to 11,000 vehicles per day during the 2011 high season and 14,300 vehicles per day in 2031. However, if Lorikeet Drive is connected to Broome Highway by 2031, traffic flows on Sandpiper Avenue will only increase to 12,800 vehicles per day west of Broome Road, with between 10,000 and 11,000 vehicles per day west of Sanderling Drive.

It is also interesting to note that the 2031 traffic volumes on Jigal Drive and Sandpiper Avenue include approximately 3,000 vehicles per day and 5,000 vehicles per day, respectively, of traffic generated from within Zone E. If this area does not develop to the extent shown, then traffic volumes on Jigal Drive and Sandpiper Avenue will be significantly lower.

In addition, it must also be noted that the traffic flows produced within the traffic model represent the high season conditions only, which apply for perhaps one or two months of the year, with significantly lower volumes during the majority of the remaining months.

Apart from the issues of residential lot access (see next section), these traffic forecasts clearly show that the overall road network for Broome can accommodate the long term future traffic flows even with the Airport remaining on its existing site, and there is no need for the construction of a new east-west link to Gubinge Road.

7.4 Acceptable Traffic Flows for Residential Streets

From a pure traffic capacity perspective, the existing Sandpiper Avenue could carry up to approximately 20,000 vehicles per day. However, if driveway access is to be provided, it was initially suggested that a maximum flow of 10,000 vehicles per day would be appropriate.

In further discussion with DPI officers, it was agreed that, due to the significant fluctuation of traffic flows experienced in Broome, a high season traffic flow of up to approximately 12,000 vehicles per day would be acceptable, particularly given that it is only an interim situation prior to the relocation of the Airport.

It is therefore concluded that traffic flows on Sandpiper Avenue will be acceptable for residential lot access in 2031 (with the Airport on its current site), as long as Lorikeet Drive has been connected to Broome Road by that time.

7.5 Traffic Under Plan A: Airport Development

The existing Airport currently generates an estimated total of 3,400 vehicle trips per day during the high season, with 2,900 vehicle trips per day accessing the southern side via MacPherson Street, and 500 vehicles per day accessing the northern side (off Broome Road). By 2031, it is estimated that 'general' airport traffic on the southern side will increase to approximately 9,100 vehicle trips per day, in line with the predicted growth in annual passenger numbers.

Mixed Use developments fronting Frederick Street and Coghlan Street could generate in the order of 4,000 vehicles per day. It is also forecast that activities on the northern side may generate up to 2,500 vehicles per day, increasing the overall traffic generation to approximately 15,000 vehicle trips per day.

On the basis of these figures, the proposed new access off Frederick Street is expected to carry approximately 5,500 vehicles per day, while MacPherson Street will carry approximately 6,000 vehicles per day, and Coghlan Street north of Frederick Street will carry 3,700 vehicles per day (which is almost identical to the existing high season traffic on Coghlan Street).

The new access off Frederick Street will therefore have to be designed as if it were a public road. As such, the specific location and design of this access road will require further review, as well as Council approval. However, now that road trains have been removed from Frederick Street there is more scope

for installing suitable intersection treatments and traffic management measures to ensure that acceptable operating conditions are achieved.

The report concludes that development under the ADP Plan A can be accommodated within the currently planned road network.

It is not feasible at this stage to reliably forecast where and when particular intersections or sections of road will become congested due to future increases in traffic volumes. It is even less practicable to try and forecast the extent to which retention of the airport is likely to be responsible for the congestion in any particular case. However, it is recognised in principle that there may be some future traffic impacts associated with the airport's retention.

Gubinge Road was opened to traffic at the end of 2007 and road trains are no longer permitted to travel along Frederick Street. Future traffic surveys will assist forecasting by refining the traffic model based on actual traffic counts. An integrated traffic survey will be undertaken during the peak and off-peak periods in 2009 to give time for traffic habits on Gubinge Road to develop.

8 ENVIRONMENT REPORT

The Environment Report is an important component of the ADP report, as it demonstrates that retention of the airport at its current location for the foreseeable future is environmentally sustainable. The full report is included in Appendix B. This section contains a brief summary.

8.1 Introduction

8.1.1 Environment Policy

The Environment Policy defines the Broome International Airport Group's (BIAG) vision for environmental management at the airport. The Environmental Policy documents BIAG's agenda for environmental management and communication with stakeholders over environmental issues. The Environment Policy is periodically reviewed by BIAG management, with the current policy being that most recently adopted by the BIAG Board in May 2006.

8.1.2 Environmental Impacts from Current Operations

Broome International Airport has operated in private ownership since 1991 and has a single runway with supporting infrastructure currently operating. Operational facilities at the airport include runway and lighting systems, an air traffic control tower and other navigational aids.

The airport has 62 tenants who carry out a diverse range of activities which include refuelling and fuel storage, aircraft maintenance, medical evacuation and associated aviation support services. Some of these operations and work practices have the potential to impact on the environment. These include:

- Fuel and oil storage and use.
- Chemical storage and use.
- Aircraft washdown.
- Solid waste disposal.
- Domestic waste water production.
- Aircraft movement.

Management plans will continue to be developed and implemented to control the risk associated with each of the above operations.

8.2 Pollution Prevention

8.2.1 Surface Water

A range of operations at the airport have the potential to impact on surface water quality. BIA has undertaken management actions to control surface water quality at the airport and is active in educating tenants about the impacts of their operations on surface water quality.

Drainage at the airport consists of a combination of piped and open drainage conveying excessive storm water run off from impervious areas including the runway, taxiways, aprons and buildings. The open drainage system includes low gradient retention swales enabling the heavier sand/ silt particles to be deposited prior to discharge off site. These swales are regularly maintained to remove accumulated sand/ silt. Ultimately, as revegetation of disturbed areas minimizes erosion, the amount of transported sand/ silt will be significantly reduced.

8.2.2 Groundwater and Soils

Groundwater and soil impacts are intimately linked, and as such, the impact of airport operations on groundwater and soil have been considered together. As surface drainage is directly linked to the aquifer, contaminants can be transmitted directly to the water table.

8.2.3 Fuel Storage

Fuel storage could pose the greatest potential threat to the groundwater and soil quality at the airport. Consequently, all fuels and oils are stored in aboveground tanks and risks associated with this storage have been minimized with the introduction of bunding and containment requirements.

A new fuel storage facility has recently been constructed north of Frederick Street to the west of the existing airport buildings. This has been designed and built by Air BP to best practice standards, including measures to meet environmental safety requirements. The environmental management practices that are in place to ensure the continued safe and sustainable operation of this facility include:

- No below-ground storage tanks.
- All storage tanks fully bunded.
- Oil/ water separator for drainage from fuel transfer hardstand areas.
- Declared dangerous goods storage zone.

8.2.4 Air Quality

Potential air emissions at Broome International Airport are minor and none would be classified as causing air pollution in accordance with the regulations.

Similarly the nature of the airport's aviation activities result in only very minor greenhouse gas emissions and are excluded from this strategy as control of aircraft emissions in flight are retained by DOTARS. Air quality control at Broome International Airport is focussed on tenant education, and dust control.

8.2.5 Domestic Waste Water

Broome International Airport is partially without sewer facilities. It is planned that wherever possible buildings located on the airport will be connected to sewerage. As a short to medium term interim arrangement, septic tanks may be installed until internal gravity sewers have been extended to any new development.

8.2.6 Tennant Obligations

Under the terms of their lease conditions, all airport tenants are obliged to maintain good environmental practices and strictly comply with all legal requirements.

8.3 Noise Management

Airservices Australia (ASA) are the regulatory authority responsible for registering and investigating aircraft noise from Australian Airports. BIA maintains a proactive role in addressing this issue and has implemented a number of initiatives since privatization to minimize the impact on local residents wherever possible.

The most recent initiative of the BIA Group to help reduce aircraft noise is the implementation of a set of procedures that direct pilots when arriving or departing the aerodrome. The Departure and Approach Procedures (DAP) are developed as part of our noise abatement program and guide pilots to 'fly neighbourly'.

BIA is currently implementing a Noise Abatement Program (NAP) and carrying out ongoing monitoring of noise levels in sensitive areas. As part of its NAP, BIA intends to prepare an Airport Noise Management Plan (NMP) in conjunction with the Shire.

8.3.1 Ground Based Noise

BIA reviews and modifies aircraft ground running procedures. Noise levels outside the airport boundary are considered and procedures specify that aircraft are restricted to a maximum of five minutes, or as recommended by the manufacturer, for start up and shut down procedures on the apron area. Engineer testing and prolonged run-ups must be conducted in dedicated run-up bays or on the designated non duty taxiway in line with the policy.

8.3.2 Construction Noise

Construction activity tends to generate noise and vibration, which may interfere with public amenity. Presently any noise generated from construction at the airport impacts on airport tenants, staff and passengers only, as works are usually conducted in and around the aviation building line during working hours.

8.4 Other Considerations

8.4.1 Heritage

The *Australian Heritage Council Act, 2003* enables areas with natural or cultural significance to be listed on the Register of National Estate. There are no such listings for land occupied by Broome International Airport. There are no sites recorded on a register of Aboriginal Heritage sites kept by the Western Australian Department of Indigenous Affairs; nor any European Heritage sites registered with the National Trust, Western Australia Heritage Commission, or the Shire of Broome.

8.4.2 Environmentally Significant Areas Roebuck Bay

The airport is immediately adjacent to the inter-tidal habitats of Dampier Creek and Roebuck Bay. The Roebuck Bay area is recognized as being of international importance and is subject to three international treaties based on its importance to migratory waders. These are:

- Ramsar (The Ramsar Convention which identifies wetlands of international significance);
- JAMBA (Japan-Australia Migratory Bird Agreement); and
- CAMBA (China-Australia Migratory Bird Agreement)

The latter two treaties recognize that the principal flight paths of migratory birds returning to the northern hemisphere take them through eastern Asia where a number of feeding/rest stops are necessary.

CASA advises that bird strikes at all airports are a recognized hazard. At Broome this often means that inter-tidal waders and other bird species must be dispersed from the landing strip with bird-scare shot prior to flight arrivals. The airport owners also have additional on-the-ground measures in place to minimize bird strikes, the details of which are covered in the BIA Wildlife Hazard Management System. BIA complies with CASA requirements in regard to prevention and reporting of bird strikes.

APPENDIX A
Traffic Study

Traffic Study for Broome International Airport, Roebuck Estate and Surrounding Areas

Prepared for
BROOME INTERNATIONAL AIRPORT GROUP

Prepared by
Uloth and Associates
27 June 2006

EXECUTIVE SUMMARY

This Traffic Study has been prepared to address the issues raised by the Broome Planning Steering Committee and Department for Planning and Infrastructure regarding traffic management on the Broome peninsula whilst the Broome International Airport remains at its current location, and also to support the Broome Airport Area Development Plan.

STUDY OBJECTIVES

The overall objectives for the Traffic Study are as follows:

- Further investigate and refine the DPI traffic forecasts, to ensure that the overall plans for Broome are adequately represented.
- Reassess the future traffic flows on Sandpiper Avenue to either confirm or refute the DPI recommendations regarding driveway access.
- Prepare a detailed traffic assessment as input to the Broome Airport Area Development Plan.

DPI TRAFFIC MODELLING

Although the December 2005 *Broome Traffic Modelling* report by DPI claims that the traffic model is sufficiently calibrated against the existing situation, a comparison of traffic counts particularly at the corner of Sandpiper Avenue and Jigal Drive shows that the DPI traffic model overstated the amount of through traffic travelling along Jigal Drive and Sandpiper Avenue, and understated the amount of traffic generated by Roebuck Estate.

This overstating of through traffic between the Cable Beach Tourist Precinct and Chinatown could therefore result in a significant overestimation of future traffic flows on both Jigal Drive and Sandpiper Avenue, and it was therefore decided that the traffic model could be refined, and an improved calibration process could be carried out.

REFINED TRAFFIC MODEL AND CALIBRATION

In order to fully calibrate the traffic model to the existing situation, a series of traffic counts were carried out within and around the overall study area during the school holiday period of April 2006, which has been identified as a 'shoulder period'– building up towards the high season, but not yet at its peak. Surveys were also undertaken within the Cable Beach Tourist Precinct to identify the available number of rooms/sites/etc, and the number occupied during the traffic survey period.

Detailed land use data used to create the DPI traffic model was also obtained, and this land use data was utilised to modify the various trip matrices to represent a series of refined land use zones. Additional data was then also obtained in regard to existing and future development within Roebuck Estate, and the 'existing' traffic model was calibrated in accordance with the existing data.

The resulting 2006 high season traffic forecast shows that the traffic flows and travel patterns within both Roebuck Estate and the Cable Beach Tourist Precinct are in line with the detailed existing weekday traffic, and that traffic flows on Broome Road and to/from Chinatown are also well represented.

Traffic forecasts were also produced for the 2011 high season and the 2031 high season, together with an alternative 2031 that includes a connection of Lorikeet Drive to Broome Road, and it is estimated that the traffic generation of Roebuck Estate will increase from 5,220 vehicles per day in the 2006 high season to 10,920 vehicles per day in 2011 and 10,860 vehicles per day in 2031.

Traffic travelling to and from the Cable Beach Tourist Precinct will increase from 12,620 vehicles per day during the 2006 high season to 15,270 vehicles per day in 2011 and 25,800 vehicles per day in 2031. However, it is important to note that the external distribution of this traffic will change, due to increased residential development north of Gubinge Road.

Weekday traffic on Sandpiper Avenue west of Broome Road will increase to 11,000 vehicles per day during the 2011 high season and 14,300 vehicles per day in 2031. However, if Lorikeet Drive is connected to Broome Highway by 2031, traffic flows on Sandpiper Avenue will only increase to 12,800 vehicles per day west of Broome Road, with between 10,000 and 11,000 vehicles per day west of Sanderling Drive.

It is also interesting to note that the 2031 traffic volumes on Jigal Drive and Sandpiper Avenue include approximately 3,000 vehicles per day and 5,000 vehicles per day, respectively, of traffic generated from the future development area west of Jigal Drive (Zone E). If this area does not develop to the extent shown, then traffic volumes on Jigal Drive and Sandpiper Avenue will be lower.

In addition, it must also be noted that the traffic flows produced within the traffic model represent the high season conditions only, which apply for perhaps one or two months of the year, with significantly lower volumes during the majority of the remaining months.

Apart from the issues of residential lot access, these traffic forecasts clearly show that the overall road network for Broome can accommodate the long term future traffic flows even with the Airport remaining on its existing site, and there is no need for the construction of a new east-west link to Gubinge Road.

ACCEPTABLE TRAFFIC FLOWS FOR RESIDENTIAL STREETS

From a pure traffic capacity perspective, the existing Sandpiper Avenue could carry up to approximately 20,000 vehicles per day. However, if driveway access is to be provided, it was initially suggested that a maximum flow of 10,000 vehicles per day would be appropriate.

In further discussion with DPI officers, it was agreed that due to the significant fluctuation of traffic flows experienced in Broome, a high season traffic flow of up to approximately 12,000 vehicles per day would be acceptable, particularly given that it is only an interim situation prior to the relocation of the Airport.

It is therefore concluded that traffic flows on Sandpiper Avenue will be acceptable for residential lot access in 2031 (with the Airport on its current site), as long as Lorikeet Drive is connected to Broome Road at an appropriate time prior to 2031.

AIRPORT AREA DEVELOPMENT PLAN

The existing Airport currently generates an estimated total of 3,400 vehicle trips per day during the high season, with 2,900 vehicle trips per day accessing the southern side via MacPherson Street, and 500 vehicles per day accessing the northern side (off Broome Road).

By 2031, it is estimated that 'typical' airport traffic on the southern side will increase to approximately 9,100 vehicle trips per day, in line with the projected growth in annual passenger numbers and aircraft movements.

However, Mixed Use developments fronting Frederick Street and Coghlan Street could generate in the order of 4,000 vehicles per day. It is also estimated that the activities on the northern side could generate perhaps 2,500 vehicles per day, increasing the overall traffic generation to approximately 15,000 vehicle trips per day by 2031.

On the basis of these figures, the proposed new access off Frederick Street is expected to carry approximately 5,500 vehicles per day in 2031, while MacPherson Street will carry approximately 6,000 vehicles per day, and Coghlan Street north of Frederick Street will carry 3,700 vehicles per day (which is almost identical to the existing high season traffic on Coghlan Street).

The new access off Frederick Street will therefore have to be designed as if it were a public road. As such, the specific location and design of this access road will require further review. However, once road trains are removed from Frederick Street there will be more scope for installing suitable intersection treatments and traffic management measures to ensure that acceptable operating conditions are achieved.

It is therefore concluded that the Airport Area Development Plan can be accommodated within the currently planned road network.

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1. INTRODUCTION

This Traffic Study has been prepared to address issues raised by the Broome Planning Steering Committee and Department for Planning and Infrastructure regarding an east-west road link from Broome Road to Gubinge Road across the northern side of the existing Airport, and also to support the proposed Airport Area Development Plan.

1.1 BROOME PLANNING STEERING COMMITTEE

Although it is planned to relocate the existing Broome Airport to an alternative site some 12 kilometres out of town, the Broome Planning Steering Committee has acknowledged that the timing for the relocation is uncertain, and that the likelihood of this occurring in the medium term is low. The Committee has therefore developed alternative options for the future growth and development of Broome to ensure that the community's needs are met in the short, medium and long term.

As part of the urban growth framework developed, opportunities were identified for establishing an east-west road between Cable Beach and Chinatown while the Airport remains, noting that these were to be confirmed by revised vehicular traffic modelling.

The Committee also noted that development plans for the Airport operational area should consider both on- and off-site impacts, and should demonstrate how the overall traffic and transport network of Broome can be managed while the Airport remains.

1.2 DPI TRAFFIC REPORT

At the request of the Broome Planning Steering Committee, a 'spreadsheet-based manual traffic model of Broome' was prepared by Department for Planning and Infrastructure (DPI), in order to assess various road network options – particularly in relation to the possible 'Sandpiper to Murray' east-west road link.

Various aspects of the traffic modelling carried out by DPI are discussed below in Section 2.1. However, the following conclusions and recommendations were drawn:

"Only one new east-west link road is required between Jigal Drive and Gubinge Road to handle the forecast traffic load. The east-west link road through the airport is considered to have greater benefits and less disadvantages than the proposed Sandpiper - Murray link road. Therefore, construction of the Sandpiper - Murray link is not recommended."

"Sandpiper Avenue will experience increasingly higher traffic volumes until after the link roads through the airport site have been constructed. It is recommended that no driveway access should be permitted onto Sandpiper Avenue until after the airport has been relocated and the link roads through the airport site have been constructed."

"Frederick Street will always need to be planned for similar traffic volumes to those experienced today. Completion of Gubinge Road will allow road trains to be removed and allow different intersection treatments to improve side road access at critical locations."

The above comments relating to Sandpiper Avenue and the need for the Sandpiper - Murray link road have led to the additional traffic modelling and analysis documented within this report, which now also forms the basis for the traffic analysis for the Airport Area Development Plan.

1.3 STUDY OBJECTIVES

The overall objectives for this Traffic Study are as follows:

- Further investigate and refine the DPI traffic forecasts, to ensure that the overall plans for Broome are adequately represented.
- Reassess the future traffic flows on Sandpiper Avenue to either confirm or refute the DPI recommendations regarding driveway access.
- Prepare a detailed traffic assessment as input to the proposed Broome Airport Area Development Plan.

1.4 REPORT STRUCTURE

The Traffic Study report is presented in several sections.

The detailed traffic modelling is presented and discussed within Chapter 2, in the front part of the report, together with the various issues regarding the possible east-west road. The corresponding detailed plans and analyses are documented in Technical Appendix A.

The study findings regarding the proposed Airport Area Development Plan are presented and discussed in Chapter 3, while the corresponding detailed data and analysis are documented within Technical Appendix B.

Overall conclusions are then summarised and presented in Chapter 4.

2. TRAFFIC MODELLING AND EAST-WEST ROAD ISSUES

2.1 DPI TRAFFIC MODELLING

- The DPI traffic model was developed as a spreadsheet-based manual traffic model using an aggregation of land use zones previously utilised by SMEC in a regional traffic model developed to assess alternative alignments for Gubinge Road.

- The land use zones utilised by DPI are shown in Figure A.7 in Chapter A.3 in Technical Appendix A. It can be seen that the whole of Broome is represented by just 11 land use zones, resulting in a fairly coarse representation of the overall traffic situation.

- In order to calibrate the model, DPI identified available traffic counts within the study area and aimed to reproduce these flows within a 2005 traffic model.

- The traffic counts identified by DPI are shown in the upper part of Figure A.2 in Chapter A.1 in Technical Appendix A. However, it can be seen that the counts are all from different periods throughout the year, with some undertaken during the high season and others carried out during the low season.

- In order to identify high season traffic flows versus low season traffic flows, traffic counts along Frederick Street throughout the different months of the year were therefore also obtained, and this seasonal variation of traffic along Frederick Street is shown in the lower part of Figure A.2 in Technical Appendix A.

- By identifying the land use details within each of the land use zones, DPI was able to estimate existing and future trip generation for each zone, and a standard gravity model was then utilised to distribute trips between each of the 11 zones within the model.

- The Base Case traffic forecasts produced for the 2005 high season and low season are reproduced in Figure A.4 in Chapter A.2 in the Technical Appendix A. By comparing the high season and low season traffic forecasts against the existing traffic counts, DPI concluded that the model was suitably calibrated and could therefore be utilised to assess future traffic flows, within main study area.

- Base Case traffic forecasts produced by DPI for 2011 and 2031 are also reproduced in Figures A.5 and A.6, in Chapter A.2 in Technical Appendix A. It can be seen in Figure A.6 that Sandpiper Avenue is estimated to increase to 17,600 vehicles per day west of Broome Road in the 2031 high season, with approximately 12,000 vehicles per day west of Sanderling Drive. It is also important to note that Gubinge Road is shown with just 5,300 vehicles per day west of Broome Road and just 1,300 vehicles per day east of Jigal Drive.

- Although the DPI report claims that the traffic model is sufficiently calibrated against the existing situation, a comparison of traffic counts particularly at the corner of Sandpiper Avenue and Jigal Drive shows that the traffic model overstates the amount of through traffic travelling along Jigal Drive and Sandpiper Avenue, and understates the amount of traffic generated by Roebuck Estate.

- This overstating of through traffic between the Cable Beach Tourist Precinct and Chinatown could therefore result in a significant overestimation of future traffic flows on both Jigal Drive and Sandpiper Avenue, and it was therefore decided that the traffic model could be refined, and an improved calibration process could be carried out.

2.2 EXISTING TRAFFIC COUNTS

- In order to fully calibrate the traffic model to the existing situation, a series of traffic counts were carried out within and around the overall study area during the school holiday period of April 2006, which has been identified as a 'shoulder period'– building up towards the high season, but not yet at its peak.

- Manual traffic counts were carried out at a series of critical intersections in order to identify the existing travel patterns. Automatic traffic counters were also placed across the roads at several locations, in order to identify daily traffic volumes and to provide sufficient information to factor up the manual traffic counts to daily values.

- The resultant existing weekday traffic flows during April 2006 are shown in Figure A.3 in Chapter A.1 in Technical Appendix A, and the following information should be noted:
  - Sandpiper Avenue west of Broome Road carried 5,350 vehicles per day.
  - Jigal Drive south of Gubinge Road carried 2,650 vehicles per day.
  - With Roebuck Estate generating an estimated 5,060 vehicle trips per day, the existing through traffic along Jigal Drive and Sandpiper Avenue was identified to be 1,470 vehicles per day.
  - Approximately 77 percent of Roebuck Estate traffic accessed the Estate via Sandpiper Avenue and Broome Road, while of the remaining 23 percent accessed the Estate via Jigal Drive.
  - The 4 access roads to the Cable Beach Tourist Precinct carried a total of 7,430 vehicles per day, and it is estimated that approximately 70 percent of this traffic travelled via Cable Beach Road East while approximately 30 percent travelled via Jigal Drive and Sandpiper Avenue.

2.3 REFINED TRAFFIC MODEL AND CALIBRATION

- When reviewing the DPI traffic model, it was first identified that representing Roebuck Estate as a single zone could result in significant inaccuracies regarding the assignment of traffic onto the overall road network.

- It was also noted that similar inaccuracies could occur within the other zones, and that these simplifications within the DPI model could significantly affect the assignment of traffic onto Jigal Drive and Sandpiper Avenue.

- A request was therefore made for DPI to provide more detailed land use data together with the trip matrices that had been developed for their traffic model, in order to allow Uloth and Associates to refine DPI's work within a computer-based traffic model, which could be fully calibrated against the existing situation, and would allow more flexibility to assess future road network options.

- The DPI land use zones (shown in Figure A.7 in Technical Appendix A) were therefore subdivided into the refined land use zones shown in Figures A.8 and A.9, and the road network was expanded to include additional roads, also shown in Figure A.10.

- After obtaining the detailed land use data from DPI and modifying the trip matrices to represent the refined land use zones, additional data was then also sort in regard to existing and future development within both the Cable Beach Tourist Precinct and Roebuck Estate, and it was then possible to calibrate the 'existing' traffic model, as discussed in Chapter A.4 in Technical Appendix A.

- The resulting 2006 high season traffic forecast is shown in Figure A.12 in Technical Appendix A, showing that the traffic flows and travel patterns within both Roebuck Estate and the Cable Beach Tourist Precinct are in line with the detailed existing weekday traffic flows shown in Figure A.3, and that traffic flows on Broome Road and to/from Chinatown are also well represented.

- It does appear that the traffic model is slightly overestimating the existing traffic flows along Frederick Street. However, it is important to note that although some areas of the traffic model have been refined from the DPI base data, clarifying comments made by DPI regarding the accuracy of traffic volumes outside the main study area still apply, since land use and traffic calibration has not been carried out for the areas south of Frederick Street or Cable Beach Road East.

2.4 FUTURE TRAFFIC FLOWS

- On the basis of the refined traffic model, traffic forecasts were also then produced in a similar manner for the 2011 high season and the 2031 high season, and an alternative forecast was also carried out for 2031, including a connection of Lorikeet Drive to Broome Road. The 2011 forecast is shown in Figure A.13 in Technical Appendix A, while the alternative 2031 forecasts are shown in Figures 1 and 2.

- The following information should be noted:
  - Traffic generation of Roebuck Estate will increase from 5,220 vehicles per day in the 2006 high season to 10,920 vehicles per day in 2011 and 10,860 vehicles per day in 2031.
  - Traffic travelling to and from the Cable Beach Tourist Precinct will increase from 12,620 vehicles per day during the 2006 high season to 15,270 vehicles per day in 2011 and 25,800 vehicles per day in 2031. However, it is important to note that the external distribution of this traffic will change, due to increased residential development north of Gubinge Road.
  - The construction of Gubinge Road from Jigal Drive to Broome Road will also attract approximately 40 percent of the through traffic that would otherwise have used Jigal Drive and Sandpiper Avenue.
  - The through traffic along Jigal Drive and Sandpiper Avenue will increase from 2,010 vehicles per day during the 2006 high season to 3,150 vehicles per day in 2011 and 3,640 vehicles per day in 2031.
  - Weekday traffic on Sandpiper Avenue west of Broome Road will increase to 11,000 vehicles per day during the 2011 high season and 14,300 vehicles per day in 2031.
  - However, if Lorikeet Drive is connected to Broome Highway by 2031, traffic flows on Sandpiper Avenue will only increase to 12,800 vehicles per day west of Broome Road, with between 10,000 and 11,000 vehicles per day west of Sanderling Drive.
  - Traffic flows on Sanderling Drive north of Sandpiper Avenue will decrease over time, as more trips are attracted to increasing employment and shopping opportunities within the northern urban development areas and within the Cable Beach Tourist Precinct.
  - Sanderling Drive is forecast to carry 3,700 vehicles per day in the 2006 high season, 3,030 vehicles per day in 2011, and 2,370 vehicles per day in 2031 (or 1,810 vehicles per day if Lorikeet Drive is connected to Broome Road).

- It is also interesting to note that the 2031 traffic volumes on Jigal Drive and Sandpiper Avenue include approximately 3,000 vehicles per day and 5,000 vehicles per day, respectively, of traffic generated from within Zone E. If this area does not develop to the extent shown, then traffic volumes on Jigal Drive and Sandpiper Avenue will be lower.

- In addition, it must also be noted that the traffic flows produced within the traffic model represent the high season conditions only, which apply for perhaps one or two months of the year, with significantly lower volumes during the majority of the remaining months.

- Apart from the issues of residential lot access, these traffic forecasts clearly show that the overall road network for Broome can accommodate the long term future traffic flows even with the Airport remaining on its existing site, and there is no need for the construction of a new east-west link to Gubinge Road.

- However, it is important to note that Broome Road south of Sandpiper Avenue will need to be widened to 4 lanes divided, and it may be necessary to construct a roundabout at the Broome Road - Sandpiper Avenue junction.

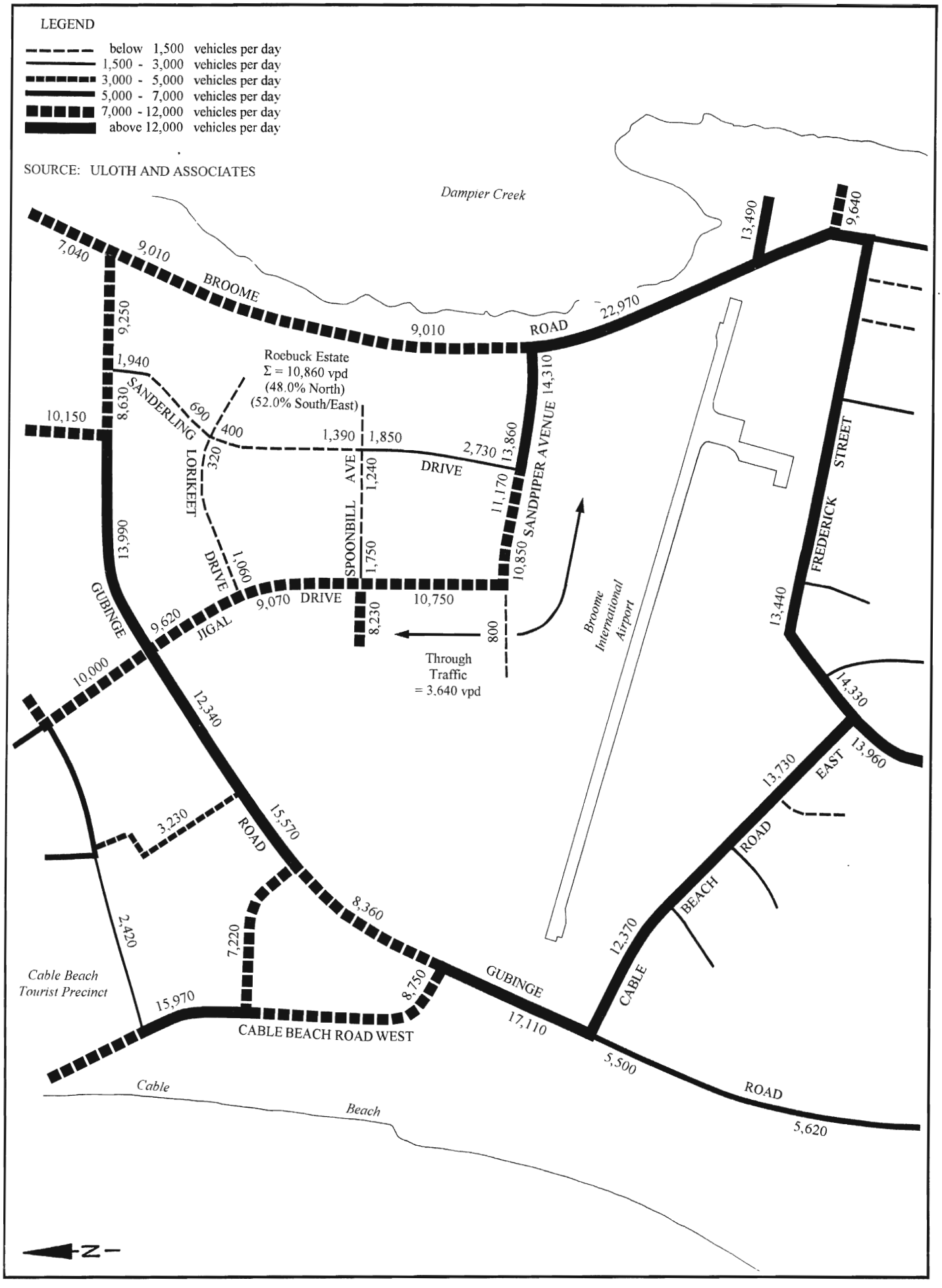
2.5 ACCEPTABLE TRAFFIC FLOWS FOR RESIDENTIAL STREETS

- From a pure traffic capacity perspective, the existing Sandpiper Avenue could carry up to approximately 20,000 vehicles per day.

- However, if driveway access is to be provided, it was initially suggested that a maximum flow of 10,000 vehicles per day would be appropriate.

- In further discussion with DPI officers, it was agreed that due to the significant fluctuation of traffic flows experienced in Broome, a high season traffic flow of up to approximately 12,000 vehicles per day would be acceptable, particularly given that it is only an interim situation prior to the relocation of the Airport.

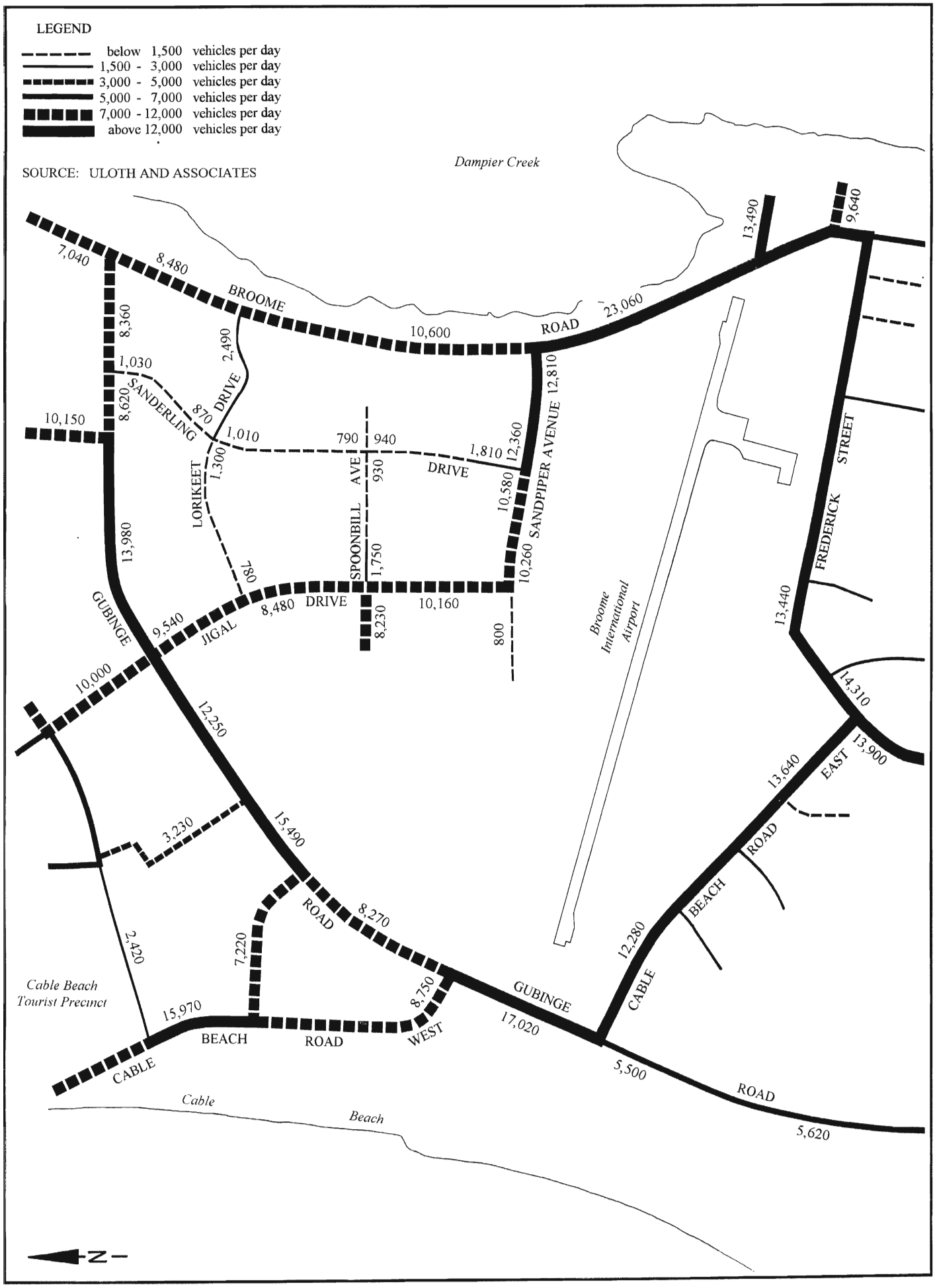
- It is therefore concluded that traffic flows on Sandpiper Avenue will be acceptable for residential lot access in 2031 (with the Airport on its current site), as long as Lorikeet Avenue has been connected to Broome Road.



2031 High Season Traffic Forecast

ULOTH AND ASSOCIATES REFINED TRAFFIC MODEL

FIG. 1



2031 Alternative Traffic Forecast

WITH LORIKEET DRIVE CONNECTED TO BROOME ROAD

FIG. 2

3. AIRPORT AREA DEVELOPMENT PLAN

The existing and future traffic flows and traffic analyses specifically related to the Airport Area Development Plan are discussed in this Chapter. Additional information is provided within Technical Appendix B.

3.1 EXISTING TRAFFIC

- The existing road network in the vicinity of Broome International Airport is shown in Figure B.1 in Technical Appendix B, while the existing (April 2006) traffic flows are shown in Figure B.2.

- It can be seen in Figure B.1 that access to the southern part of the Airport is only provided via MacPherson Street and Coghlan Street, while access to the northern part of the Airport is provided off Broome Road.

- It can be seen in Figure B.2 that the southern side of the Airport generated 2,180 vehicles per day during April 2006, and that approximately 63 percent of this traffic travels to/from Frederick Street via Coghlan Street, while 37 percent travels to/from Broome Road via Bagot Street.

- It is also estimated that the northern side of the Airport currently generates approximately 320 vehicle trips per day, increasing to perhaps 500 vehicles per day during the high season.

- It can also be seen that Frederick Street carried approximately 11,000 or 12,000 vehicles per day in April 2006, while Broome Road carried 7,800 vehicles per day, and Coghlan Street carried 2,400 vehicles per day.

3.2 BROOME AIRPORT AREA DEVELOPMENT PLAN

- The Broome Airport Area Development Plan is shown in Figure B.3 in Technical Appendix B.

- The plan includes a variety of 'typical' airport uses both north and south of the runway, together with some areas for mixed use developments along Frederick Street and Coghlan Street.

- The plan also includes some residential development south of Sandpiper Avenue. However for analysis purposes, this area is included as part of the Roebuck Estate within the overall traffic forecasts.

- By analysing the difference in monthly passenger numbers between April 2006 and July 2005, and then the differences in annual passenger forecasts from 2005 to 2006 and 2031, it is estimated that the traffic generation of 'typical' airport activities on the southern side of the airport will increase from 2,180 vehicles per day in April 2006 to 3,400 vehicles per day in July 2006, and 9,080 vehicles per day in July 2031, as shown in Table B.3 in Technical Appendix B.

- It is also estimated that the Mixed Use areas could accommodate up to perhaps 16,000 square metres of floorspace, and could generate approximately 4,000 vehicle trips per day.

- Table B.4 in Technical Appendix B therefore shows that with an assumed 10 percent interaction between the Mixed Use developments and the 'typical' airport uses, the southern side of the airport could generate a total of 12,280 external vehicle trips per day.

- An additional access road off Frederick Street, approximately 560 metres west of Coghlan Street, is therefore proposed, in order to accommodate the expected traffic increase.

- It is also estimated that the traffic generation on the northern side of the airport could increase to 2,530 vehicle trips per day, resulting in a total traffic generation of 14,810 vehicle trips by 2031, for the non-residential components of the overall plan.

3.3 FUTURE TRAFFIC FLOWS

- The estimated 2031 high season traffic flows for the Airport Area Development Plan have been assigned to the surrounding road network on the basis of the trip generation calculations discussed above, and the trip distribution assumptions documented in Chapter B.4 in Technical Appendix B.

- The resulting long term weekday traffic flows are shown in Figure B.4 in Technical Appendix B, while the corresponding peak hour traffic flows at critical intersections are shown in Figures B.5 and B.6 in Technical Appendix B.

- The forecast shows that MacPherson Street will increase from 3,400 vehicles per day in 2006 to 6,000 vehicles per day in 2031, although most of the additional traffic will travel via Coghlan Street and Bagot Street to Broome Road.

- The new access road off Frederick Street is expected to carry 5,480 vehicles per day, with the majority of these travelling to and from Frederick Street west.

- For analysis purposes, it is assumed that Frederick Street will carry 12,000 vehicles per day of non-airport traffic west of the new access road, resulting in a total figure of approximately 17,000 vehicles per day.

- In a similar way, it is assumed that Frederick Street west of Coghlan Street could carry 14,000 vehicles per day of non-airport traffic, giving a total of approximately 16,000 vehicles per day.

3.4 INTERSECTION OPERATIONAL EVALUATION

- Intersection operational analyses have been carried out for the critical intersections of Frederick Street - New Access Road, Frederick Street - Coghlan Street and Coghlan Street - MacPherson Street, as documented in Tables B.6 to B.8 in Technical Appendix B.

- It is assumed that in the long term Frederick Street will be modified to provide a boulevard treatment, with a single traffic lane in each direction separated by a central median, in accordance with the specifications in *Liveable Neighbourhoods* for an Integrator B Arterial Street.

- This type of road can accommodate up to 20,000 vehicles per day, as long as suitable intersection treatments are included.

- Tables B.6 and B.7 show that the Frederick Street junctions with the New Airport Access Road and Coghlan Street will operate at Levels of Service C and B, respectively, under this scenario, as long as a 6.0 metre wide median is provided at each junction.

- With an estimated 5,500 vehicles per day using the New Access Road off Frederick Street, it will need to be designed as if it is a public road. It is therefore important to note that the specific location of the New Access Road will need to be further assessed, in order to ensure that suitable intersection spacings are provided along Frederick Street.

- The analysis in Table B.8 shows that the existing intersection at Coghlan Street - MacPherson Street will operate at a high Level of Service B, indicating good operating conditions with short traffic delays.

- No specific analysis has been carried out for the Broome Road - Bagot Street - Short Street intersection, since Shire of Broome has already identified the need to install either traffic signals or a roundabout at this intersection. It is assumed that either of these treatments will have sufficient capacity to accommodate the expected future traffic flows.

4. OVERALL CONCLUSIONS

The following overall conclusions are drawn, on the basis of the discussion presented above in Chapters 2 and 3, and the additional information provided within the Technical Appendices.

- The refined and calibrated traffic forecasts clearly show that the overall road network for Broome can accommodate the anticipated long term traffic flows, even with the Airport remaining on its existing site.
- There is therefore no need for the construction of a new east-west road between Sandpiper Avenue and Gubinge Road.
- Traffic flows on Sandpiper Avenue will only reach a maximum of 12,800 vehicles per day in the 2031 high season, if Lorikeet Avenue is extended to Broome Road. This level of traffic is considered acceptable for residential lot access.
- Following the removal of road trains from Frederick Street, it is assumed that modifications will be made to improve traffic flow along Frederick Street, and to provide an improved environment for all road users.
- With traffic flows already pushing up towards 15,000 vehicles per day (in the high season), it is reasonable to expect that Frederick Street will be modified to provide a boulevard treatment (at least in the long term) in accordance with an Integrator B Arterial Street within *Liveable Neighbourhoods*.
- The new access road off Frederick Street serving the southern side of the Airport Area will operate at an acceptable Level of Service C during the 2031 high season peak hour, while the Coghlan Street junction will operate at a high Level of Service B, as long as a 6.0 metre wide median is provided at each intersection (to shelter right turn vehicles).
- It is therefore concluded that the proposed Airport Area Development Plan can be accommodated within the currently planned road network.

TECHNICAL APPENDIX A

Traffic Modelling and East-West Roads.

A.1 EXISTING SITUATION

Figure A.1 shows the existing Broome road network in the vicinity of Roebuck Estate and Broome International Airport.

Figure A.2 shows the existing traffic counts identified within the DPI *Broome Traffic Modelling* report, including an indication of seasonal fluctuation on Frederick Street.

Figure A.3 shows existing weekday traffic flows for April 2006, as determined by Uloth and Associates from counts carried out during the April school holiday period.

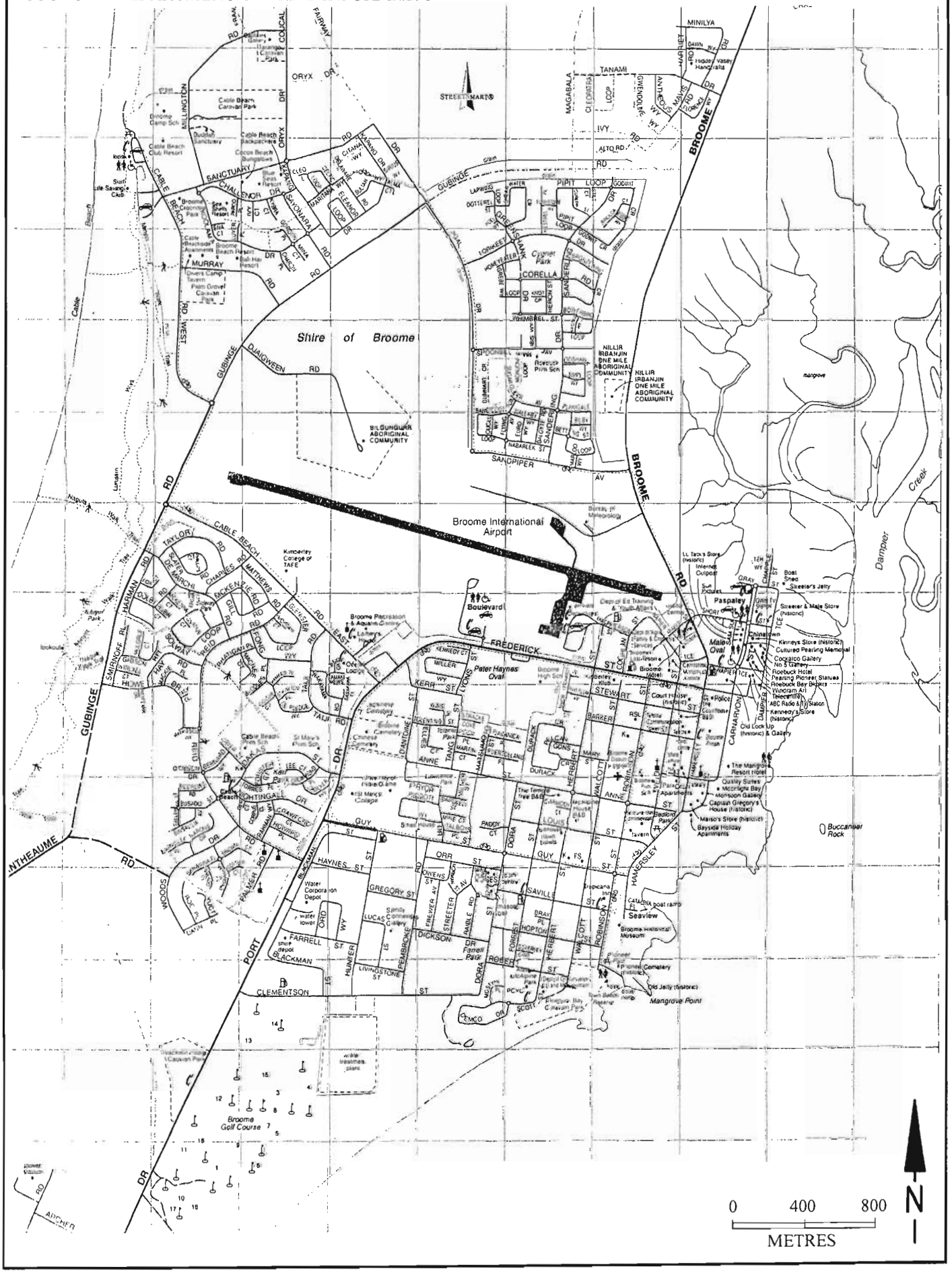
It can be seen in Figure A.3 that Roebuck Estate was identified as generating a total of 5,060 vehicle trips per day on the survey day, with 23 percent travelling to/from the north on Jigal Drive and 77 percent travelling south/east to Broome Road - Sandpiper Avenue, leaving a total of 1,470 vehicles per day of through traffic on Jigal Drive and Sandpiper Avenue.

It can also be seen that a total of 7,430 vehicles per day utilised the 4 roads accessing the Cable Beach Tourist Precinct from Gubinge Road, and it is estimated that approximately 70 percent of these travelled via Cable Beach Road East while the remaining 30 percent travelled via Jigal Drive.

A.2 DPI TRAFFIC FORECASTS

Figure A.4 shows the 2005 traffic forecasts for both high season and low season, as documented within the DPI report, while Figures A.5 and A.6 show the corresponding base case traffic forecasts for 2011 and 2031.

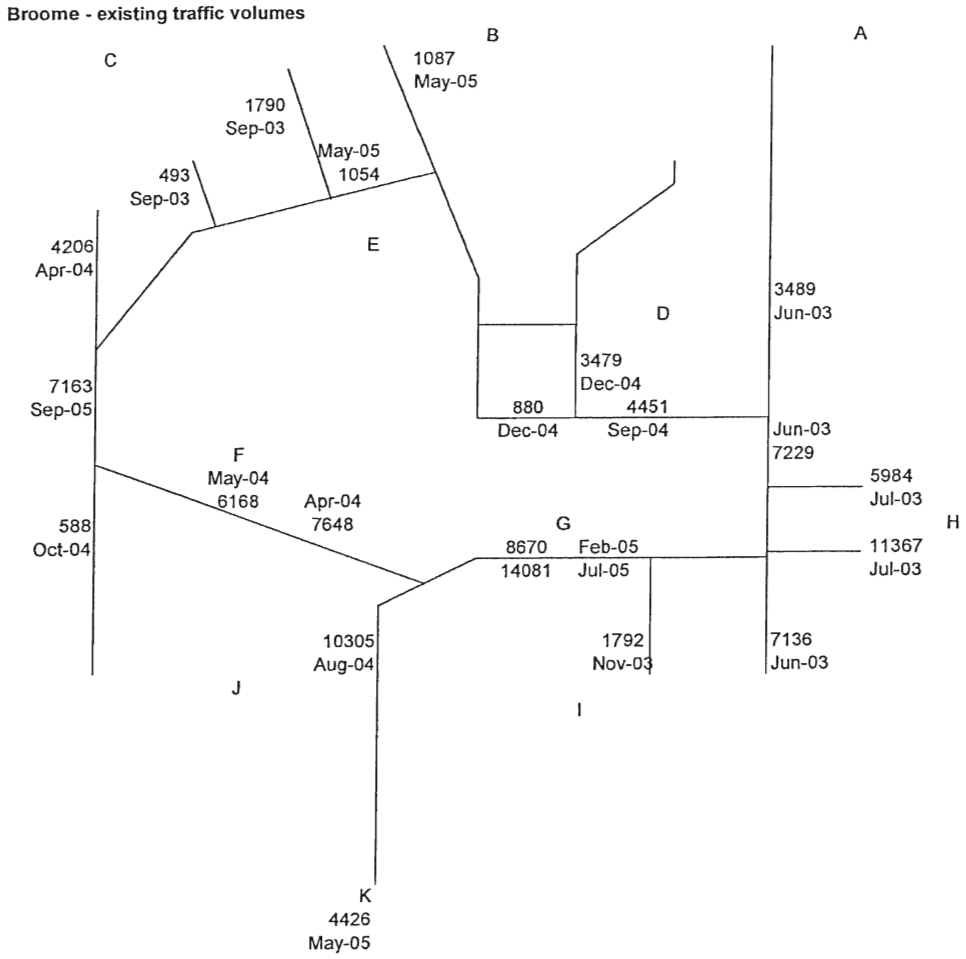
SOURCE: DEPARTMENT OF LAND INFORMATION



Existing Broome Road Network

FIG. A.1

Existing Traffic Counts



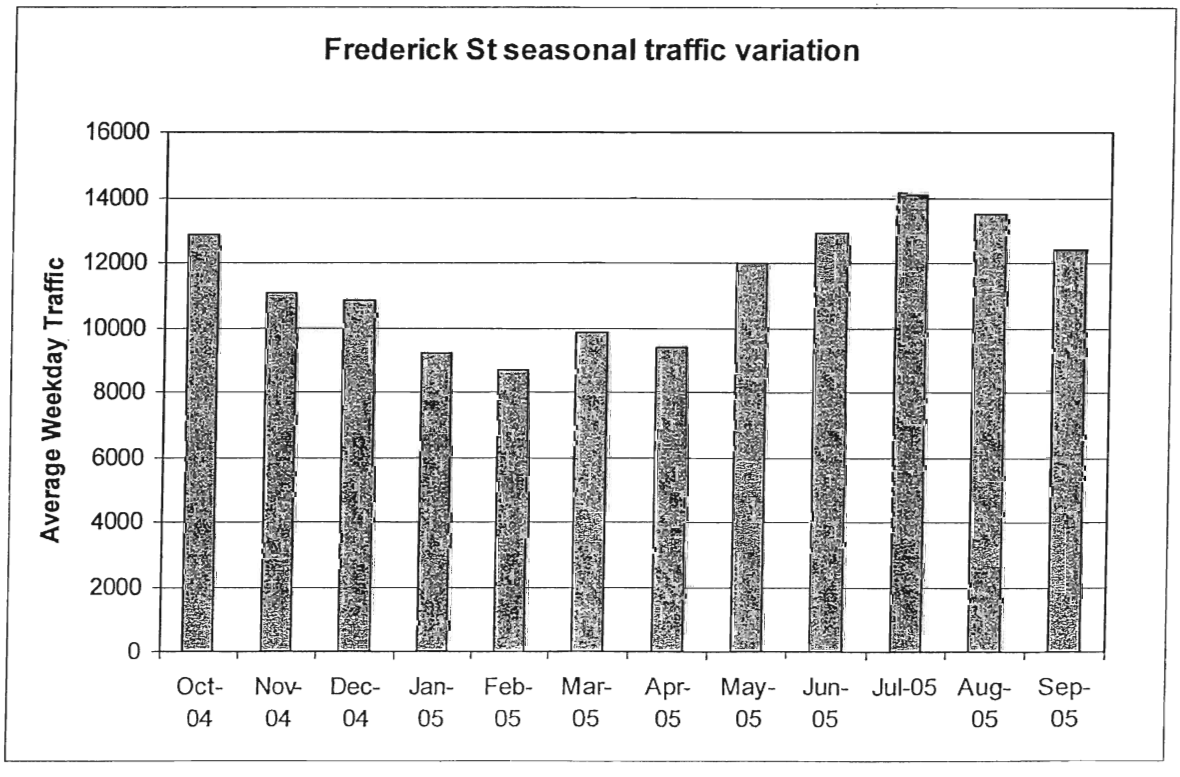
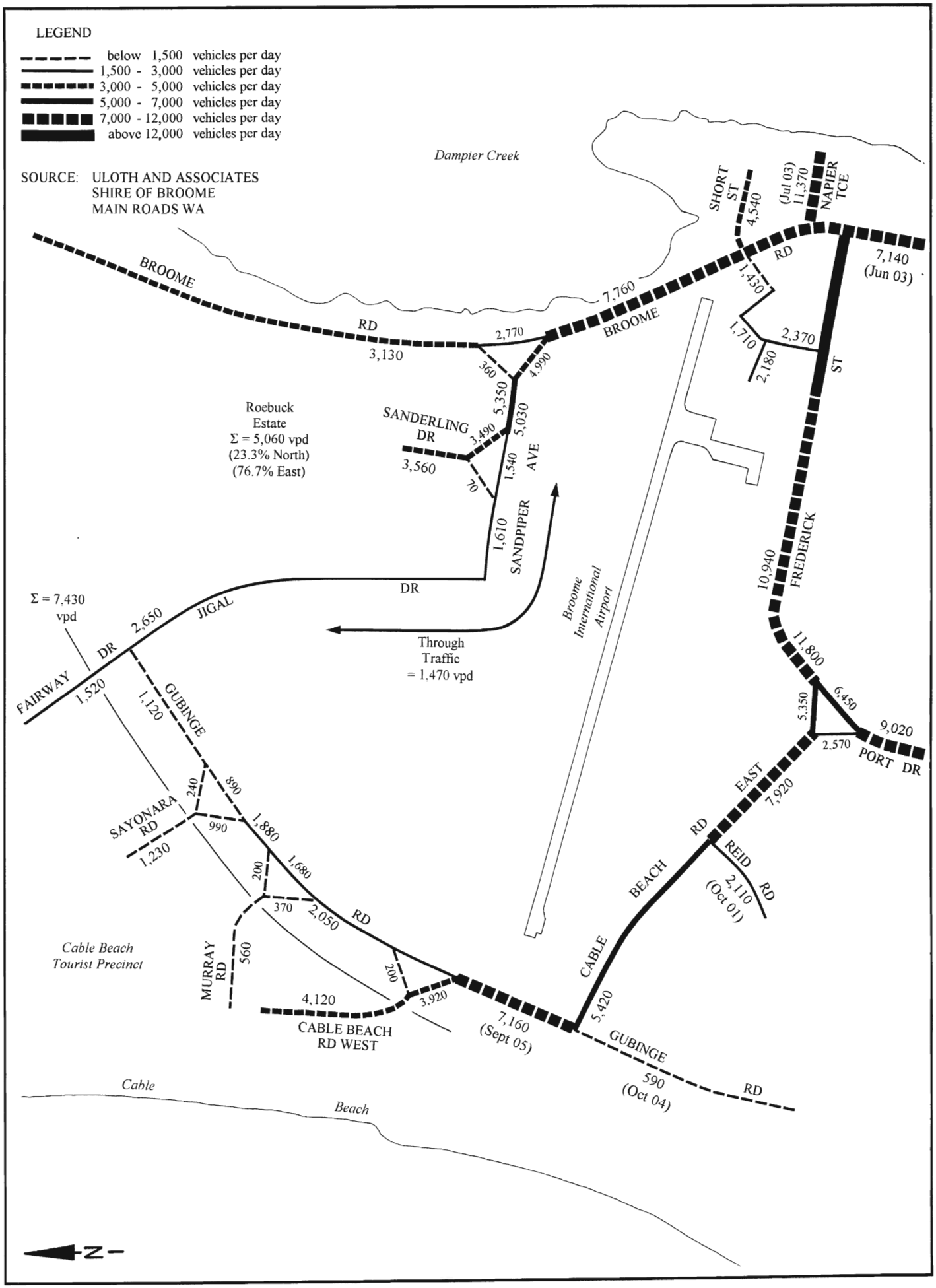


FIG. A.2

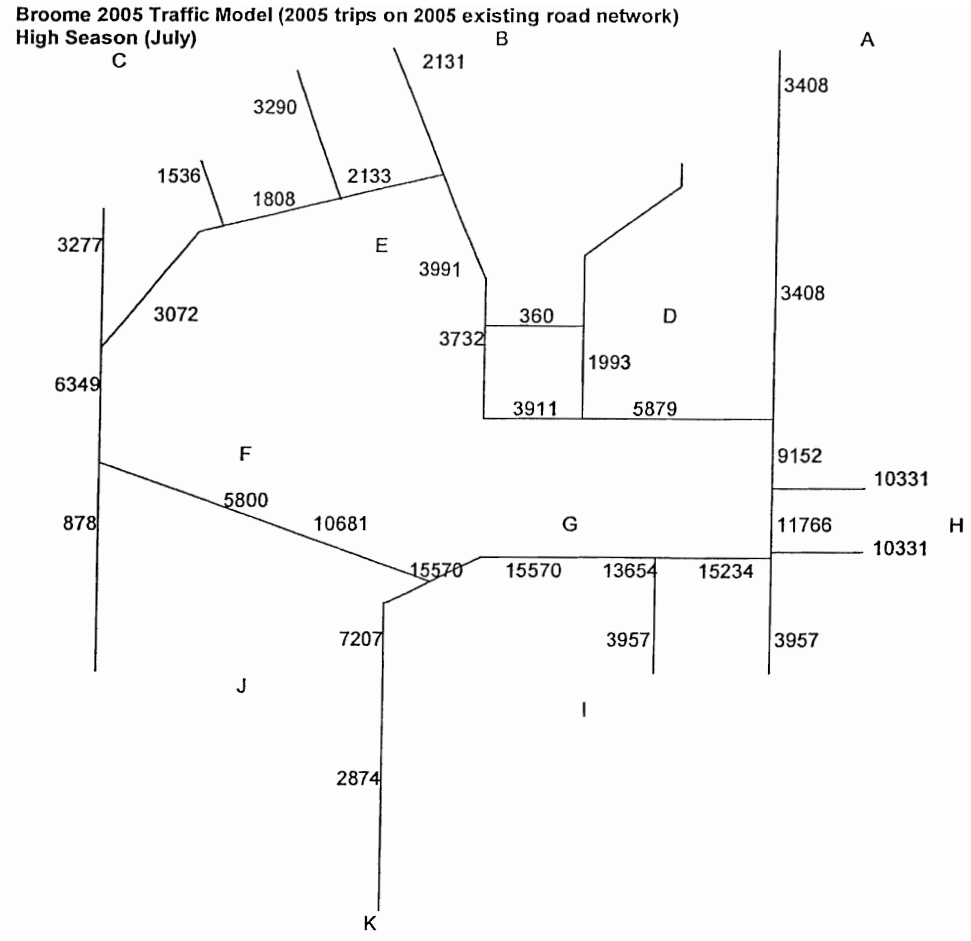
Existing Traffic Counts Utilised in DPI Report



Existing Weekday Traffic Flows - April 06

IN THE VICINITY OF BROOME AIRPORT AND ROEBUCK ESTATE

FIG. A.3



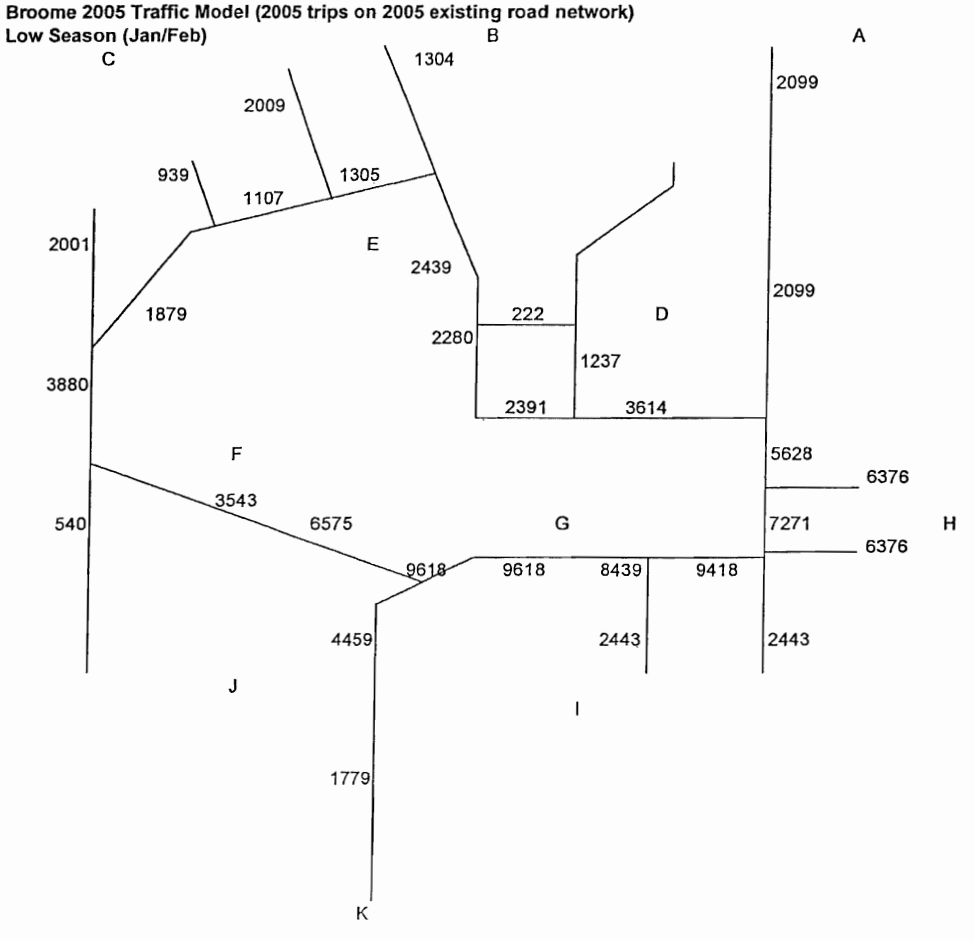
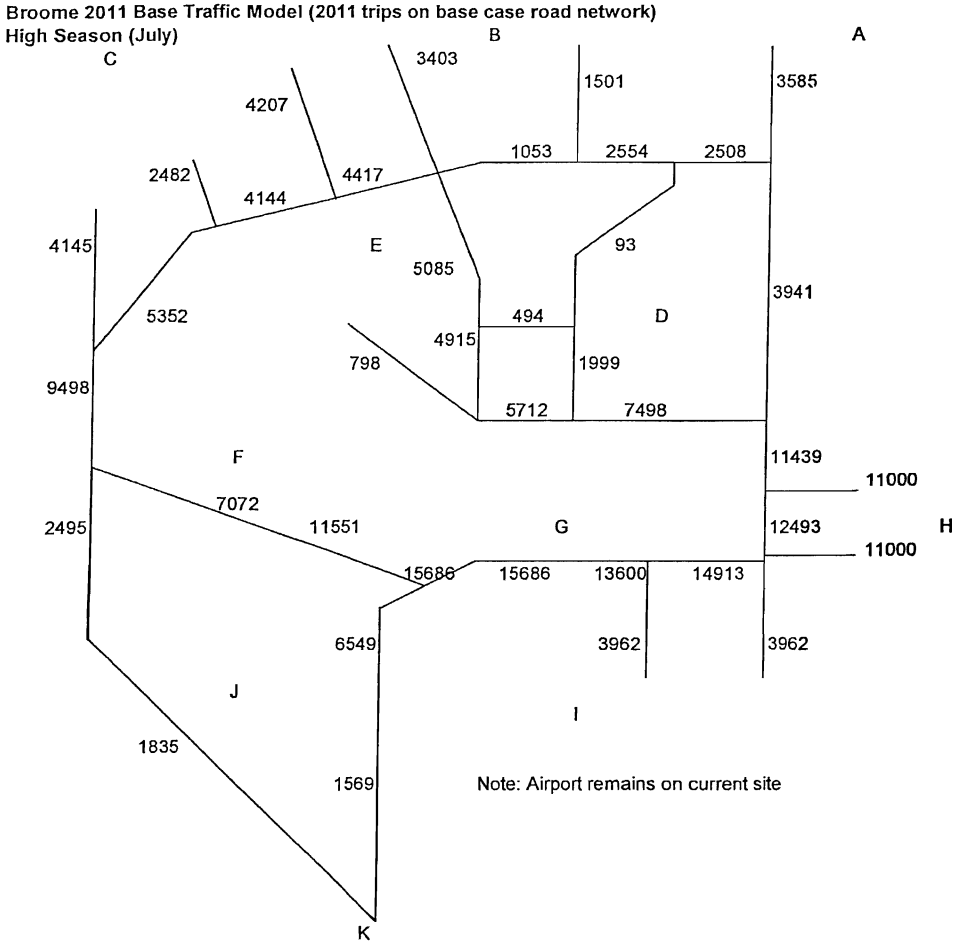


FIG.
A.4

DPI Base Case Traffic Forecasts - 2005



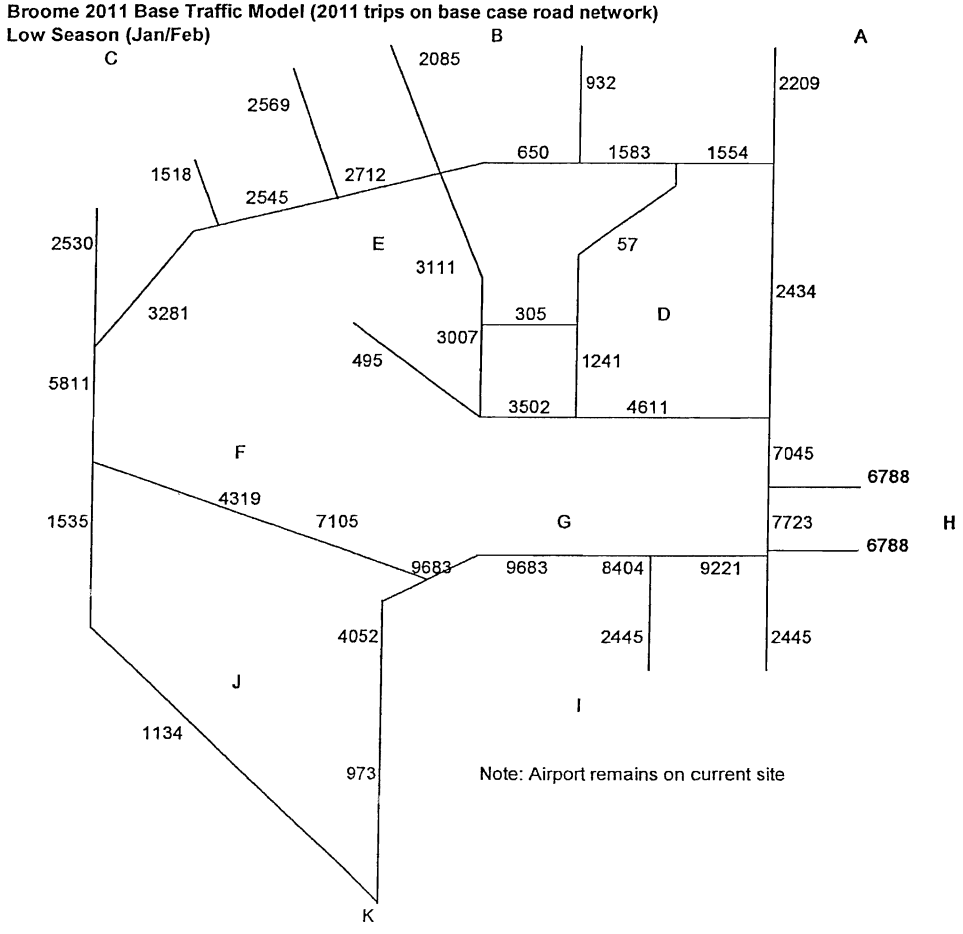
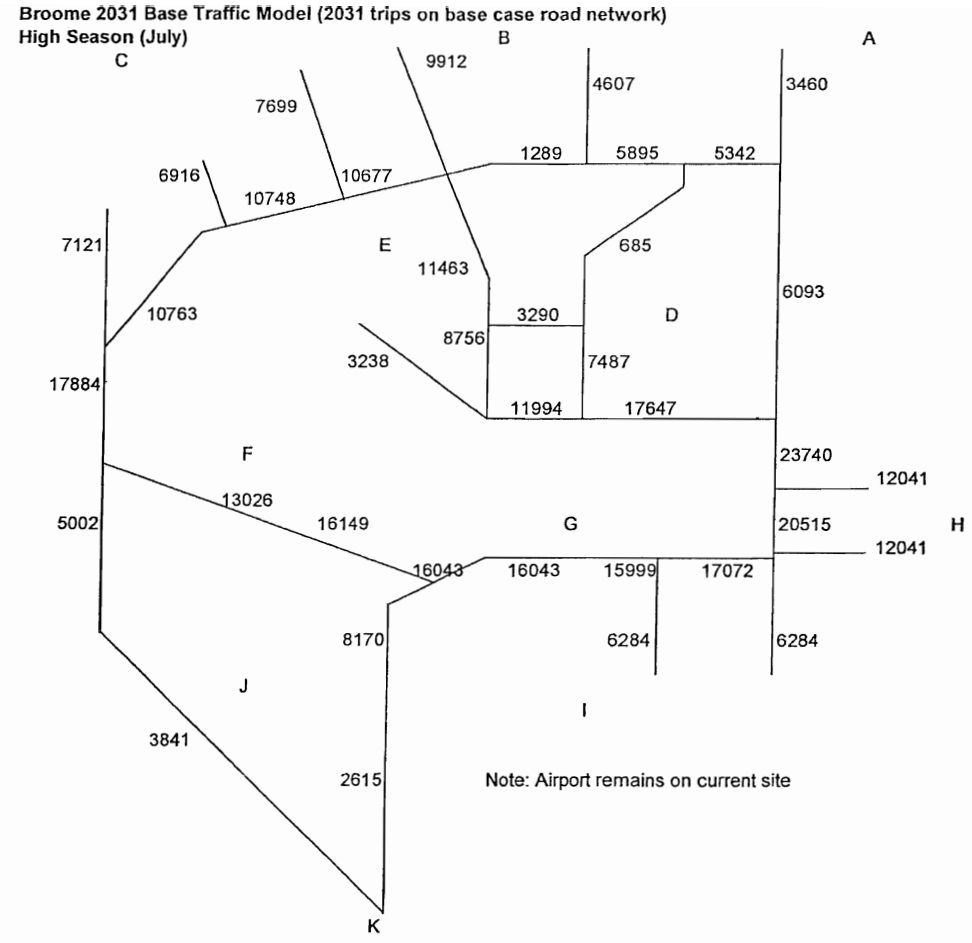


FIG.
A.5

DPI Base Case Traffic Forecasts - 2011



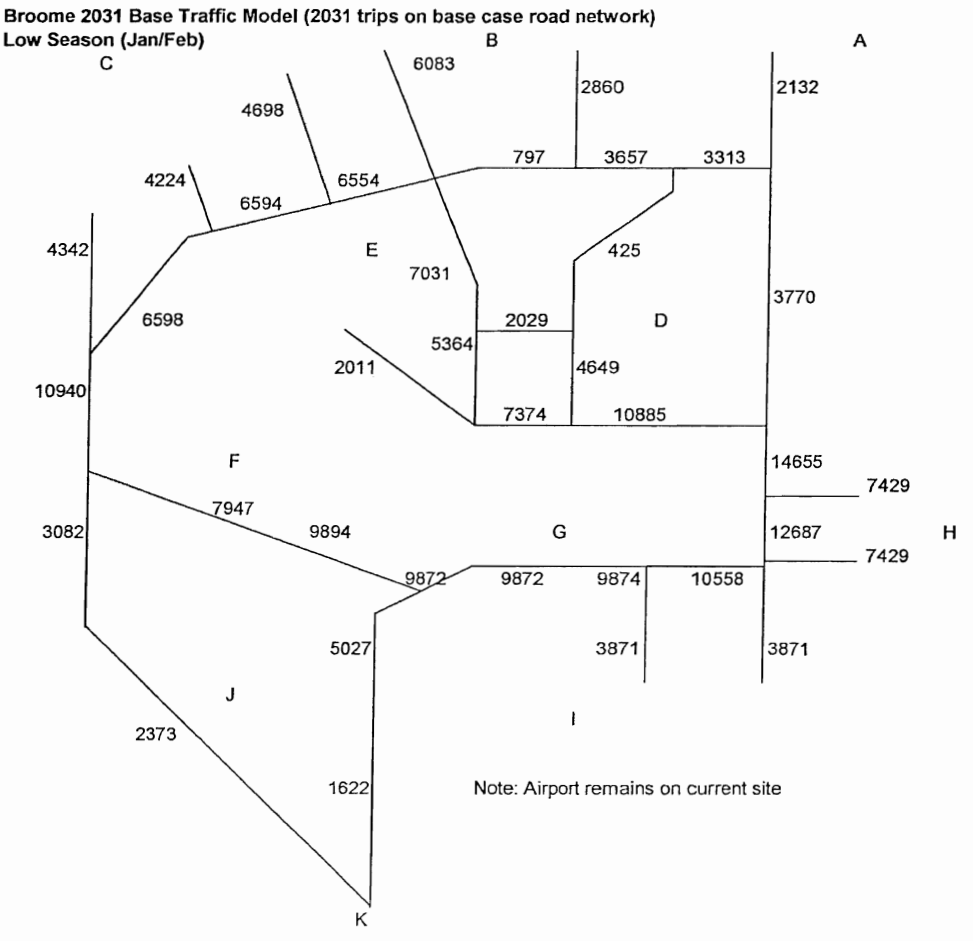


FIG.
A.6

DPI Base Case Traffic Forecasts - 2031

A.3 CREATION OF REFINED TRAFFIC MODEL

In order to create a refined computer-based traffic model, Uloth and Associates expanded a previously developed local area traffic model for Roebuck Estate, sub-divided several of the zones utilised by DPI in order to provide a better-defined road network, and then modified the DPI trip matrices to suit the refined model.

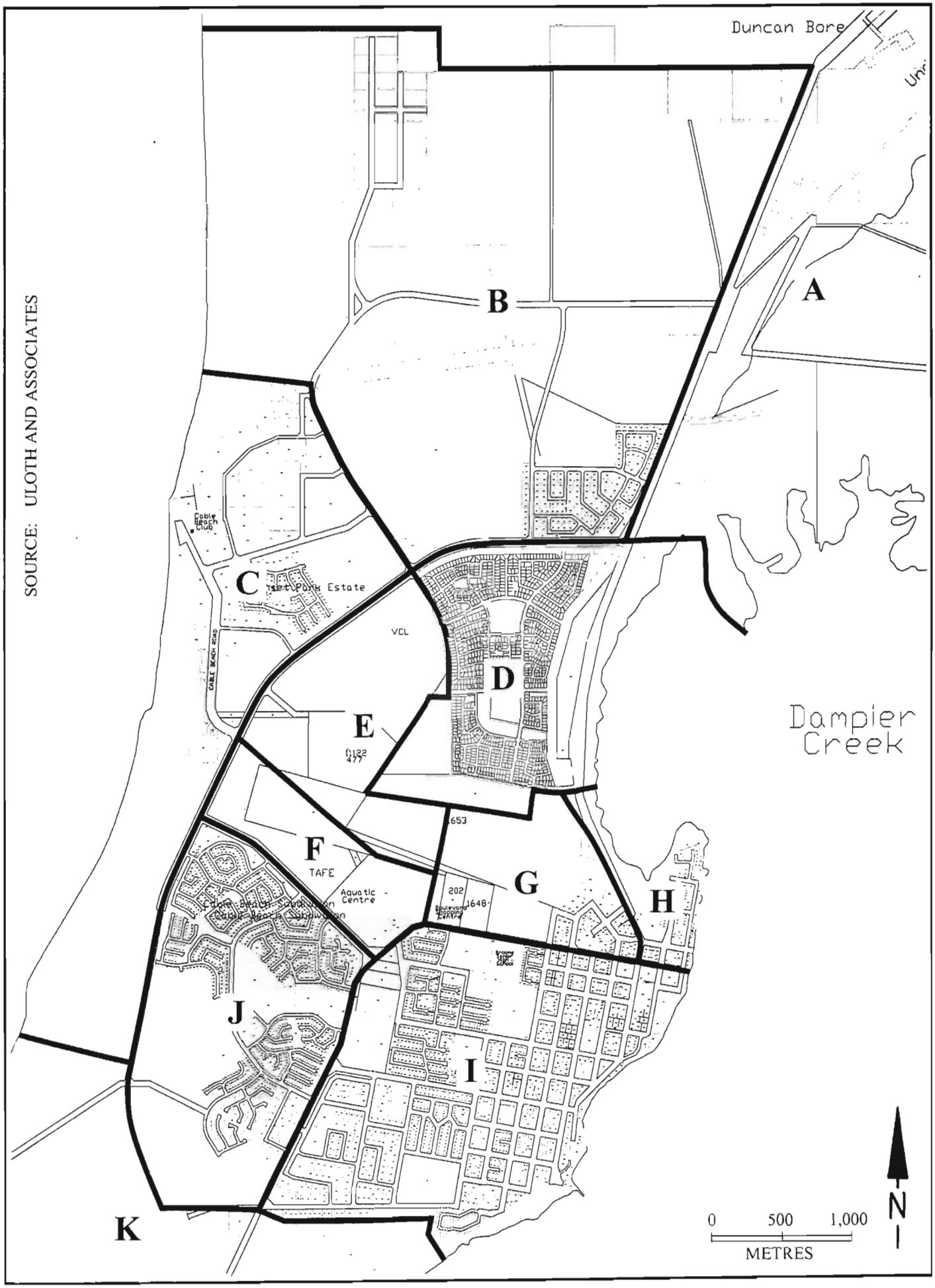
Roebuck Estate was treated as the 'Internal' part of the model, and the external distribution of trips to/from Roebuck Estate was initially based on the distribution from the DPI trip matrix, prior to the calibration process described below in Section A.4.2.

The remaining zones were all treated as 'external' zones, and the resultant 'external' trip matrix was simply broken down into the various sub-zones based on the allocation of land use within each zone.

Figure A.7 shows the future land use zones as utilised within the DPI traffic model, while Figure A.8 shows the refined land use zones within the overall area, as utilised by Uloth and Associates, and Figure A.9 shows the more detailed zones utilised within Roebuck Estate.

Figure A.10 shows the comparison between the road network utilised within the DPI traffic model, and the more detailed road network utilised by Uloth and Associates.

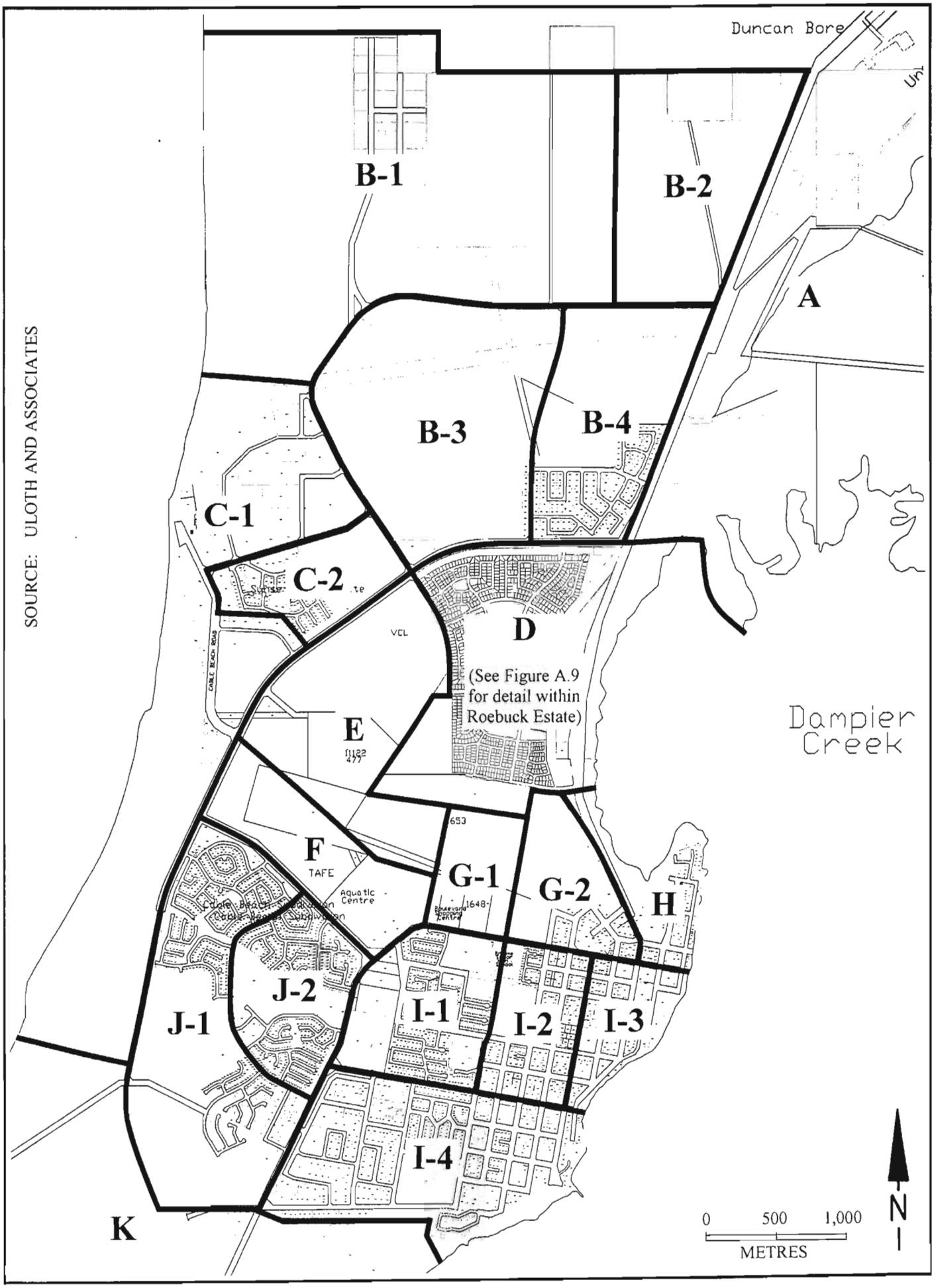
The calibration of the refined traffic model is discussed in the following Chapter A.4.



Future Land Use Zones

AS UTILISED IN DPI TRAFFIC MODEL

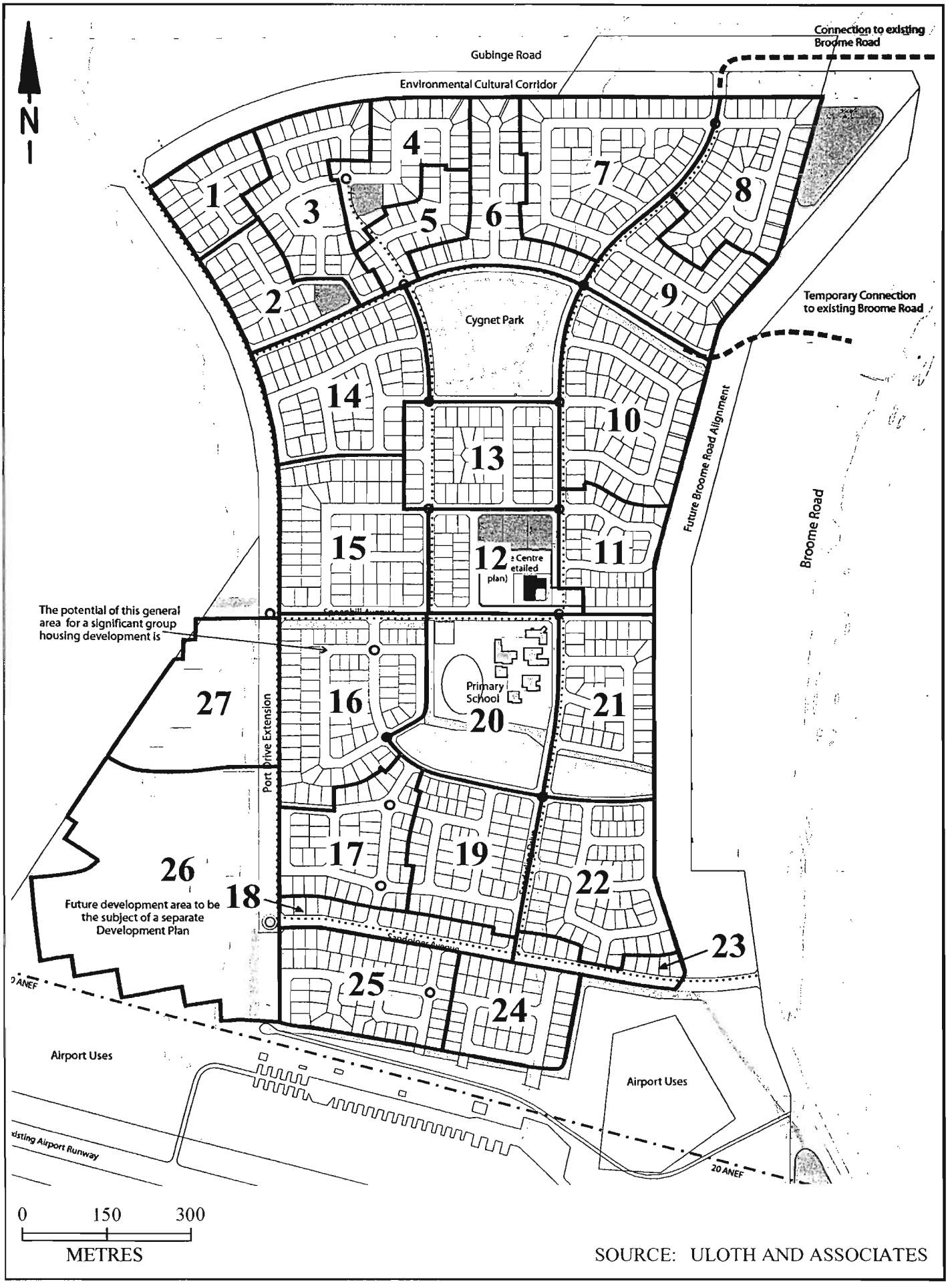
FIG. A.7



Refined Future Land Use Zones

AS UTILISED IN ULOTH TRAFFIC MODEL

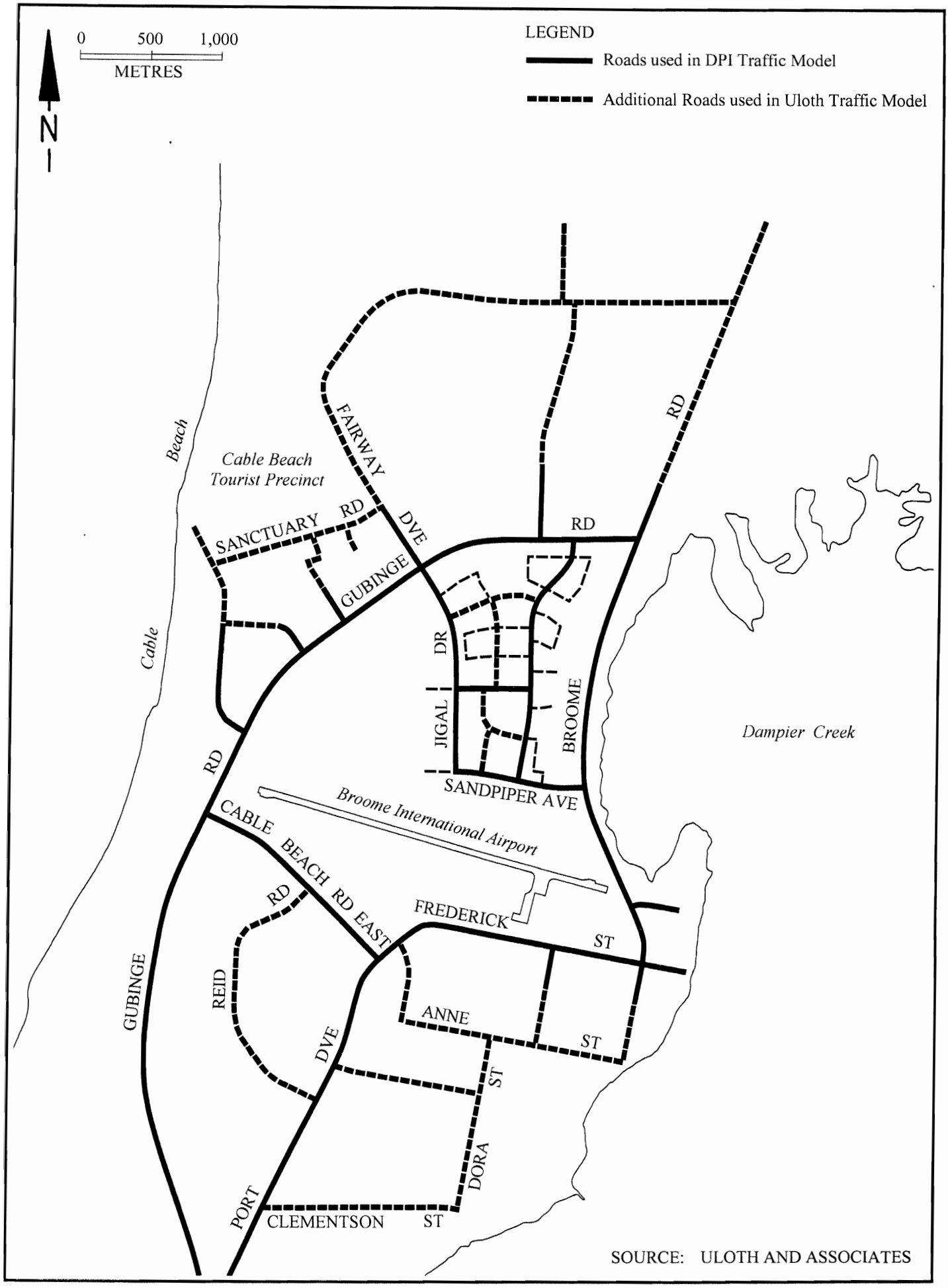
FIG. A.8



Refined Future Land Use Zones

ROEBUCK ESTATE (ZONE D)

FIG. A.9



Comparison of Modelled Road Networks

DPI TRAFFIC MODEL vs. ULOTH TRAFFIC MODEL

FIG. A.10

A.4 CALIBRATION OF REFINED TRAFFIC MODEL

Initial inspection of DPI traffic model results for 2005 suggested that the amount of through traffic on Jigal Drive and Sandpiper Avenue was too high, and that this was not identified as part of the initial calibration because the traffic generation of Roebuck Estate was understated.

Closer inspection of the DPI traffic model shows that Roebuck Estate was modelled with a traffic generation of only 2,300 vehicle trips per day, compared to the surveyed generation of 5,060 vehicle trips per day in April 2006 (or 5,220 vehicle trips per day expected during the 2006 High Season). It is also clear that approximately 85 percent of all Roebuck Estate traffic was modelled using Sandpiper Avenue west of Broome Road, leaving just 15 percent travelling north via Jigal Drive, compared to the surveyed figure of 23 percent using Jigal Drive.

It is therefore clear that in order to properly calibrate the refined traffic model to the existing situation it is necessary to pay close attention to the traffic generation and distribution of Roebuck Estate.

The traffic generation and travel routes to/from the Cable Beach Tourist Precinct must also be closely assessed, since these will have a significant impact on through traffic volumes on Jigal Drive and Sandpiper Avenue.

The calibration processes for the Cable Beach Tourist Precinct and Roebuck Estate are discussed in the following.

A.4.1 CABLE BEACH TOURIST PRECINCT

Existing Land Use and Trip Generation - To accurately model the through traffic using Jigal Drive and Sandpiper Avenue, it is necessary to ensure that we fully understand the trip generation and travel patterns to and from both the existing and future developments.

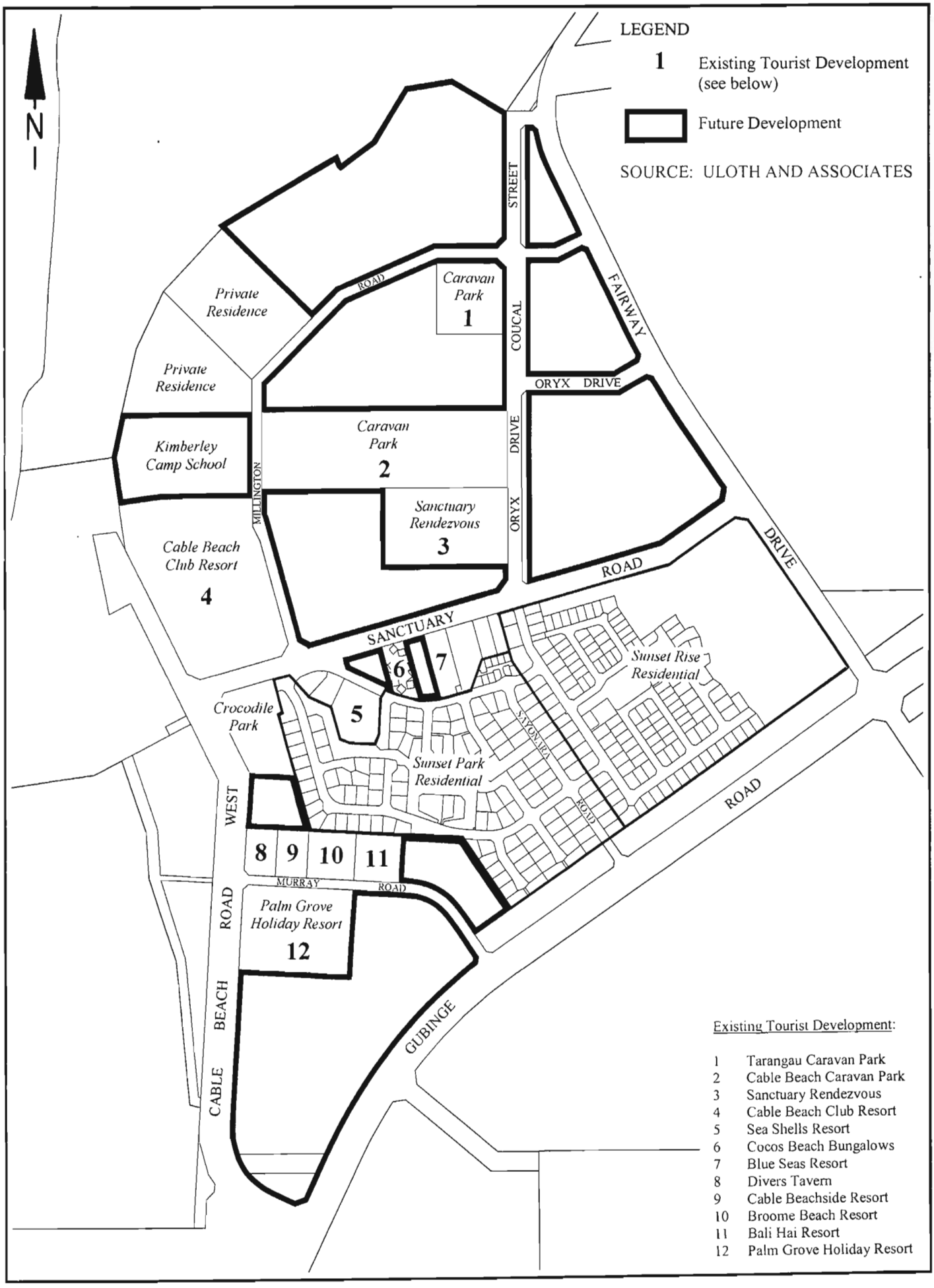
Detailed information was therefore sought from each of the existing tourism developments within the overall Tourist Precinct, and the number of existing dwellings within the residential areas was also identified.

Existing developments within the Cable Beach Tourist Precinct are identified in Figure A.11, and future development sites within the overall precinct are also shown.

Table A.1 shows that there are currently 533 resort/hotel rooms and 592 caravan park sites available within the Tourist Precinct, giving a total of 1,125 rooms/sites, and it can also be seen that 77 percent of resort/hotel rooms were occupied on the day of the traffic surveys, compared with 32 percent of caravan park sites, and 54 percent overall.

It is also important to note that there are currently 214 residential dwellings within the overall Tourist Precinct, (out of a total of 339 planned residential lots), and it is assumed that 90 percent of these were occupied on the day of the traffic surveys.

Table A.2 shows the calculation of trip productions for the Tourist Precinct for the April 2006 survey day, giving an estimated total of 4,920 vehicle trips per day based on standard trip generation rates.



Existing and Future Developments

CABLE BEACH TOURIST PRECINCT

FIG. A.11

TABLE A.1
AVAILABLE TOURIST ACCOMMODATION AND SURVEYED OCCUPANCY
CABLE BEACH TOURIST PRECINCT – THURSDAY 20 APRIL 2006

LOCATION	TOTAL UNITS AVAILABLE	SURVEYED OCCUPANCY	
		No. of Units	Percent
• Resorts/Hotels			
- Sanctuary Rendezvous	76	36	47 %
- Cable Beach Club Resort	231	200	87 %
- Sea Shells Resort	49	38	78 %
- Cocos Bungalows	8	8	100 %
- Blue Seas Resort	44	24	55 %
- Cable Beachside Resort	16	15	94 %
- Broome Beach Resort	34	33	97 %
- Bali Hai Resort	31	29	94 %
- Palm Grove Holiday Resort	44	29	66 %
- Total	533	412	77 %
• Caravan Parks			
- Cable Beach Caravan Park	500	131	26 %
- Palm Grove Holiday Resort	92	61	66 %
- Total	592	192	32 %
• Grand Total	1,125	604	54 %

Note: 1) The various existing developments are shown in Figure A.11.

Source: Surveyed by BIA Group.

TABLE A.2
EXISTING ACCOMMODATION AND RESULTANT TRIP PRODUCTIONS
CABLE BEACH TOURIST PRECINCT – APRIL 2006

ITEM	AMOUNT			
	Resort/Hotel (rooms)	Caravan Parks (Units/Sites)	Residential (Dwellings)	Total
• Available Accommodation	533	592	214	1,339
• Number Occupied	412 (77%)	192 (32%)	193 (90%)	797 (60%)
• Assumed Trip Rates (vehs. per day)	4/room	8/site	9/dwelling	-
• Total Trip Productions (vehs. Per day)	1,650	1,530	1,740	4,920

Source: Uloth and Associates.

Table A.3 shows the calculation of April 2006 traffic flows to and from the Cable Beach Tourist Precinct, on the basis of the surveyed screenline traffic flow of 7,430 vehicles per day on the 4 access roads north of Gubinge Road (as shown in Figure A.3 in Chapter A.1).

It can be seen in Table A.3 that on the basis of the assumption that 10 percent of all trip productions will remain within the Tourist Precinct, there was a total of 4,430 vehicles per day travelling from the Cable Beach productions to external attractions, leaving 3,000 vehicles per day travelling from external areas into the Cable Beach attractions.

TABLE A.3
CALCULATION OF APRIL 2006 TRAFFIC FLOWS
TO/FROM CABLE BEACH TOURIST PRECINCT

ITEM	AMOUNT
• Total Trip Productions [1)] • Less 10% Trips to Cable Beach Attractions	4,920 490
• Total External Trips from Cable Beach Productions	4,430
• Surveyed Traffic crossing External Screenline [2)]	7,430
• Resultant External Trips to Cable Beach Attractions • Plus Trips from Internal Productions	3,000 490
• Total Cable Beach Attractions	3,490

Notes: 1) As calculated in Table A.2.
2) As identified in Figure A.3 in Chapter A.1

Source: Uloth and Associates.

Table A.4 shows that the total accommodation within the Tourist Precinct is estimated to increase from 1,339 units in 2006 (including 214 residential dwellings) to 1,767 units in 2011 and 3,477 units by 2031, on the basis of an average rate of 25 resort/hotel units per hectare of undeveloped land.

Table A.4 also shows that the Cable Beach Tourist Precinct trip productions are therefore estimated to increase to 8,790 vehicle trips per day during the 2006 high season, and then to 10,630 vehicle trips per day in 2011 and 17,970 vehicle trips per day in 2031.

TABLE A.4
SUMMARY OF EXISTING AND FUTURE ACCOMMODATION AND RESULTANT TRIP PRODUCTIONS – CABLE BEACH TOURIST PRECINCT

ITEM	AMOUNT			
	Resort/Hotel (rooms)	Caravan Parks (Units/Sites)	Residential (Dwellings)	Total
2006 High Season				
• Total Accommodation [1)]	533	592	214	1,339
• Assumed Trip Rates (vehs. per day)	4/room	8/site	9/dwelling	-
• Total Trip Productions (vehs. per day)	2,130	4,740	1,920	8,790
2011 High Season				
• Total Accommodation [1)]	936 [2)]	592	239 [3)]	1,767
• Assumed Trip Rates (vehs. per day)	4/room	8/site	9/dwelling	-
• Total Trip Productions (vehs. per day)	3,740	4,740	2,150	10,630
2031 High Season				
• Total Accommodation [1)]	2,546 [2)]	592	339 [3)]	3,477
• Assumed Trip Rates (vehs. per day)	4/room	8/site	9 dwelling	-
• Total Trip Productions (vehs. per day)	10,180	4,740	3,050	17,970

Note: 1) Assumed 100 percent occupied in High Season.
2) Assumes that the sites identified as 'Future Development' in Figure A.11 will produce an average of 25 Resort/Hotel units per hectare in the long term, with pro-rata growth to 2011.
3) Assumes full development of Sunset Park and Sunset Rise by 2031, with pro-rata growth to 2011.

Source: Uloth and Associates.

Table A.5 therefore shows that the resultant traffic flows crossing the external screenline will increase from 7,430 vehicles per day in April 2006 to 12,620 vehicles per day during the 2006 high season, then 15,260 vehicles per day in 2011 and 25,810 vehicles per day in 2031.

It is interesting to note that although the 12,620 vehicles per day in 2006 is higher than the corresponding figure in the DPI 2005 traffic model (10,230 vehicles per day), the estimated figures for 2011 and 2031 are both lower than the figures calculated by DPI.

TABLE A.5
SUMMARY OF EXISTING AND FUTURE TRAFFIC FLOWS
TO/FROM CABLE BEACH TOURIST PRECINCT

ITEM	AMOUNT			
	April 2006	2006 High Season	Future High Season	
			2011	2031
• Total Trip Productions [1)]	4,920	8,790	10,630	17,970
• Less 10% Internal	490	880	1,060	1,800
• External Trips from Cable Beach Productions	4,430	7,910	9,570	16,170
• Total Trip Attractions	3,490 [2)]	5,590 [3)]	6,760 [4)]	11,430 [4)]
• Less Internal Productions	490	880	1,060	1,800
• External Trips to Cable Beach Attractions	3,000	4,710	5,700	9,630
• Total Trips Crossing External Screenline	7,430	12,620	15,270	25,800

Notes: 1) From Tables A.2 and A.4.
2) From Table A.3.
3) Assumed 60 percent higher than April 2006.
4) Based on same rate of increase as total trip productions from 2006 to 2011 to 2031.

Source: Uloth and Associates.

Traffic Distribution and Assignment - By assigning the refined 2006 trip matrix to the road network and comparing the output against the existing weekday traffic flows (particularly on Cable Beach Road West), it was identified that the choice of travel routes to and from Cable Beach is more accurately represented when based on travel time along, rather than on a combination of travel times and travel distance.

However, it was also clear that the distribution of trips travelling to the Cable Beach attractions was not accurately represented by the gravity model calculations undertaken by DPI, and that the trips should be re-allocated based solely on the distribution of the overall population, regardless of the distance travelled.

A.4.2 ROEBUCK ESTATE

Land Use and Traffic Generation - In order to accurately model the traffic flows to/from Roebuck Estate, it is first necessary to ensure that the land use data and traffic generation calculations are accurate.

The existing and future land use data has therefore been identified, as shown in Table A.6, which is based on the detailed land use zones shown in Figure A.9 in Chapter A.3.

It can be seen in Table A.6 that there was a total of 580 occupied residential dwellings within Roebuck Estate in April 2006, out of a total of 1,215 planned residential dwellings in the long term.

The April 2006 traffic generation of 5,060 vehicles per day is therefore equivalent to an average of 8.7 vehicle trips per dwelling. However, it is assumed that this will increase to 9 vehicle trips per dwelling during the high season, giving a total traffic generation of 5,220 vehicles per day.

Trip Distribution - The external distribution of trips generated by Roebuck Estate was initially based on the trip distribution within the DPI trip matrix.

However, once the refined trip matrix was assigned to the road network, it was clear that too few trips were allocated from Roebuck Estate to the Cable Beach area.

The external distribution was therefore adjusted to increase these trips, and corresponding reductions were made to the Boulevard Shopping Centre and Chinatown.

TABLE A.6
EXISTING AND FUTURE LAND USE – ROEBUCK ESTATE (ZONE D)

SUB-ZONE [1]	NO. OF DWELLINGS		OTHER
	Total Planned	Occupied in April 2006	
1	25	0	
2	33 [2]	0	
3	41	4	
4	36 [2]	31	
5	22	20	
6	36	29	
7	68	66	
8	50	50	
9	39	37	
10	63 [3]	61	
11	43	41	
12	17	6	Local Shops (450 m^2) Child Care Centre
13	48	48	
14	63	10	
15	67	0	
16	79	0	
17	46	23	
18	18	0	
19	59	48	
20	-	-	Primary School
21	45	44	
22	66	62	
23	10	0	
24	28	0	
25	44	0	
26	80	0	
27	43	0	
Total	1,215	580	

Notes: 1) Land Use Zones are as shown in Figure A.9.
2) Includes 6 grouped housing dwellings at R20.
3) Includes 18 grouped housing dwellings at R20, 10 dwellings at R30 and 13 dwellings at R40.

Source: BIA Group Pty Ltd.

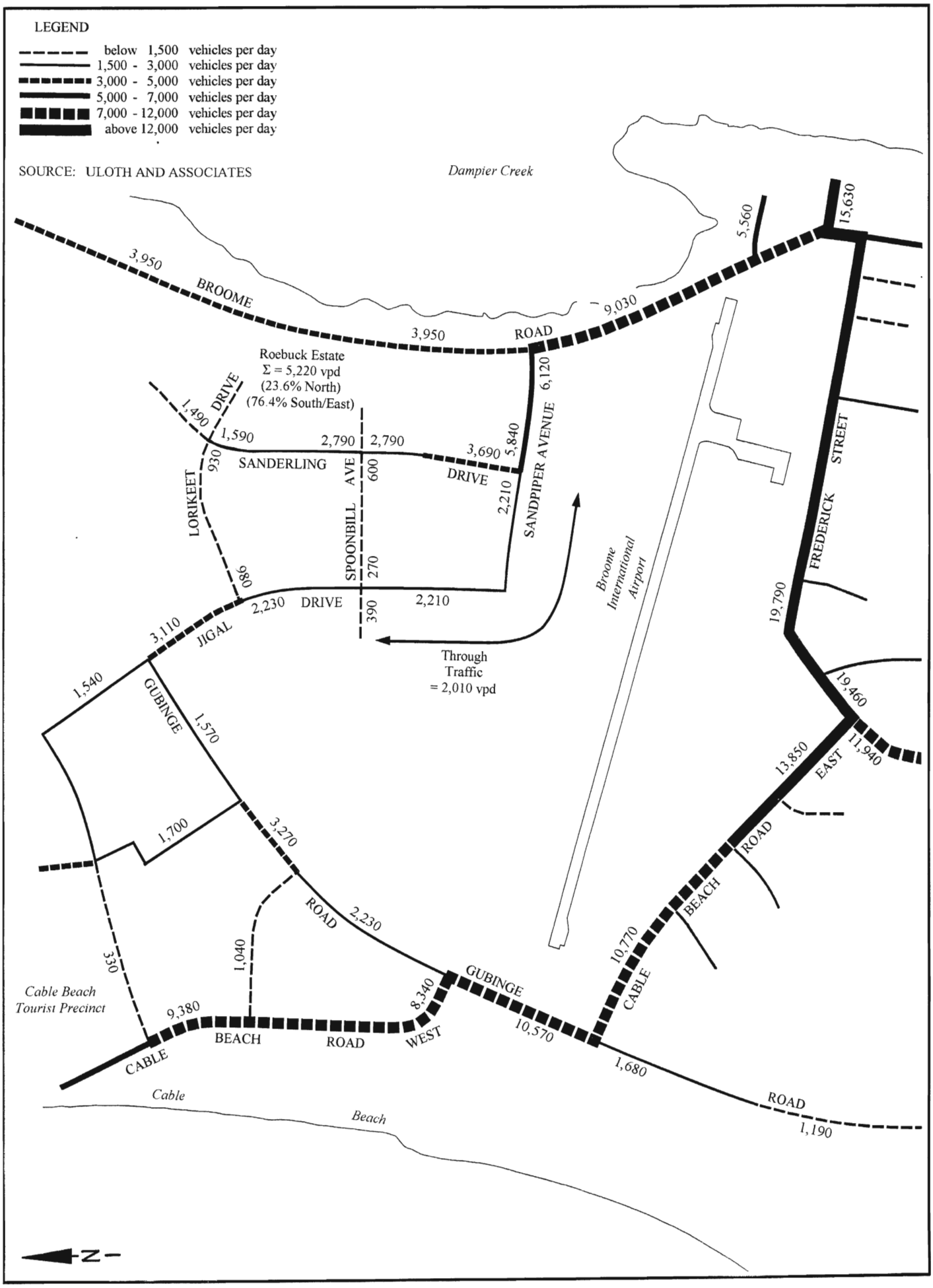
A.5 2006 HIGH SEASON TRAFFIC FORECAST

The final 2006 high season traffic forecast is shown in Figure A.12.

A.6 FUTURE HIGH SEASON TRAFFIC FORECASTS

The 2011 high season traffic forecast is shown in Figure A.13.

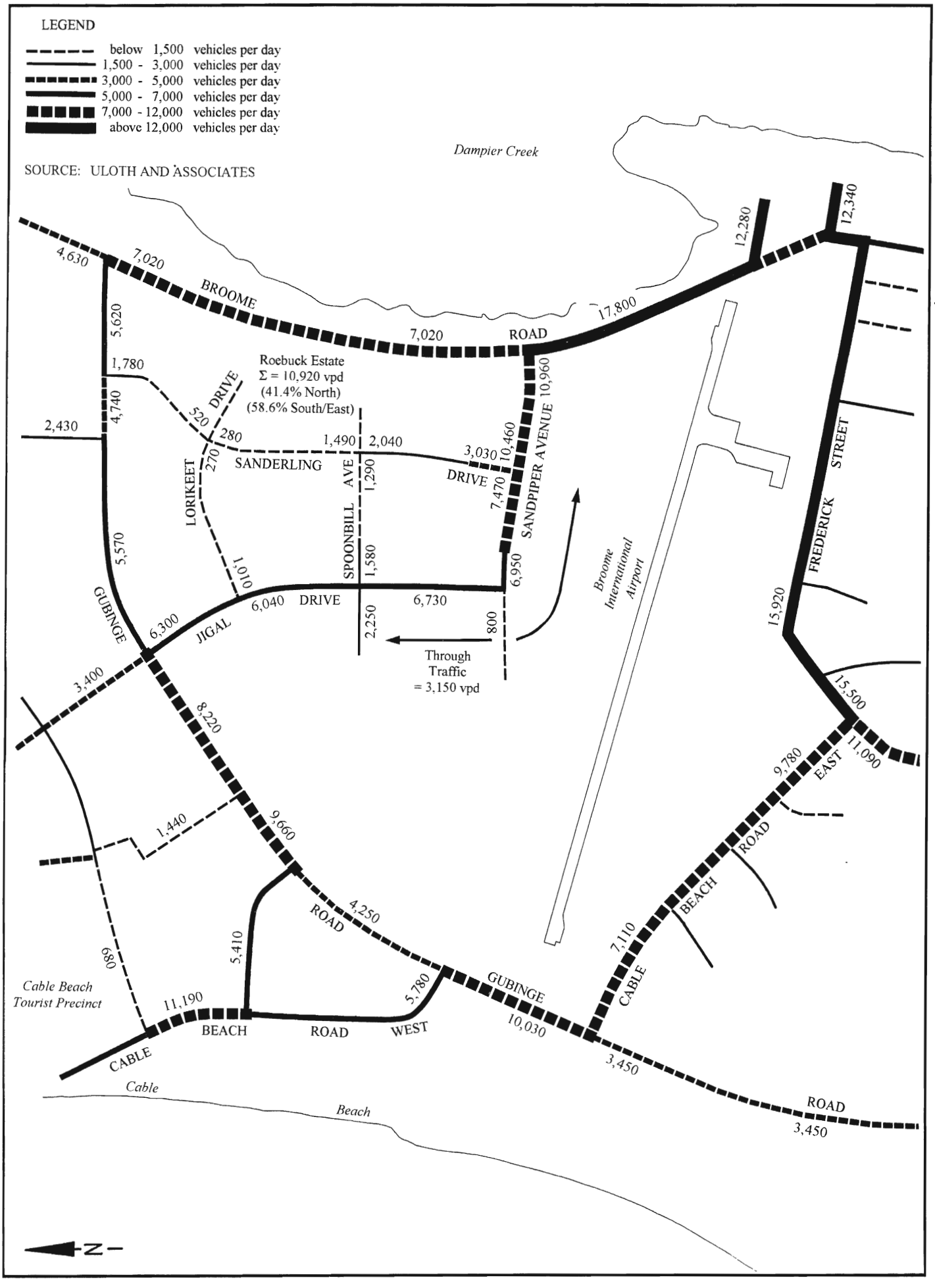
Alternative forecasts for the 2031 high season are shown in Figures 1 and 2 in Section 2.4.



2006 High Season Traffic Forecast

ULOTH AND ASSOCIATES REFINED TRAFFIC MODEL

FIG. A.12



2011 High Season Traffic Forecast

ULOTH AND ASSOCIATES REFINED TRAFFIC MODEL

FIG.
A.13

TECHNICAL APPENDIX B

Airport Area Development Plan.

B.1 EXISTING SITUATION AT BROOME AIRPORT

Figure B.1 shows the existing road network in the vicinity of Broome International Airport.

Figure B.2 shows the existing weekday traffic flows for April 2006, including an indication of turning patterns at MacPherson Street, Coghlan Street and Bagot Street.

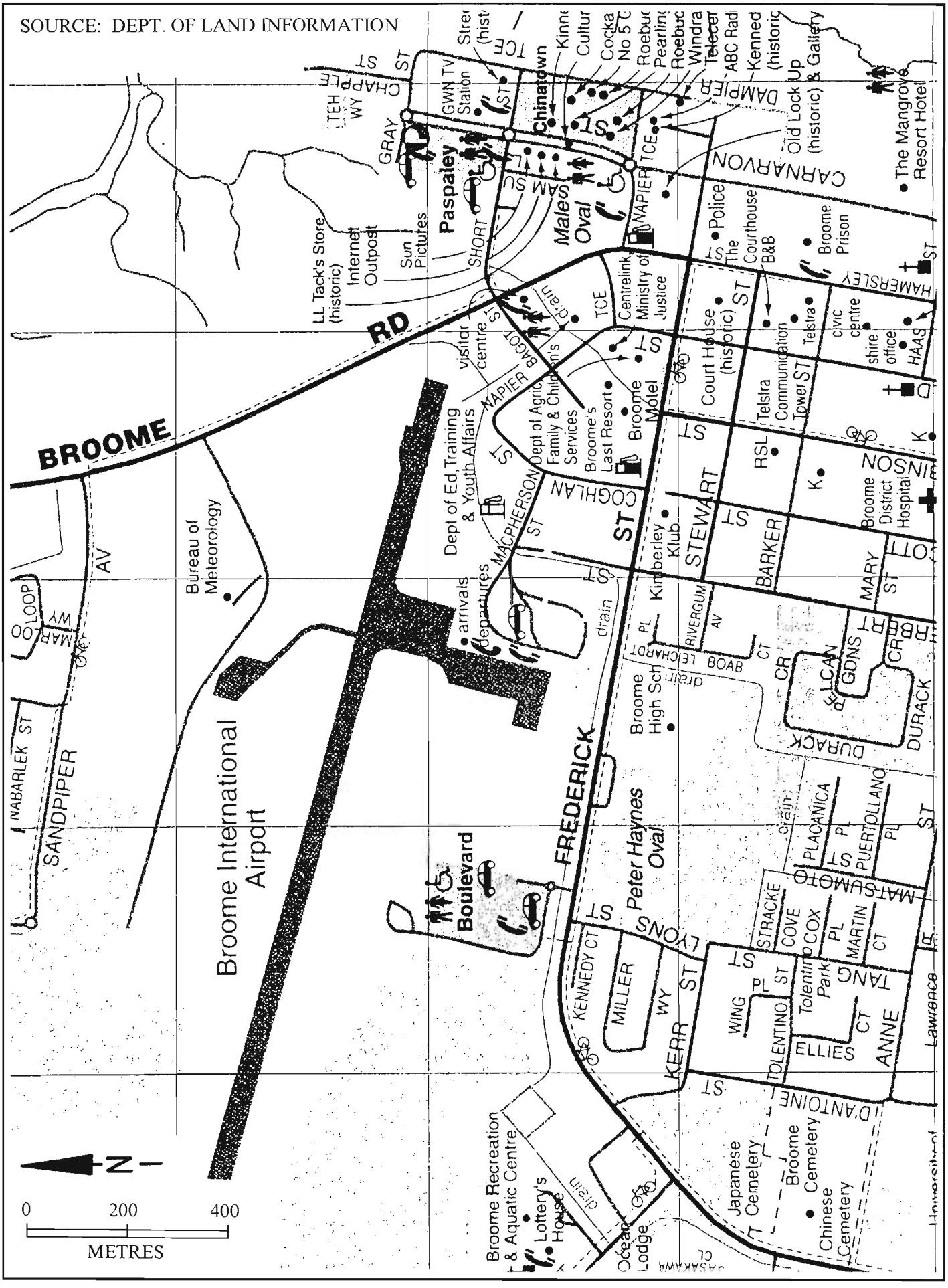
B.2 AIRPORT AREA DEVELOPMENT PLAN

The Broome Airport Area Development Plan is shown in Figure B.3.

It can be seen that the proposed plan includes a new access road off Frederick Street, which is located approximately 560 metres west of Coghlan Street.

It is important to note that in addition to 'typical' airport uses, the plan also includes provision for Mixed Use development along Frederick Street and Coghlan Street.

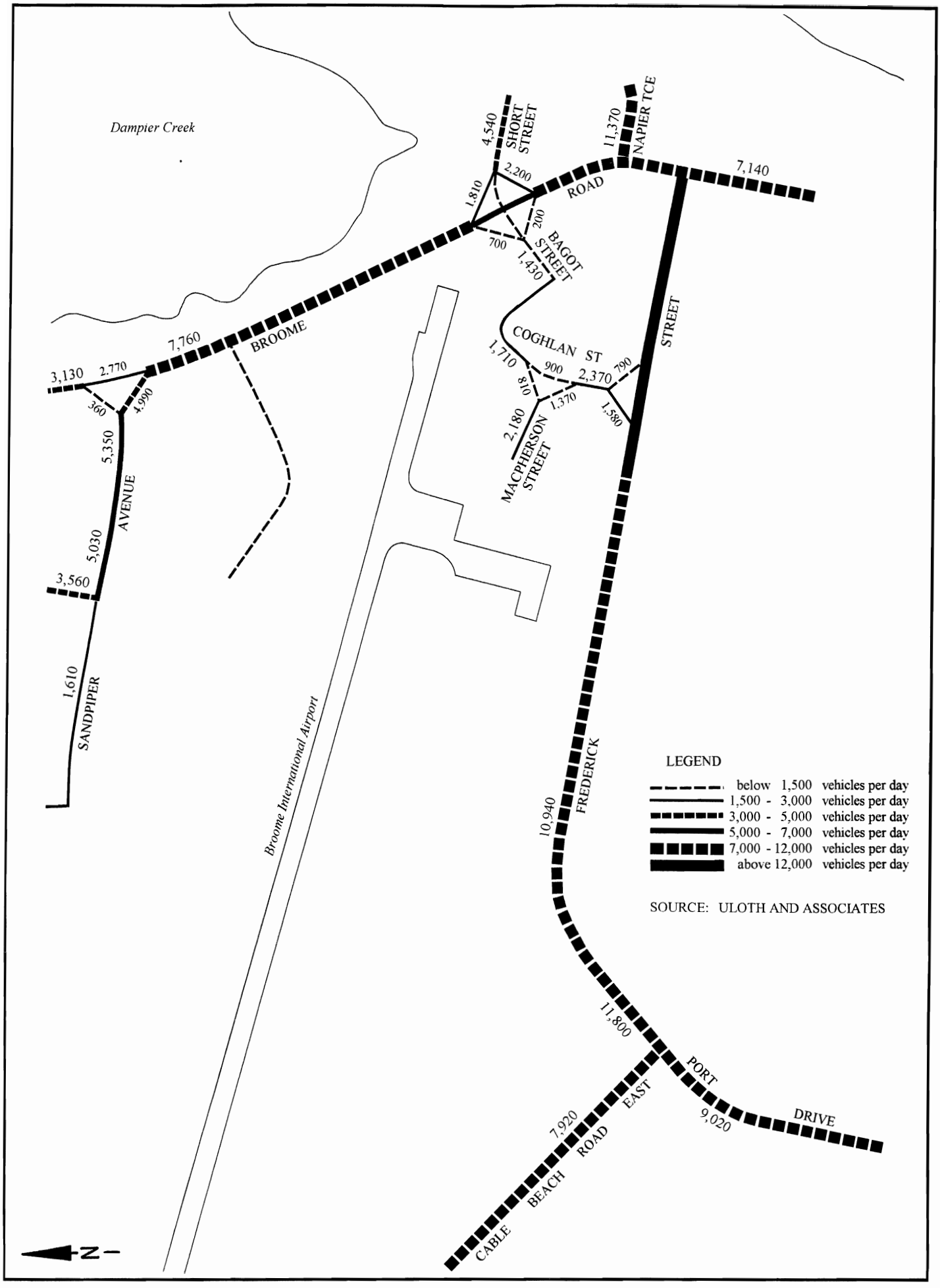
The plan also includes residential development south of Sandpiper Avenue. However, this is already included in the various traffic forecasts as part of Roebuck Estate.



Existing Road Network

IN THE VICINITY OF BROOME AIRPORT

FIG. B.1

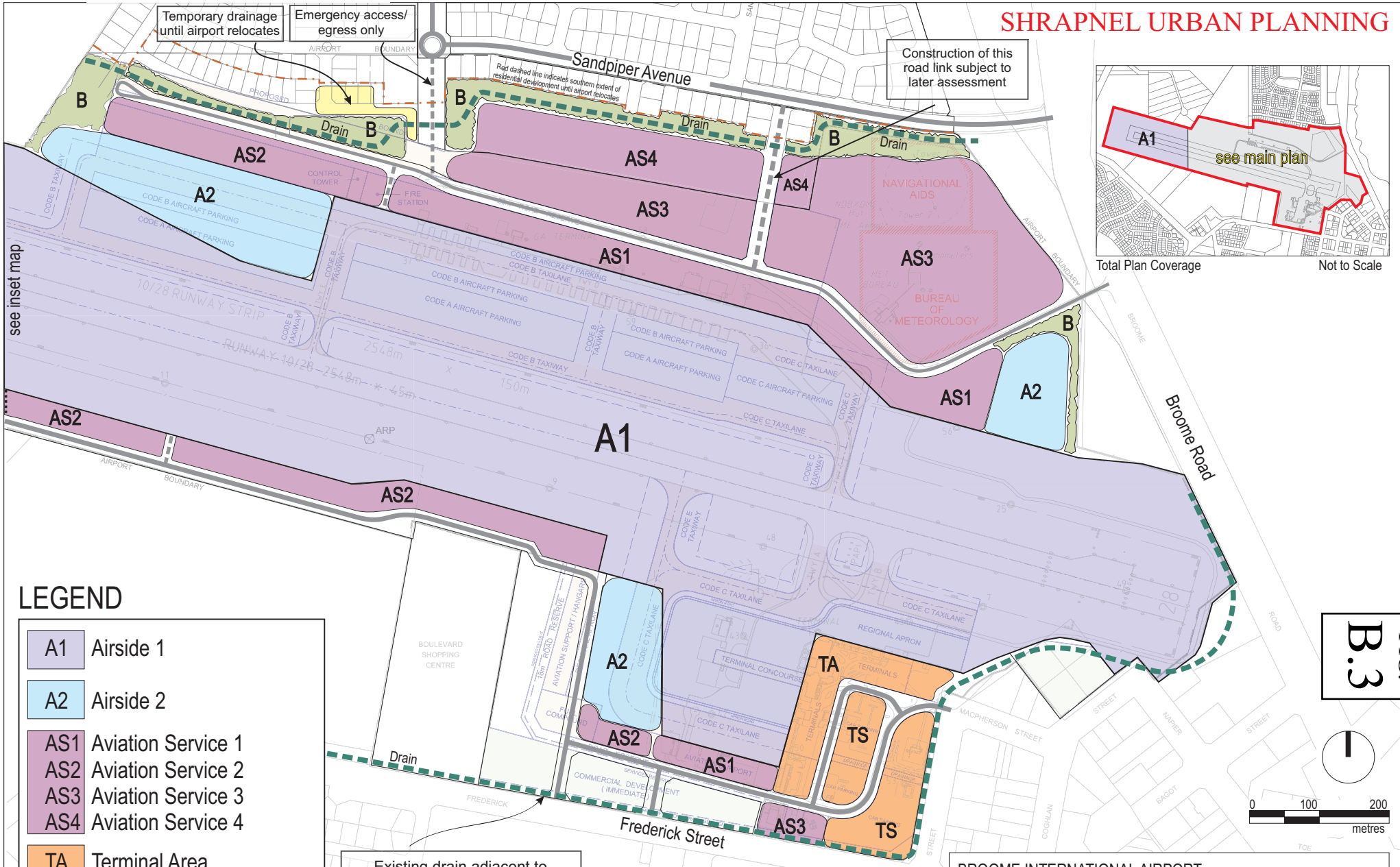


Existing Weekday Traffic Flows

IN THE VICINITY OF BROOME AIRPORT

FIG. B.2

SHRAPNEL URBAN PLANNING



Total Plan Coverage Not to Scale

LEGEND

A1	Airside 1
A2	Airside 2
AS1	Aviation Service 1
AS2	Aviation Service 2
AS3	Aviation Service 3
AS4	Aviation Service 4
TA	Terminal Area
TS	Terminal Area Support
B	Landscaped Buffer

FIG. B.3

0 100 200 metres

BROOME INTERNATIONAL AIRPORT
Airport Development Plan

PLAN A: AIRPORT DEVELOPMENT

Base Map is Indicative and Subject to Change
Source: Broome International Airport Pty Ltd

February 2012

B.3 FUTURE TRAFFIC GENERATION

Table B.1 shows the estimated increase in passenger numbers from 2005 to 2006 and 2031, and Table B.2 then calculates the growth factor from April 2006 to July 2006.

Table B.3 therefore shows the calculation of 2031 high season traffic flows related to 'typical' airport activities.

Table B.4 then shows the calculation of future external traffic flows to and from the southern side of the Airport Area Development Plan, taking into account an assumed 10 percent interaction between the 'typical' airport activities and the Mixed Use developments.

TABLE B.1
CALCULATION OF ANNUAL PASSENGER GROWTH FACTORS TO 2006 AND 2031
BROOME INTERNATIONAL AIRPORT

ITEM	AMOUNT
• Annual Passenger Forecasts [1)] - 2005 - 2006 - 2031	 310,243 passengers 323,583 passengers 865,087 passengers
• Growth Factor - 2005 to 2006	1.04
• Growth Factor - 2006 to 2031	2.67

Notes: 1) Passenger numbers provided by BIA Group Pty Ltd.

Source: Uloth and Associates.

TABLE B.2
CALCULATION OF PASSENGER GROWTH FACTOR FROM APRIL 2006 TO JULY 2006
BROOME INTERNATIONAL AIRPORT

ITEM	AMOUNT
• Monthly Passenger Numbers [1)] - July 2005 - April 2006	 37,892 passengers 25,386 passengers
• Factor - April 06 to July 05 • Growth Factor - July 05 to July 06 [2)]	1.49 1.04
• Combined Factor - April 06 to July 06	1.56

Notes: 1) Passenger numbers provided by BIA Group Pty Ltd.
2) From annual growth factors in Table B.1.

Source: Uloth and Associates.

TABLE B.3
CALCULATION OF 2031 HIGH SEASON 'TYPICAL' AIRPORT TRAFFIC
BROOME INTERNATIONAL AIRPORT

ITEM	AMOUNT
• Existing Airport Traffic (April 2006) [1)]	2,180 vehs. per day
• Factor to July 2006 [2)]	1.56
• 2006 High Season Airport Traffic	3,400 vehs. per day
• Factor to 2031 [3)]	2.67
• 2031 High Season 'General Airport' Traffic [4)]	9,080 vehs. per day

Notes: 1) As shown in Figure A.2.
2) Combined Factor (April 06 to July 06) from Table B.2.
3) Growth Factor (2006 to 2031) from Table B.1.
4) Does not include traffic generated by any Mixed Use developments along Frederick Street or Coghlan Street.

Source: Uloth and Associates.

TABLE B.4
CALCULATION OF FUTURE EXTERNAL TRAFFIC FLOWS
BROOME AIRPORT AREA DEVELOPMENT PLAN - SOUTHERN SIDE

ITEM	AMOUNT
• 'Typical' Airport Activities	
- Total Traffic Generation [1)]	9,080 vehicles per day
- Less internal trips to Mixed Uses [2)]	400 vehicles per day
- Resultant External Traffic	8,680 vehicles per day
• Mixed Use Developments	
- Total Traffic Generation	4,000 vehicles per day
- Less internal trips to Airport [2)]	400 vehicles per day
- Resultant External Traffic	3,600 vehicles per day
• Total External Traffic (To/From Southern Side of Airport)	12,280 vehicles per day

Notes: 1) From Table B.3.
2) Assumed 10 percent of Mixed Use traffic generation.

Source: Uloth and Associates.

B.4 EXTERNAL TRIP DISTRIBUTION

Table B.5 shows the existing and future distribution of traffic flows to and from the 'typical' airport activities and the Mixed Use developments within the Airport Area Development Plan.

The distribution of 'typical' airport traffic was initially based on the distribution of Tourist Accommodation as documented within the DPI Traffic Modellings report, with minor changes to reflect the surveyed traffic patterns within Coghlan Street and MacPherson Street.

The distribution of Mixed Use traffic is based on the distribution of residential trip productions within the refined and calibrated trip matrices, as utilised in the overall traffic model.

TABLE B.5
EXISTING AND FUTURE TRAFFIC DISTRIBUTION
BROOME AIRPORT AREA DEVELOPMENT PLAN

APPROACH	PERCENTAGE DISTRIBUTION		
	'Typical' Airport Traffic		2031 Mixed Use Traffic
	Existing	2031	
• Broome Road, north of Short St	26%	35%	33%
• Short Street, east of Broome Rd	11%	5%	2%
• Frederick Street, east of Coghlan St	15%	10%	12%
• Herbert Street, south of Frederick St	14%	5%	11%
• Frederick Street, west of Herbert St	34%	45%	42%
• Total	100%	100%	100%

Source: Uloth and Associates

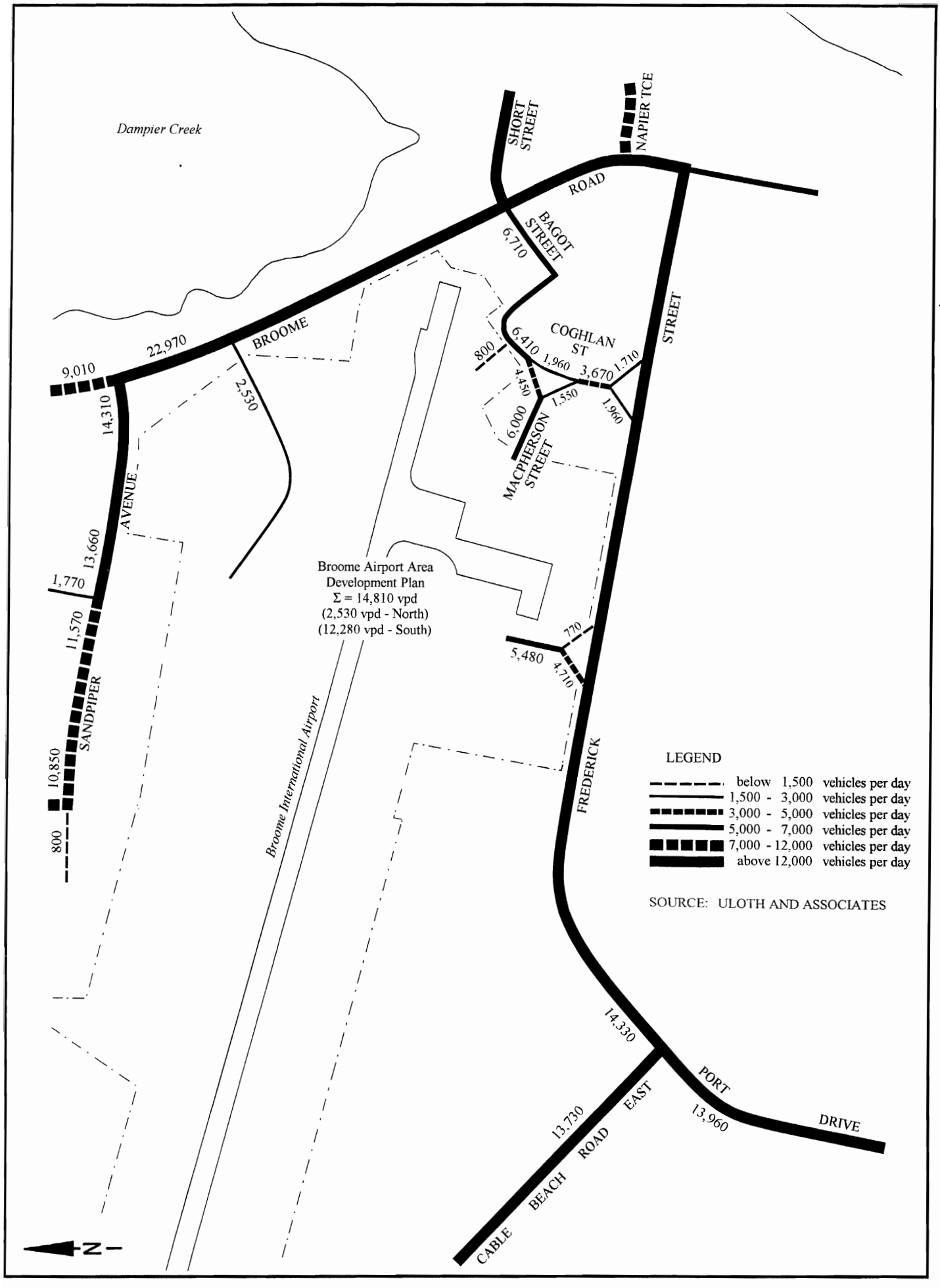
B.5 FUTURE TRAFFIC FLOWS

Figure B.4 shows the 2031 high season traffic flows in the vicinity of Broome International Airport.

The Airport traffic is based on the traffic generation and traffic distribution presented in Chapters B.3 and B.4.

The surrounding traffic was initially based on the 2031 traffic forecast shown in Figure 2 in Chapter 2.4. However, for analysis purposes, it is assumed that Frederick Street will carry 12,000 vehicles per day of non-airport traffic west of Herbert Street, and 14,000 vehicles per day east of Herbert Street, giving total traffic flows of approximately 17,000 vehicles per day west of the new airport access road and approximately 16,000 vehicles per day east of Coghlan Street.

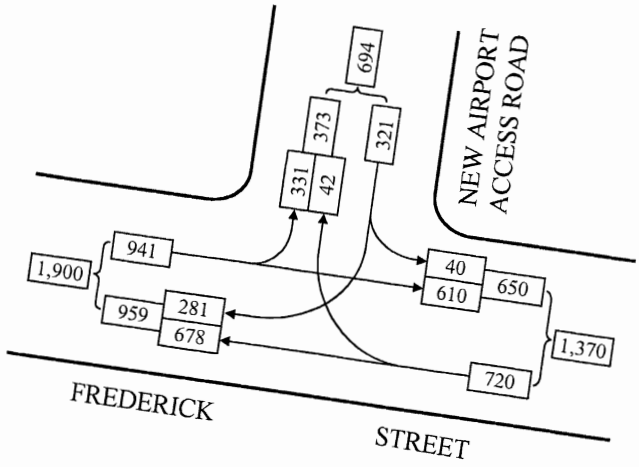
The corresponding peak hour traffic flows at MacPherson Street, Coghlan Street, Frederick Street, and the new access road are shown in Figures B.5 and B.6.



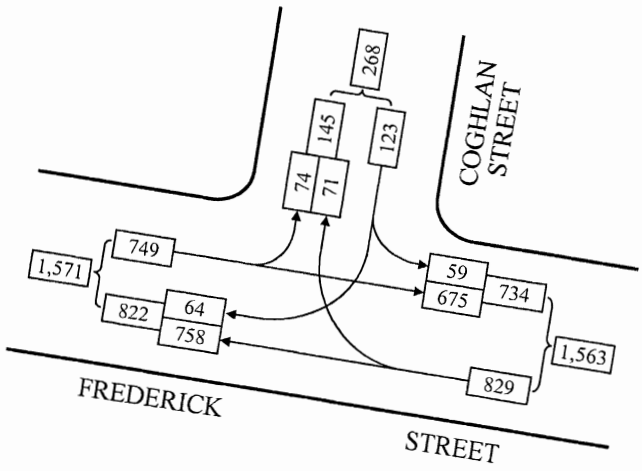
2031 High Season Traffic Flows

IN THE VICINITY OF BROOME AIRPORT

FIG. B.4



FREDERICK STREET - NEW AIRPORT ACCESS



FREDERICK STREET - COGHLAN STREET

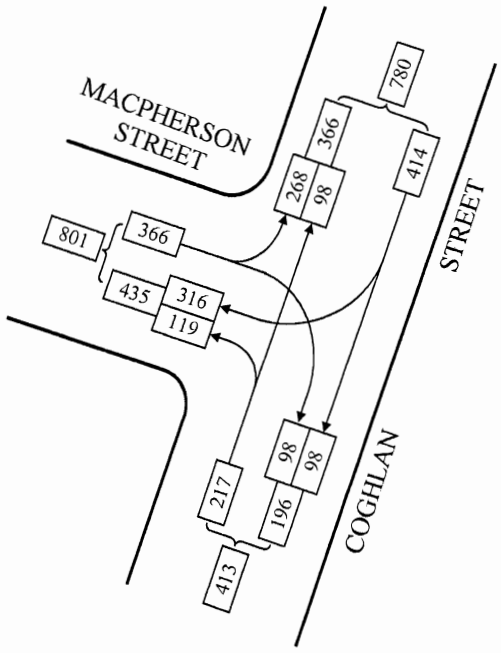
N

SOURCE: ULOTH AND ASSOCIATES

2031 Peak Hour Traffic

FREDERICK STREET, NEW AIRPORT ACCESS, COGHLAN STREET

FIG. B.5



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COGHLAN STREET - MACPHERSON STREET

SOURCE: ULOTH AND ASSOCIATES

2031 Peak Hour Traffic

COGHLAN STREET - MACPHERSON STREET

FIG.

B.6

B.6 TRAFFIC OPERATIONAL ANALYSIS

Tables B.6 to B.8 show the 2031 high season peak hour intersection operational characteristics for the Frederick Street - New Access Road, Frederick Street - Coghlan Street, and Coghlan Street - MacPherson Street unsignalised junctions, on the basis of the future peak hour traffic flows in Figures B.5 and B.6.

The Broome Road - Bagot Street - Short Street intersection has not been analysed, since the intersection is already planned to be upgraded to a traffic signal or roundabout, which will ensure suitable operating conditions.

It can be seen in Table B.6 that the Frederick Street - New Airport Access Road junction will operate at an acceptable Level of Service C, indicating satisfactory operating conditions with average traffic delays, during the 2031 high season peak hour. However, it is important to note that this is only based on an improved layout of Frederick Street, including the provision of a wide median to allow right turn vehicles to cross Frederick Street in 2 stages.

It is also important to note that the new airport access road should be slightly further west than the position shown on the Airport Area Development Plan, in order to provide suitable intersection spacing between the existing driveways and access roads along the southern side of Frederick Street.

Minimum intersection spacings of 40 metres for a right-left stagger and 60 metres for a left-right stagger are recommended, as specified in *Liveable Neighbourhoods* for Integrator B Arterial Streets.

TABLE B.6
OPERATIONAL CHARACTERISTICS FOR UNSIGNALISED FREDERICK ST - NEW AIRPORT ACCESS RD JUNCTION – BROOME AIRPORT AREA DEVELOPMENT PLAN
2031 HIGH SEASON EVENING PEAK HOUR

ITEMS	OPERATIONAL CHARACTERISTICS Evening Peak Hour					
No. of Approach Lanes: N E S W	2 2 - 1					
Approach	Move-ment	X-Value	Max. Queue (veh)	Max. Queue m	Avrge Delay (sec)	Level of Serv.
Airport Access Rd - north	L	0.083	0.3	2	12.9	B
	R	<u>0.696</u>	4.5	33	20.4	C
Frederick St - east	T	0.378	0.0	0	0.0	A
	R	0.092	0.4	3	15.5	C
Frederick St - west	LT	0.534	0.0	0	2.9	A

Notes: Level of Service calculations are based on Average Delay and Degree of Saturation.
Underlined X-values denote maximum values.

Source: Uloth and Associates

Table B.7 shows that the Frederick Street - Coghlan Street junction will operate at a high Level of Service B, if Frederick Street is upgraded in the long term, while Table B.8 shows that the existing Coghlan Street - MacPherson Street junction will also operate at a high Level of Service B, indicating good operating conditions with short traffic delays.

TABLE B.7
OPERATIONAL CHARACTERISTICS FOR UNSIGNALISED FREDERICK STREET - COGHLAN STREET JUNCTION – BROOME AIRPORT AREA DEVELOPMENT PLAN
2031 HIGH SEASON EVENING PEAK HOUR

ITEMS	OPERATIONAL CHARACTERISTICS Evening Peak Hour					
No. of Approach Lanes: N E S W	2 2 - 1					
Approach	Move-ment	X-Value	Max. Queue (veh)	Max. Queue m	Avrge Delay (sec)	Level of Serv.
Coghlan St - north	L	0.111	0.4	3	12.3	B
	R	0.150	0.5	4	14.0	B
Frederick St - east	T	<u>0.423</u>	0.0	0	0.0	A
	R	0.149	0.7	5	14.6	B
Frederick St - west	LT	0.420	0.0	0	0.8	A

Notes: Level of Service calculations are based on Average Delay and Degree of Saturation.
Underlined X-values denote maximum values.

Source: Uloth and Associates

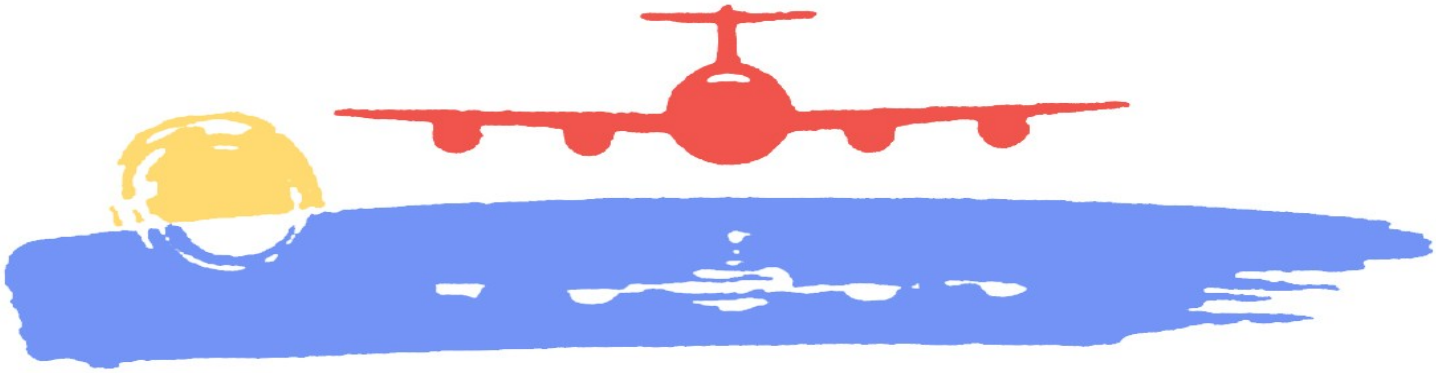
TABLE B.8
OPERATIONAL CHARACTERISTICS FOR UNSIGNALISED COGHLAN STREET - MACPHERSON STREET JUNCTION – BROOME AIRPORT AREA DEVELOPMENT PLAN
2031 HIGH SEASON EVENING PEAK HOUR

ITEMS	OPERATIONAL CHARACTERISTICS Evening Peak Hour					
No. of Approach Lanes: N E S W	2 - 1 2					
Approach	Move-ment	X-Value	Max. Queue (veh)	Max. Queue m	Avrge Delay (sec)	Level of Serv.
Coghlan St - north	T	0.054	0.0	0	0.0	A
	R	<u>0.291</u>	1.8	13	7.9	A
Coghlan St - south	LT	0.124	0.0	0	3.6	A
MacPherson St - west	L	0.267	1.1	8	7.2	A
	R	0.167	0.8	6	11.0	B

Notes: Level of Service calculations are based on Average Delay and Degree of Saturation.
Underlined X-values denote maximum values.

Source: Uloth and Associates.

APPENDIX B
Environment Report



BROOME INTERNATIONAL AIRPORT

ENVIRONMENT REPORT

Final

February 2012

Ref: server\lyn\menzies\BIA Enviro Report Final

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Executive Summary

Environment Policy

The Environment Policy defines the Broome International Airport Group's (BIAG) vision for environmental management at the airport. The Environmental Policy documents BIAG's agenda for environmental management at the airport and communication with stakeholders over environmental issues.

The Environment Policy is periodically reviewed by BIAG management with the current policy adopted by the BIAG Board in May 2006.

Environmental Impacts from Current Operations

Broome International Airport has operated in private ownership since 1991 and has a single runway with supporting infrastructure currently operating.

Operational facilities at the airport include runway and lighting systems, an air traffic control tower and other navigational aids.

Broome International Airport has 62 tenants who carry out a diverse range of activities which include refuelling and fuel storage, aircraft maintenance, medical evacuation and associated aviation support services.

Some of these operations and work practices have the potential to impact on the environment. These include:

- Fuel and oil storage and use
- Chemical storage and use
- Aircraft washdown
- Solid waste disposal
- Domestic waste water production
- Aircraft movement

Management plans will be developed and implemented to control the risk associated with each of the above operations.

Heritage

The *Australian Heritage Council Act, 2003* enables areas with, natural or cultural significance to be listed on the Register of National Estate. There are no such listings for land occupied by Broome International Airport.

There are no sites recorded on a register of Aboriginal Heritage sites kept by the Western Australian Department of Indigenous Affairs and no European Heritage sites registered with the National Trust, Western Australia Heritage Commission or the Shire of Broome.

Environmentally Significant Areas Roebuck Bay

The airport is immediately adjacent to the inter-tidal habitats of Dampier Creek and Roebuck Bay.

The Roebuck Bay area is recognized as being of international importance and is subject to three international treaties based on its importance to migratory waders.

These are:

- Ramsar (The Ramsar Convention which identifies wetlands of international significance) (see Figures 4.1 and 4.2);
- JAMBA (Japan-Australia Migratory Bird Agreement); and
- CAMBA (China-Australia Migratory Bird Agreement)

Executive Summary continued……..

The latter two treaties recognize that the principal flight paths of migratory birds returning to the northern hemisphere take them through eastern Asia where a number of feeding/rest stops are necessary.

Bird strikes at the airport are a recognized hazard. This often means that inter-tidal waders and other bird species must be dispersed from the landing strip with bird-scare shot prior to flight arrivals.

The airport owners also have additional on the ground measures in place to minimize bird strike, the details of which are covered in the BIA Wildlife Hazard Management System.

Natural Area Management

At Broome International Airport we recognize the importance of protecting our ecological values and have made the commitment to preserve the natural environment under our care to the best of our ability.

Surface Water

A range of operations at the airport have the potential to impact on surface water quality. BIA has undertaken management actions to control surface water quality at the airport and will be active in educating tenants about the impacts of their operations on surface water quality.

Drainage at the airport consists of a combination of piped and open drainage conveying excessive storm water run off from impervious areas including the runway, taxiways, aprons and buildings.

The open drainage system include low gradient retention swales enabling the heavier sand/silt particles to be deposited prior to discharge off site. These swales will be regularly maintained, and ultimately, as revegetation minimizes erosion, the amount of transported silt will be significantly reduced.

Groundwater and Soils

Groundwater and soil impacts are intimately linked, and as such, the impact of airport operations on groundwater and soil have been considered together.

As surface drainage is directly linked to the aquifer contaminants can be transmitted directly to the water table.

Fuel storage poses the greatest potential threat to the groundwater and soil quality at the airp ort. All fuels and oils are stored in aboveground tanks and risks associated with this stora ge have be en minimized with the introdu ction of bundi ng and containment requirements.

Domestic Waste Water

Broome International Airport is partially without sewer facilities. It is planned nevertheless that wherever possible buildings located on the airport will eventually be connected to sewerage. In the short to medium term the choice for domestic wastewater treatment still lies between traditional septic systems and new technology alternatives, such as aerobic treatment units.

BIA are looking at implementing a policy that requires existing and new developments to con nect to Wate r Corporation sewers wherever possible.

Executive Summary continued……..

Air Quality

Potential air emissions at Broome International Airport are minor and none would be classified as causing air pollution in accordance with the regulations. Similarly the nature of the airport's aviation activities result in only very minor greenhouse gas emissions and are excluded from this strategy as control of aircraft emissions in flight are retained by DOTARS. Air quality control at Broome International Airport is focused on tenant education, and dust control.

Noise Management

Airservices Australia (ASA) are the regulatory authority responsible for regi stering and investigating aircraft noise from Australian Airports, however BIA maintain a proactive role in addressing these issues.

BIA has implemente d a number of initiatives since privatization to minimize t he impact on local re sidents wherever possible.

The most recent initiative of the BIA Grou p to h elp reduce aircraft noise is the implement ation of a se t of procedures that dire ct pilots whe n arriving or depa rting the aerodrome. The DAPS are developed as part of our noise abatement program and g uide pilots to 'fly neighbourly'.

Ground Based Noise

BIA is in the process of reviewing and modifying the ground running procedures. Noise levels outsi de the airport boundary need to be con sidered and the new procedures specify that aircraft are restricted to a maximum of five minutes or as reco mmended by the manufacturer for start up and shut down procedures on the apron area. Engineer testing and prolonged run-ups must be conducted in de dicated run-up bays o r on the designated non duty taxiway in line with the policy.

Construction Noise

Construction activity tends to gene rate noise a nd vibration, which may interfere with p ublic amenity. Presently any noise ge nerated from construction at the airport impacts on airp ort tenants o nly, as works are usually conducted in and arou nd the aviation building line during working hours.

Section 1. Existing Environment

1. THE EXISTING ENVIRONMENT

1.1 The Site
1.2 Climate
1.3 Soils
1.4 Hydrology
1.5 Hydrogeology
1.6 Flora & Fauna
1.7 Heritage
1.8 Environmentally Significant Areas
1.9 Airport Operations and Tenants

Existing Environment

1. 1 THE SITE

Broome International Airport (BIA), Western Australia's largest regional airport is located on the Dampier Peninsula approximately 1.5 kilometers from the commercial centre of Broome and stretching from Roebuck Bay in the west to Dampier Creek in the east **(Figure 1)**. The total site area is 163 ha of which 146 ha is developed aviation infrastructure and 17 ha of either cleared land or remnant and re-growth bush land which will be developed for future aviation uses.

Topography

The Dampier Peninsula in the vicinity of Broome consists of a slight ridge generally running north-south with gentle gradients to Roebuck Bay in the west and Dampier Creek in the east. BIA is predominately on the eastern gradient of the ridge which peaks at an elevation of 17.5m Australian Height Datum (AHD), approximately 500 metres from the western end of the runway. The level at the eastern end of the runway is approximately 6.3m in AHD.

1.2 CLIMATE

Broome has a semi-arid tropical climate with average maximum temperatures ranging from 28^0C to 35^0C. Rainfall has ranged between 132mm and 1,454mm per annum with an average of 569mm. The majority of rain falls between December and March. A warm dry season occurs from April to November.

1.3 SOILS

Apart from the Holocene dunes, which lack a soil horizon, and the immature soils developed in the Pleistocene dunes, the principal soil-type on the Peninsula is the pindan, which developed during the Quaternary period (the past two million years) on a desert dune sandstone.

The term pindan has been used to describe the most widespread plant community on the Peninsula, and is also applied to the soil-type associated with this vegetation. The soils of the area are red earthy sands, which are of wind blown origin. They have deep uniform profiles of coherent clayish sands, and an earthy appearance apparently due to the coating and bridging of sand grains by clayish materials, including iron oxides.

The pindan soils form extensive undulating plains with little or no organized surface drainage; seasonal run-off forms sheets of water behind the coastal dune systems. Around Broome, the pindan is often overlain by a layer of more recent, coarser and unconsolidated sand, which assists in water penetration, plant establishment and growth.

When pindan soils dry out, they become hard with a dusty surface. When they are wet they become soft and greasy, with the potential to erode rapidly and form deep, steep-sided gullies.

Where the pindan plain meets the sea, undercutting of the land often occurs at high tide level, followed by slumping, which creates an eroding pindan cliff line.

Existing Environment continued.....

1.4 HYDROLOGY

Surface drainage within the airport landholding is primarily west to east with ultimate discharge via open drainage under Broome Road and into Dampier Creek. A limited amount of drainage run-off is to the west ultimately into Roebuck Bay via the Cable Beach drainage system.

The intensity and amount of rainfall, particularly during the "wet" season in Broome requires installation of significant drainage infrastructure throughout the town including large open drains, compensating basins and drainage swales. Drainage at the airport consists of a combination of piped and open drainage to accommodate run-off in excess of the infiltration capacity of the soils.

1.5 HYDROGEOLOGY

The airport site is situated within the Broome Groundwater Area. This Area was proclaimed in 1974 and has subsequently been extended to now cover an area of 175,473 ha. The southern limit of the Groundwater Area is marked by the southern limit of the Broome peninsula. From here, the Groundwater Area extended approximately 57 km northwards along the coast and approximately 35 km to the east.

1.6 FLORA & FAUNA

The most prevalent vegetation category in Broome is "Pindan". This category includes a combination of vegetation ranging from grasslands, heaths and shrubs to Eucalypt woodlands.

1.7 HERITAGE

♦ **Natural Heritage**

The *Australian Heritage Council Act 2003* enables areas with natural and cultural significance to be listed on the Register of National Estate. There are no such listings for land occupied by Broome International Airport.

♦ **Indigenous Heritage**

Database searches provided by the Western Australian Heritage Council and the Australian Heritage Commission revealed that there are no sites of significance within the boundaries of Broome International Airport.

As there are no sites of ethnographic or archaeological significance within the area proposed for the development, there will be no impacts on any known sites protected under *Aboriginal Heritage Act 1972.*

♦ **European Heritage**

No European heritage sites have been registered with the National Trust, Western Australian Heritage Commission or the Shire of Broome. There are also no visible signs of European heritage on site.

1.8 ENVIRONMENTALLY SIGNIFICANT AREAS

Roebuck Bay

The Roebuck Bay area is recognized as being of international importance and is subject to three international treaties based on its importance to migratory waders. These are:

- Ramsar (The Ramsar Convention which identifies wetlands of international significance) (see Figures 4.1 and 4.2);
- JAMBA (Japan—Australia Migratory Bird Agreement); and
- CAMBA (China—Australia Migratory Bird Agreement)

The latter two treaties recognize that the principal flight paths of migratory birds returning to the northern hemisphere take them through eastern Asia where a number of feeding/rest stops are necessary (Collins, 1995).

Roebuck Bay supports extensive areas of intertidal flats and beaches which comprise the landfall and feeding resources for large numbers of international migratory birds (Tulp and de Goeij, 1994). A wide range of species utilize the Roebuck Bay area and it has been estimated that up to 850,000 waders of 44 different species utilize the Bay and Eighty Mile Beach during migratory periods (Watkins, 1993; Keneally, et al., 1997). Roebuck Bay has been identified as an internationally important site for 19 of these species (Watkins, 1993). Amongst these 19 species of waders, the most abundant at Roebuck Bay include the Bartailed Godwit *Limosa lapponica* (up to 65,000 individuals), the Large Sand Plover *Charadrius leschenaultii (*up to 26,900) and the Great Knot *Calidris tenuirostris (*22,600) (Watkins, 1993).

The majority of arrivals from the northern hemisphere occurs during the period of August—September, with departures during the following March—April (Collins, 1995). A smaller proportion of these waders, particularly first and second year juveniles, remain resident in the area throughout the year. The timing of the departures for the majority of the migratory birds is well defined and usually occurs over a period of about 3 weeks in March—April, with most departures taking place in the two to three hours before dusk (Chris Hassell, pers. com., 2000).

The airport is immediately adjacent to the intertidal habitats of Dampier Creek and Roebuck Bay. This often means that intertidal waders and other bird species must be dispersed from the landing strip with bird-scare shot or other methods prior to flight arrivals.

CASA has advised that bird strikes at the airport are a recognized hazard. Pilots are made aware of the bird hazard via notices in the Airservices Australia pilots publication Enroute Supplement Australia (ERSA). The airport owners also have additional on the ground measures in place to minimize bird strike. This includes regular checks, drainage and rubbish control, bird harassment, minimize standing water and food sources and participation in the ATSB bird reporting programme. It should be noted however, the actual incidence of bird strikes is small. Generally bird strikes reported to the airport to date have been at an altitude of less than 20 m AGL (Above Ground Level).

BIA has produced and implemented a 'Wildlife Hazard Management System' which addresses in detail the identification and management of bird strikes.

Natural Values

There are no environmentally significant areas on the airport land.

Existing Environment continued.....

1.9 AIRPORT OPERATIONS AND TENANTS

Broome International Airport has been privately operated since 1991 and has one runway with supporting infrastructure **(Figure 2)**.

Operational facilities at the airport include runway and lighting systems, a CAGRO tower, general aviation area and other navigational aids. Other facilities include refuelling and fuel storage depots, aircraft maintenance facilities, and associated aviation support services.

Tenants

The 62 tenants at Broome International Airport conduct a varied range of aviation and non aviation activities. The majority of these businesses are associated with the aviation industry including RPT operations, charter flights, air surveillance, refuelling depot, maintenance services, air freight, catering and aircraft supplies. A range of operations and work practices at the airport have the potential to impact on the environment.

These include:

- Fuel and oil storage and usage
- Chemical storage and usage
- Domestic wastewater production
- Aircraft washdown
- Fire control
- Aircraft movements
- Solid waste disposal

BIA proposes to produce an environmental handbook for the airport. This booklet will provide advice on environmental management issues for tenants and airport users.

Surface Water—Drainage

Drainage at the airport consists of a combination of piped and open drainage conveying excessive storm water run off from impervious areas including the runway, taxiways, aprons and buildings.

The grassed flight strip provides significant capacity for infiltration of run off from the runway and, where possible, other grassed impervious areas will be incorporated into future planning to encourage infiltration and reduce storm water flows off site.

The open drainage system include low gradient retention swales enabling the heavier sand/silt particles to be deposited prior to discharge off site. These swales will be regularly maintained, to remove accumulated sand/silt. Ultimately, as revegetation minimizes erosion, the amount of transported silt will be significantly reduced.

Groundwater and Soils

Groundwater and soil impacts are intimately linked, and as such, the impact of airport operations on groundwater and soil have been considered together.

As surface drainage is directly linked to the aquifer contaminants can be transmitted directly to the water table. Contamination sources within the airport generally relate to a number of distinct areas:

- Leakage from fuel storage tanks
- Spillage of fuels and chemicals
- Domestic Wastewater
- Aircraft Washdown

Existing Environment continued.....

Fuel storage poses the greatest potential threat to the groundwater and soil quality at the airport. There are no underground fuel tanks supplying or storing waste oil. All fuels and oils are stored in aboveground tanks. Fuel and oil is also stored in drums in and around the workshops and at refuellers depots. Risks associated with this storage have been minimized with the introduction of bunding and containment requirements, construction of above ground tanks and the introduction of waste recycling programs.

Domestic Waste Water

The majority of developments requiring waste water connections on the southern side of the aerodrome connected to the Water Corporation system via an extension of the internal gravity mains. Some existing facilities are connected to septic tanks.

Nearly all developments requiring waste water connections on the northern side of the aerodrome are connected to septic tanks until such time there is the opportunity to connect to Water Corporation gravity sewers that may be extended from future developments south of Sandpiper Avenue. The recently constructed heavy helicopter hangars and passenger terminal have been connected to the Water Corporation sewers via a pump station and pressure main.

Aircraft Washdown

Dedicated aircraft washdown facilities are currently being considered on the airport. BIA policy will direct aircraft to be washed only in these dedicated aircraft washdown bays. Facilities will include high pressure water guns, detergent and degreaser provided to ensure the use of quickbreak, low phosphorous detergents. These facilities will be serviced by plate separator systems.

Hire Car Wash Down

Hire car wash down facilities incorporate a waste water collection system that discharges into the Water Corporation sewers via a settlement chamber to remove solids and silt.

Air Quality

Air pollution includes the emission of particles, odours and gases into the atmosphere. Broome International Airport being predominately a general aviation aerodrome, does not experience the same degree of impact on air quality as Australia's major airports. Despite this, BIA has worked to address the major air quality issues associated with Broome International Airport in a bid to enhance air quality for airport tenants, visitors and the surrounding community. The focus at Broome is on tenant education and dust control.

Noise

The most obvious environmental impact on the community surrounding Broome International Airport is aircraft noise. The responsibility for operational noise while in takeoff, flight, landing and taxiing does not rest with BIA. Noise from aircraft in flight and taxiing is regulated under the Air Navigation (Aircraft Noise) Regulations by Airservices Australia. BIA has received negligible complaints relating to aircraft noise during the previous 5 years. However, BIA does recognize this as an important issue to manage proactively and have implemented a number of initiatives to minimize the impact on local residents wherever possible.

- **Noise Abatement Program**

In 2008 BIA implemented a Noise Abatement Program which included an Airport Noise Management Plan (NMP) to address noise issues on an ongoing basis to ensure future increases in noise levels are kept to a minimum.

Existing Environment continued.....

- **Departure & Approach Procedures (DAPS)**

A recent initiative of the BIA Group to help reduce aircraft noise is the implementation of a set of procedures that direct pilots when arriving or departing the aerodrome. The DAPS are developed as part of our noise abatement program and guide pilots to 'fly neighbourly'.

These procedures apply to piston, turboprop and rotary wing aircraft except where stress of weather or traffic avoidance procedures require alternative action. They have been developed in consultation with local pilots, air traffic advisory personnel (CAGRO) and professional consultants.

Essentially the procedures establish minimum target height levels for approaching and departing aircraft flying over Chinatown, the Cable Beach area and adjacent neighbourhoods so as to minimize the impact of noise within the constraints of standard aircraft safe operational procedures.

Compliance with the DAPS will be monitored by BIA's Certified Air Ground Radio Operators (air traffic management).

Ground Based Noise

BIA is in the process of reviewing and modifying the ground running procedures. Noise levels outside the airport boundary need to be considered and the new procedures specify that aircraft are restricted to a maximum of five minutes or as recommended by the manufacturer for startup and shutdown procedures on the apron area. Engine testing and prolonged run-ups must be conducted in dedicated run-up bays or on the designated non duty taxiway in line with the policy.

Construction Noise

Construction activity tends to generate noise and vibration, which may interfere with public amenity. The levels generated by construction depend on the activities being carried out. Presently any noise generated through construction at Broome International Airport impacts on airport tenants only, as works are usually conducted in and around the existing building line during business hours. Local residents adjacent to the airport experience little or no noise impacts from building construction.

BIA has not received any complaints in regard to construction noise during the preceding five years other than one resident complaining about the noise from the reversing horn of construction equipment during works in 2002.

Waste Management

Waste is a major global environmental issue and with 3.70 million tones of waste going to landfill in Western Australia alone, effective waste management is essential. BIA recognize this and realize the importance of improving waste management at Broome International Airport.

Energy and Renewable Resources

With 62 tenants at Broome International Airport, the demand for energy and water resources is very high. Activities such as heating, cooling, lighting and mechanical systems contribute to the overall energy requirements at the airport. This energy is provided by mains power sourced from Western Power.

Existing Environment continued.....

Energy use reduction is promoted at Broome International Airport, with everyone encouraged to take part. As air conditioning, lights and office equipment generally account for close to two thirds of all electricity use, even small acts such as turning off equipment when leaving rather than leaving on standby adds up. Energy costs are a major expense for all business.

Water is a highly valuable resource, especially in WA, and water awareness programs publicised in the general media are reinforced at Broome International Airport. The water use associated with businesses at Broome International Airport is sourced from the Water Corporation's scheme water, whilst water required for maintaining grassed areas airside and landside is drawn from a mix of limited groundwater and scheme water.

Airport businesses are also encouraged to:

- Comply with water restrictions
- Utilize reclaimed water where possible
- Maintain reticulation taps and other water using devices

Environmental Health and Hygiene

Broome International Airport has public terminal buildings, training facilities, food outlets and short stay staff accommodation units.

BIA liaises with the Shire of Broome's Environmental Health and Hygiene Officer to conduct regular inspections and certify these facilities, in order to meet the requirements of the Public Health Act 1911.

These include:

- Certification of waste water units
- Quarterly inspection of food preparation facilities
- Annual inspections and certification of public buildings and accommodation units

Section 2. Environmental Management

2. ENVIRONMENTAL MANAGEMENT

2.1 The Environment Policy

2.2 Legislative Framework

2.3 Organisational Structure

Environment Policy

Broome International Airport Group

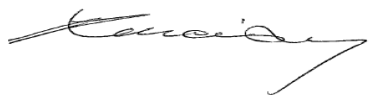
Broome International Airport Group (BIAG) manages and operates Broome International Airport, Western Australia's largest regional airport.

BIAG recognises its responsibility to maintain and protect the quality of the environment in and around its operations. In accepting this responsibility, BIA has committed to:

- Developing and managing Broome International Airport in an environmentally sound manner;
- Complying with environmental legislation and regulations;
- Pursuing opportunities to reduce, re-use and recycle waste products;
- Establish a management system to continually measure, monitor, report and improve upon the environmental performance defined by our objectives and targets;
- Document and promote BIA's commitment to the environment, to our employees, tenants, customers and neighbours.

Fulfilling our Environmental Responsibilities….

Broome International Airport Group employees, contractors and tenants all have a duty to fulfil environmental responsibilities.



Kim Maisey
Chief Executive Officer
BIA Group
April, 2006

Environmental Management continued.....

2.1 ENVIRONMENT POLICY

The environmental policy defines BIAs vision for environmental management at the airport, and documents BIA's agenda for environmental management at the airport and communication with stakeholders over environmental issues. The environment policy is periodically reviewed by BIA management.

2.2 LEGISLATIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

The 148ha of Broome International Airport exists as a freehold land in private ownership.

The airport operates in accordance with State Environmental Legislation including:

- Environmental Protection Act 1986 and Regulations
- Aboriginal Heritage Act
- Conservation and Land Management Act 1984
- Health Act 1911 and Regulations

as well as the local Government Town Planning Scheme and Policies.

Commonwealth laws protect endangered species, national heritage and matters of indigenous heritage and apply at Broome International Airport, including:

- Environmental Protection and Biodiversity Conservation Act 1999
- Aboriginal and Torres Strait Islander Heritage Protection Act 1984
- Australian Heritage Council Act 2003
- Native Title Act 1993

2.3 STRUCTURE AND RESPONSIBILITIES

BIA consists of a small staff, with all members involved in achieving environmental improvement of Broome International Airport. All staff are responsible for reporting environmental breaches to the Airport Manager and promoting BIA's Environmental Policy.

The Airport Manager ensures environmental recommendations are incorporated into operational procedures.

Environmental Responsibilities

The CEO is responsible for:

- The overall environmental performance of Broome International Airport
- Endorsement of the environment policy
- Allocation of appropriate financial and staff resources for environmental management

Environmental Management continued.....

The Airport Manager is responsible for:

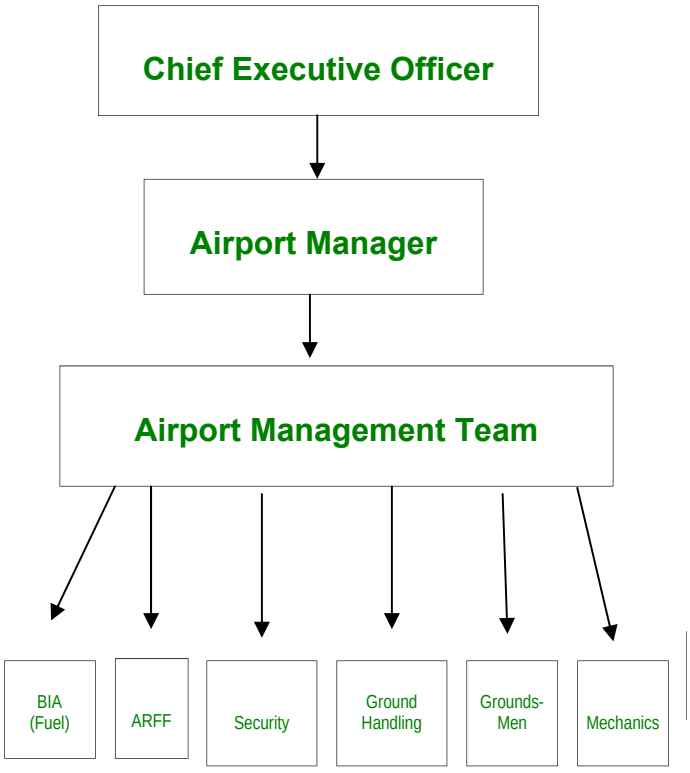
- Environmental performance management of each department
- Leads the Airport Management Team who are responsible for:
    - Identifying areas of significant environmental risk
    - Reviewing performance in relation to Key Performance Indicators
    - Assessing Environmental Management Plan's
    - Ensuring compliance with Regulations
    - Integration of environmental considerations into procedures and works
    - Promotion of environmental awareness at Broome International Airport
    - Selection and retention of external environmental consultants to advise and support the Management team.

Environmental Responsibility of Others:

All Contractors, airport users and Tenants have a responsibility to operate within environmental regulations.

Environmental Management continued.....

BIA Organisational Structure



Section 3. Groundwater and Soil

3. GROUNDWATER & SOIL PROTECTION

3.1 Overview

3.2 Objectives

3.3 Achievements

Groundwater and Soil Protection continued.....

3.1 OVERVIEW

Several airport activities have the ability to impact upon groundwater quality, such as fuel and chemical storage, aircraft wash down, accidental spills, fertilisers and sewage.

BIA recognise the importance of groundwater quality protection and are committed to the following strategies.

3.2 OBJECTIVES

- To protect the groundwater from impacts by airport operations
- To minimise potential contamination to soil and groundwater
- To identify and manage contaminated sites
- To comply with legislated standards
- To educate and inform airport users of pollution control measures

3.3 ACHIEVEMENTS

Over the past five years BIA have achieved a number of initiatives aimed at Ground Water and soil protection. An inventory of known contaminated sites is currently being compiled in order to document known sites and prioritise remedial actions. This register will detail current and past tenants, the location and nature of contaminated sites, spill incident and animal hazard reporting and the location of relevant documentation.

Monitoring and Reporting

BIA propose to establish a program for ongoing monitoring of contaminated sites, with regular reports on the airport environmental condition being provided to the Airport Manager. This program will include one contaminated site so far identified, the decommissioned Fire Training Area which closed within the last two years.

Contaminated Sites

Soil and water contamination due to washdown of hire car was identified as posing an environmental risk. This issue was addressed by upgrading existing hire car washdown bay facilities. Works included construction of concrete pads, remediating and installing interceptors. The washdown facilities are available to hire car companies and washing operations must be conducted in the bays, unless previous approval is sought from BIA for exceptional circumstances.

There are no Underground Storage Tanks (UST) in use on the airport site and no new UST's will be installed.

The current aviation fuel storage compound is leased to BP Australia Ltd and Mobil Oil Australia Pty Ltd. As a requirement of their leases these companies have undertaken soil investigations to determine the extent of any contamination to the surrounding areas. This sampling revealed some minor seepage stemming from underground tanks which were decommissioned several years ago. The source of the contamination has long been addressed, with all current tanks above ground and bunded.

Groundwater and Soil Protection continued.....

Remediation of this soil will be undertaken by these companies as part of the removal of the current facility when the new fuel storage facility is commissioned during 2007.

Aboveground storage tanks are fully bunded and comply with all relevant standards.

Spill Management

BIA are fostering a growing awareness of spill management on the airport, utilizing appropriate brochures and handbooks to raise awareness.

Mandatory spill reporting is now enforced and was initially slow, as airport users become more comfortable with the reporting process, spill incidents are declining as storage and refueling practices improve. Spill report monitoring will continue with plans afoot to streamline the reporting process, improve education programs and facilities so that tenants are encouraged to adopt effective spill management programs.

BIA has addressed the issue of aircraft test fuel disposal at the airport. New fuel receivers were purchased and located throughout aircraft parking areas on the aerodrome. to encourage users to dispose of their pre-flight test fuel safely, reducing the environmental and operational effects of incorrect disposal.

With a large expanse of grassed areas required to be maintained around the movement area to ensure aircraft safety, appropriate greens maintenance has been implemented. As part of our water quality protection program, a low phosphorous fertiliser is used for lawn maintenance to reduce nutrient movement.

Section 4. Air Quality

4. AIR QUALITY

4.1 Overview

4.2 Objectives

Air Quality

4.1 OVERVIEW

Good quality air is a basic requirement for neighbours and users of Broome International Airport. Air quality can be determined by odour, and substances contained such as particulates, chemicals and combustion products.

Air emissions from aircraft operating to and from the airport are regulated under the Air Navigation (Aircraft Engine Emissions) Regulations. Compliance with these regulations is the responsibility of Airservices Australia with Airport Owners such as BIA required to attend to air emissions caused by ground operations, such as ground based aircraft movements, refuelling, solvent emissions from painting, mechanical and maintenance shop emissions, the use of ozone depleting substances and dust. These emissions are addressed in the Airports (Environmental Protection) Regulations, and hence within this environment strategy.

Given its size, emissions from BIA are minor with air quality control focused on tenant education and dust management.

4.2 OBJECTIVES

- To minimise air emissions from airport operations.
- To comply with Commonwealth & State air quality standards.

Tenant Education

BIA is developing a focus on tenant education at Broome International Airport, in order to raise awareness about relevant operational issues which could impact on the environment and provides guidelines on how these matters can be managed and improved. One of the aspects is air quality, in particular dealing with refrigerant gases, brake cleaning, dust, solvents and BCF fire extinguishers.

It is proposed to develop a handbook to be distributed to all businesses, tenants and subtenants located at the airport.

Dust Management

Dust at Broome International Airport emanates from new developments.

The risk of dust is minimized during construction phases using water and suppressants. Soil stabilization and revegetation is undertaken as soon as possible after completion of construction.

BCF Fire Extinguishers

Public Transport BCF fire extinguishers are no longer permissible at BIA.

Section 5. Natural Area Management

5. Natural Area Management

5.1 Overview

5.2 Objectives

5.3 Achievements

Natural Area Management

5.1 OVERVIEW

At Broome International Airport we recognise the importance of protecting our ecological values and have made the commitment to preserve the natural environment under our care to the best of our ability.

5.2 OBJECTIVES

- To ensure the maximum degree of protection for areas of significant natural environment
- To retain flora, fauna and natural processes wherever possible

5.3 ACHIEVEMENTS

Revegetation
Emphasis has focused on revegetation of damaged areas within the airport boundary to minimise erosion and control dust. New plantings are designed to minimize the risk of bird strikes in accordance with the Wildlife Hazard Management System.

Wildlife Hazard Management
The activity of wildlife on and around an airfield is a recognised potential source of hazard to the safe operation of aircraft.

BIA has produced and implemented (in June 2005) a "Wildlife Hazard Management System" with the following objectives.

- To aid compliance with the Civil Aviation Safety Regulations Part 139.
- To obtain accurate information on wildlife activity and to identify wildlife hazards for the safe operation of aircraft.
- To enable actions to be taken to prevent future strikes
- To produce reports from wildlife hazard data to allow management decisions to be made.
- To analyse wildlife hazard data collected and identify trends and relationships in order to focus mitigation efforts on key problem areas.
- To reduce as far as practicable the potential risk of a wildlife strike.

Flora and Fauna Retention
There is approximately 10 ha of remnant or regrowth vegetation remaining on the airport site **(Figure 3)**. The majority of this vegetation will be removed to enable expansion of the airport infrastructure. However a reduced amount of vegetation will be retained to provide screening bushland buffers to the airport.

Section 6. Surface Water Quality

6. Surface Water Quality

6.1 Overview

6.2 Objectives

6.3 Achievements

Surface Water Quality

6.1 Overview

A range of operations at the airport have the potential to impact on surface water quality such as; fuel and oil spills on the tarmac during refuelling and servicing, releases from wash down facilities, incorrect storage and disposal of chemicals, herbicide and fertiliser application, emergency response, and a range of point sources from tenanted sites.

Due to the rapid infiltration of surface waters at Broome International Airport day to day management of surface water quality focuses on controlling potential pollutants before they reach storm water locations. BIA are active in encouraging tenants to become aware of the impacts of their operations on surface water quality. Management actions undertaken to control surface water quality at the airport are discussed below, and are focus points for achieving our objectives.

6.2 Objectives

BIA intend to reduce the impact that our operations may have on surface water quality by:

- Minimising impacts due to contaminated runoff from paved surfaces
- Minimising contaminated waters entering storm water drainage
- Preventing surface waters becoming contaminated, and to contain contaminated liquids.

6.3 Achievements

The education of airport users as to the effect of operational practices on surface water quality remains crucial to management. Proposed initiatives include Tenant education to provide detail on regulatory and leasing requirements as well as basic information on solutions to commonly experienced environmental issues, and individual advice through audits and works applications.

Chemical storage improvements have been an important development, with numerous advancements being made such as bunding and containment policies introduced in line with Australian Standards, a Dangerous Goods register, documented emergency plans, and the adoption of AS 1940 as a minimum standard for storage of flammable and combustible materials. Bunding for storage must be adequate, clean and well maintained and this condition is checked through works approvals and biennial auditing.

Spill awareness programs have been introduced with mandatory reporting of spills and increased requirements for spill amelioration. This initiative has resulted in a reduction of the number, size and impact of spills as well as raising awareness amongst the industry about inappropriate liquid disposal.

BIA introduced aircraft fuel testing disposal receptors into aircraft parking areas in order to stop inappropriate disposal methods long practised by the industry.

Section 7. Domestic Waste

7. Domestic Waste Water

7.1 Overview

7.2 Objectives

7.3 Achievements

Domestic Waste Water

7.1 Overview

The majority of the southern side of Broome International Airport including the terminal complex is connected to the Water Corporation's sewers which ultimately discharge to the town's waste water treatment plant.

Some facilities on the southern side and all facilities on the northern side of the aerodrome are connected to septic systems.

Domestic waste water can often be a source of groundwater pollution. BIA acknowledge this and measures are being undertaken to reduce potential impacts.

7.2 Objective:

To prevent domestic wastewater from Broome International Airport activities impacting upon groundwater quality and potential leaching into Dampier Creek.

7.3 Achievements

BIA is exploring introducing a policy that requires existing and new developments to connect to Water Corporation sewers wherever possible.

A sewage pump station has been installed on the northern side of the aerodrome to enable the majority of existing facilities to connect to Water Corporation sewers.

The requirement for septic systems either as an interim or permanent method of waster water disposal will be in line with local environmental health and hygiene regulations and enforced through building application approvals with the Shire of Broome.

Education

Education campaigns will be introduced to alert staff and tenants about what chemicals and products can be safely disposed of into the wastewater stream, with an eventual aim of excluding all chemicals from wastewater.

Section 8. Noise Management

8. Noise Management

8.1 Overview

8.2 Objectives

8.3 Noise Issues

8.4 Achievements

Noise Management

8.1 Overview

Perhaps the most significant environmental impact on the community surrounding Broome International Airport is potential noise generated from the airport:

With the expansion of Broome's residential and commercial areas and the location of the airport within Broome town site there are a number of noise issues involving the surrounding community including:

- Aircraft Noise
- Ground Based Noise
- Construction Noise

Broome International Airport recognize noise as an issue and have implemented a number of initiatives since privatization to minimize the impact on the local community wherever possible.

8.2 Objectives

- To manage and minimize noise impacts from the airports operations on the adjacent community.
- To educate surrounding land buyers of the proximity of Broome International Airport.
- To minimize the impact of ground based noise on tenants, employees and visitors at Broome International Airport.

Airservices Australia (ASA) are the regulatory authority responsible for registering and investigating aircraft noise from Australian airports however BIA maintain a pro-active role in addressing these issue**s.**

8.3 Noise Issues

8.3.1 Aircraft Noise

Measurement

The system of aircraft noise measurement used in Australia for the purposes of evaluating land use compatibility is known as the Australian Noise Exposure Forecast (ANEF) system. This system is employed to produce the following noise measures, which are usually illustrated in the form of noise exposure contours -

- ANEF—being a noise exposure *forecast* for a particular time in the future or based on particular circumstances such as ultimate capacity;
- ANEI—being a noise exposure *index* based on data for a previous year where the exact numbers and types of aircraft which used the airport are known;
- ANEC—being a noise exposure *concept* depicting possible noise exposure levels based on a predetermined set of assumptions about the operation and use of the airport.

The ANEF system was used to determine noise exposure at Broome, and a chart of ANEF contours was produced for planning for the year 2025 **(Figure 4)**. This is a series of contours which provide anticipated boundaries for various noise exposure levels around the airport. The 2025 ANEF has been validated by Airservices Australia for technical accuracy.

Noise Management

Impacts

The impact of aircraft noise on residents in proximity to airports is subjective and is influenced by a number of factors including attitudes toward the aviation industry, personal sensitivity to noise and fear of aircraft crashing.

Australian Standard AS 2021-1985, *Acoustics-Aircraft noise intrusion-Building siting and construction* provides guidance to regional and local authorities, organizations and others associated with urban and regional planning and building production on the location and construction of new buildings and on the acoustic adequacy of existing buildings in areas near aerodromes.

The extent of aircraft noise intrusion within a building depends substantially on:

A) the location and orientation of the site relative to the direction of the aerodrome's runway;

B) The types of activity to be, or being, accommodated in the building; and

C) The type of layout, construction and ventilation utilized.

This Standard includes guidelines for the assessment of potential aircraft noise exposure at a given site, which are based on the Australian Noise Exposure Forecast (ANEF) system.

An issue to be aware of relates to the interpretation of sets of ANEF contours. Aircraft noise does not cease at the edge of a noise contour—it is just less than the amount the contour represents. Anywhere within a 20 to 30km radius of the airport can expect, on occasions, to be overflown by aircraft and thus be subject to some level of aircraft noise.

The majority of aircraft follow regular flight patterns but for a variety of reasons aircraft can sometimes be diverted from their usual path.

- **Areas below 20 ANEF**

There is no restriction on zoning or development within this noise exposure zone, which is identified as acceptable for all building types in the Building Site Acceptability table in Appendix 1. However, according to the Australian Standard, noise nuisance may still be experienced in areas below the 20 ANEF exposure level, particularly in the case of newly exposed communities

- **Areas above 25 ANEF**

Development control provisions should take into consideration the level of noise exposure forecast for the area and the Building Site Acceptability for the particular noise exposure zone as identified in Appendix 1. This includes structure planning by which development is controlled.

8.3.2 Ground Based Noise

Ground based noise includes noise emanating from the airport whilst they are on the ground and general noise from workshops, maintenance areas and training drills by the Fire and Rescue service vehicles.

8.3.3 Construction Noise

Construction noise is noise resulting from construction and maintenance of infrastructure and facilities at Broome International Airport.

Noise Management

8.4 Achievements

8.4.1 Aircraft Noise

Noise complaints are affected by factors other than the number of aircraft movements. General aviation and jet aircraft movements have increased by 29% over the past five years with current estimates at around 27,000 movements per annum.

BIA receives less than 5 complaints per annum from neighbours regarding noise. The majority of the complaints received relate to small light aircraft in the early morning and helicopter operations and not jet aircraft.

A number of initiatives and management strategies have been developed in order to minimise the impacts of aircraft operations. These include:

Departure and Approach Procedures

The most recent initiative of the BIA Group to help reduce aircraft noise is the implementation of a set of procedures that direct pilots when arriving or departing the aerodrome. The DAPS are developed as part of our noise abatement program and guide pilots to 'fly neighbourly'.

These procedures apply to piston, turboprop and rotary wing aircraft except where stress of weather or traffic avoidance procedures require alternative action. They have been developed in consultation with local pilots, air traffic advisory personnel (CAGRO) and professional consultants.

Essentially the procedures establish minimum target height levels for approaching and departing aircraft flying over Chinatown, the Cable Beach area and adjacent neighbourhoods so as to minimize the impact of noise within the constraints of standard aircraft safe operational procedures.

Compliance with the DAPS will be monitored by BIA's Certified Air Ground Radio Operators (air traffic management).

Noise Abatement Program

In 2008 BIA implemented a Noise Abatement Program which included an Airport Noise Management Plan (NMP) to address noise issues on an ongoing basis to ensure future increases in noise levels are kept to a minimum

8.4.2 Ground Based Noise

BIA will prepare ground running procedures to assess, monitor and report on ground based noise at Broome International Airport. Noise levels outside the airport boundary are a consideration and few site complaints regarding ground based noise have been received. The new procedures specify that aircraft are restricted to a maximum of five minutes or as recommended by the manufacturer for start-up and shut-down procedures on the apron area.

BIA has commenced the construction of a dedicated noise attenuated engine run-un bay for engine testing and prolonged run-ups. This facility is located on the northern side of the runway and is expected to be completed in August 2006.

8.4.3 Construction Noise

Construction activity tends to generate noise and vibration, which may interfere with people's amenity. The levels generated by construction depend on the activities being carried out. In terms of noise and vibration emissions, demolition, excavation and construction work can be divided into two phases, earth works, and building works. Earth works is typically the noisier of the two phases of any construction.

Presently any noise generated through building work at Broome International Airport impacts on airport tenants and not the wider Broome community, as works are usually conducted in and around the existing building line during business hours.

Impacts and management strategies relating to construction matters are evaluated by BIA, through the works permit process.

Where required, BIA and/or developers must :

- provide EMP's
- undertake noise monitoring
- advise tenants and the local community
- provide a complaints contact telephone number

Construction noise is not considered to be a significant issue.

Section 9. Figures

9. Figures

1. Locality Plan
2. Airport Plan
3. Vegetation Plan
4. ANEF Contours 2025

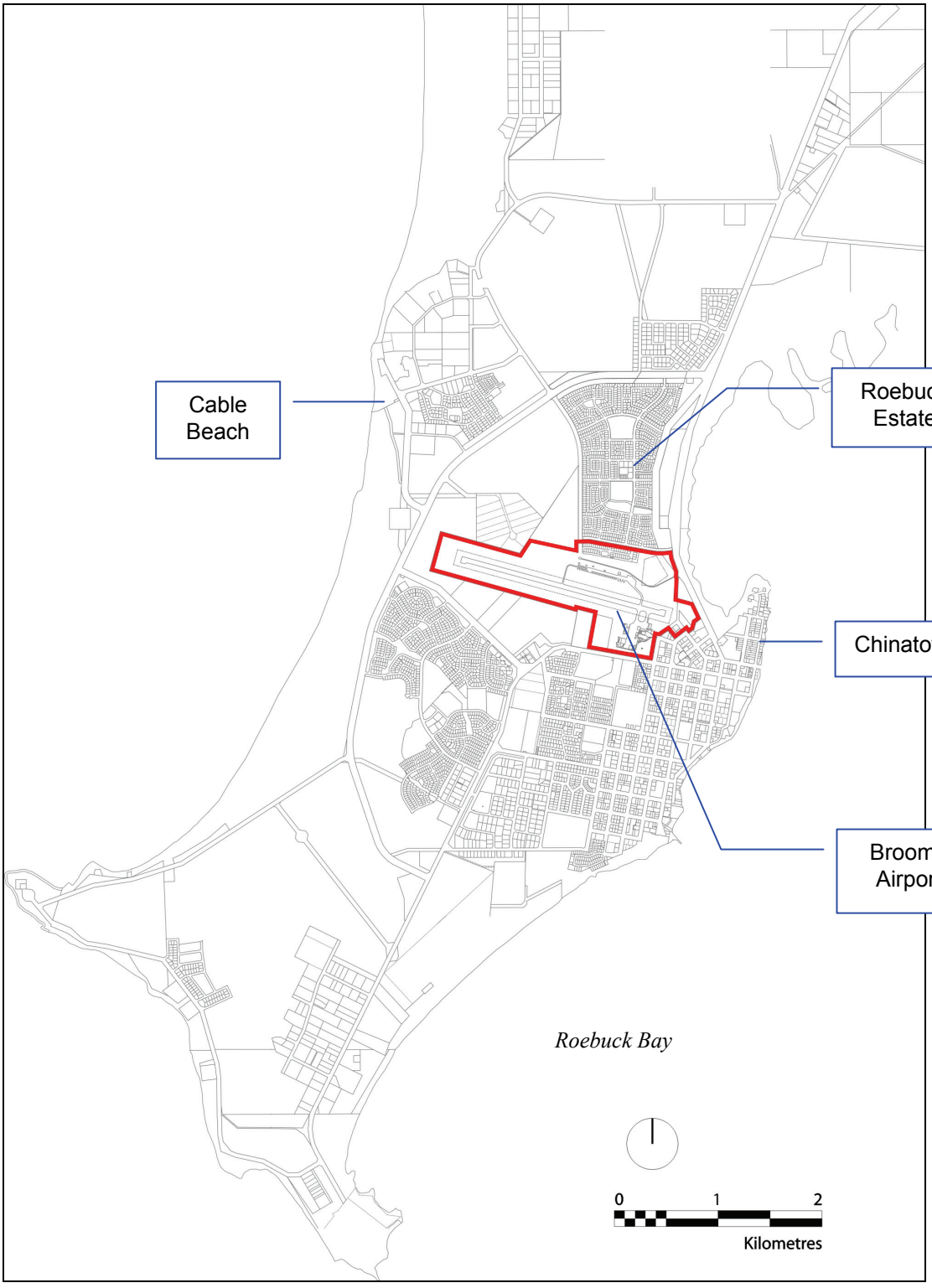


Figure 1 Locality Plan

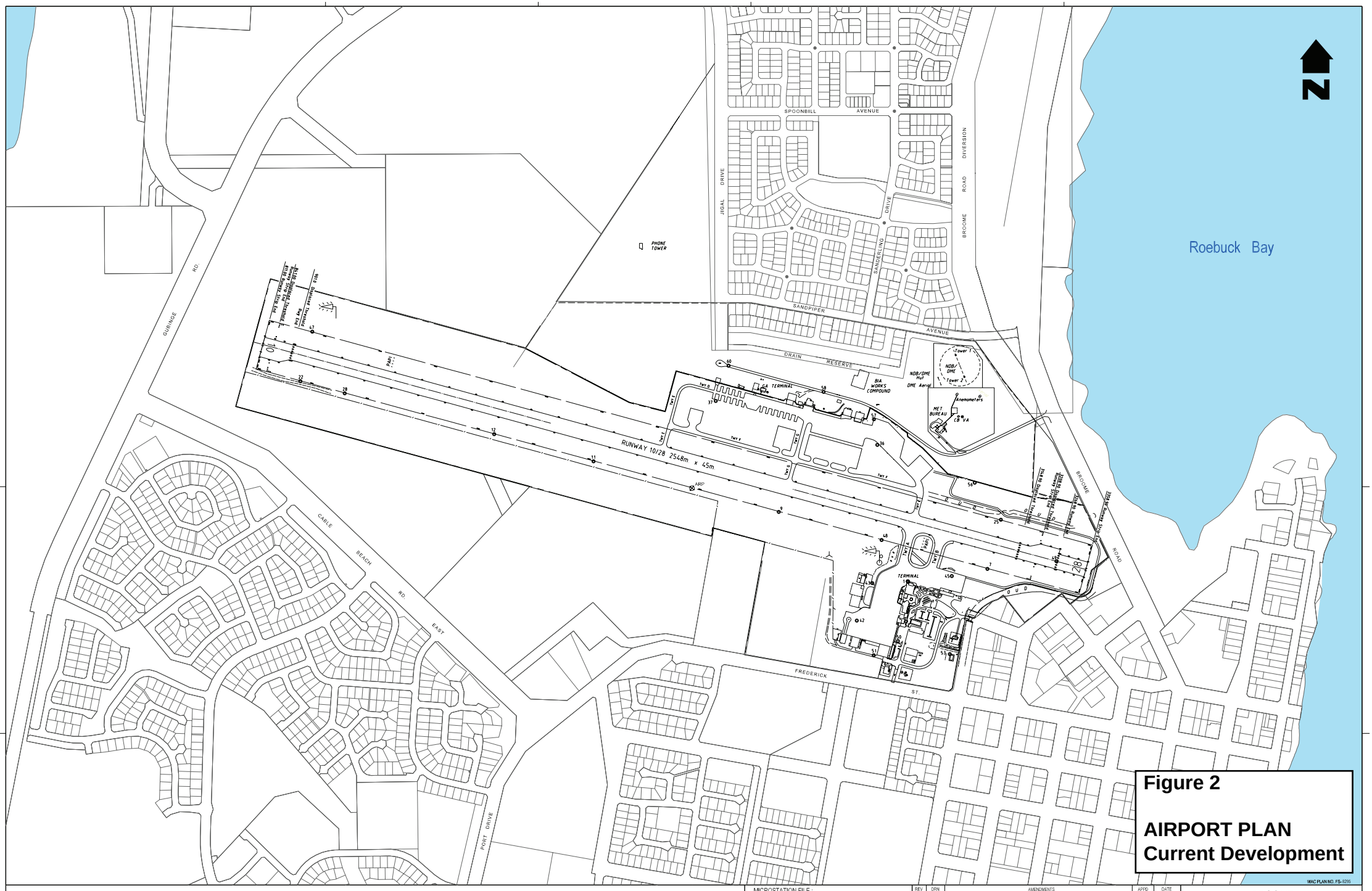


Figure 2

AIRPORT PLAN
Current Development

WAC PLAN NO. FS-8255

PERTH AIRPORT

WHELANS

BROOME INTERNATIONAL AIRPORT

MICROSTATION FILE : AIRPORT PLAN.DGN

DATA SOURCE : WHELANS DATA, 1:500 COVERAGE

ORIGINAL ISSUE

DRAWN: NJV DATE: 17.12.02

REV	DRN	AMENDMENTS	APPD	DATE
A	NJV	New subdivision, perimeter road and fence adjacent 28 end, boundary modification	RM	3.2.03
B	NJV	Detail update as per Whelans survey. Rwy light'sleadins2D.dgn	RM	13.02.03
C	NJV	Detail update as per Whelans survey of April 2003	RM	08.05.03
D	NJV	Apron widening, car parks, roads and Terminal modifications from KBR design	RM	17.11.03
E	KGH	Signal Area added	RM	18.3.04
F	KGH	Terminal Upgrade. PSM 10 changed to ARP	RM	19.4.04
G	NJV	NDB/DME & Met leases amended	RM	4.08.04
H	JAL	New northern apron and twy works from design. PSM59 gone	RJM	16.09.05
I	KGH	Engine Runup amended	RJM	7.11.05
J	KGH	Boundary amended. Subdivision added		13.2.06

BROOME INTERNATIONAL AIRPORT

AIRPORT PLAN

SCALE 1:5000 @ A1, 1:10000 @ A3

DRAWING No. BR - 1 - 4 - 001

REV No. J

INDEX CODE

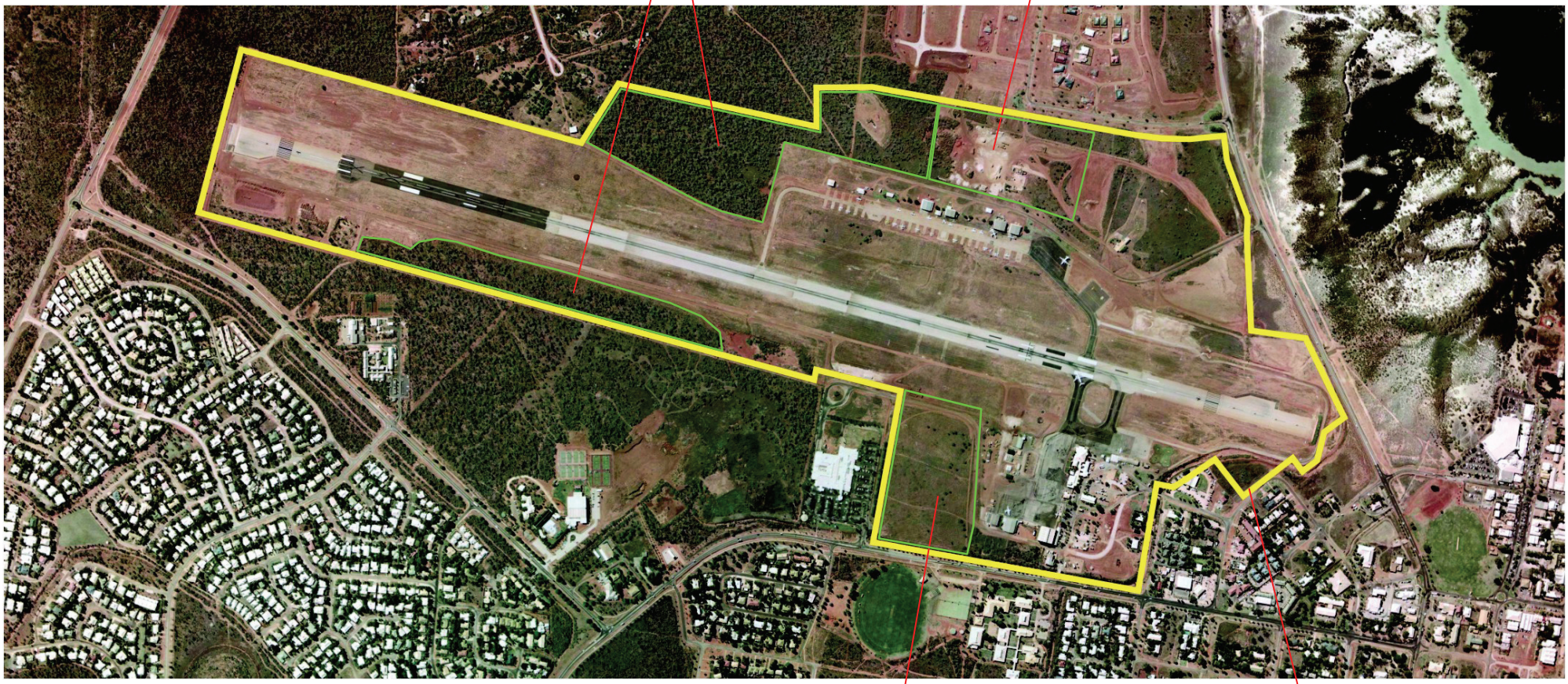


Figure 3 Vegetation Plan

BROOME AIRPORT ANEF 2025

AIRCRAFT	INM	MOVEMENTS ANNUAL	MOVEMENTS 24HR	DAY/ NIGHT SPLIT		Arrival RWY 10 TRACK EF02	Arrival RWY 10 TRACK H-EF02	Arrival RWY 28 TRACK WF02	Arrival RWY 28 TRACK H-WF02	Departure RWY 10 TRACK EF01	Departure RWY 10 TRACK H-EF01	Departure RWY 28 TRACK EF03	Departure RWY 28 TRACK WF01	Departure RWY 28 TRACK H-WF01	Departure RWY 28 TRACK WF03	Departure RWY 28 TRACK WF04
Mid widebody	A330	1096	3	day	100	0.6		0.9		0.3		0.3	0.45		0.45	
				night												
Small narrowbody	737700	2190	6	day	70	0.84		1.26		0.21		0.63			0.95	0.32
				night	30	0.36		0.54		0.09		0.27			0.41	0.14
Large narrowbody	737800	3650	10	day	70	1.4		2.1		0.14		1.26	0.21		1.89	
				night	30	0.6		0.9		0.06		0.54	0.09		0.81	
Dash 8	DHC83C	2190	6	day	50	0.6		0.9		0.6			0.9			
				night	50	0.6		0.9		0.6			0.9			
Heavy helicopters		4380	12	day	100		2.4		3.6		2.4			3.6		
				night												
GA twin	BECSBP	6000	16.44	day	90	2.96		4.44		1.48		1.48	0.22		2	2.22
				night	10	0.33		0.49		0.16		0.16	0.02		0.22	0.25
GA single	GASEPF	42810	117.29	day	90	21.11		31.67		10.56		10.56			15.83	15.83
				night	10	2.35		3.52		1.17		1.17			1.76	1.76
GA single	GASEPV	12000	32.88	day	90	5.92		8.88		2.96		2.96			4.44	4.44
				night	10	0.66		0.99		0.33		0.33			0.49	0.49
TOTALS		74316	203.61			38.33	2.40	57.49	3.60	18.66	2.40	19.66	2.79	3.60	29.25	25.45

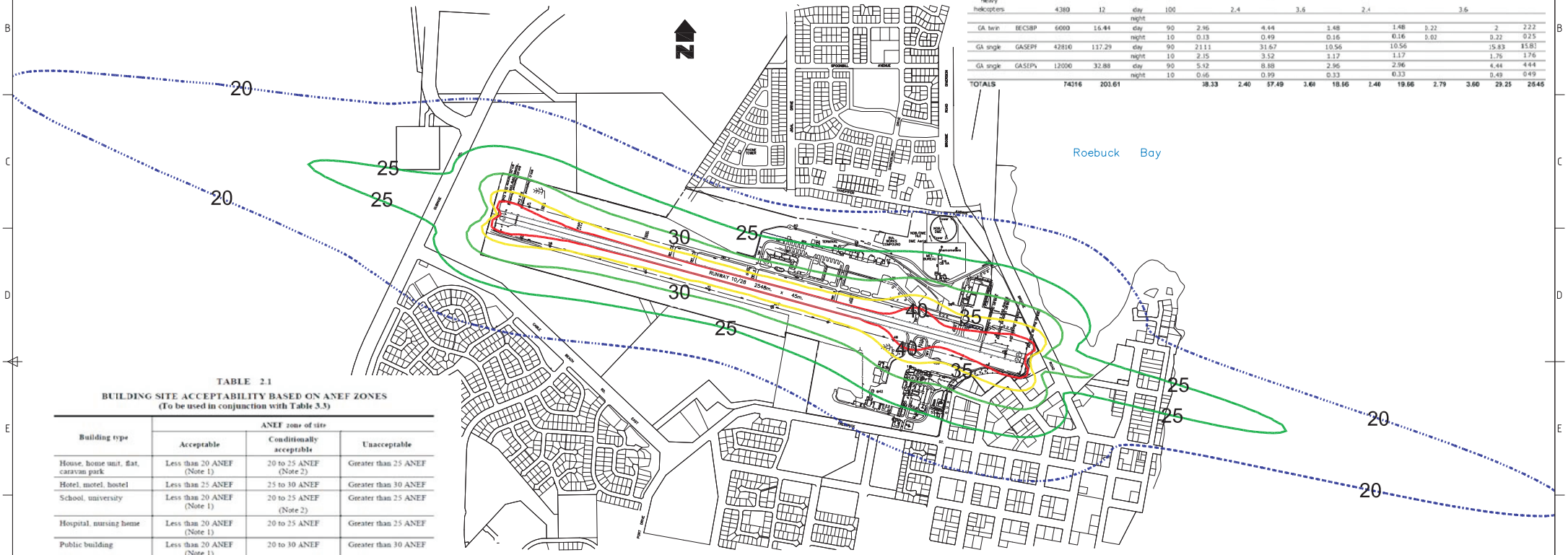


TABLE 2.1

BUILDING SITE ACCEPTABILITY BASED ON ANEF ZONES
(To be used in conjunction with Table 3.3)

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF (Note 1)	20 to 25 ANEF (Note 2)	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF (Note 1)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1)	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

NOTES:

1 The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of Clause 2.3.2 may be followed for building sites outside but near to the 20 ANEF contour.

2 Within 20 ANEF to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate (see also Figure A1 of Appendix A).

3 There will be cases where a building of a particular type will contain spaces used for activities which would generally be found in a different type of building (e.g. an office in an industrial building). In these cases Table 2.1 should be used to determine site acceptability, but internal design noise levels within the specific spaces should be determined by Table 3.3.

4 This Standard does not recommend development in unacceptable areas. However, where the relevant planning authority determines that any development may be necessary within existing built-up areas designated as unacceptable, it is recommended that such development should achieve the required ANR determined according to Clause 3.2. For residences, schools, etc., the effect of aircraft noise on outdoor areas associated with the buildings should be considered.

5 In no case should new development take place in greenfield sites deemed unacceptable because such development may impact airport operations.

Figure 4

0 100m 200m 300m 400m 500m

RevNo	Revision note	Drawn	Checked	Date
C	Revised to include qualifications and other notes	LW	BC	19 DEC 2011

Qualifications
Factors taken into account in this ANEF are:
- Aircraft Flight Tracks.
- Where figures have been rounded discrepancies may occur between totals and the sums of items.
- Stage length for departures(representing distance to destination)
- ANEF contour modelled with INM7.0b, not incorporating terrain data.

Legend
- 40-45 ANEF
- 35-40 ANEF
- 30-35 ANEF
- 25-30 ANEF
- 20-25 ANEF

Datum:MGA 51

Broome International Airport
2025 Australian Noise Exposure Forecast

Scale	DWG Title	Rev No.
1:9000 @ A1 , 1:18000 @ A3	11046 ANEF 2025	C

Data Source
INM 7.0b Movement Data / Flight Paths supplied by BIA