AQUIS RESORT AT THE GREAT BARRIER REEF PTY LTD

ENVIRONMENTAL IMPACT STATEMENT

VOLUME 4

CHAPTER 24

TRANSPORT

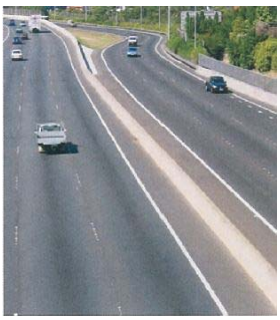
24. TRANSPORT

24.1 ROAD NETWORK

24.1.1 Existing Situation

Performance of a road link has been expressed in the context of Level of Service (LoS), a traffic engineering parameter used to describe the performance of a road link or intersection. The Department of Transport and Main Roads Planning and Design Manual describes LoS as 'a qualitative measure of such factors as speed, trip time, interruptions, interference, freedom to overtake, ability to manoeuvre, safety, comfort, convenience and vehicle operating costs.' This is most simply expressed in terms of the traffic volumes experienced by the road link, or degree of saturation at an intersection.

Figure 24-1 provides a visual representation of typical LoS conditions to provide a point of reference.

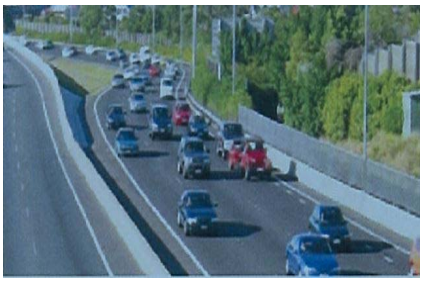


LoS A

LoS B

LoS C

LoS D



LoS E

LoS F

Figure 24-1 LoS reference photographs.

The Department of Transport and Main Roads (DTMR) would ideally trigger upgrade of road links when the links are consistently operating at a LoS D or worse. Notwithstanding this, the decision to upgrade is subject to the availability of funding and the competing demands for available funds.

a) State Controlled Road Network

The state controlled road network for the Cairns environs is managed and operated by DTMR. A network map for the Cairns area is provided in **Figure 24-2.**

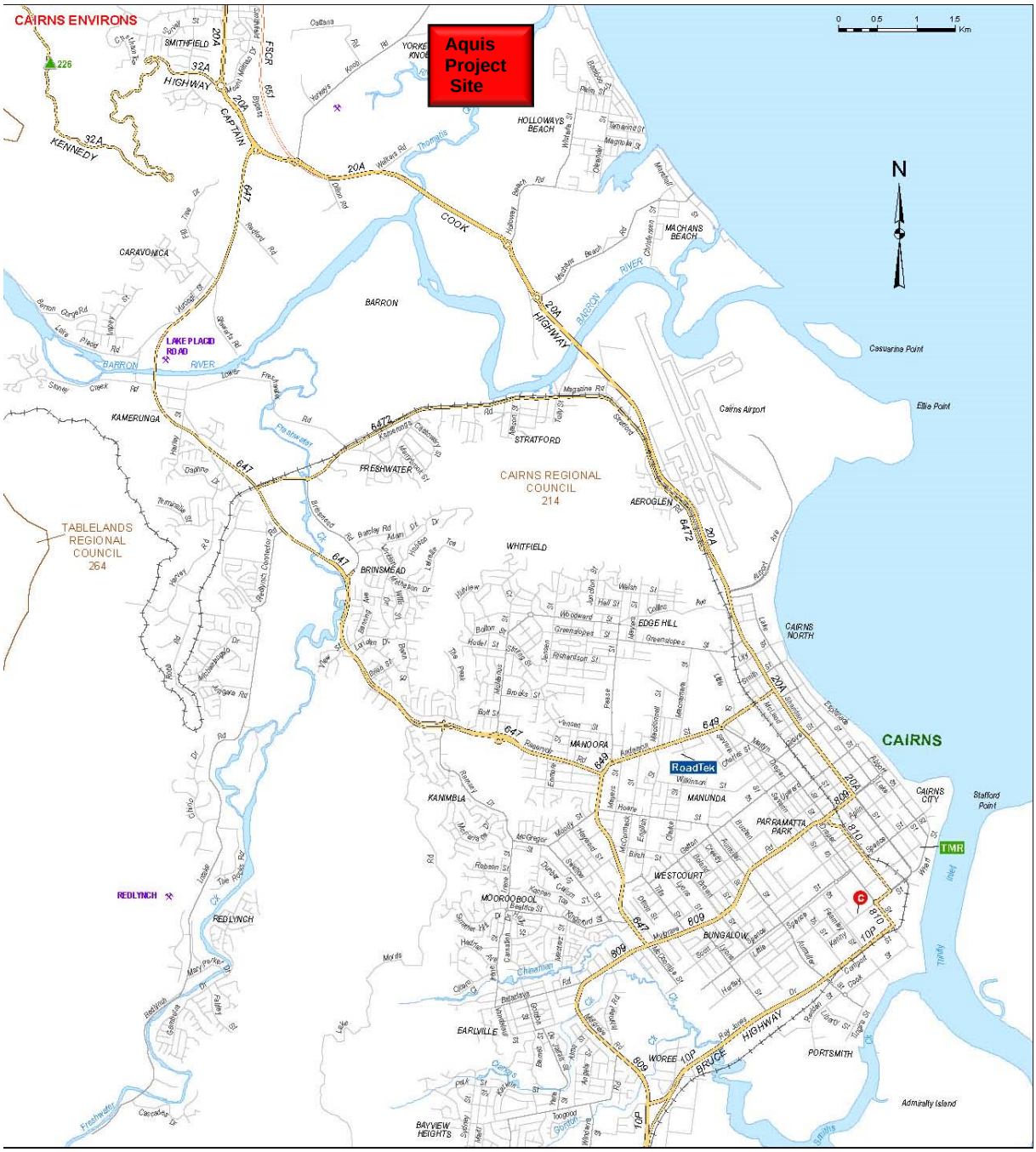


Figure 24-2 DTMR Gazetted Road Network in Cairns environs.

Source: Queensland Department of Transport and Main Roads.

The state managed road network fulfils an important freight and transport task for Cairns and the state of Queensland, providing capacity and connectivity across and between major nodes of economic activity.

The Bruce Highway is the major entry to the city from the south, and is the primary road freight route and passenger transport corridor from the southern suburbs to the port and the city.

Mulgrave Road provides connectivity to the Cairns Western Arterial Road and the Cairns City from the Bruce Highway.

The Cairns Western Arterial Road conveys traffic to and from the western and southern suburbs of Cairns to the northern suburbs.

Captain Cook Highway provides direct linkage between the Cairns City, Northern Beaches of Cairns and destinations further north to Port Douglas, Mossman and Daintree.

Due to the narrow linear development footprint of Cairns, the DTMR road network conveys a large proportion of the daily commuter and freight movements through the region. The DTMR and CRC have a regional road network model known as the Cairns Strategic Transport Model (CSTM). The CSTM is a four-step (i.e. trip generation, trip distribution, and mode choice and traffic assignment) strategic transport model for the Cairns area. It includes all the roads within the Cairns region (with the exception of minor 'dead-end' streets) from Gordonvale in the south to the northern beaches areas in the north and also extends west as far as Kuranda. It also includes the road network within the Cairns Central Business District (CBD) and Cairns Airport. The model is used as a tool to forecast future traffic volumes across the road network in line with changes in land use and demographics and to model the effects of new developments.

Captain Cook Highway

The Captain Cook Highway is a four lane divided arterial highway that services the Northern Beaches of Cairns and providers the transport link to Port Douglas and communities further north. The Captain Cook Highway primarily conveys traffic between the Northern Beaches and the Cairns CBD / Aeroglen / North Cairns and the Airport.

When considering existing capacity and performance of the Captain Cook Highway, the route can be considered as five links as follows:

Mulgrave Road to Airport Avenue (Sheridan Street)

Sheridan Street carries 40 000 vehicles per day (vpd) and operates at capacity during the peak periods, resulting in significant queuing and delays at a LoS of E/F. It is configured as a four-lane urban type cross section and capacity is generally affected by the number of intersections and associated operational 'friction' created by property accesses, on street car parking, cross and turning movements.

DTMR and CRC have undertaken planning studies that have examined the opportunity for six laning of Sheridan Street and rationalisation of intersection functionality to increase capacity and to encourage the utilisation of the parallel local street network to share traffic flows. Council is currently constructing the Lake Street connection to Airport Avenue which will remove some airport traffic off Sheridan Street. DTMR has no current funding commitment to ongoing upgrading of Sheridan Street.

Airport Avenue to Barron River

Airport Avenue to the Barron River has fewer intersections and operates more efficiently due to limited access and prohibition of on street car parking. It is configured as a four-lane rural type cross section and carries 37 000 vpd and operates typically at LoS 'C' during peak periods. DTMR has no plans to undertake further upgrading of this section of the Captain Cook Highway.

Barron River to Captain Cook Highway / Cairns Western Arterial Intersection (Caravonica Roundabout)

Barron River to Caravonica Roundabout conveys 35,000 vehicles per day. It has large roundabout controlled intersections at Machans, Holloways and Yorkeys Knob Beach Roads and at the intersection of the Cairns Western Arterial Road and the Captain Cook Highway. The link is configured as a four-lane rural type cross section and operates at LoS B during peak periods. DTMR has no plans to undertake further upgrading of this section.

DTMR has advised that the existing cross drainage structures on this segment are deteriorating and are being monitored for structural performance that may lead to future replacement or upgrading.

The current capacity and traffic demands predicted for the Barron River to Caravonica Roundabout portion of the Captain Cook Highway are illustrated in **Figure 24-3**.

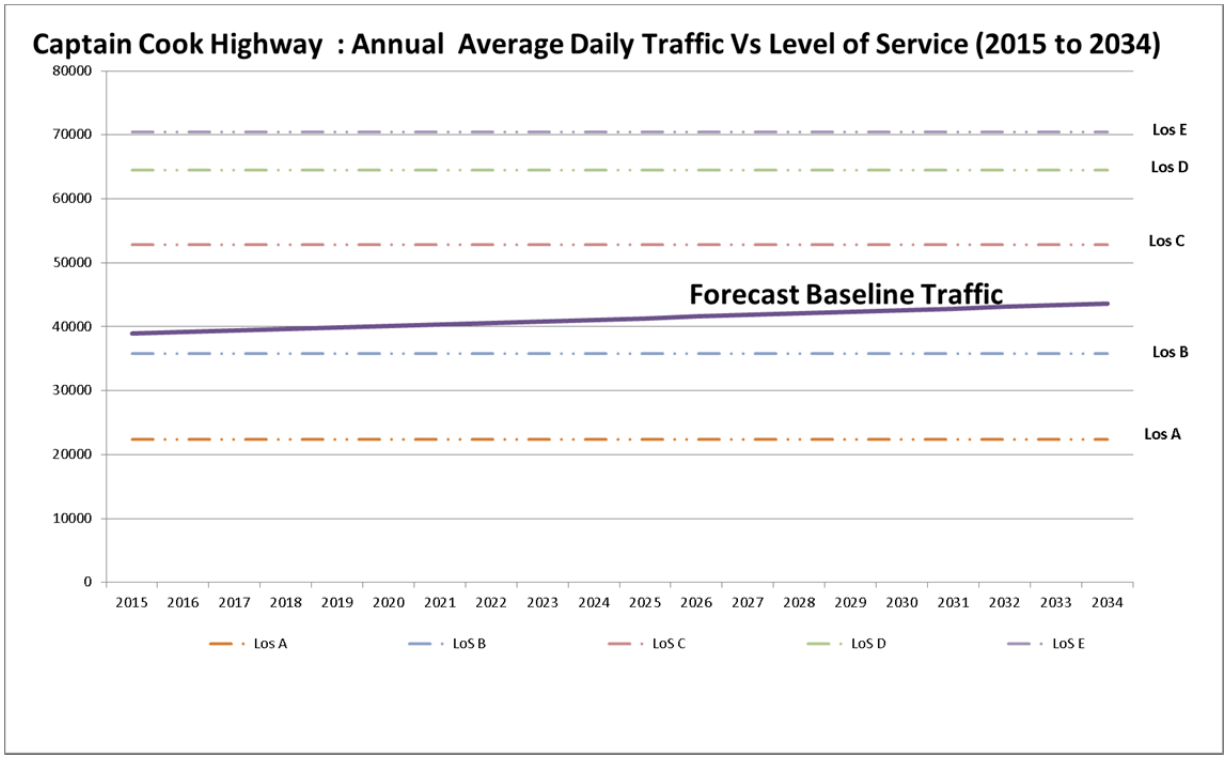


Figure 24-3 Captain Cook Highway: AADT Vs LoS (2015-2034).

The traffic predictions have been sourced from the DTMR Cairns Traffic Network Model and indicate that Captain Cook Highway between Barron River and Caravonica Roundabout will function at LoS B to C up to 2034.

<u>Caravonica Roundabout to Intersection of Captain Cook Highway / Kennedy Highway (Smithfield Roundabout)</u>

The Caravonica Roundabout to Smithfield Roundabout portion of the Captain Cook Highway is configured as a four-lane rural type section and carries the order of 45,000 vpd. The Caravonica Roundabout is the point of convergence of the Captain Cook Highway and the Cairns Western Arterial Road, and the short link is a focal point of traffic movements of traffic from the Northern Beaches and the Atherton Tablelands to Cairns CBD and the broader urban environs.

This section currently operates at Level of service D/E. DTMR is currently preparing a business case study examining the implementation of the Smithfield Bypass which creates a route to the east of Smithfield and links the Macgregor Road Roundabout to the Yorkeys Knob Roundabout. This will reduce the demand on the Caravonica Roundabout to the Smithfield Roundabout and improve the level of service on the existing route.

Smithfield Roundabout to McGregor Road Roundabout

The Smithfield Roundabout is the confluence of significant traffic streams contributed by the Captain Cook Highway and the Kennedy Highway. This segment is configured as a four-lane median separated rural type section and carries in the order of 45,000 vehicles per day. It includes exit and entry ramps associated with access to the Regional Shopping Centre and a signalised four way intersection at Stanton Road. Significant delays and queuing are experienced on the approaches to the Stanton Road Intersection and Smithfield Roundabout. This segment operates at a LoS E/F in the AM and PM peaks.

As noted, DTMR is currently preparing a planning study to examine the benefits of implementation of the Smithfield Bypass. It is anticipated this will significantly improve level of service on this link. No funding commitment has been made by DTMR for the implementation of the Smithfield Bypass.

Cairns Western Arterial Road

The Cairns Western Arterial Road (CWAR) is an arterial highway that services the Northern Beaches and inner western suburbs of Cairns, providing connectivity to the city and suburbs to the south.

The capacity and performance of the Cairns Western Arterial Road can be considered as two segments.

Pease Street to Freshwater Creek Bridge

This segment represents the existing four-lane divided section urban type section of CWAR which operates at a LoS B and C in the peak periods. There are several major at grade intersections on this road situated at Pease Street, Enmore Street, Ramsay Drive / Park Ridge Drive, Loridan Drive / View Street and the Brinsmead – Kamerunga Road. ,

The intersection with Pease Street is a signalised T intersection and currently experiences significant queuing, but not excessive delay, on the inbound lanes in the AM peak. The Enmore Street intersection is a signalised four way intersection and operates satisfactorily in the peak periods. The Ramsay Dr / Park Ridge Drive intersection is an unsignalised four way intersection and has been constrained to limit the opportunity for cross movements and right turn manoeuvres in response to safety issues. The Ramsay Drive / View Street signalised intersection operates adequately in the peak periods.

The unsignalised T intersection at the Brinsmead – Kamerunga Road coincides with a four-lane to two-lane merge on CWAR just prior to the Freshwater Creek Bridge. Whilst CWAR does not experience delay at this intersection there can be significant delay on the Brinsmead – Kamerunga Road right turn approach in peak periods and observation identifies that there are safety issues with this manoeuvre. There is a bottle neck at Freshwater Creek Bridge where traffic flows merge from four lanes to two lanes at the bridge. DTMR has no current plans for upgrade of this section.

Freshwater Creek Bridge to Captain Cook Highway

This section of the CWAR is configured as a two-lane undivided rural type section. The link has several major intersections including the Redlynch Connection Road, Kamerunga Road, Harley Street, Stoney Creek Road and the Lake Placid Road. The intersection at the Redlynch Connection Road Intersection is signalised and has a four-lane divided configuration. This intersection generally operates adequately in the peak periods. The Kamerunga Road T intersection is unsignalised and has an accident record and safety issues. The Harley Street intersection is configured as 4 way signalised and operates with excessive queuing in the AM peak. The Stoney Creek T intersection is unsignalised and has safety issues that are mitigated by queuing from the Harley Street intersection in the AM peak allowing access onto CWAR by courteous drivers providing a gap. The signalised T intersection to Lake Placid also experiences significant delay on CWAR in the AM peak. This on occasions is from

queuing extending back from the Harley Street intersection but is also created by the 'green time' required on the Lake Placid Road.

This link also crosses several major features with bridge structures including Freshwater Creek, Kuranda Rail / Redlynch to Freshwater Connection Road and the Barron River.

The current LoS and traffic demands predicted for this segment are illustrated in **Figure 24-4** which is based upon traffic forecast data generated from the DTMR network model.

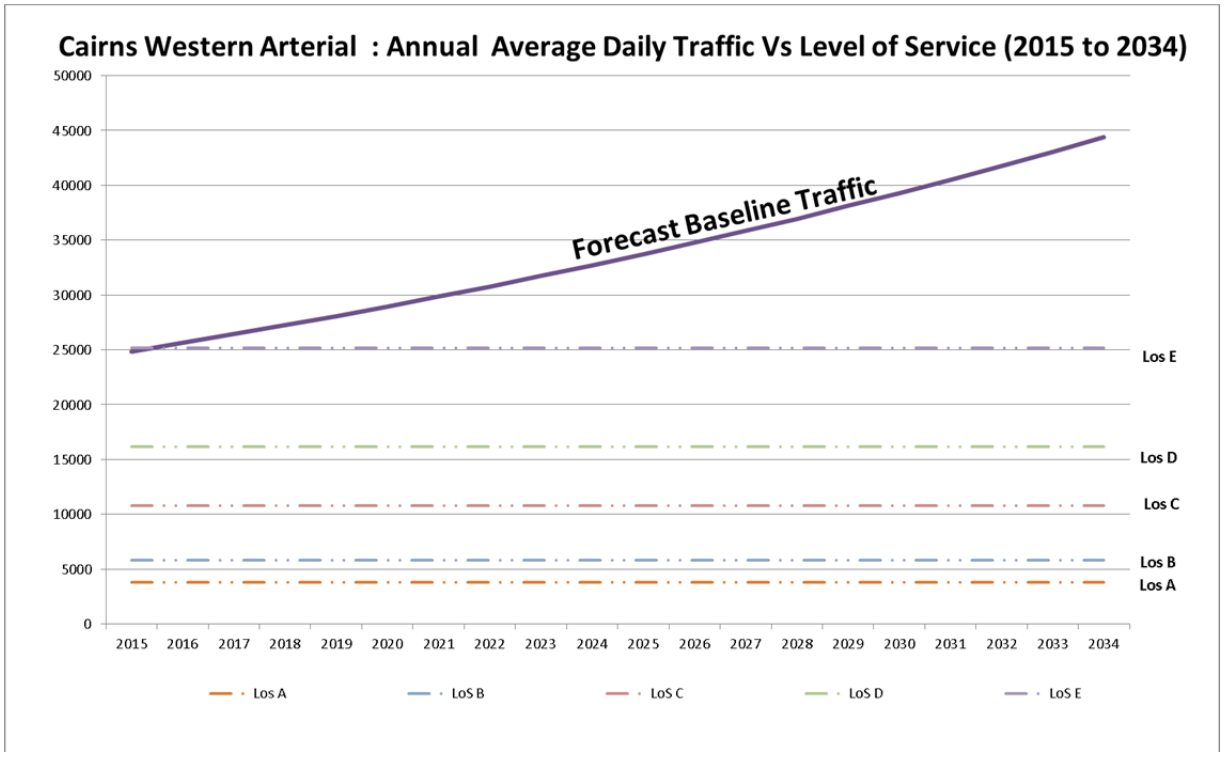


Figure 24-4 CWAR–AADT Vs Capacity (2015-2034).

Figure 24-4 demonstrates the segment from Freshwater Creek Bridge to the Caravonica Roundabout currently operates at LoS E and will be at LoS F in the near future. The segment is approaching capacity and requires upgrade. DTMR has no funding commitment to upgrade of the Cairns Western Arterial Road.

Yorkeys Knob Roundabout

The ***Yorkeys Knob Roundabout*** forms the juncture of Yorkeys Knob Road and Captain Cook Highway. **Table 24-1** summarises the current performance of the Yorkeys Knob Roundabout.

TABLE 24-1 CURRENT PERFORMANCE OF YORKEYS KNOB ROUNDABOUT

EXISTING PERFORMANCE	APPROACH VOLUME	LOS
Yorkeys Knob Road / Captain Cook Highway		
AM Peak		
Captain Cook Highway (to Cairns CBD)	2000	A
Captain Cook Highway (to Smithfield)	840	A
Yorkeys Knob Road	520	B
PM Peak		
Captain Cook Highway (to Cairns CBD)	1040	B
Captain Cook Highway (to Smithfield)	1960	A
Yorkeys Knob Road	480	A

Analysis indicates that the intersection operates at an average LoS B in the AM and PM peaks.

DTMR has advised there is planning to meter the roundabouts at the intersections of Yorkeys Knob, Machans Beach and Holloways Beach Roads by signalisation of the approaches. These works are currently underway.

Caravonica Roundabout

The ***Caravonica Roundabout*** controls traffic at the intersection of the Captain Cook Highway and the Cairns Western Arterial Road. The roundabout is configured to allow south bound traffic on the Captain Cook Highway and north bound traffic exiting the CWAR to bypass the intersection and merge with the departure lanes of the roundabout.

Table 24-2 summarises the current performance of the Caravonica Roundabout.

TABLE 24-2 CURRENT PERFORMANCE OF CARAVONICA ROUNDABOUT

EXISTING PERFORMANCE	APPROACH VOLUME	LOS
Cairns Western Arterial / Captain Cook Highway		
AM Peak		
Captain Cook Highway (to Cairns CBD)	2200	A
Captain Cook Highway (to Smithfield)	850	A
Cairns Western Arterial	1050	A
PM Peak		
Captain Cook Highway (to Cairns CBD)	980	A
Captain Cook Highway (to Smithfield)	1820	B
Cairns West Arterial	1117	A

Analysis indicates the intersection operates at an average LoS B in the AM and PM peaks.

b) Local Road Network

Yorkeys Knob Road

Yorkeys Knob Road is configured as a two-lane rural road that services the township of Yorkeys Knob and operates at a LoS B. The link experiences poor flood immunity. CRC has plans for the upgrade of the Yorkeys Knob Road to improve immunity to 10% annual exceedance probability (AEP). There is no funding commitment within the next five years for this work to proceed.

The current LoS and traffic demands predicted for Yorkeys Knob Road from 2015 to 2034 are illustrated in **Figure 24-5**.

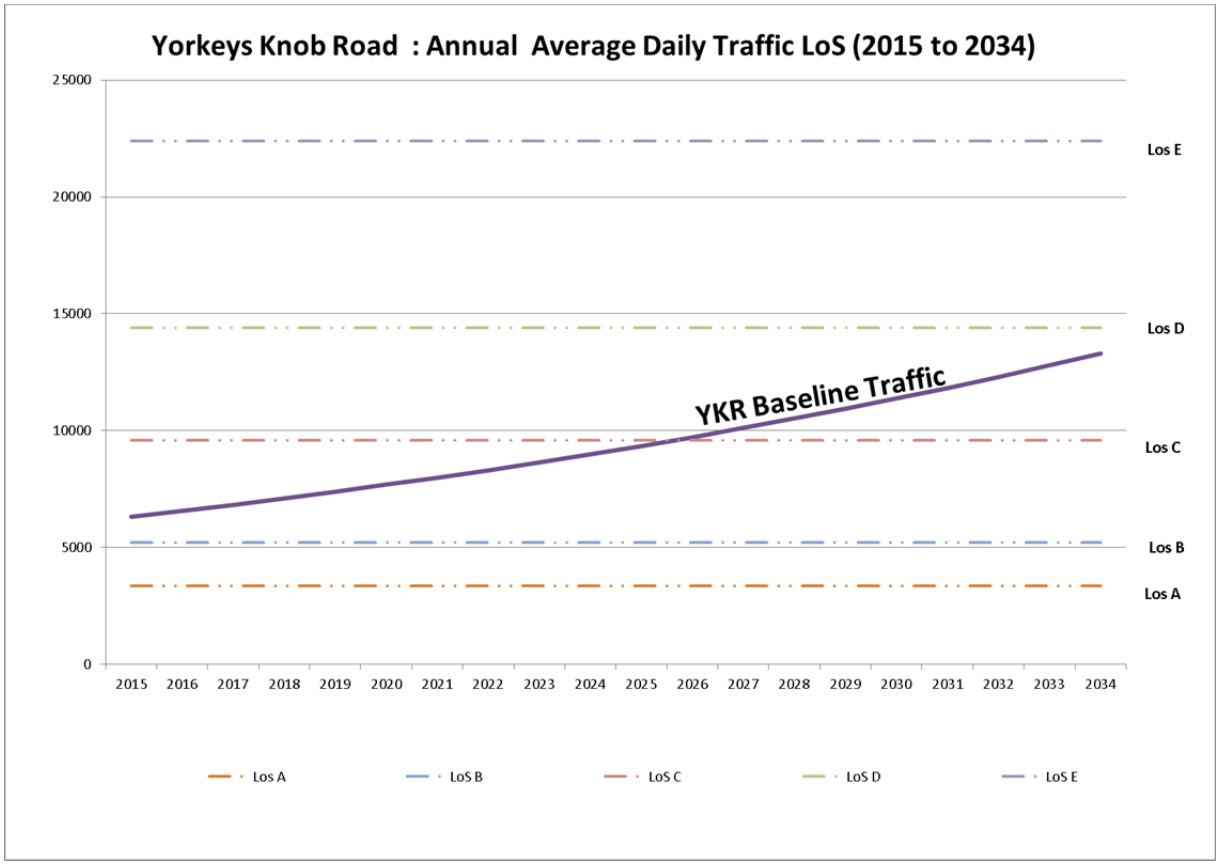


Figure 24-5 Yorkeys Knob Road traffic forecast Vs LoS (2015-2034).

The analysis shows that Yorkeys Knob Road operates at LoS B will be approaching LoS D by 2034. This is based upon current traffic volumes with a compound growth rate of 1% annually to reflect incremental redevelopment and densification of Yorkeys Knob over time.

Dunne Road

Dunne Road is a two-lane rural road which provides an alternative route for local trips between Yorkeys Knob and Smithfield avoiding the need to access via the Captain Cook Highway and also provides access to the Smithfield Waste Transfer Facility, Marlin Coast Wastewater Treatment Plant and the Cattana wetlands. Dunne Road has a deficient horizontal geometry and has poor flood immunity. Similar to Yorkeys Knob Road, CRC plan to upgrade Dunne Road to improve immunity of

the link to 10% AEP. There is no funding commitment within the next five years for this work to proceed.

The Northern Beaches Interconnector is planned by CRC as a four-lane sub-arterial road to provide an alternative route for the movement of local traffic between Poolwood Road and McGregor Road and consequently reduce local trips on the Captain Cook Highway.

Dunne Road is not currently identified as a southern extension of the Northern Interconnector.

Figure 24-6 illustrates the current and predicted demands and LoS on Dunne Road.

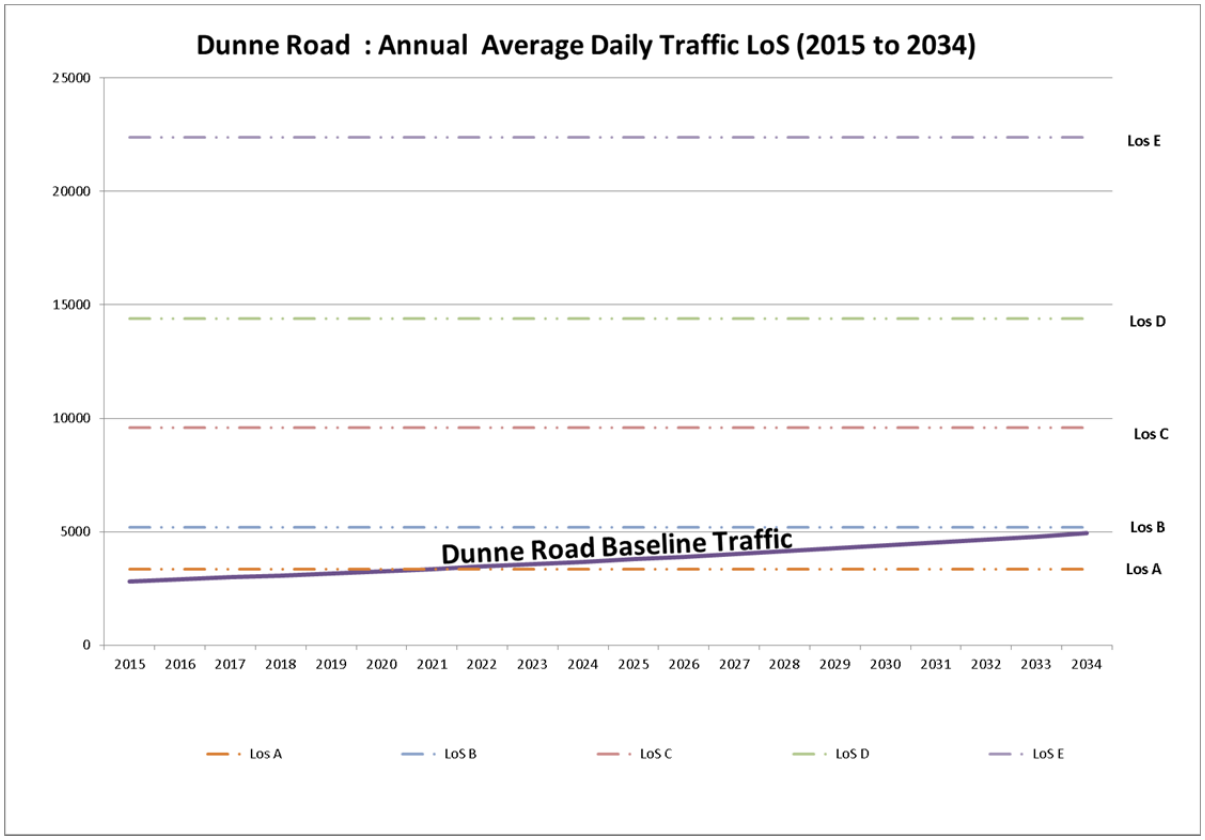


Figure 24-6 Dunne Road: annual average daily Traffic LoS (2015-2034).

Dunne Road currently experiences low traffic volumes. A compound growth rate of 1% has been adopted to mimic that occurring on Yorkeys Knob Road. The analysis shows that Dunne Road currently operates at LoS A and is likely to be near LoS B by 2034.

24.1.2 Impacts

a) Road Transport Task

The staged construction and operations of Aquis Resort will evolve over a number of distinct phases and timelines which are described as follows:

- Construction Stage 1 (2015 to 2018)
- Operations Stage 1 only (2019 to 2020)
- Operations Stage 1 coincident with Construction Stage 2 (2020 to 2023)
- Operations Ultimate – Stages 1 + 2 (2024 onwards).

The traffic volumes and distributions resulting from each of these phases overlap where the phases are initiating or winding down. Hence the analysis of traffic impacts for Aquis has been considered as a continuum from the commencement of construction in mid-2015 through to 2034 (10 years from commencement of operations of the ultimate stage).

Trip Generations

Trip generations are created as a consequence of the need to move materials and construction workers, guests, visitors, staff and back of house deliveries. The transport of construction workers and operational staff are significantly the dominant trip generators.

Construction

During the construction phases traffic generation will most significantly be created by the movement of construction workers to and from site, the transport of construction materials to site and the export of surplus earthworks materials offsite.

Stage 1 construction will involve a peak workforce of 3,750, and Stage 2, 3,500 workers. Trip generation modelling has been prepared on the basis of workers travelling by vehicle, bicycle and by foot adopting an assumed modal split of:

- Vehicle : 90% at an occupancy of 1.5 pax/car
- Bicycle : 6%
- Pedestrian : 4%

In order to manage the movement of the large volume of workers to and from site, the proponent will require the managing contractor to adopt a staggered 10-hour shifting arrangement described in **Table 4-1**.

TABLE 24-3 CONSTRUCTION STAFF SHIFTING ARRANGEMENTS

Staff Shifting Distributions	Proportion of Staff
Shift 1 Start 6am - 7am	40%
Shift 1 Finish 3pm - 4pm	40%
Shift 2 Start 7am – 8am	35%
Shift 2 Finish 4pm - 5pm	35%
Shift 3 Start 8am - 9am	25%
Shift 2 Finish 5pm - 6pm	25%

Peak daily movements by construction staff are estimated to be 5,250 for Stage 1 and 4,900 for Stage 2.

For the transport of construction materials, **Table 24-4 and Table 24-5** provide a summary of the anticipated quantum of construction materials to be moved for each stage of construction and the expected traffic generation and spectrum of heavy vehicle types.

TABLE 24-4 STAGE 1 CONSTRUCTION MATERIAL TRIPS

Material	Total Material Quantities		Vehicle Type (No. of Axles, Austroads Class No.)	Vehicle Usage	Material Quantity per Truck Trip		Material Quantity per Truck Trip – Conversion to Tonnes		Truck Trips – Excl-udes Return Trips
Concrete	342,000	m^3	Three Axle Truck (3 Axle, Class 4)	100%	5	m^3	12	tonnes	68 400
Reinforcement	51,000	tonnes	Semi-Trailer (6 Axle, Class 9)	100%	25	tonnes	25	tonnes	2040
Steel	6,000	tonnes	Semi-Trailer (6 Axle, Class 9)	100%	25	tonnes	25	tonnes	240
Quarry Materials	300,000	m^3	Truck & 4-Axle Dog (7Axle,Class 10)	50%	19	m^3	29	tonnes	7895
			Semi-Trailer (5 Axle, Class 8)	50%	15	m^3	22.5	tonnes	10 000
Asphalt	25,000	tonnes	Semi-Trailer (5 Axle, Class 8)	100%	23	tonnes	23	tonnes	1087
Glass	115,000	m^2	Large Rigid Truck (2 Axle, Class 3)	100%	154	m^2	6	tonnes	747
Timber	12,000	m^3	Semi-Trailer (6 Axle, Class 9)	100%	20	m^3	14	tonnes	600
Plasterboard	1,310,000	m^2	Semi-Trailer (6 Axle, Class 9)	100%	3570	m^2	25	tonnes	367
Earthworks	2,800,000	m^3	Truck & 4-Axle Dog (7Axle,Class 10)	50%	19	m^3	29	tonnes	147 368
Precast Products	6,350	tonnes	Semi-Trailer (6 Axle, Class 9)	100%	20	m^3	14	tonnes	454
Various	15,000	tonnes	Semi-Trailer (6 Axle, Class 9)	100%	25	tonnes	25	tonnes	2946
TOTAL									**242,143**

Of the 242 143 construction materials trips to and from site, 60% relate to the haulage of 2.8 million m^3 of excavated material.

TABLE 24-5 STAGE 2 CONSTRUCTION MATERIAL TRIPS

Material	Total Material Quantities		Vehicle Type (No. of Axles, Austroads Class No.)	Vehicle Usage	Material Quantity per Truck Trip		Material Quantity per Truck Trip – Conversion to Tonnes		Truck Trips – Excl-udes Return Trips
Concrete	228 000	m3	Three Axle Truck (3 Axle, Class 4)	100%	5	m3	12	tonnes	45 600
Reinforce-ment	37 000	tonnes	Semi-Trailer (6 Axle, Class 9)	100%	25	tonnes	25	tonnes	1480
Steel	4000	tonnes	Semi-Trailer (6 Axle, Class 9)	100%	25	tonnes	25	tonnes	160
Quarry Materials	70 000	m3	Truck & 4-Axle Dog (7Axle,Class 10)	50%	19	m3	29	tonnes	1842
			Semi-Trailer (5 Axle, Class 8)	50%	15	m3	22.5	tonnes	2333
Asphalt	6000	tonnes	Semi-Trailer (5 Axle, Class 8)	100%	23	tonnes	23	tonnes	261
Glass	105000	m2	Large Rigid Truck (2 Axle, Class 3)	100%	154	m2	6	tonnes	682
Timber	8 000	m3	Semi-Trailer (6 Axle, Class 9)	100%	20	m3	14	tonnes	400
Plasterboard	1 050 000	m2	Semi-Trailer (6 Axle, Class 9)	100%	3570	m2	25	tonnes	294
Earthworks Excavation	235 000	m3	Truck & 4-Axle Dog (7Axle,Class 10)	50%	19	m3	29	tonnes	12 368
Precast Products	1000	tonnes	Semi-Trailer (6 Axle, Class 9)	100%	20	m3	14	tonnes	71
Various	10000	tonnes	Semi-Trailer (6 Axle, Class 9)	100%	25	tonnes	25	tonnes	2946
TOTAL									**68 438**

Peak daily movements of materials for each stage of construction are 585 trips each way for Stage 1 and 132 for stage 2.

Operations

The operational phases of the Aquis Resort will create a traffic spectrum that will be dominated by the movement of guests and the transport of staff to and from the resort. The Aquis Resort will respond to these demands in several ways.

Operation of Stage 1 will require peak staffing of 10,684 to cater for a maximum occupancy of 6,000 guests, and for ultimate operations a peak staffing of 19, 811 to cater for a maximum occupancy of 11,250 guests. Trip generation modelling has been undertaken on the basis of the transport modal splits shown in **Table 24-6.**

TABLE 24-6 OPERATIONS TRANSPORT MODAL SPLITS

	Coach	Mini-Bus	Taxi/Limo	Car	Bicycle	Pedestrian	Heavy Vehicle
In House Guests	90%		10%				
Visitors from other Guest Houses		50%	50%				
In House Guests on Day Trips	100%						
Cairns Residents			30%	70%			
Staff				90%	6%	4%	
Back of House Deliveries							100%

In order to manage the large volume of staff movements the proponent will require the hotel and casino operators to adopt a staggered eight-hour shifting arrangement described in **Table 24-7.**

TABLE 24-7 OPERATIONS STAFF SHIFTING ARRANGEMENTS

Staff Shifting Distributions
Shift 1 Start 6am - 9am
Shift 1 Finish 1pm - 3pm
Shift 2 Start 1pm - 4pm
Shift 2 Finish 8pm - 10pm
Shift 3 Start 8pm – 10pm
Shift 3 Finish 5am – 7am

Distribution of construction and operational traffic onto the adjacent road network is shown in **Figure 4-1 and Figure 24-8**.

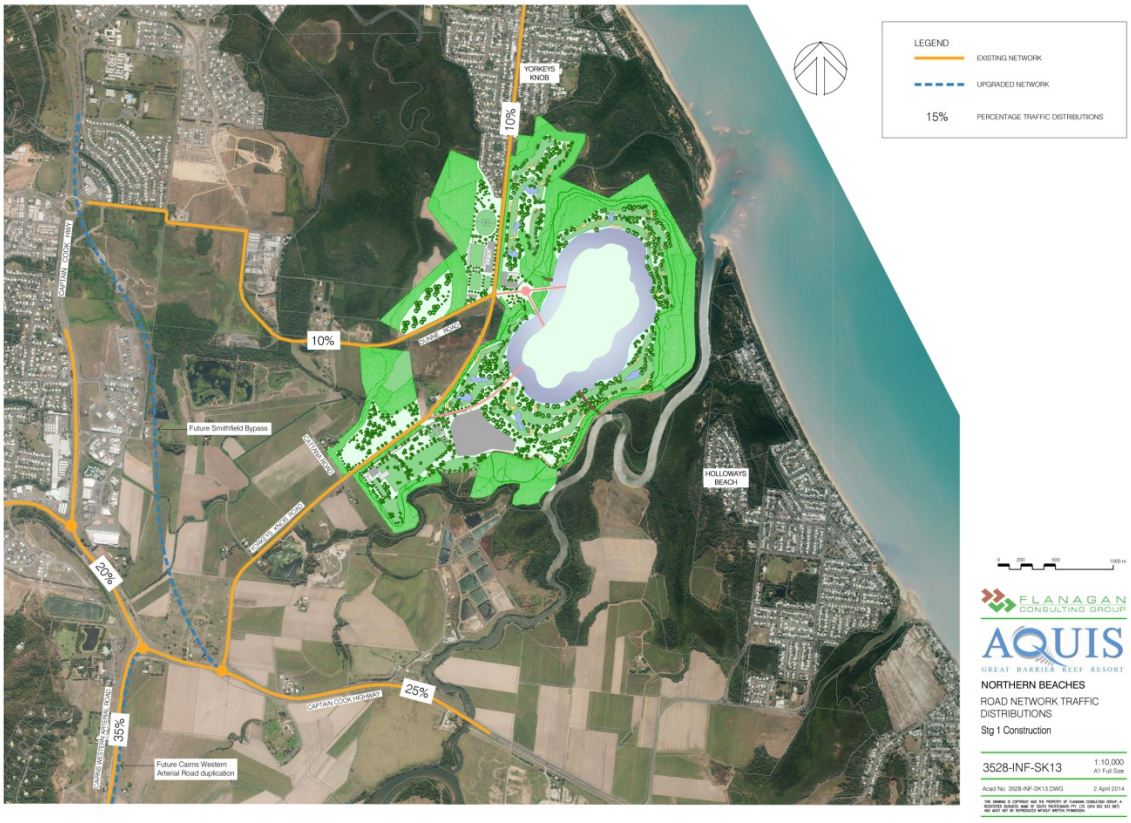


Figure 24-7 Stage 1 Construction Traffic Distributions.

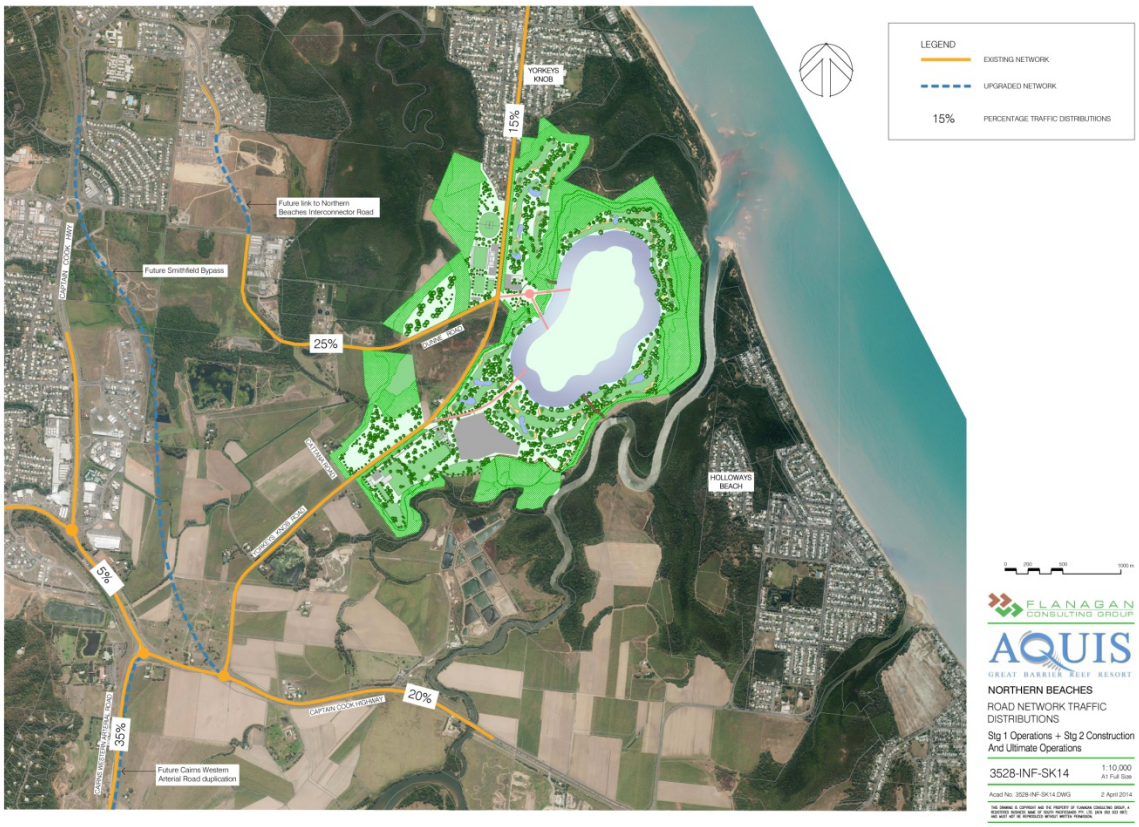


Figure 24-8 Stage 2 construction, Stage 1 and ultimate operations traffic distributions.

The distributions reflect anticipated desire lines for the movement of workers, staff and materials. The first two years of Construction of Stage 1 is largely defined as an earthworks excavation process and includes the excavation and disposal of approximately 2.8 million cubic metres of material from the site. A number of potential sites have been identified to receive the material, the most significant being the Cairns Airport.

In establishing the network distributions, it is assumed elements of new or augmented road network planned for upgrade by DTMR and CRC have proceeded and are operating. For example, it is assumed that the Northern Beaches Interconnector is in place by 2020 to facilitate the movement of northern beaches resident staff onto Dunne Road and to Aquis Resort.

The external state and local road network elements assessed for impacts arising from the development include:

- Captain Cook Highway (DTMR)
- Cairns Western Arterial Road (DTMR)
- Intersection of Yorkeys Knob Road and Captain Cook Highway (DTMR)
- Intersection of Cairns Western Arterial Road and Captain Cook Highway (DTMR)
- Yorkeys Knob Road (CRC)
- Dunne Road (CRC).

A further strategic level assessment of impacts on the Cairns Regional Road Network has been undertaken using the current Cairns Strategic Transit Model (CSTM) to establish the 'ripple effect' the development may create across the local road network.

Based upon the trip generations, modal splits and traffic distributions described above, an analysis of the traffic impacts on elements of the state road network has been conducted and compared against LoS thresholds prescribed by DTMR in section 5.15 of the Road Planning and Design Manual (RPDM). The analysis has been undertaken over the period of 2015 (commencement of construction of stage 1) through to 2034 (10 years from commencement of operations of the ultimate development in 2024).

b) State Controlled Network

Captain Cook Highway (Barron River to Caravonica Roundabout)

Figure 24-9 illustrates the predicted annual average daily traffic (AADT) on the Captain Cook Highway as a consequence of the traffic loads imposed by Aquis from 2015 to 2034.

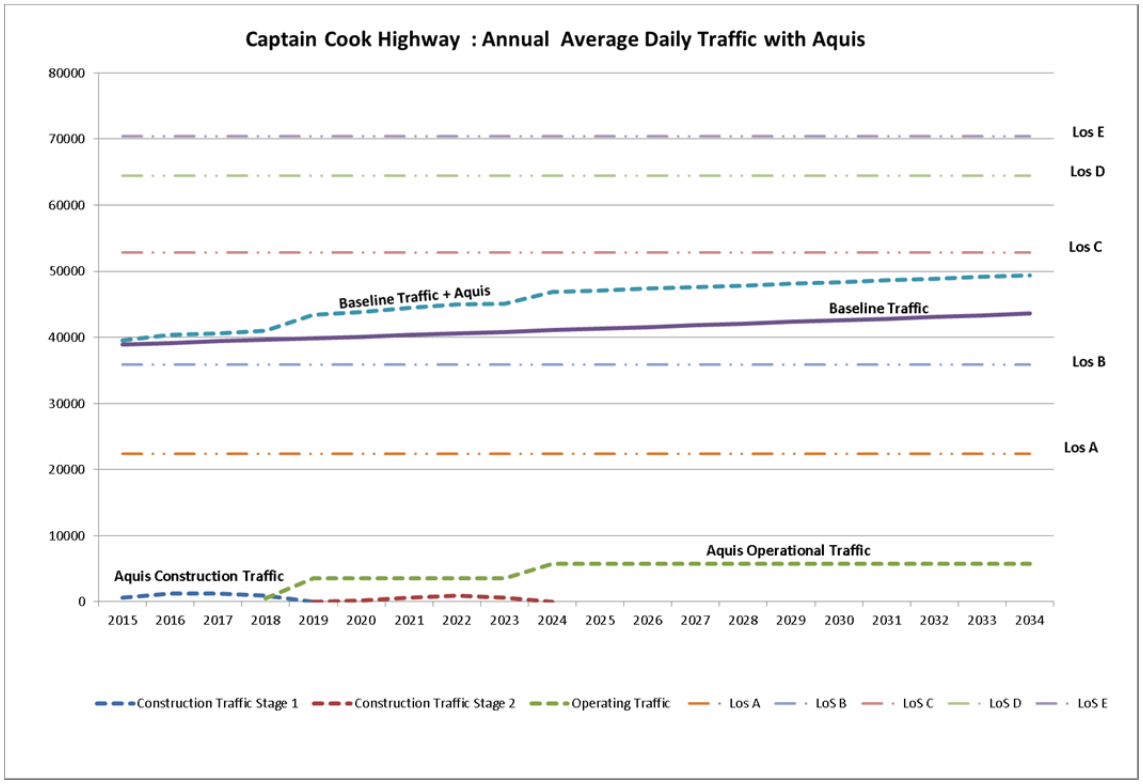
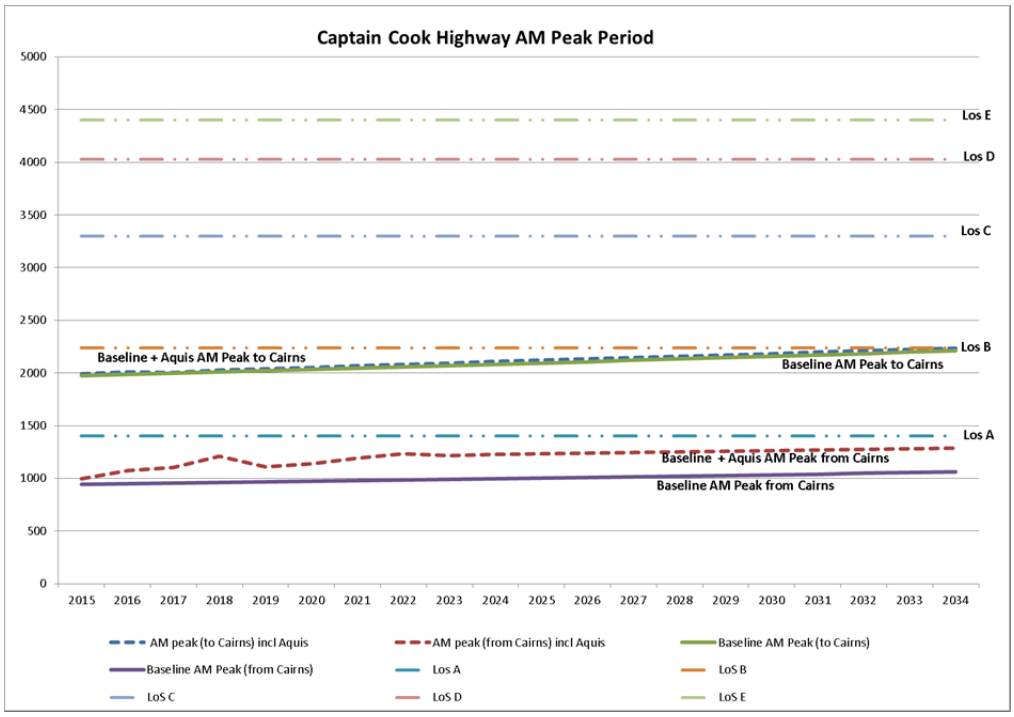


Figure 24-9 Captain Cook Highway – AADT with Aquis.

The red and blue dotted lines reflect the traffic generated during the Aquis construction stages; the green dotted line is the daily traffic generated by the operational phases over time; the purple solid line is the baseline traffic generation on the Captain Cook Highway based upon current DTMR growth models and the doted light blue line is the accumulated traffic loads of the Aquis construction, operational traffic volumes and baseline traffic arising from normal Cairns background demands.

The plot demonstrates this portion of the Captain Cook Highway operates on average at LoS B at 2015 and in the absence of Aquis will continue to be at LoS B to C by 2034. With the Aquis traffic demands overlayed, LoS B to C is maintained at 2034. Hence the Aquis Resort impacts on the operating efficiency and capacity of the Captain Cook Highway link on average are not significant.

In relation to the operating peak periods, the construction and operations of Aquis will be managed to mitigate impacts on the peak periods experienced on the Captain Cook Highway. Aquis will have an AM peak between 6 am and 7 am and a PM peak between 2 pm and 3 pm which is not coincident with the Captain Cook Highway commuter peaks of 8 am to 9 am and 5 pm to 6 pm. The benefit of this operating regime is that by operating non-coincident peaks, Aquis can utilise latent capacity in the network. To illustrate this, **Figure 24-10** shows the AM (8 am to 9 am) and PM (5 pm to 6 pm) peak traffic volumes for the Captain Cook Highway, with and without Aquis demand.



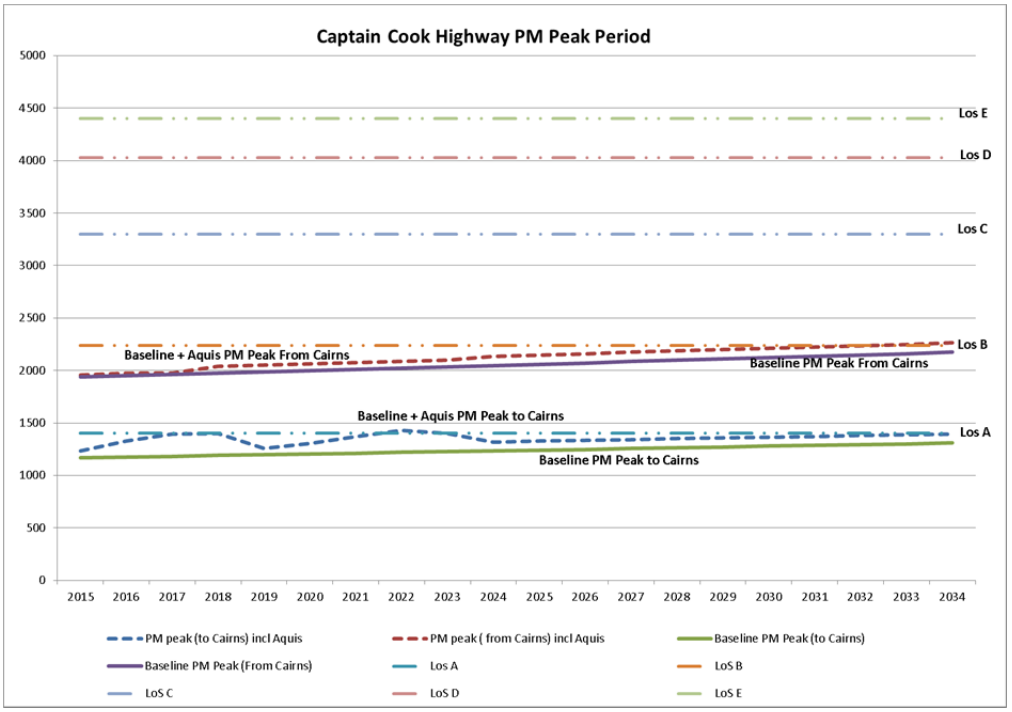


Figure 24-10 Captain Cook Highway AM and PM coincident peaks.

Figure 24-10 demonstrates that for the AM and PM Captain Cook Highway peaks, Aquis demands are relatively low and the capacity is being consumed on the contra-direction of flow.

The Aquis Resort demands do not impact upon LoS outcomes for the Captain Cook Highway during the traditional AM and PM peaks.

Figure 24-11 shows the Aquis peak AM (6 am to 7 am) and PM (2 pm to 3 pm) peak traffic generated on the Captain Cook Highway with and without Aquis traffic loads.

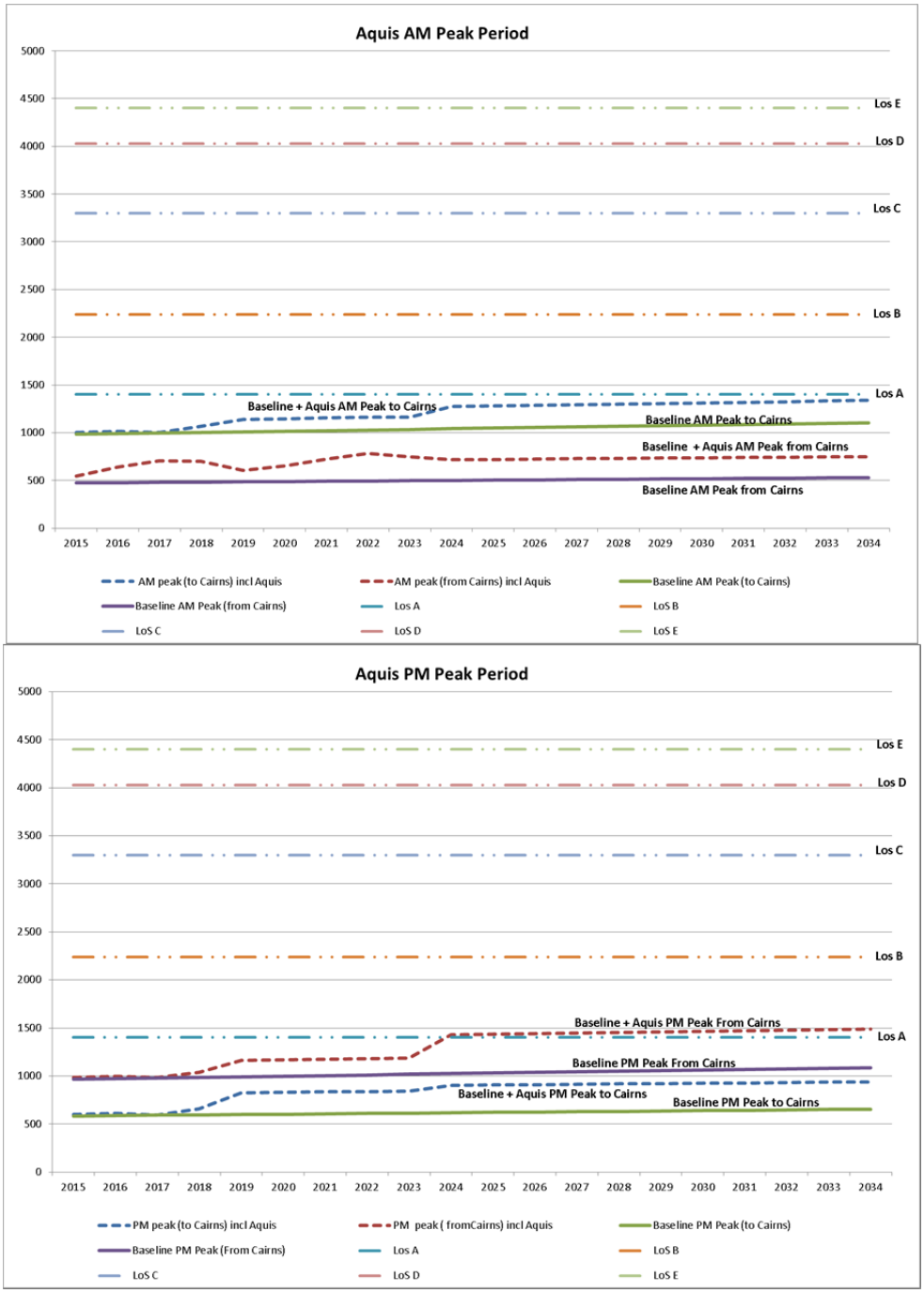


Figure 24-11 Aquis AM and PM non-coincident peaks on Captain Cook Highway.

Figure 24-11demonstrates for the AM and PM Aquis Resort peaks that the demands increase the non-coincident peak flows on the Captain Cook Highway, however the LoS is still generally maintained at A. The Aquis Resort demands do not significantly impact upon LoS outcomes for the Captain Cook Highway as it occurs in non-coincident peaks.

Cairns Western Arterial Road (Freshwater Creek Bridge to Caravonica Roundabout)

Figure 24-12 illustrates the predicted annual average daily traffic (AADT) on the Cairns Western Arterial Road with and without the planned 4 lane upgrade.

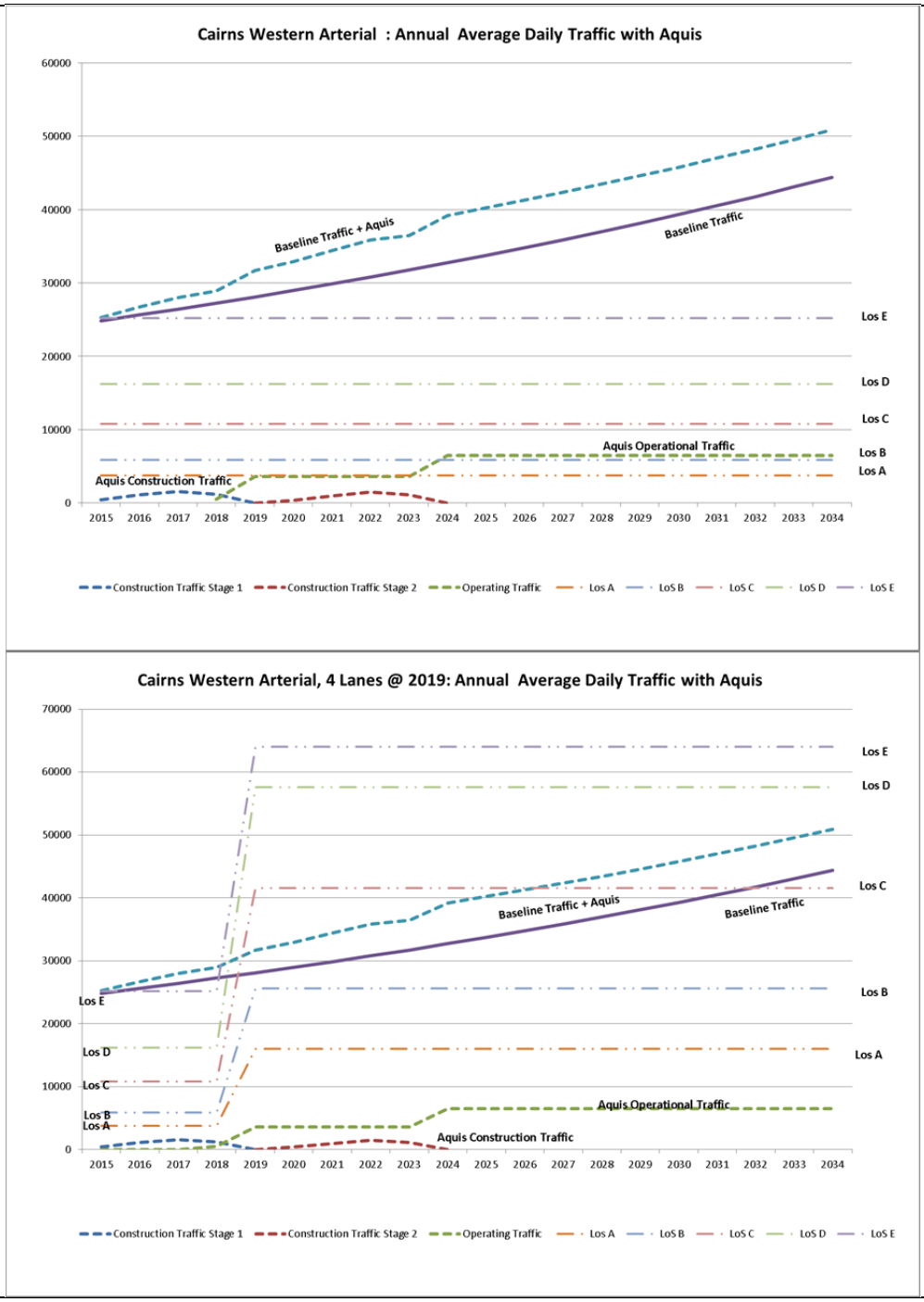
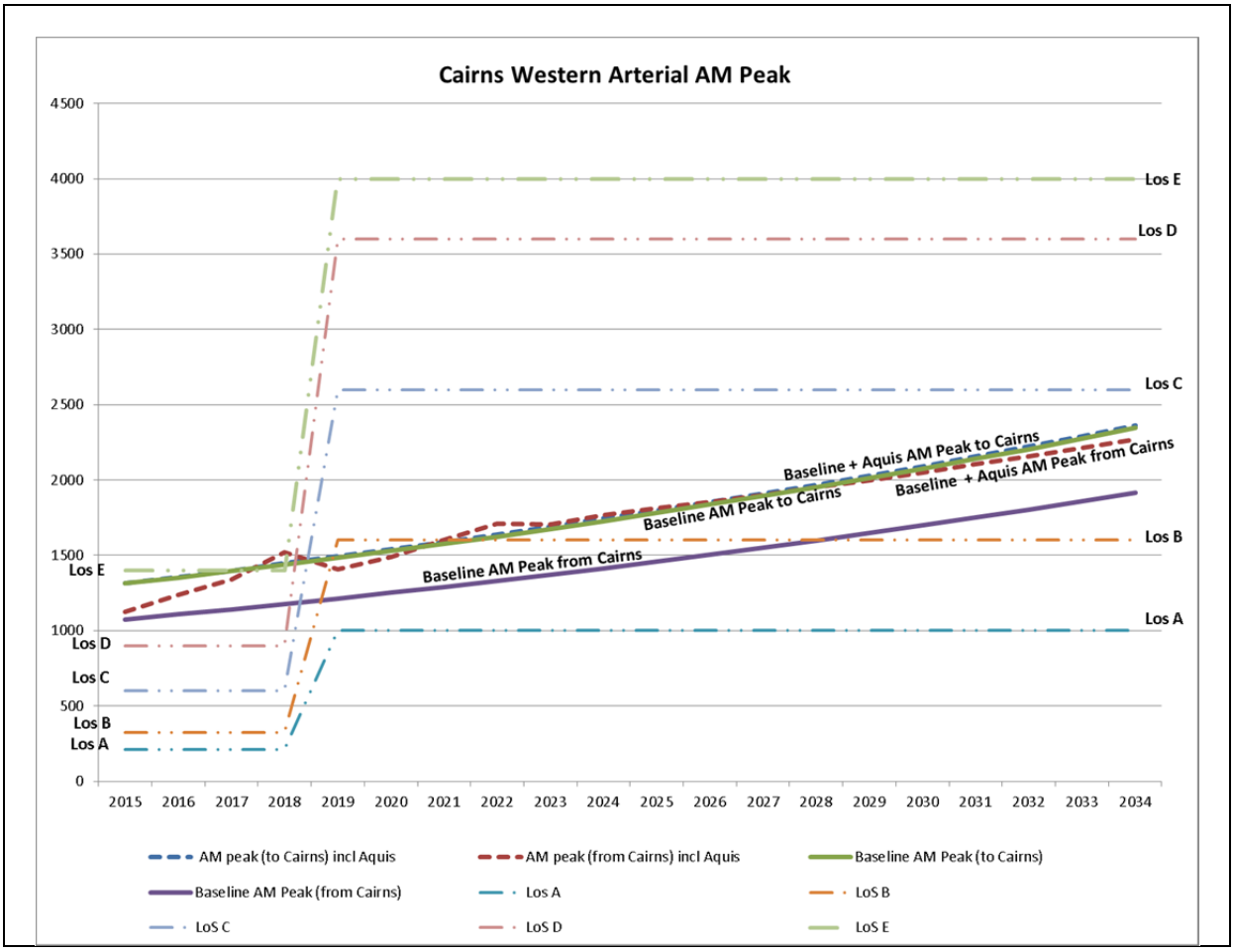


Figure 24-12 CWAR AADT Level of Service with / without 4 lanes.

This section of the CWAR is currently at or approaching LoS E and F and warrants upgrading to four lanes in the absence of the Aquis Resort. Overlaying Aquis resort demands on the traffic profile will significantly exacerbate the current performance problems with CWAR.

The second plot demonstrates the benefits of upgrading CWAR to four lanes by 2019. LoS can be improved from LoS E to B immediately and by 2034 the link would still be operating at LoS C to D.

In relation to peak hour impacts, **Figure 24-13** shows the AM (8am to 9am) and PM (5pm to 6pm) peak traffic volumes for the CWAR with and without Aquis Resort. This figure is in two parts.



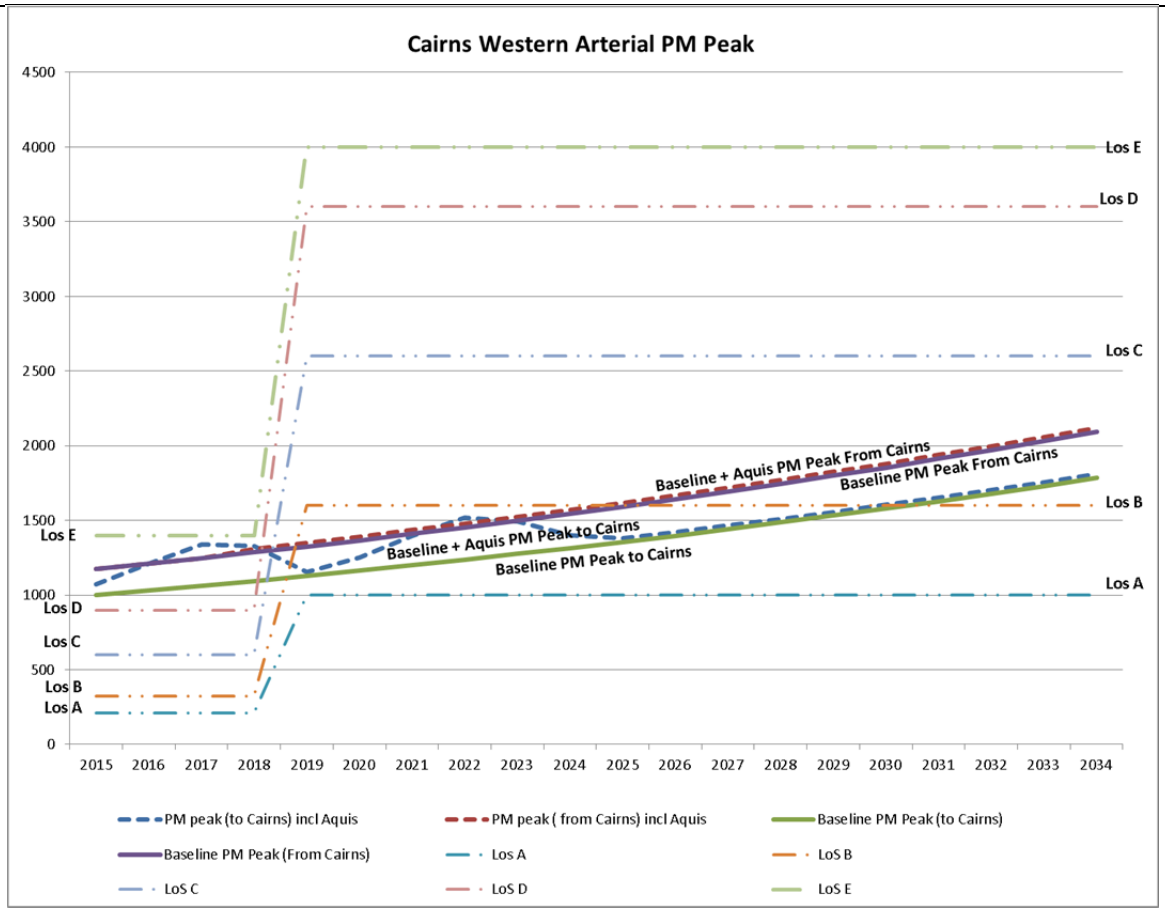


Figure 24-13 CWAR traditional AM and PM peak hour impacts.

The figures demonstrate the AM and PM Aquis Resort peaks increase the non-coincident peak flows on the four-lane upgraded CWAR, however the LoS is maintained at B to C. The Aquis Resort demands have minimal impact upon LoS outcomes for the four-lane upgraded CWAR.

Intersection of Captain Cook Highway / Yorkeys Knob Road

The performance of the Yorkeys Knob Road roundabout over time is difficult to predict with certainty as the configuration and functional demands on the intersection will be a subject to DTMR planning outcomes for the Smithfield Bypass and the timing for its implementation.

On the assumption that the roundabout maintains current functionality with no significant change to traffic patterns other than those imposed by Aquis, **Table 24-8** summarises the impacts on Yorkeys Knob Road roundabout to 2034.

TABLE 24-8 IMPACTS OF AQUIS OPERATION TRAFFIC ON YORKEYS KNOB ROUNDABOUT

EXISTING INTERSECTIONS Aquis RESORT OPERATIONAL TRAFFIC 2034 '10 YEAR HORIZON'	APPROACH VOLUME	LOS	DEGREE OF SATUR-ATION	QUEUE LENGTH (95TH) (m)	AVERAGE DELAY (s)
Yorkeys Knob Road / Captain Cook Highway					
AM Peak					
Captain Cook Highway (to Cairns CBD)	2527	F	1.35	2203	325
Captain Cook Highway (to Smithfield)	1290	A	0.54	34	8
Yorkeys Knob Road	2014	F	2.47	2184	915
PM Peak					
Captain Cook Highway (to Cairns CBD)	1396	B	0.60	65	15
Captain Cook Highway (to Smithfield)	2262	F	1,87	3615	801
Yorkeys Knob Road	1615	E	1.04	302	72

The analysis demonstrates the Yorkeys Knob Roundabout will become dysfunctional and require upgrade in order to maintain acceptable LoS outcomes to 2034.

The stage 1 construction phase will create proportionally high right turn movement onto Yorkeys Knob Road in the AM peaks which is expected to create delays for traffic travelling inbound to Cairns on the Captain Cook Highway. The result will be motorists electing to use CWAR as an alternative route which is not desirable given the current poor performance of CWAR.

Augmentation or reconfiguration of the roundabout is the appropriate response to this issue; however in the absence of DTMR planning outcomes it is not possible at present, to define the likely reconfigured intersection. The proponent will engage and work with DTMR to arrive at a solution that meets agreed performance outcomes.

Intersection of Captain Cook Highway / Caravonica Roundabout

Similar to the Yorkeys Knob roundabout, the performance of the Caravonica roundabout over time is difficult to predict with certainty as the configuration and functional demands on the intersection will be subject to the planning outcomes for the Smithfield Bypass and the timing for its implementation.

On the assumption that the roundabout remains functional with no significant change to traffic patterns other than those imposed by Aquis, **Table 24-9** summarises the impacts on Caravonica roundabout at 2034.

TABLE 24-9 IMPACTS OF AQUIS OPERATIONAL TRAFFIC ON CARAVONICA ROUNDABOUT

EXISTING INTERSECTIONS Aquis RESORT OPERATIONAL TRAFFIC 2034 '10 YEAR HORIZON'	APPROACH VOLUME	LOS	DEGREE OF SATUR-ATION	QUEUE LENGTH (95TH) (m)	AVERAGE DELAY (s)
Caravonica Roundabout					
AM Peak					
Captain Cook Highway (to Cairns CBD)	2527	B	0.90	184	14
Captain Cook Highway (to Smithfield)	1290	F	2.50	3270	1400
Cairns Western Arterial	2360	A	0.61	21	6
PM Peak					
Captain Cook Highway (to Cairns CBD)	1396	B	0.93	224	20
Captain Cook Highway (to Smithfield)	2262	F	2.29	4417	1183
Cairns Western Arterial	2120	E	1.98	687	680

The analysis demonstrates the Caravonica Roundabout experiences significant delay and will require upgrade in order to realise acceptable LoS outcomes.

Broader Road Network Impacts

Understanding impacts on the broader Cairns Road Network is an important aspect of gauging the 'ripple effect' a development the size and scale of Aquis can generate on the broader road network. The Cairns Strategic Transport Model (CSTM) prepared by Bitzios Consulting for the DTMR and CRC is an effective and recognised tool for establishing regional road network impacts arising from development including Aquis.

The model underwent an update in 2013 which included an update of the road network and demographic data including population and employment data for both the 2011 and 2031 models. During this process the model also underwent a thorough revalidation to ensure fitness for purpose in undertaking strategic assessments for new road projects and major developments. The model validation focussed on the key/major road corridors such as the Bruce, Kennedy and Captain Cook Highways across a number of screen lines but also included detailed validation for the CBD and Cairns Airport. The CSTM is an appropriate model in terms of providing a strategic level assessment of impacts on the major road corridors. The impacts on the local road network need to be viewed with a little more caution.

The traffic demands and associated demographic data associated with operating and servicing Aquis have been overlayed onto the 2031 model and a suite of maps were generated which communicate the impacts created by Aquis above and beyond the current 2031 predictions.

The 2031 predictive modelling includes anticipated infrastructure upgrades as provided by CRC and DTMR in the development of the model. This includes future four-lane upgrades of Cairns Western Arterial, Yorkeys Knob Road, Dunne Road, the Northern Beaches Interconnector and Smithfield Bypass.

Mapping data is presented for the 'Construction Stage 1', 'Operation Stage 1 + Construction Stage 2' and 'Ultimate Operations' stages for:

- Links where 5% or more vehicles per day increase is forecast
- Links tipped over capacity AM Peak
- Links tipped over capacity PM peak.

The 5% figure represents a threshold defined by DTMR where the development is considered to have the potential to create 'impact' on the network. The assessment as to the 'tipping over capacity' establishes whether the impact has the potential to result in the need for more capacity to be provided on the network beyond that already planned.

As the original CSTM model established for DTMR has been developed around the 2011 and 2031 baseline and 20 year planning window, the assessment of Aquis Resort impacts are related to these timelines. The 2011 and 2031 do not align specifically with the Aquis Resort construction and operational milestones, but it does provide a good 'first pass' of potential impacts.

As such the stages considered relate to the CSTM modelling milestones as follows:

- Construction Stage 1 : 2011 CSTM Model
- Construction Stage 2 and Operations Stage 2 : 2031 CSTM model
- Ultimate Operations : 2031 CSTM model.

Further development of the CSTM model is expected by the DTMR to more specifically reflect the Aquis timelines. The refined model will form the basis for establishing a decision framework to a proposed infrastructure agreement between the proponent and DTMR.

The maps generated for each of the above stages are provided in **Figure 24-14** to **Figure 24-21**. Those routes highlighted in red line work identify where thresholds are being exceeded.

Figure 24-14 illustrates there are segments of the network where the 2011 AADT volumes are exceeded by more than the 5% threshold as a consequence of Aquis. The Captain Cook Highway is highlighted as the most impacted by the stage 1 construction which is anticipated given the large earthworks haulage task proposed to Cairns Airport. (As noted above, the efficacy of the predicted volumes and thus impacts on the lower hierarchal roads in the network need to be interpreted with some caution.)

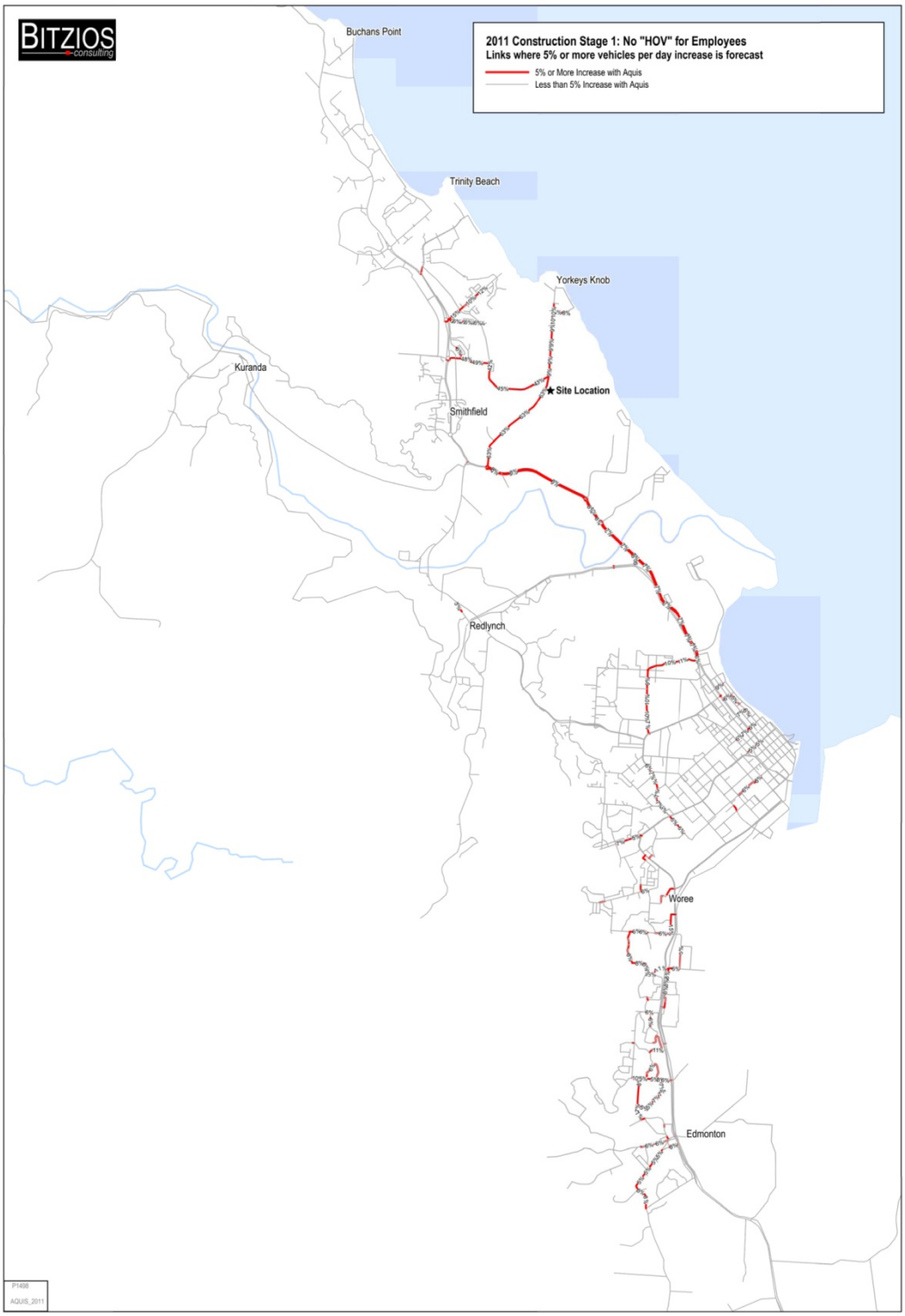


Figure 24-14 Network where 5% increase in background traffic threshold is exceeded (Stage 1 Construction).

Figure 24-15 AM network peak where capacity is exceeded (Stage 1 Construction).

Figure 24-16 PM network peak where capacity is exceeded (Stage 1 Construction).

Figure 24-15 and Figure 24-16 indicate the capacity of the network in 2011 will not be exceeded by the construction of Stage 1 of Aquis. This suggests that Stage 1 of construction of Aquis can be accommodated within existing road infrastructure capacity.

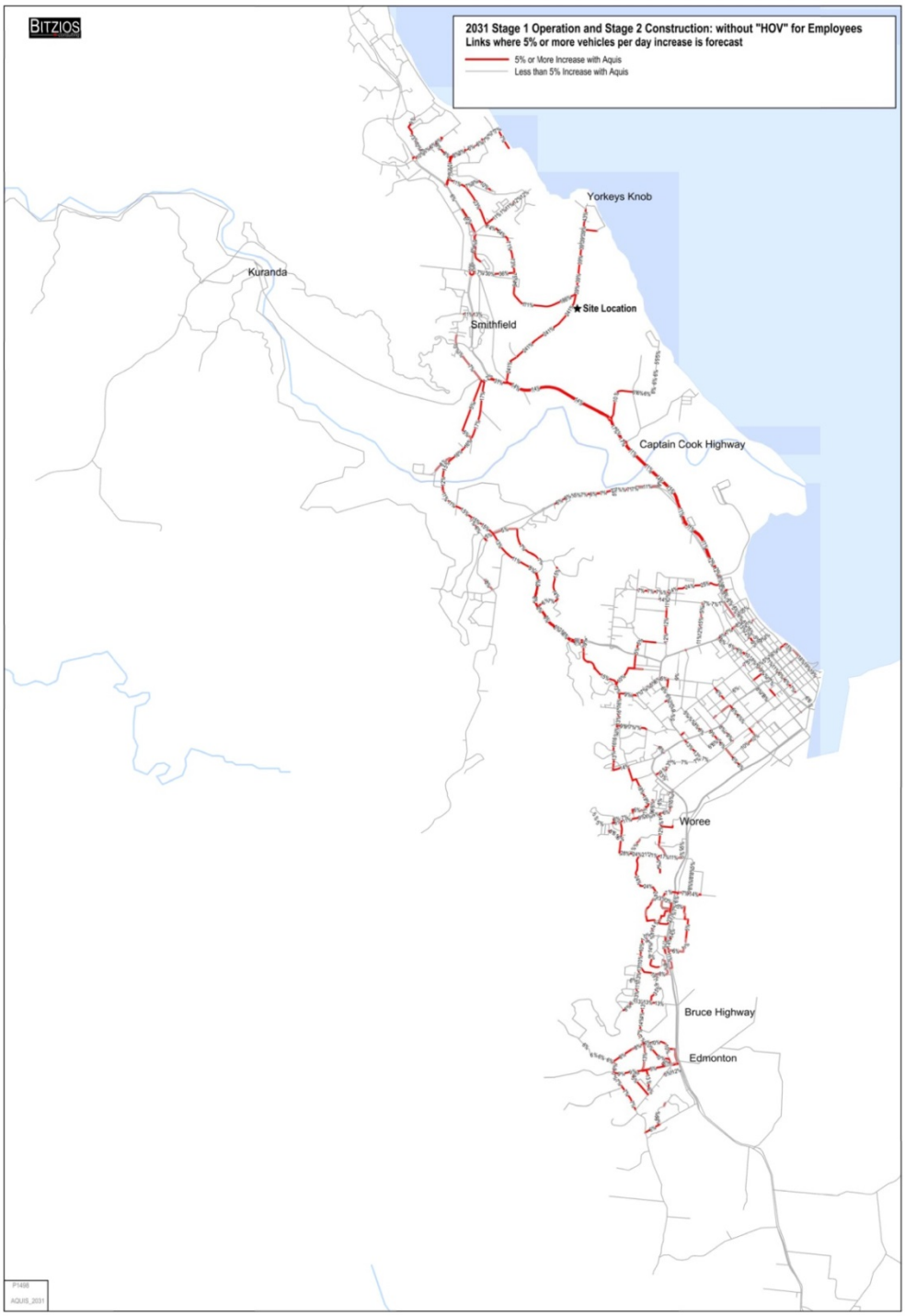


Figure 24-17 Network where 5% increase in background traffic threshold is exceeded (Stage 1 Operations and Stage 2 Construction).

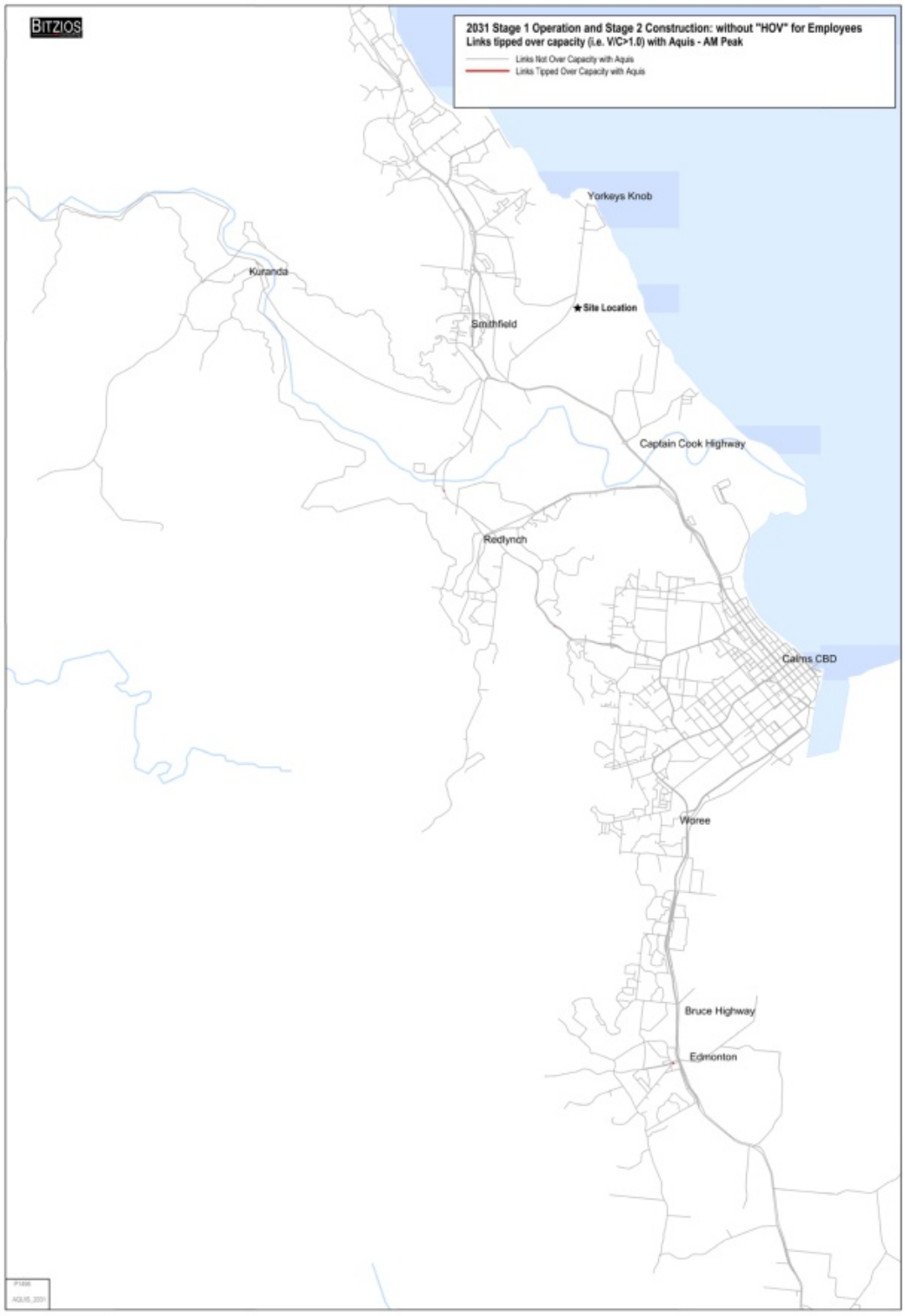


Figure 24-18 AM network peak where capacity is exceeded (Stage 1 Operations and Stage 2 Construction).

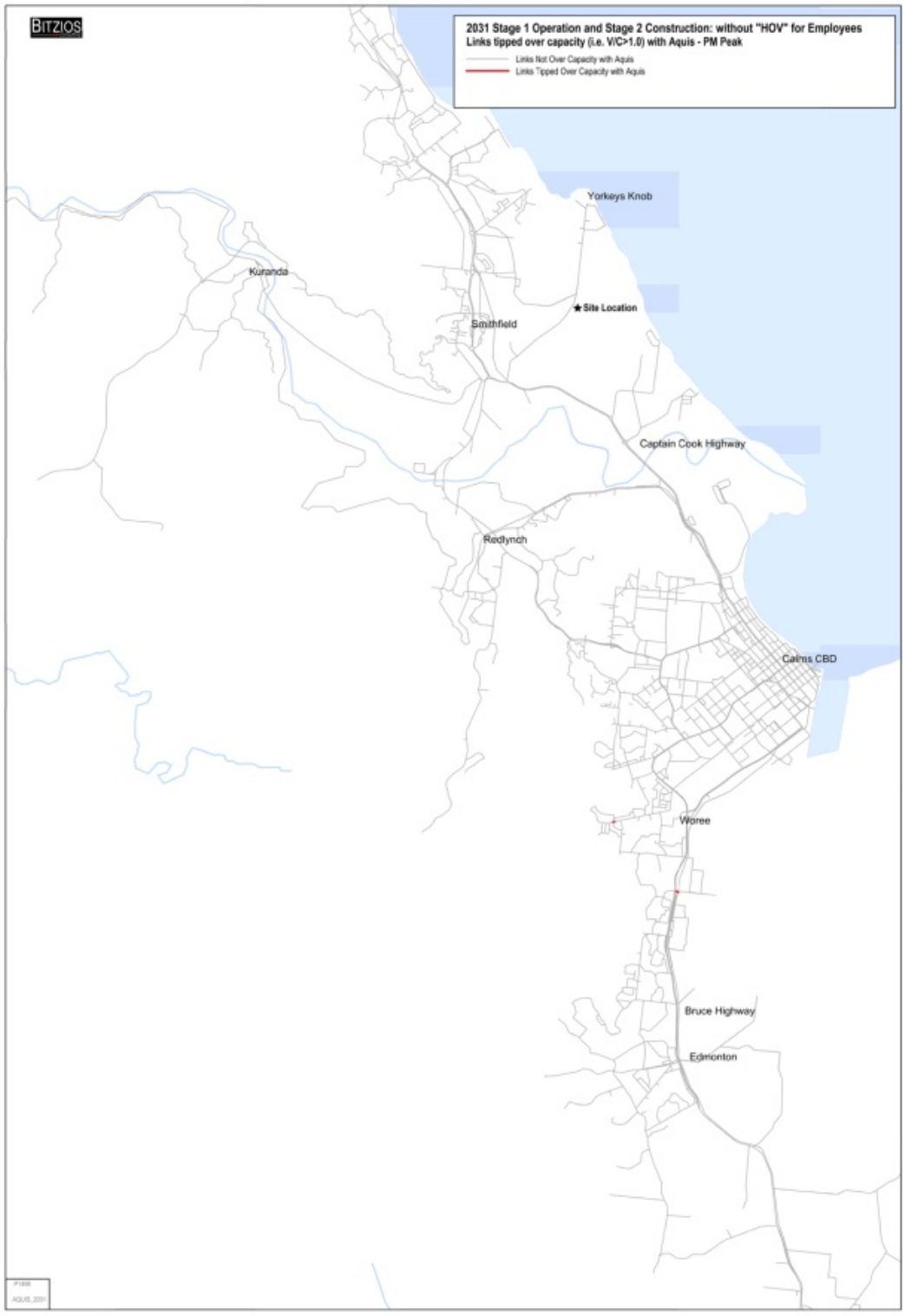


Figure 24-19 PM network peak where capacity is exceeded (Stage 1 Operations and Stage 2 Construction).

Figure 24-17 illustrates that there are segments of the network where the predicted 2031 AADT volumes are in excess of the 5% threshold as a consequence of Aquis. Of the State Road Network, the Captain Cook Highway and Cairns Western Arterial are highlighted.

Figure 24-18 and Figure 24-19 indicates that the capacity of the proposed network in 2031 will not be exceeded by the operation and construction of Aquis. This reflects that Aquis fits within the planning framework for road infrastructure capacity to 2031.

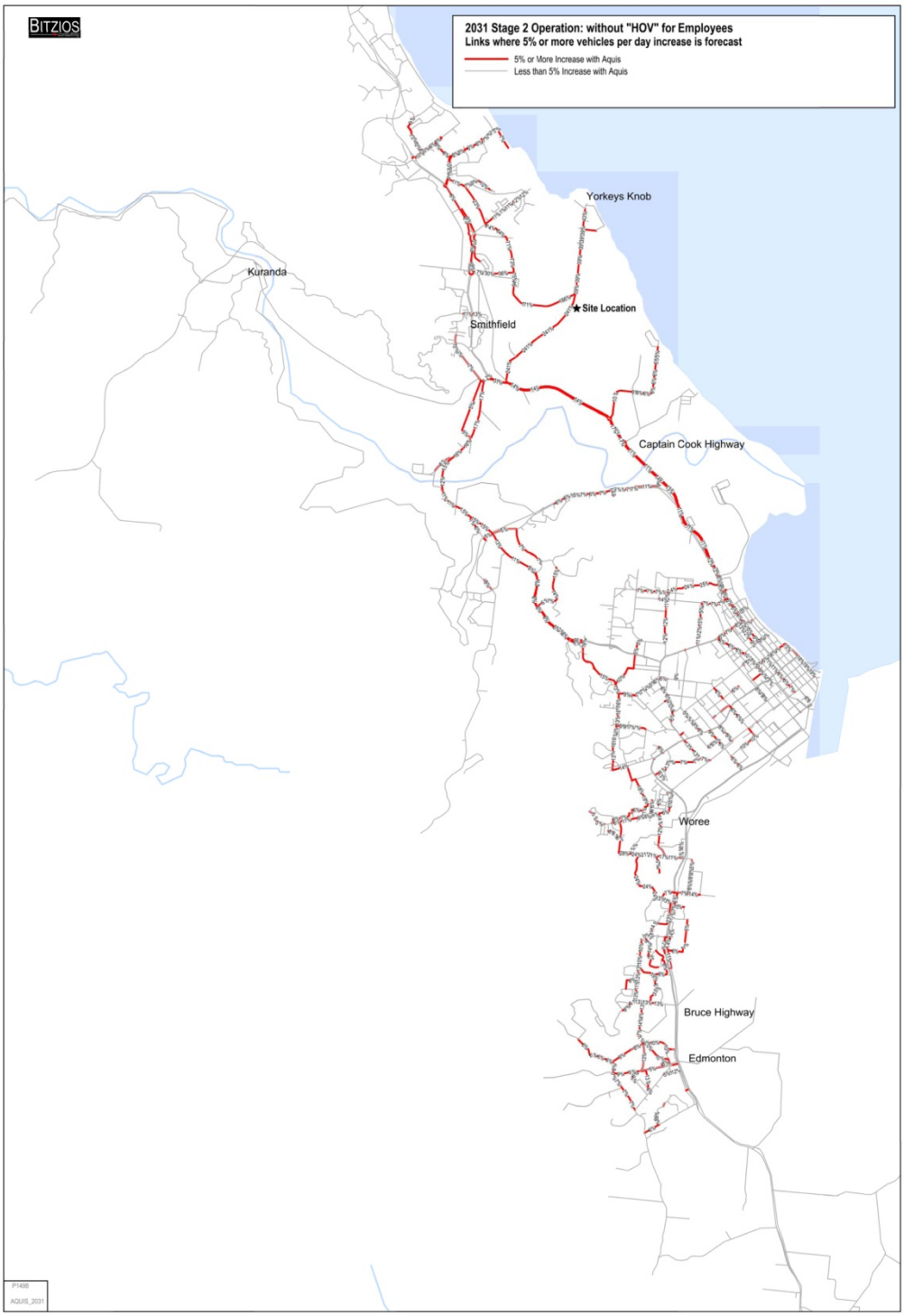


Figure 24-20 Network where 5% increase in background traffic threshold is exceeded (Ultimate Operations : 2031).

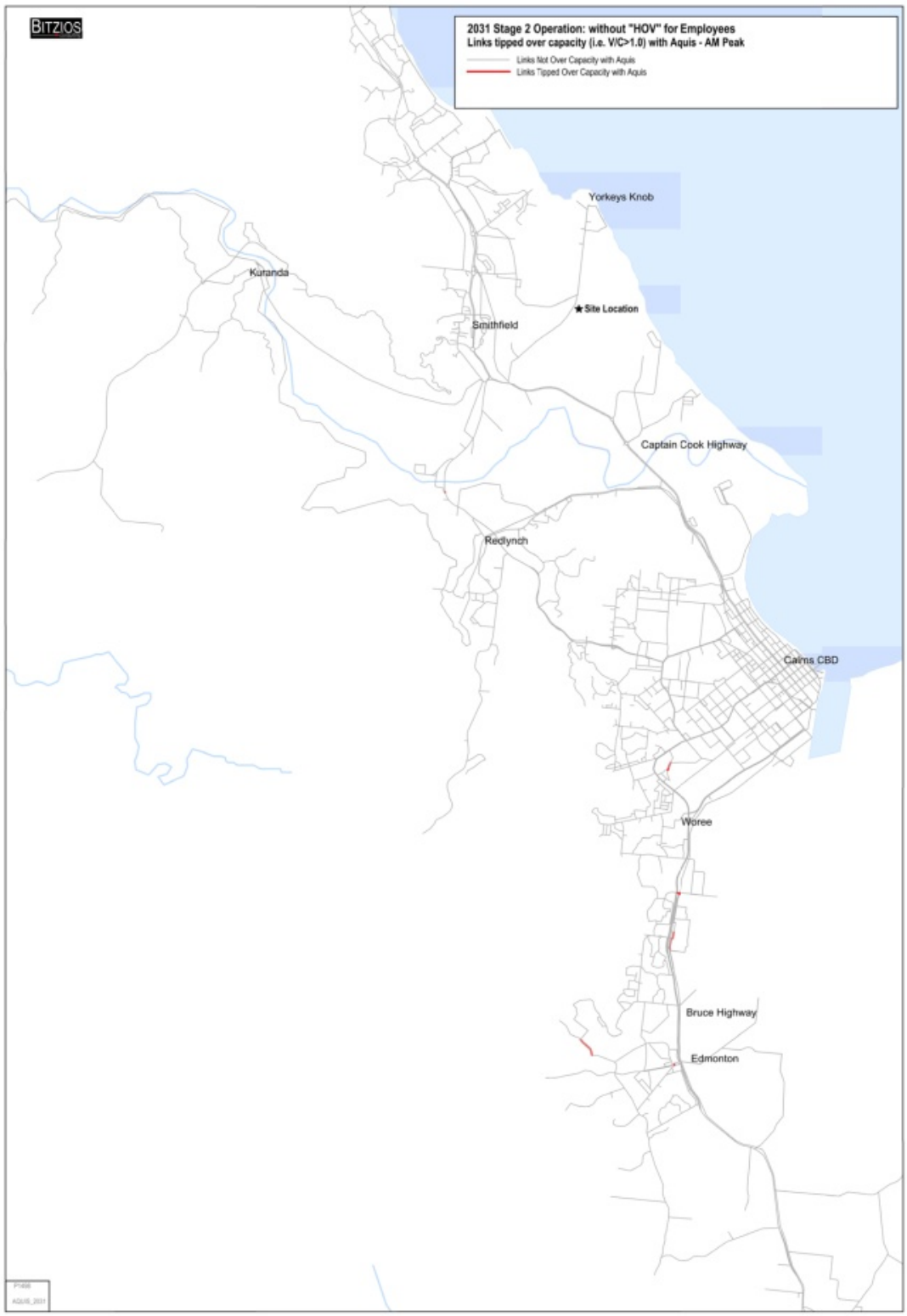


Figure 24-21 AM network peak where capacity is exceeded (Ultimate Operations: 2031).

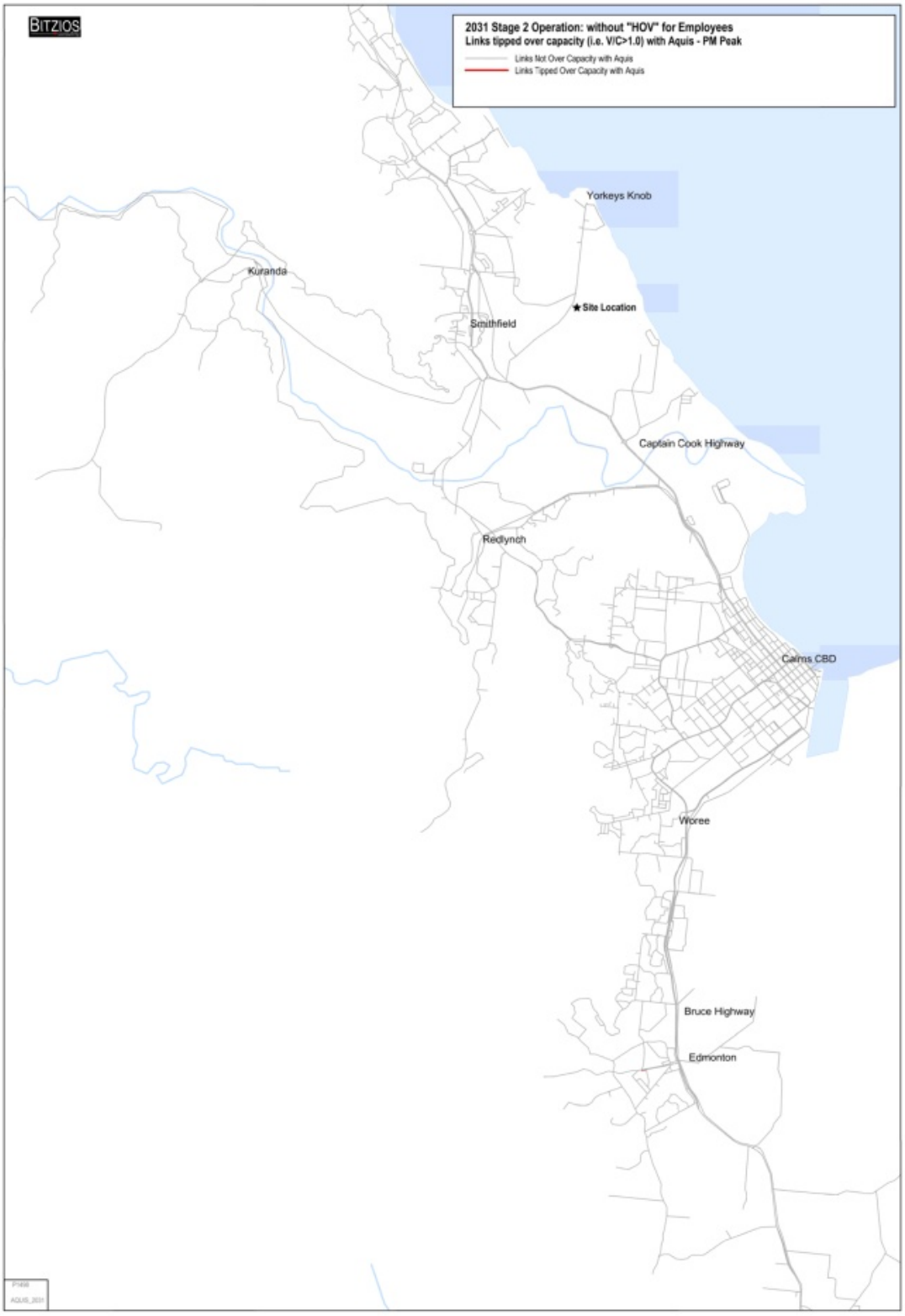


Figure 24-22 PM network peak where capacity is exceeded (Ultimate Operations: 2031).

Figure 24-20 illustrates that there are segments of the network where the predicted 2031 AADT volumes are in excess of the 5% threshold as a consequence of Aquis ultimate operations.

Figure 24-21 and Figure 24-22 indicate that the capacity of the proposed network in 2031 will not be exceeded by the operations of Aquis. This reflects that Aquis fits within the planning framework for road infrastructure to 2031.

Pavement Impacts

The DTMR Traffic Impact Assessment methodology requires that there be consideration of the impacts arising on the pavement assets. This is triggered by the threshold defined by DTMR where the development causes greater than 5% more Equivalent Standard Axles (ESAs) than predicted for the network in the absence of Aquis. In order to assess the magnitude of the pavement impact of the Aquis Resort on the State Controlled Road network, the increase in ESAs are assessed against the background ESAs to determine additional costs that may be required for the pavement rehabilitation and / or maintenance.

A detailed assessment of likely pavement impacts has been undertaken for the Aquis construction and operational stages of Aquis on the Captain Cook Highway and the Cairns Western Arterial to 2034 and these are discussed below.

The total ESAs associated with transporting construction materials for the development are summarised in **Table 24-10**. These values were determined by adopting assumed truck types (and typical vehicle ESAs), likely payload per trip, and truck volumes. The ESA information for each vehicle class (unloaded and fully loaded) has been obtained from material provided separately by DTMR. It is noted that ESA adjustments have been made for all trips carrying loads below the maximum allowable payload.

TABLE 24-10 CONSTRUCTION ESA CALCULATION

Material	Vehicle Type (No. of Axles, Austroads Class No.)	Vehicle ESA (per trip)		Material Qty per Truck Trip (Tonnes)	Truck Trips (One Way)	ESAs		
		Fully Loaded	Unloaded			Loaded Trips	Unloaded Trips	TOTAL
Concrete	Three Axle Truck (3 Axle, Class 4)	3.7	0.5	12	114 000	421 800	57 000	478 800
Reinforc-ement	Semi-Trailer (6 Axle, Class 9)	5.1	0.51	25	3520	17 952	1795	19 747
Steel	Semi-Trailer (6 Axle, Class 9)	5.1	0.51	25	4955	400	204	604
Quarry Materials	Truck & 4-Axle Dog (7Axle,Class 10)	7.2	0.53	29	9827	70 754	5208	75 962
	Semi-Trailer (5 Axle, Class 8)	5.9	0.52	22.5	12 333	72 765	6413	79 178
Asphalt	Semi-Trailer (5 Axle, Class 8)	5.9	0.52	23	1348	7953	701	8654
Glass	Large Rigid Truck (2 Axle, Class 3)	3	0.54	6	1429	4287	772	5059
Timber	Semi-Trailer (6 Axle, Class 9)	5.1	0.51	14	1000	5100	510	5610
Plaster-board	Semi-Trailer (6 Axle, Class 9)	5.1	0.51	25	661	3371	337	3708
Various	Semi-Trailer (6 Axle, Class 9)	5.1	0.51	25	5892	30 049	3004	33 053
Precast	Semi-Trailer (6 Axle, Class 9)	5.1	0.51	25	525	2678	268	2946
Earthworks Excavation	Truck & 4-Axle Dog (7Axle,Class 10)	7.2	0.53	29	159 736	1 150 100	84 660	1 234 760
Totals						**1 787 209**	**160 872**	**1 948 081**

The road network will experience an additional 2 million ESAs of loading over the eight year construction period. Approximately 65% of the additional ESAs is related to the transport of the 2.8 million cubic metres of earthworks exported from site.

The estimated ESAs have been assigned to the State Controlled Road network taking into consideration the traffic assignments as well as the construction vehicle class likely to travel on a particular route.

Therefore, the estimated ESAs during the eight-year construction period have been assigned to the external DTMR road network for construction materials as follows:

- 43% to / from Cairns Western Arterial
- 57% to / from the Captain Cook Highway.

The estimated ESAs for exporting of the surplus earthworks have been assigned to the external road network as follows:

- 0% to / from Cairns Western Arterial
- 100% to / from the Captain Cook Highway (south) – based upon delivery of materials to Cairns Airport.

Taking the above into consideration, the additional ESAs over the construction period on the adjacent State Controlled Road network is summarised in **Table 24-11**.

TABLE 24-11 CONSTRUCTION ESA DISTRIBUTION

STATE CONTROLLED ROAD	ESAs (8 YEAR CONSTRUCTION PERIOD)		
	To Site	From Site	TOTAL
Captain Cook Highway (South of Yorkeys Knob Road towards Cairns)	411,812	1,189,199	1,601,011
Captain Cook Highway (Yorkeys Knob Road to CWAR)	310,109	37,115	347,224
Captain Cook Highway (North of CWAR)	36,152	4,344	40,496
Cairns Western Arterial Road	273,957	32,771	306,728

In order to appreciate the increase in ESAs on the State Controlled Road network, a comparison is made against the background ESAs for that period. It is anticipated that construction will commence in mid-2015 and be completed in 2023. Therefore, for comparison purposes, 2015 to 2023 have been selected as the design years for comparing base and design ESAs for construction traffic.

The base, proposed and percentage increase in ESAs on the State Controlled Road network for each segment are summarised in **Table 24-12**.

TABLE 24-12 CONSTRUCTION INCREASE IN ESA

State Controlled Road	Existing Average ESAs (8 Years)			Proposed Construction ESAs (8 Years)			Percentage Increase in ESAs		
	To Site	From Site	TOTAL	To Site	From Site	TOTAL	To Site	From Site	TOTAL
Captain Cook Highway (South of Yorkeys Knob Road towards Cairns)	4 521 895	4 339 485	8 861 470	411 812	1 189 199	1 601 011	9.1%	27.4%	18.1%
Captain Cook Highway (Yorkeys Knob Road to CWAR)	3 881 410	4 229 985	8 111 395	310 109	37 115	347 224	8.0%	0.8%	4.3%
Captain Cook Highway (North of CWAR)	5 908 715	6 417 430	12 327 145	36 152	4344	40 496	0.6%	0.1%	0.3%
Cairns Western Arterial Road	3 095 930	2 841 525	5 937 455	273 957	32 771	306 728	8.8%	1.1%	5.2%

The DTMR threshold of 5% above base levels dictates as to whether a development will meet criteria for impact on the pavement life. Those network segments that are impacted include:

- Captain Cook Highway (East of Yorkeys Knob Road – Inbound and Outbound)
- Captain Cook Highway (Yorkeys Knob Road to CWAR – Inbound)
- Cairns Western Arterial (Inbound).

The haulage of the surplus earthworks materials to Cairns Airport is strongly reflected by the 27.4% increase in ESAs on the Captain Cook Highway south.

The total ESAs associated with the heavy vehicle trips for the operational stages of Aquis Resort (which includes servicing vehicles, HOVs transporting guests) are summarised in Table 24-13.

TABLE 24-13 OPERATIONAL ESA GENERATION

Use	Vehicle Type (No. of Axles, Austroads Class No.)	Vehicle ESA (per trip)		Trips (One Way)	Loading Status		Total ESAs/Day		
		Fully Loaded	Unloaded		To Site	From Site	To Site	From Site	TOTAL
HoV for Arriving / Departing Guests	Bus (2 axle, Class 3)	3	0.54	77	Loaded	Loaded	231	231	462
HoV for Guest Day Trips	Bus (2 axle, Class 3)	3	0.54	76	Loaded	Loaded	193	193	386
Trucks for Servicing (Rigid)	Three Axle Truck (3 axles, Class 4)	3.7	0.5	360	Loaded	Empty	1332	180	1,512
Trucks for Servicing (Semi - Trailer)	Semi –Trailers (6 Axle Class 9)	5.1	0.51	360	Loaded	Empty	1836	183	2020
				873		**TOTAL**	**3592**	**787**	**4380**

Based on the above there will be an additional 4,380 ESAs on the network during each day of operation of Aquis from 2023.

The operational ESAs generated by Aquis are distributed across the adjacent road network as follows:

- Captain Cook Highway (South): 60%
- Captain Cook Highway (North): 15%
- Cairns Western Arterial: 25%.

The distribution has been derived based upon the likely sources and direction from which heavy vehicle carried goods and services will be delivered to site. For example it is anticipated a large portion of the heavy vehicle trips will be guests from the airport and food and beverage which will come from the south along the Captain Cook Highway.

No information has been available from DTMR as to the forecast ESAs on the adjacent network and as such these have been predicted based upon existing commercial traffic volumes and growth rates and is detailed below:

1. Applying a base traffic growth rate of 2% p.a. (compound) to the 2011 AADT volumes to establish the 2015 to 2034 base traffic volumes. AADT volumes on Cairns Western Arterial and Captain Cook Highway (south of Cairns Western Arterial) were estimated by utilising available peak hour and AADT data obtained on Captain Cook Highway, just north of Cairns Western Arterial. A directional split of 50%/50% was assumed for all road segments where daily traffic data was not available.
2. Adopting a heavy vehicle percentage of 5.95% northbound and 5.69% southbound, which is consistent with the heavy vehicle percentages measured on Captain Cook Highway just north of Cairns.
3. Applying an average of 3.2 ESAs/truck. This rate is generally accepted by DTMR for all State Controlled Roads excluding the Bruce Highway.

Utilising the base ESAs derived through the above methodology and the additional ESAs generated by Aquis, the percentage increase in ESAs has been derived and is provided in Table 24-14.

TABLE 24-14 OPERATIONAL INCREASE IN ESA

STATE CONTROLLED ROAD	EXISTING AVERAGE DAILY ESAs			PROPOSED DAILY ESAs			PERCENTAGE INCREASE IN ESAs		
	To Site	From Site	TOTAL	To Site	From Site	TOTAL	To Site	From Site	TOTAL
Captain Cook Highway (South of Yorkeys Knob Road)	3190	2927	6117	2157	474	2631	67.6%	16.1%	43.0%
Captain Cook Highway (Yorkeys Knob Road to CWAR)	2738	2984	5722	1436	313	1749	52.4%	10.5%	30.6%
Captain Cook Highway (North of CWAR)	4169	4527	8695	539	118	657	12.9%	2.6%	7.6%
Cairns Western Arterial Road	2184	2004	4178	896	195	1091	41.0%	9.7%	26.1%

When compared against the DTMR threshold of 5% above base level ESAs , those network segments that are impacted include:

- Captain Cook Highway (South of Yorkeys Knob Road – Inbound and Outbound)
- Captain Cook Highway (Yorkeys Knob Road to CWAR – Inbound and Outbound)
- Captain Cook Highway (North of CWAR – Inbound)
- Cairns Western Arterial (Inbound and Outbound).

The pavement impacts associated with the operation of Aquis will be relatively significant and will need to be catered for as part of the infrastructure agreement between the proponent and DTMR.

c) Local Road Network

Traffic impacts on elements of the local road network were assessed and compared against LoS thresholds prescribed by DTMR in section 5.15 of the Road Planning and Design Manual (RPDM). The analysis was undertaken over the period of 2015 (commencement of construction of stage 1) through to 2034 (ten years from the commencement of operations of the ultimate development).

Yorkeys Knob Road

Figure 24-23 illustrates the predicted annual average daily traffic (AADT) on the Yorkeys Knob Road as a consequence of the Aquis Resort imposed traffic loads relative to LoS.

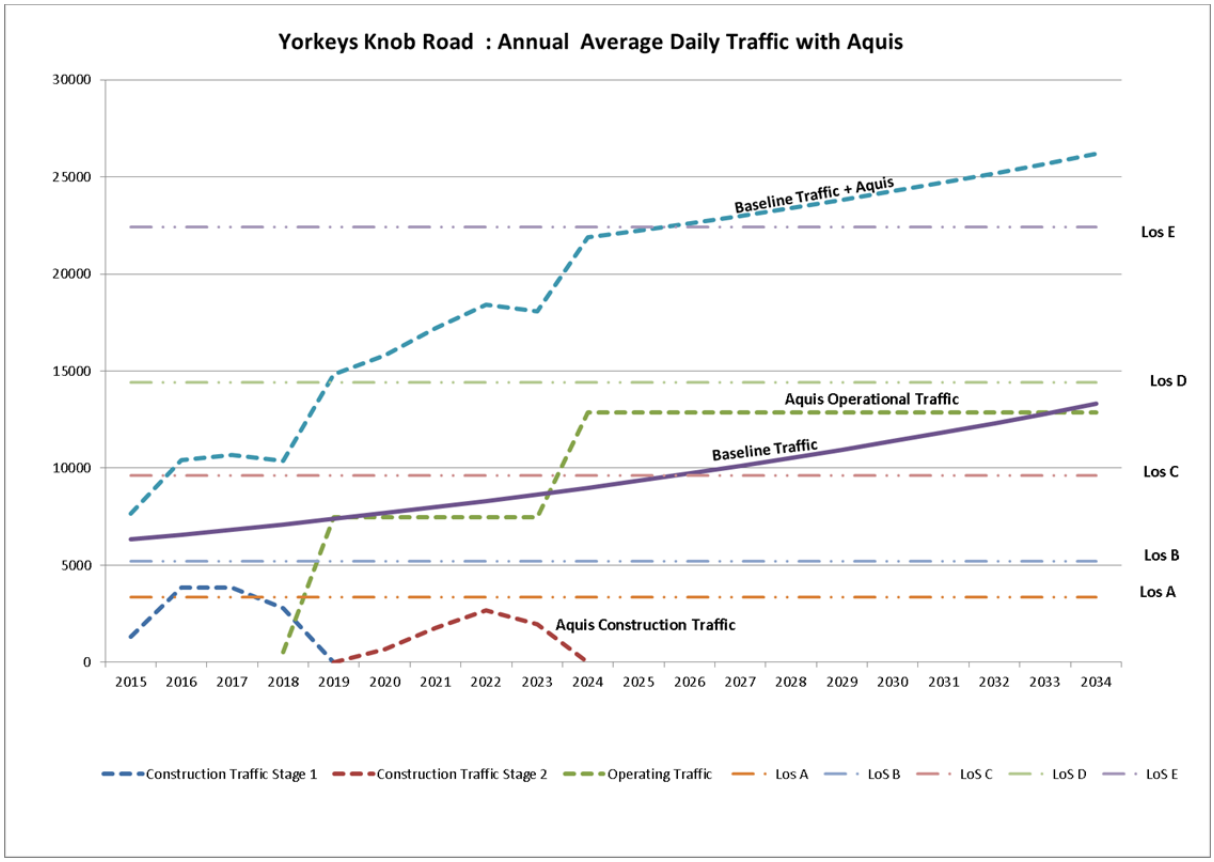


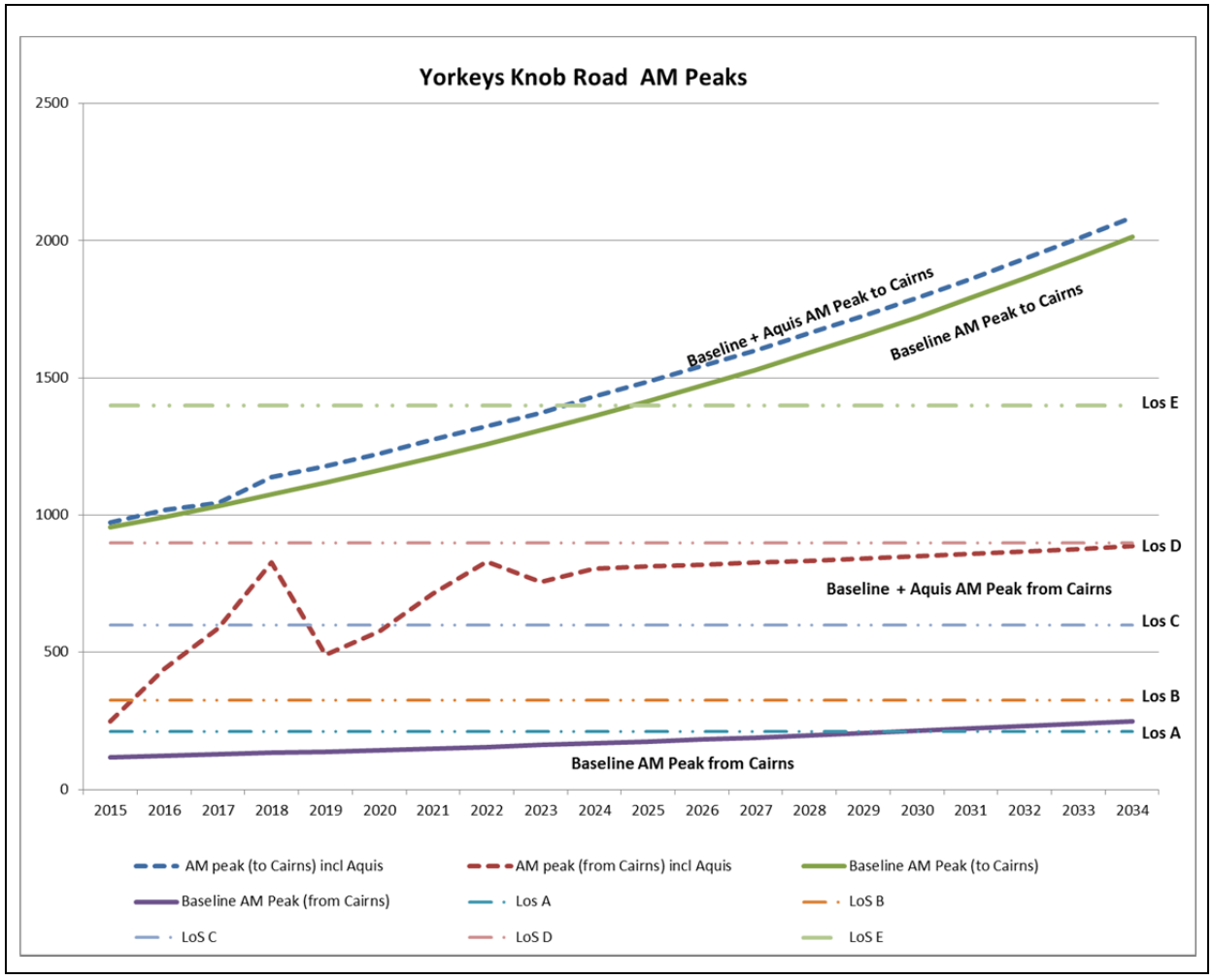
Figure 24-23 Annual average daily traffic on Yorkeys Knob Road with Aquis Resort.

The red and dark blue dotted lines reflect the traffic loads imposed during the Aquis construction stages; the green dotted line is the daily traffic generated by the operational phases over time; the purple solid line is the baseline traffic generation on the Yorkeys Knob Road based upon current DTMR and Council growth models and the dotted dark blue line is the accumulated traffic loads of the Aquis construction, operational and baseline loads.

The plot demonstrates the Yorkeys Knob Road at 2015 operates at LoS B, and in the absence of Aquis will be at LoS D by 2034.

With the Aquis traffic loadings imposed, Yorkeys Knob Road will exceed LoS E/F which renders the link unserviceable. Hence the Aquis Resort impacts on the operating behaviour of the Yorkeys Knob Road are significant. The anticipated response to this outcome will be four-lane upgrading of Yorkeys Knob Road.

In relation to the operating peak period, the construction and operations of Aquis will be managed to mitigate impacts on the peak periods experienced on the surrounding road network. **Figure 24-27** shows the AM (8 am to 9 am) and PM (5 pm to 6 pm) peak traffic volumes for Yorkeys Knob Road with and without Aquis Resort and, **Figure 24-28** shows the AM (6 am to 7 am) and PM (2 pm to 3 pm) peak traffic generated with and without Aquis. This figure is in two parts.



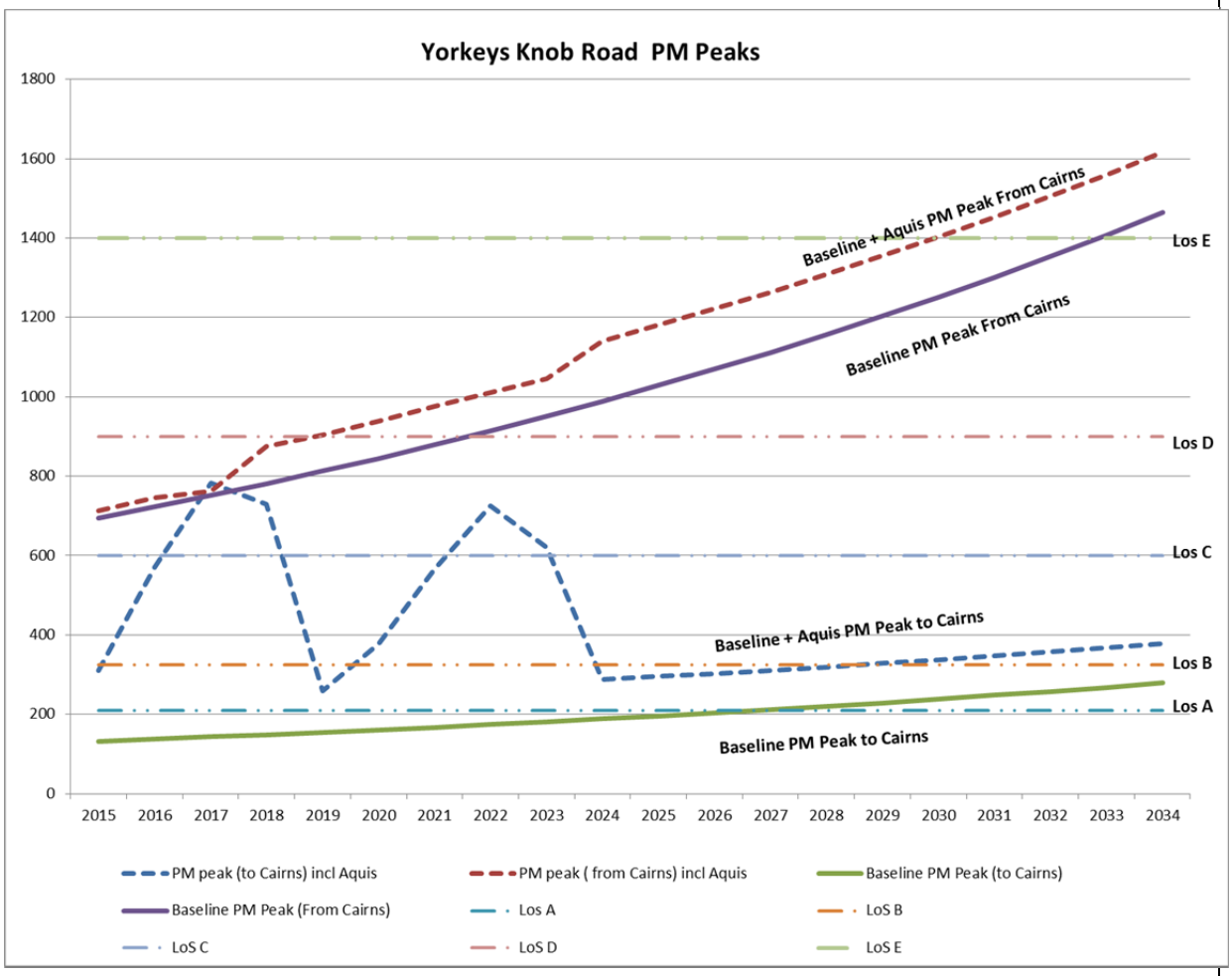
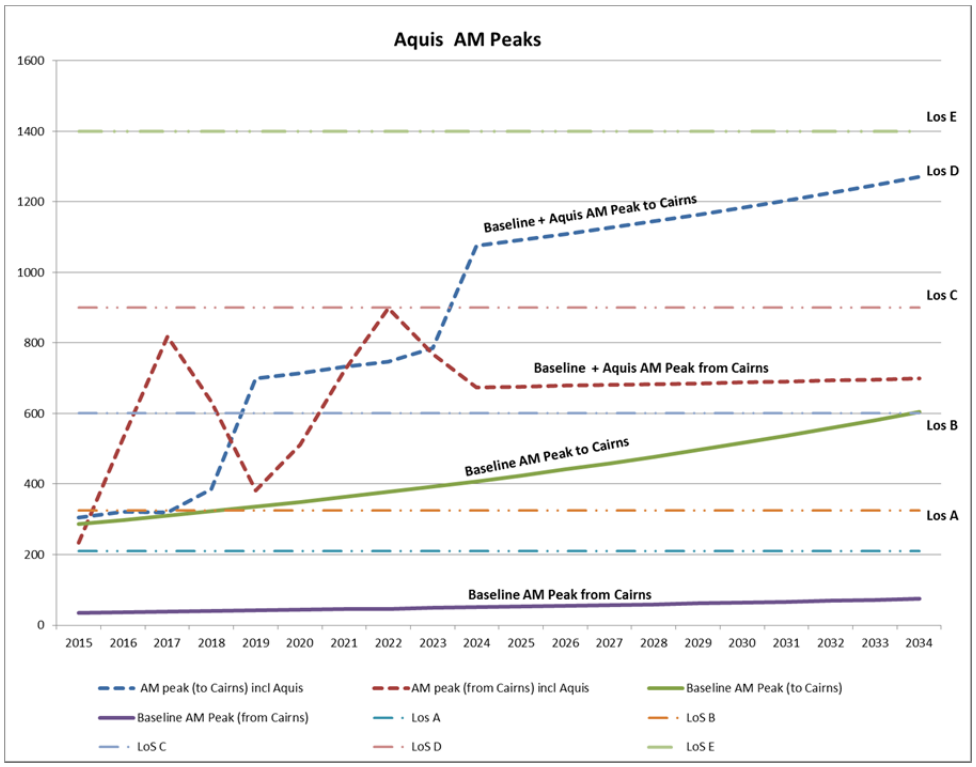


Figure 24-24 Yorkeys Knob Road AM peak (8 am – 9 am) and PM peak (5 pm – 6 pm).



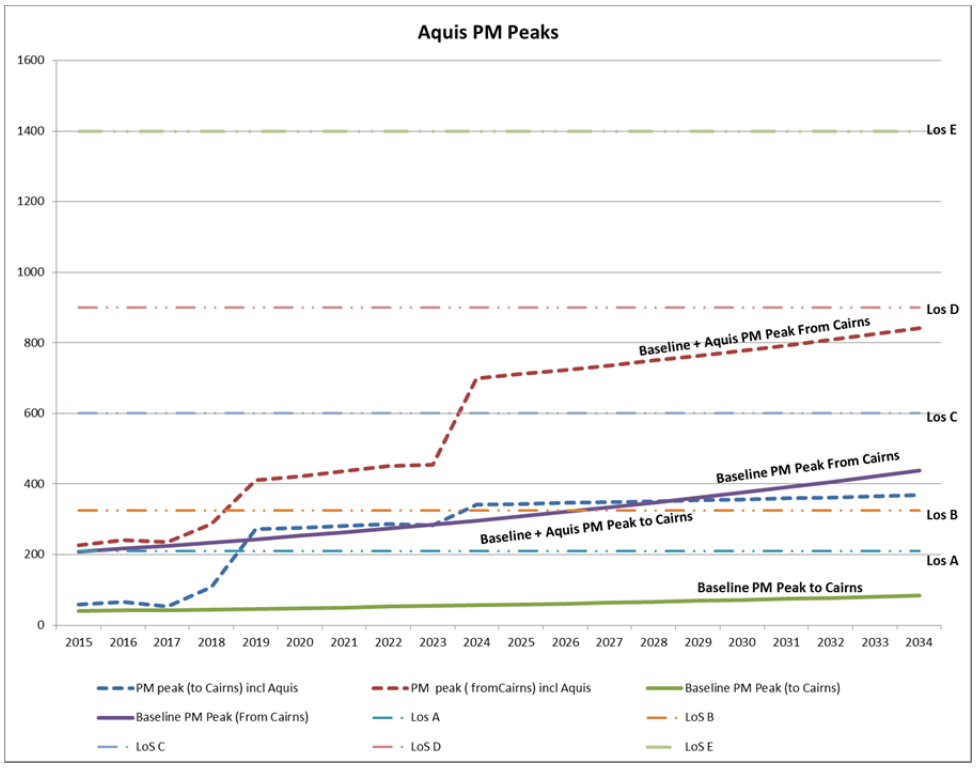


Figure 24-25 Yorkeys Knob Road non-coincident AM peak (6 am – 7 am) and PM peak (2 pm – 3 pm).

The plots illustrate that in the coincident and non-coincident peaks level of service D and E is being achieved by 2034, reflecting the need for Yorkeys Knob Road to be upgraded.

It has been estimated 10% of travel demands generated by construction workers and staff will have an origin from the Yorkeys Knob community. This equates to approximately 1600 trips per day at full operations of the development. It is anticipated that approximately one third of these trips will be by passive transport given the convenience of the close proximity of the development to Yorkeys Knob, and as an outcome off road facilities would be provided to meet this need. The balance 1200 trips per day by motor car would be spread across three work shifts and this would equate to 400 trips per shift change spread across a two-hour window, generating 200 trips per hour in the peaks. This impact will be minor in the context of road capacity and traffic movements across the Yorkeys Knob road network.

Dunne Road

Figure 24-26 illustrates the predicted annual average daily traffic (AADT) on Dunne Road as a consequence of the Aquis Resort imposed traffic loads compared with LoS.

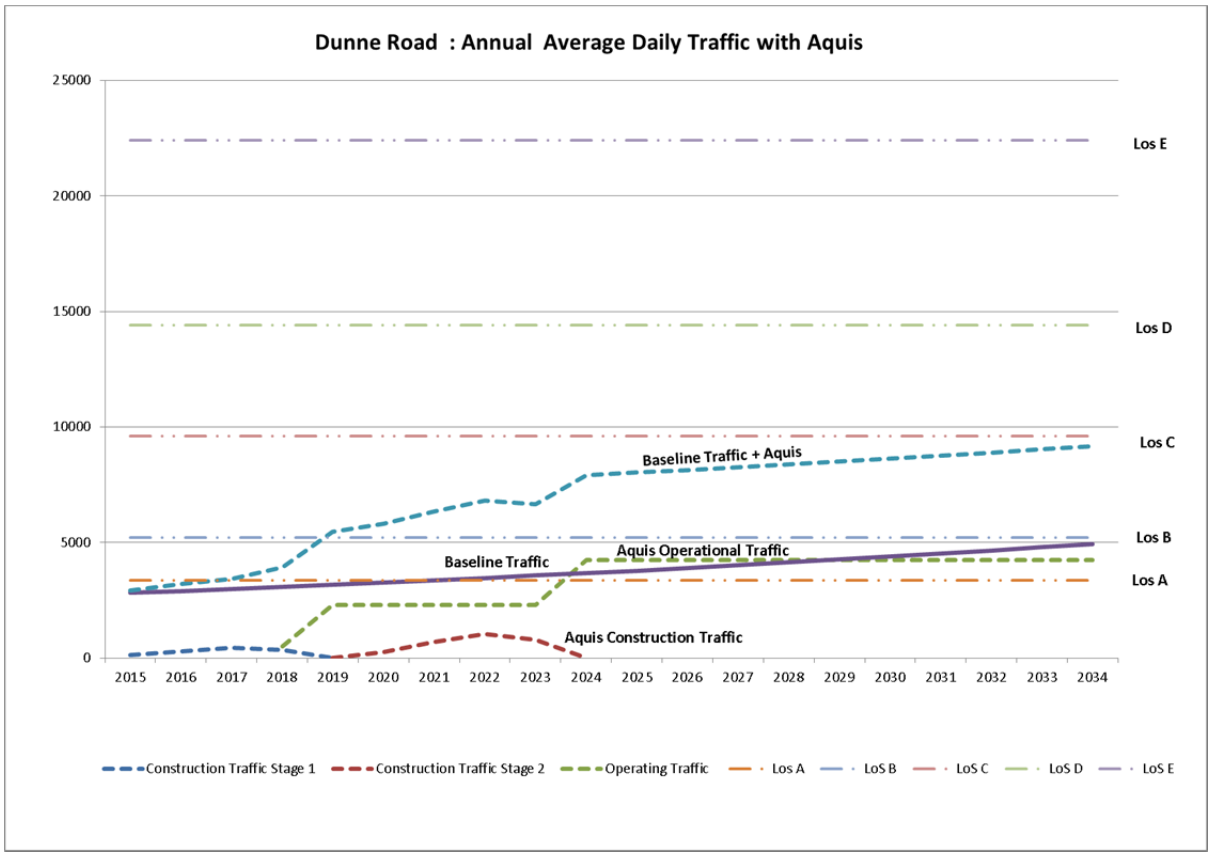
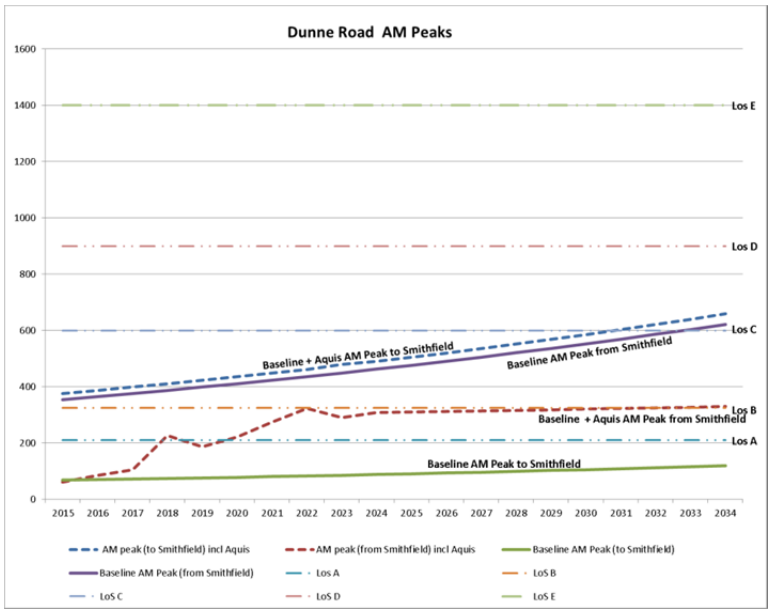


Figure 24-26 Annual average daily traffic on Dunne Road with Aquis Resort.

The plot demonstrates Dunne Road at 2015 operates at LoS A, and in the absence of Aquis will be at LoS B by 2034.

With the Aquis traffic loadings imposed, Dunne Road will not exceed LoS C at 2034 which is an acceptable outcome. Hence the Aquis Resort impacts on the operating behaviour of Dunne Road are not significant.

In relation to the operating peak period, the construction and operations of Aquis will be managed to mitigate impacts on the peak periods experienced on the surrounding road network. **Figure 24-27** shows the AM (8 am to 9 am) and PM (5 pm to 6 pm) peak traffic volumes for Dunne Road with and without Aquis Resort and, **Figure 24-28** shows the AM (6 am to 7 am) and PM (2 pm to 3 pm) peak traffic generated with and without Aquis.



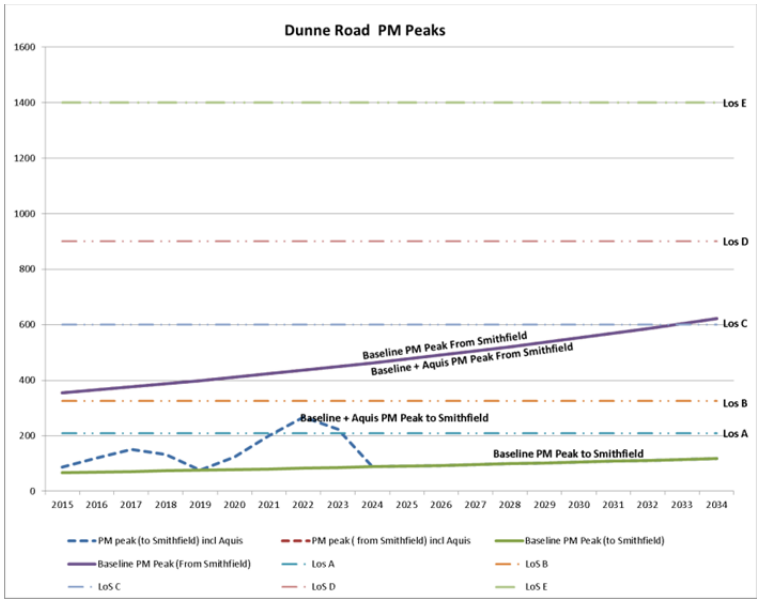
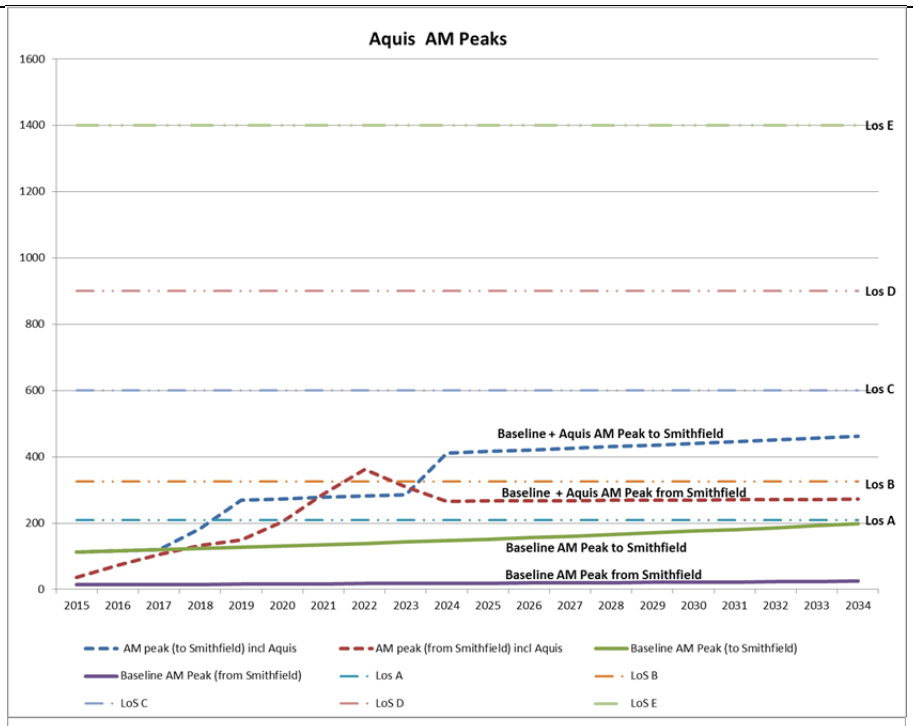


Figure 24-27 Dunne Road AM Peak (8 am – 9 am) and PM Peak (5 pm – 6 pm).

For both the AM and PM Dunne Road peaks, the figure demonstrates the Aquis demands are relatively low and the capacity is being consumed on the contra-direction of flow. The Aquis Resort demands do not impact upon LoS outcomes for Dunne Road.



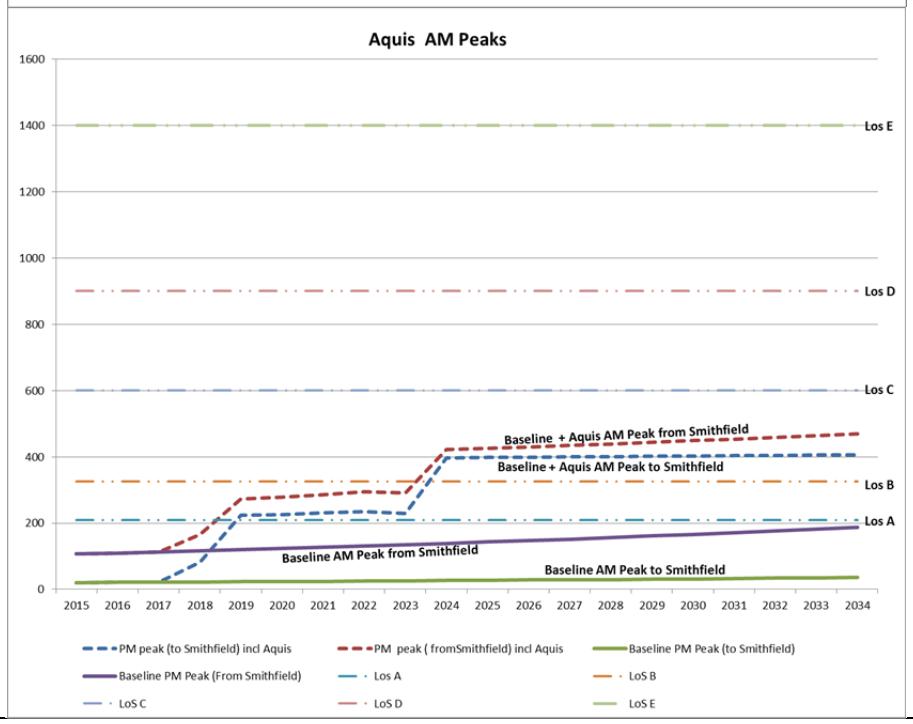


Figure 24-28 Dunne Road non-coincident AM peak (6 am – 7 am) and PM Peak (2 pm – 3 pm).

The figure demonstrates for both the AM and PM Aquis Resort peaks that the Aquis demands increase the non-coincident peak flows on Dunne Road, however the LoS is still generally maintained at A or B. The Aquis Resort demands do not impact upon LoS outcomes for Dunne Road.

24.1.3 Augmentation

Impact Mitigation

With respect to management and mitigation of impacts on the state and local road network the proponent will be implementing management and infrastructure solutions as a means of reducing traffic generation by the development. These initiatives will include:

- Staggered shifting arrangement by construction workers and operational staff to mitigate impacts on traditional commuter peaks
- Provision of trip end facilities including secure storage and change rooms and showers to encourage active transport modes
- Staff incentivisation schemes to encourage carpooling and use of public transport
- Provision of a dedicated fleet of high occupancy vehicles (HOV) for the transfer of guests.

Infrastructure Agreements

The proposed development will result in:

- Infrastructure that has not been included in current planning and that would be wholly attributable to the proposed development
- Future infrastructure that is currently planned that would need to be brought forward in time to accommodate the proposed development.

The proponent also proposes that it enter into an Infrastructure Agreement with the DTMR and CRC on the basis that:

- the cost of works required to maintain the safety and efficiency of the State and Local Controlled Road network as a direct consequence of the Aquis development will be met by the proponent
- the proponent will contribute its proportionate share of the cost of the upgrades to the State and Local Controlled Road Network taking into account existing thresholds for upgrades required to meet planned future growth in Cairns
- cost sharing arrangements would be identified for shared trunk infrastructure and for accelerated deterioration of pavement assets.

The CSTM model will be further developed in conjunction with DTMR and Council during the concept design phase of the project to align the timing of the construction and operational phases of Aquis with the model analysis. The CSTM will be used as the basis for understanding broader network impacts and assist with establishing criteria and thresholds for the development of the infrastructure agreement.

The CRC Transport Supply Charges as prescribed under the Trunk Infrastructure Contributions Policy have been estimated based upon the following:

- Total traffic movements per day = 17,128
- Equivalent EDU = 17128/10 trips per day = 1,713
- Approx. Road Network charge / EDU = $9,440 / EDU
- Total Road Network Infrastructure Charge = $16,170,720

The proponent will be seeking credits to the Road Network Infrastructure Charge for works already planned for upgrade of flooding immunity on Yorkeys Knob Road and Dunne Road.

State Road Network

Cairns Western Arterial Road

On the basis of the analysis of impacts in section 24.1.2, the need for upgrade of the section of CWAR from the Freshwater Creek Bridge to Caravonica Roundabout is imminent and required in the absence of Aquis impacts. The analysis demonstrates that the provision of four laning to meet this upgrading requirement will also adequately accommodate increased traffic loads associated with Aquis on CWAR.

Captain Cook Highway

Traffic demands on the Captain Cook Highway between Airport Avenue and Caravonica Roundabout are not significant impacts and would not warrant further upgrading to increase capacity of the link. The Caravonica Roundabout to Macgregor Road sections, which currently experiences significant congestion, will realise further deterioration of performance when operation of Aquis Resort is commenced. The proposed Smithfield Bypass project will alleviate the current congestion issues and mitigate the relatively minor traffic impacts of Aquis.

The intersections at the Yorkeys Knob Roundabout and Caravonica Roundabout will require upgrading. The form and scope of the upgrading cannot be established at this time as the Smithfield Bypass planning and business case being undertaken by DTMR is incomplete. The proponent will work with DTMR to establish appropriate solutions consistent with the principles described in the proposed Infrastructure Agreement.

Local Road Network

Yorkeys Knob Road

The Yorkeys Knob Road will require upgrading to four lanes in order to safely and efficiently accommodate the traffic impacts associated with Aquis. **Figure 24-29** demonstrates the benefits of the 4 lane upgrade by changing LoS at 2019 to reflect a four-lane configuration.

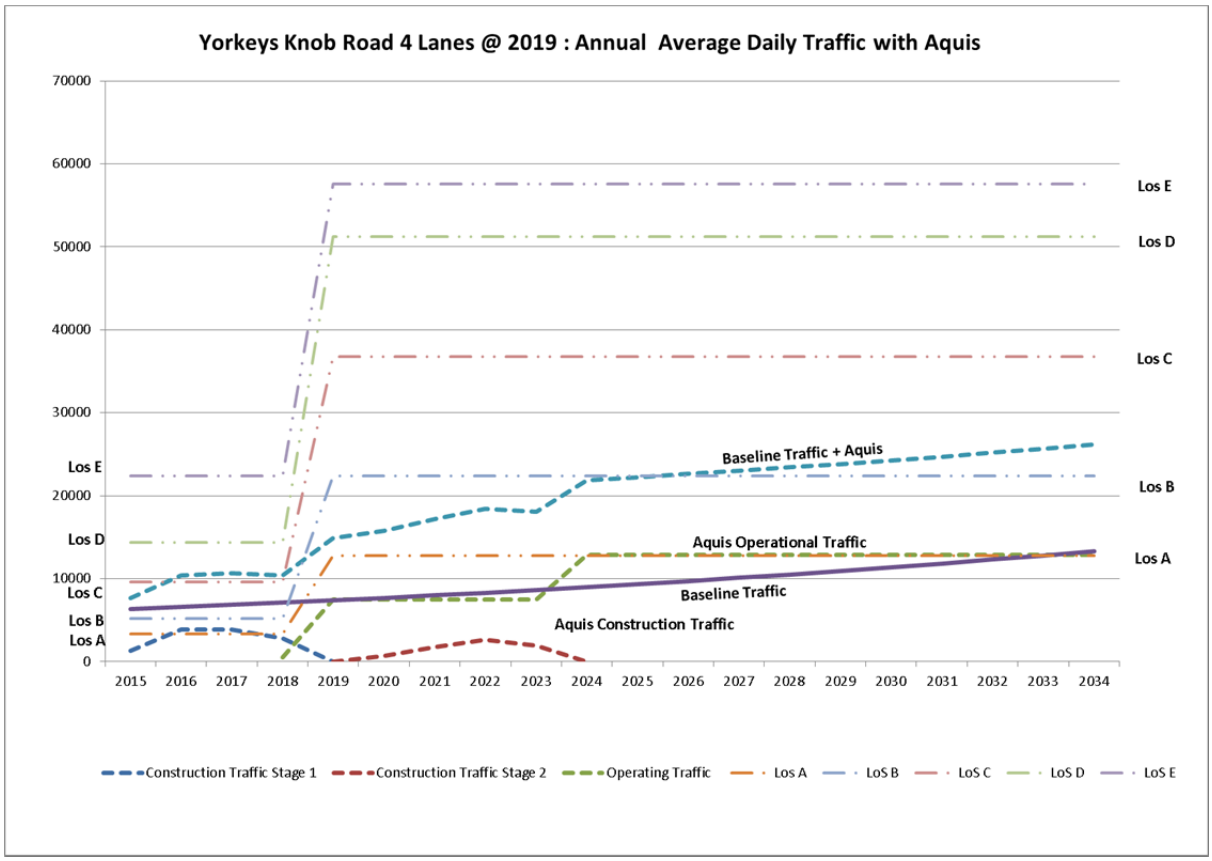
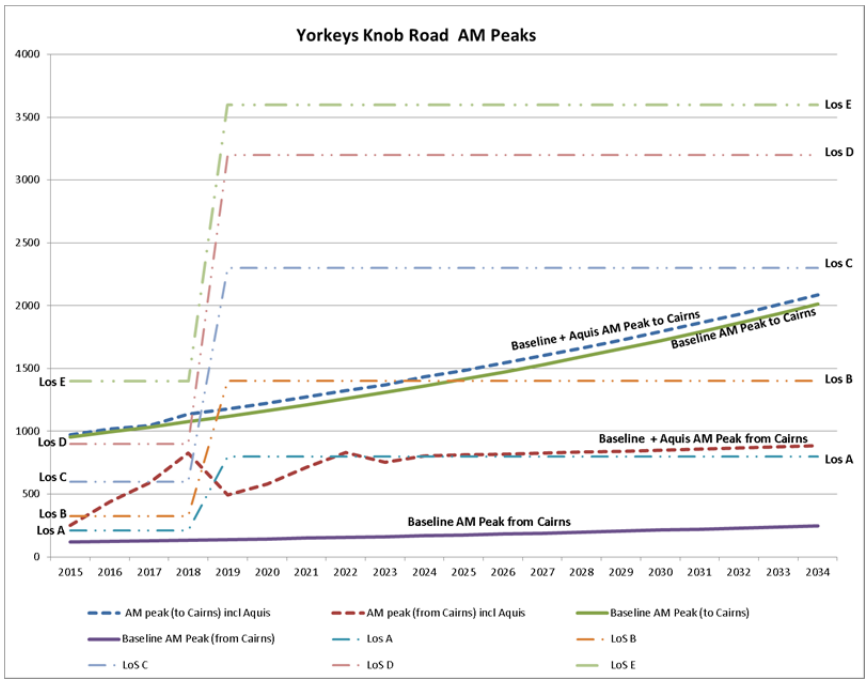


Figure 24-29 Annual average daily traffic on Yorkeys Knob Road with Aquis Resort (4 Lanes in 2019).

The elevation of LoS at 2019 will result in Yorkeys Knob having significant surplus capacity. At 2034 the road would be operating at LoS B to C. **Figure 24-30** shows the AM (8 am to 9 am) and PM (5 pm to 6 pm) peak traffic volumes for the Yorkeys Knob Road with four laning in place by 2019. **Figure 24-31** shows the AM (6 am to 7 am) and PM (2 pm to 3 pm) peak traffic generated.



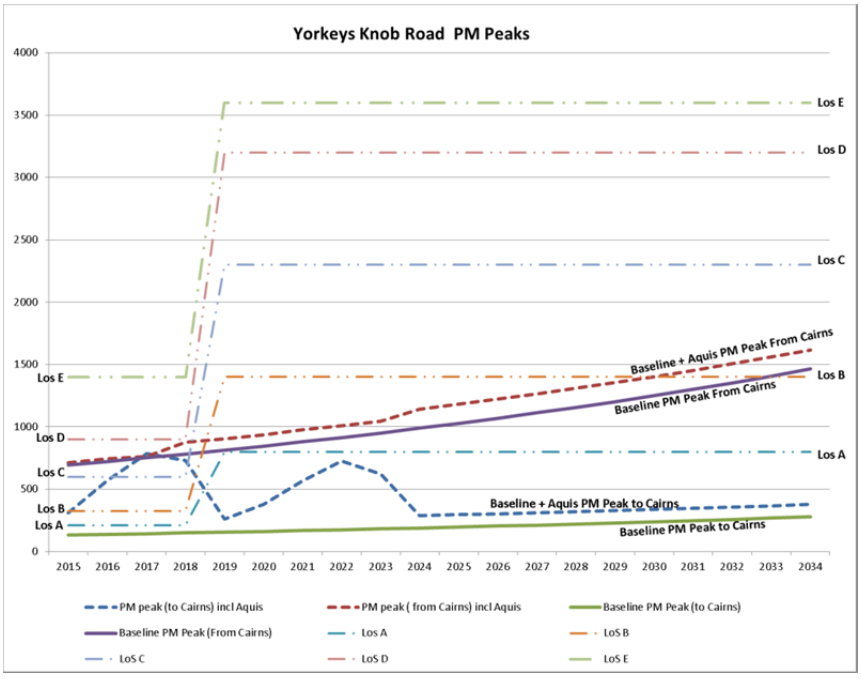
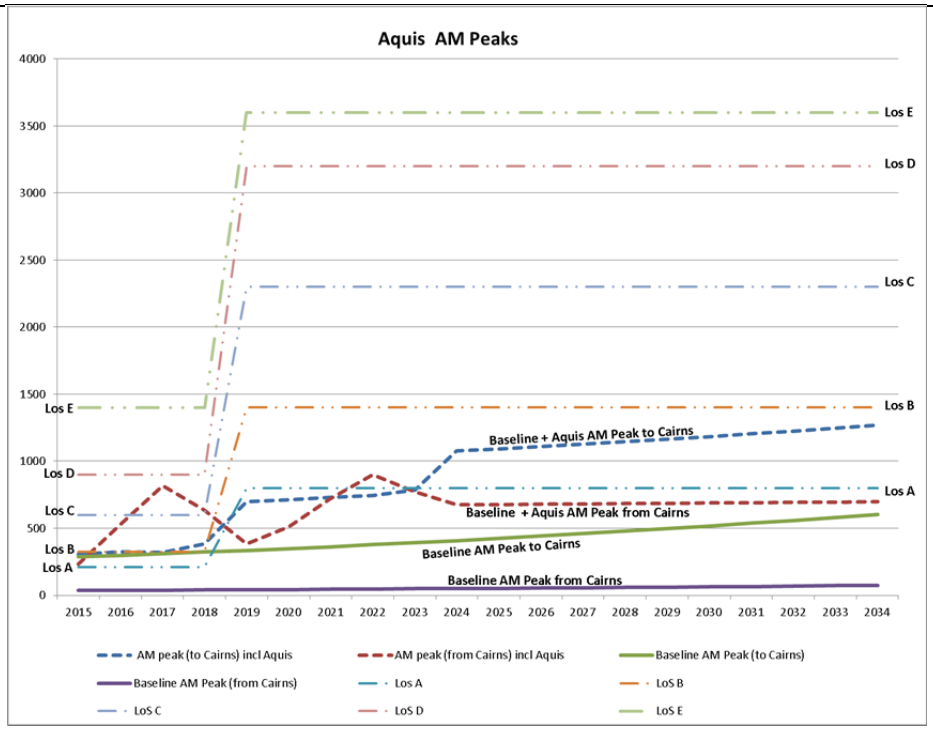


Figure 24-30 Yorkeys Knob Road AM Peak (8 am – 9 am) and PM Peak (5 pm – 6 pm)



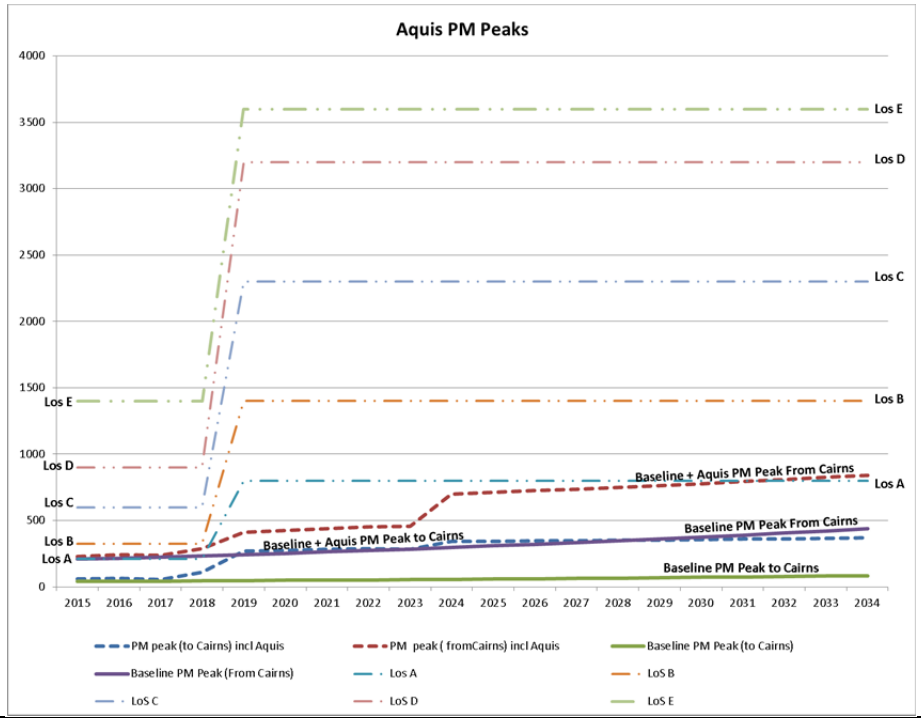


Figure 24-31 Yorkeys Knob Road non-coincident AM peak (6 am – 7 am) and PM peak (2 pm – 3 pm).

The figure demonstrates for the AM and PM Aquis Resort peaks the Aquis demands increase the non-coincident peak flows on the Yorkeys Knob Road, however the LoS is still generally maintained at A or B. The Aquis Resort demands do not impact upon LoS outcomes for the four-lane configuration of the Yorkeys Knob Road.

The proposed four-lane upgrade of Yorkeys Knob Road is to respond to a number of constraints:

- Provision of additional two lanes to provide adequate capacity and functionality to cater for the demands imposed by the Aquis Resort.
- Elevate the new carriageways to improve immunity to a standard equivalent to the CWAR immunity. (It is understood this equates to approximately 30% AEP.)
- Realignment of Yorkeys Knob Road to provide a direct connection to CWAR at the Caravonica Roundabout. (As a consequence the realigned Yorkeys Knob Road would also cross the proposed Smithfield bypass.) This will serve to respond to the strong desire line between CWAR and Yorkeys Knob and provides the opportunity for a more direct and efficient route.

Figure 24-32 illustrates the proposed realignment and upgrade of Yorkeys Knob Road. The type section demonstrates an option to elevate a large portion of the alignment on culverts so as to establish flood immunity.

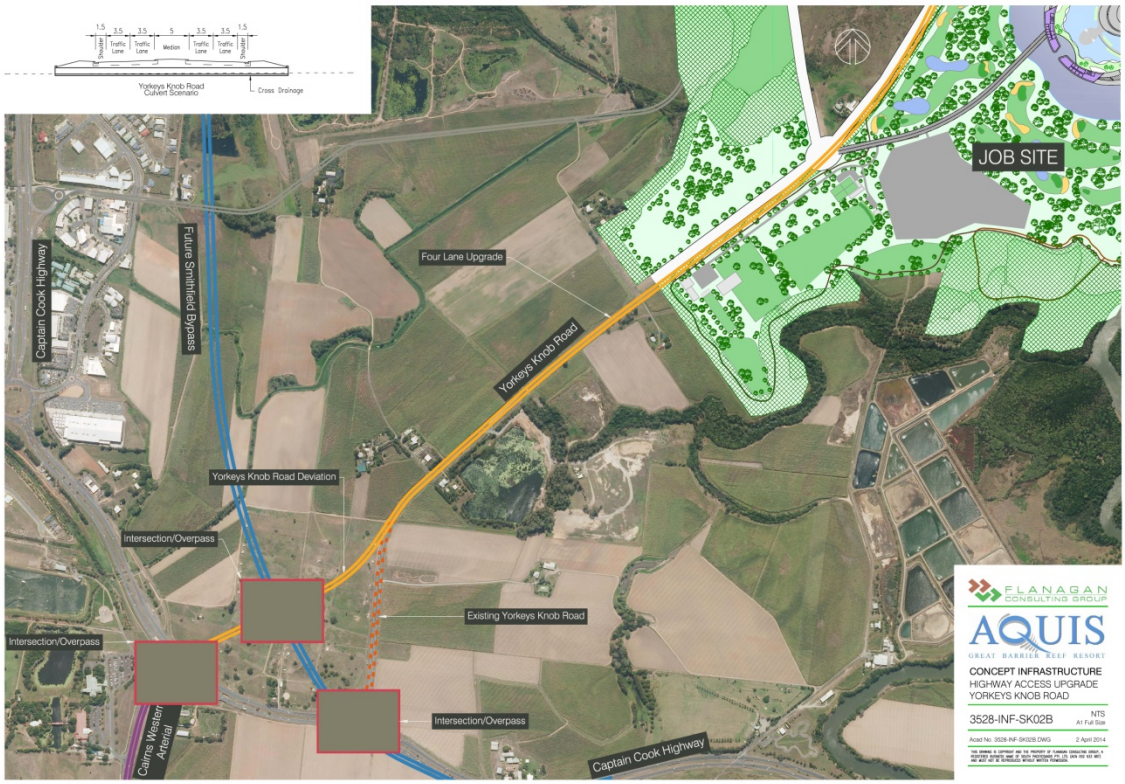


Figure 24-32 Possible solution for realignment and upgrade of Yorkeys Knob Road.

Figure 24-32 shows there will be a requirement for upgrade or provision of new intersections at Yorkeys Knob Roundabout, Caravonica Roundabout and the future crossover with the Smithfield Bypass.

Dunne Road

Whilst the analysis indicates that capacity of Dunne Road will not be significantly impacted, the current geometry of Dunne Road is of poor standard and would not support safe and efficient operation when additional traffic loadings of Aquis are imposed. As such it is proposed to upgrade Dunne Road.

Figure 24-33 shows the proposed concept layout of the proposed Dunne Road upgrade to two-lane divided standard and where it interfaces with the future Northern Beaches Interconnector. The

upgrade would include modifications to the intersections with the Yorkeys Knob Road, Cattana Wet Lands access and Macgregor Road.

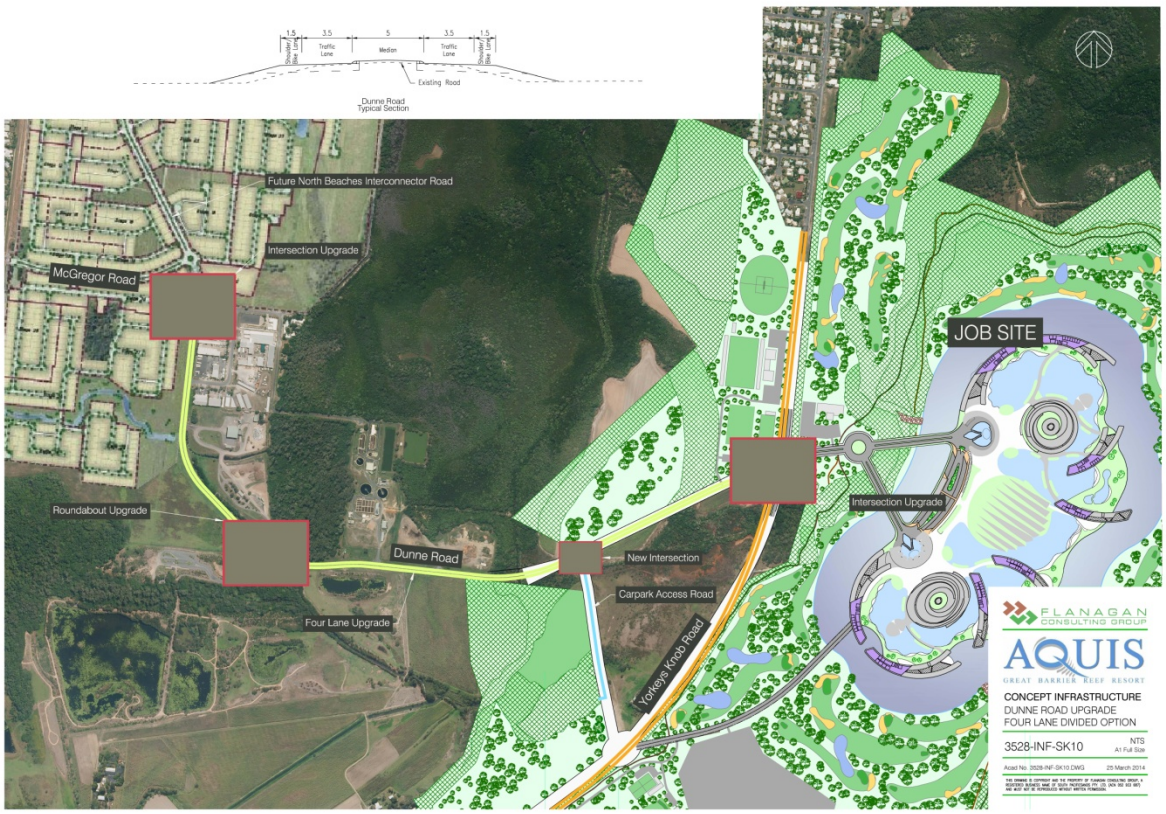


Figure 24-33 Possible solution for proposed Dunne Road upgrade.

Aquis Site Access and Intersections

Safe and efficient access and egress to Aquis will be an important aspect of the functionality and safety of Yorkeys Knob Road. The volume of traffic entering and exiting the site each day will require that there be several points of access to efficiently cater for the need.

There are two proposed access points from the Yorkeys Knob Road. One is aligned with an existing unconstructed road corridor and will enter / exit the development from the south. The intersection will also be the junction for a proposed new road between Dunne Road and Yorkeys Knob Road.

The second access is to be located at the Dunne Road intersection with Yorkeys Knob Road. This will reconfigure the existing 'T' intersection to a four way intersection.

Both of these intersections would likely be signalised and possible solutions are illustrated in **Figure 24-34**.

Figure 24-34 Aquis access intersection solutions on Yorkeys Knob Road and Dunne Road.

Pavement Impacts

Details of the pavements impacts assessment process and calculations have been discussed for the State Road Network. The impacts and associated contributions to be made by the proponent will be subject to the development of the proposed infrastructure agreement.

The cumulative traffic demands imposed on Yorkeys Knob Road and Dunne Road will be collectively the same as that experienced on the Captain Cook Highway and the Cairns Western Arterial Road. Given the relatively low back ground ESAs on the two local roads, the ESA increases imposed by Aquis will be far in excess of the 5% threshold for pavement impacts.

Yorkeys Knob will be upgraded to four lanes and Dunne Road augmented to two lanes with new pavement construction. The pavement designs for each will cater for the spectrum and frequency of traffic loadings that will be generated by the catchment including the Aquis Resort.

24.2 RAIL

24.2.1 Existing Situation

The North Coast Rail Line is the primary rail network that services the east coast of Queensland. It has a general freight and passenger transport function.

The North Coast Rail Line terminates at Cairns at the rail yards situated in Portsmith where the freight handling facility operates. Passengers are disembarked at the Cairns Central Station in the City.

Most of the regions building materials and a large proportion of food and beverage is rail freighted into Cairns by Aurizon and QRX.

Fourteen trains per week operate into Cairns carrying about 10 000 tonnes/week (500 000 tonnes a year). These movements have capacity to carry up to 650 000 tonnes a year. Industry enquiries estimate the composition of rail freight is presently 70% food and beverage and 30% hardware and building products.

24.2.2 Impacts

Rail is not a likely mode of commuter transport for construction workers, resort guests or staff. A small proportion of guests may travel to Cairns as part of a holiday experience however the numbers are expected to be minor.

The rail freight task will increase significantly to meet additional demands generated for movement of construction materials and general goods. An additional four trains per week will be required to meet construction phase demands, and a further four trains to cater for ongoing growth to 2025.

24.2.3 Augmentation

There is substantial latent capacity in the existing rail network that can meet the demands of the increased rail freight task generated by Aquis. As commercial entities it is expected that Aurizon and QRX will invest in additional infrastructure associated with freight handling and rolling stock to capture and meet the additional freight demands generated by Aquis.

24.3 PORT

24.3.1 Existing Situation

The Sea Port at Cairns is managed by Ports North, a Queensland Government owned Corporation. Ports North operates the Ports of Cairns, Cape Flattery, Karumba, Mourilyan, Skardon River, Quintell Beach, Thursday Island, Burketown and Cooktown.

The Port of Cairns is a small multipurpose regional port that caters for a diverse range of customers from bulk and general cargo, cruise shipping, fishing fleet and reef passenger ferries.

The port can cater for over 200 international and domestic cruise ship visits a year. It is located virtually in the heart of the city with a Reef Fleet Terminal providing a gateway to the Great Barrier Reef and a 261 berth Marina accommodating a variety of cruising vessels, super yachts and reef vessels.

Ports North has a number of common user cargo wharves available for use for containers or break bulk cargo including 250 m Wharf 7/8, 300 m Wharves 4-6 and cargo facilities at Smith's Creek wharves. In addition to these wharves the Port of Cairns has three barge ramps including a barge ramp in Tingira Street suitable for barges up to 70 m. Furthermore Ports North is currently planning a permanent common user barge facility on Port Land in the upper reaches of Smith's Creek which would cater for large barges potentially up to 80 m in length.

Ports North have focused planning for future growth on increasing cargo operations, cruise ship numbers and Reef Fleet operations. In the recent past Ports North have undertaken the redevelopment of the Cruise Ship Terminal.

The existing Wharf 7/8 is designed to cater for future installation of either a rail container crane or mobile container crane as well as container forklifts. At present heavy lifts of up to 62 t have been accommodated over the wharf by use of 200 t mobile cranes. Lifts up to 77 t utilising a 400 t crane have been investigated and are viable. Subject to sufficient demand for a Port container crane, Ports North has indicated that it would be prepared to provide this infrastructure.

The main cargo Wharf 7/8 is supported by an existing cargo consolidation yard with a Australian Quarantine and Inspection Service and Customs approved container washdown facility. This 7300 m^2 is underutilised and recent reconfigurations have increased its capacity to 530 containers. The Port

Masterplan includes options for further expansions of these yards to create an additional 4500 m^2 and 240 container spaces. The Masterplan also identifies two additional cargo consolidation areas south of the existing fertiliser facility delivery in the first stage an additional 14 200 m^2 or providing space for 830 containers as the first stage and a further stage of 10 000 m^2 of cargo consolidation area.

The cargo consolidation area supporting Wharf 7/8 is underutilised and the Port planning provides capacity for significant future expansions both in this location and in other sites adjacent to Wharf 7/8.

In addition to the cargo consolidation area at Wharf 7/8, Ports North has a 20 hectare Port land development in Tingira Street that provides a suitable base for consolidation and storage of cargo before transporting to the main cargo wharves or utilising the adjacent large barge ramp at the site.

The Port is serviced by a 90 m wide channel with a design depth of 8.3 m LAT. The current channel geometry allows mid-sized general freight or container shipping. Ports North is currently undertaking an EIS for the widening and deepening of the channel which is primarily aimed at catering for larger cruise vessels but will allow larger and deeper drafted cargo shipping into the Port.

Ports North Cityport Masterplan and recent Foreshore Development Works have catered for future possible expansion of the Reef Fleet via two marina fingers adjacent to The Hilton and the proposed Cityport Precinct 7.

24.3.2 Impacts

The Port of Cairns has the opportunity to realise growth arising from the Aquis development primarily through increases in Cruise Ship and Reef Fleet movements and potentially with containerised cargo.

24.3.3 Augmentation

An increase in freight movements arising from Aquis through the Port of Cairns can be accommodated with existing latent capacity and planned upgrades subject to freight demands creating a business case for the Port of Cairns for upgrading. Planning is in place to provide for the expansion of marina facilities to accommodate growth in Reef Fleet capacity.

24.4 AIRPORT

24.4.1 Existing Situation

a) Overview

Cairns Airport is located approximately 5 km to the south-east of the project site. While the location of the site in close proximity to the airport was a major consideration in the proponent's selection of the site for the resort, it also means that particular attention must be paid to factors that can influence the safe operation of the airport. The majority of these factors are considered in the 2009 CairnsPlan which gives effect to (former) State Planning Policy 1/02: *Development In The Vicinity Of Certain Airports and Aviation Facilities* and has overlay codes for the following:

- Primary Light Control / Bird and Bat Strike Hazard
- Australian Noise Exposure Forecasts (ANEF) 2005
- Airport Public Safety Zone
- Obstacle Limitation Surfaces (OLS)
- Aviation facilities
- Procedures for Air Navigation Services – Aircraft Operations Surfaces Overlay (PANS-OPS).

SPP 1/02 has now been incorporated into the SPP 2013 – Planning for infrastructure (Strategic airports and aviation facilities).

Section 4.6.7 of CairnsPlan documents operational aspects of the Cairns International Airport Code including both performance criteria and acceptable measures to minimise the effect a development will have on airport operation and the effect activities associated with the airport will have on a development.

Of particular importance is the existence of two flight paths which pass over the project site. These are the standard night / bad weather / jumbo jet approaches (ILS[12]), one of which is directly over the project, and the other is over Richters Creek (RNP[13]).

Finally, the issue of possible helicopter operations between the airport and the resort and between the resort and other destinations was explored. This is not covered in CairnsPlan but is nonetheless relevant to the design and operation of the resort.

The balance of this section summarises:

- consultation undertaken with Cairns Airport Pty Ltd (CAPL), Airservices Australia (ASA), and the Civil Aviation Safety Authority (CASA)
- summary of findings of the detailed report on airport issues (**Appendix O**), namely:
  - analysis of the issues covered in Section 4.6.7 of CairnsPlan (Operational Aspects of the Cairns International Airport Code)
  - helicopter use from the site
  - recommended actions for future stages of the project (i.e. construction, design and operation) from the perspective of airport issues
- further discussion regarding wildlife strike (birds and bats)
- airport capacity issues (i.e. the effect of extra flights required to transport resort guests to and from the Cairns International Airport)
- implications for the airport's emergency management planning and policies.

[12] ILS (Instrument Landing System) is a form of 'Smart Tracking' described as a 'course-forming radio navigation aid that supports the safe and efficient movement of air traffic into and out of the airport, particularly during low visibility and bad weather conditions'. The ILS route is directly over the resort site.

[13] RNP (Required Navigational Performance) is a form of 'Smart Tracking' that allows more aircraft arriving from the north to track along Richters Creek close to the eastern part of the Aquis site and avoiding residential areas. This will result in noise improvements for some suburbs to the north including Yorkeys Knob and is they basis of the draft revised ANEF. The Smart Tracking proposals do not include a departure track over the city.

b) Consultation

Consultation was undertaken with CAPL, ASA, and CASA as summarised below. Detailed records of meetings and/or correspondence is included as part of **Appendix O**.

TABLE 24-15 CONSULTATION

COMPANY / AGENCY	REPRESENTATIVES	ISSUES
Cairns Airport Pty Ltd	Kate McCreery Carr, General Manager Operations Paul Lamont, Manager Operations Colin Evans, Airside Operations Manager Jeff McEachern, General Manager Assets Matthew Williams, Environment David Voss, Manager Compliance Kevin Brown, CEO	• Wildlife strike • Fuel dumping • Lighting constraints • Height restrictions • Noise issues • Helicopter operations • Interference with land-based navigational aids. • Safety and emergency management. • Capacity issues.
Civil Aviation Safety Authority	Greg Parnell, Aerodromes Inspector	• Height restrictions (PANS-OPS) • Lighting • Wildlife strike
Airservices Australia	Steve Tattam, Aviation Relations Manager, Corporate and Industry Affairs	• Possible interference with Redden Creek radar

c) Summary of Airport Constraints

The following table summarises all airport constraints, namely:

- analysis of the issues covered in Section 4.6.7 of CairnsPlan (Operational Aspects of the Cairns International Airport Code)
- helicopter use from the site
- recommended actions for future stages of the project (i.e. construction, design and operation) from the perspective of airport issues.

Figure 24-35 shows key geometric limitations referred to in the associated table.

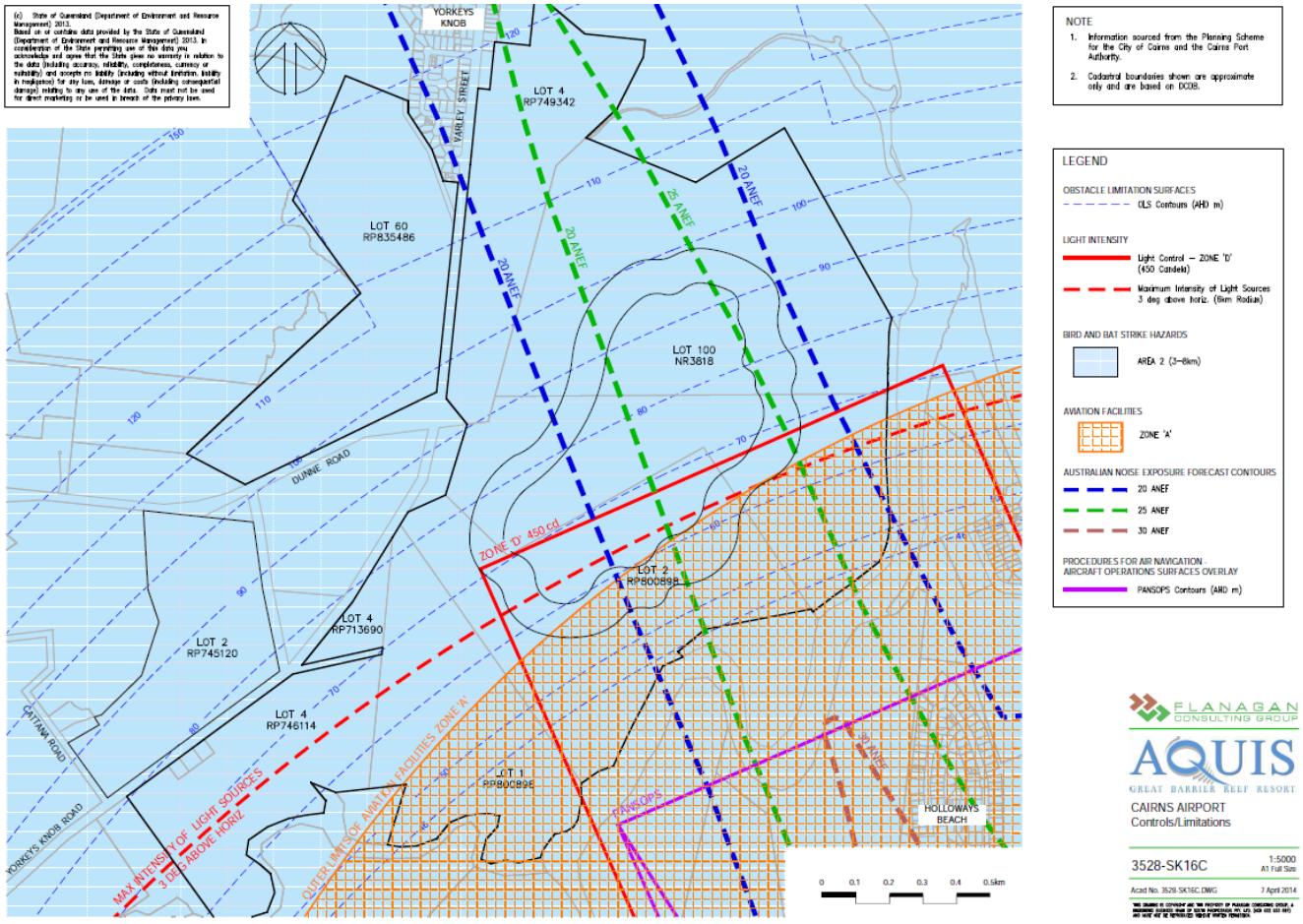


Figure 24-35 Cairns Airport controls / limitations.

This figure does not include the limitations imposed by the Redden Creek Radar 'area of interest'.

TABLE 24-16 SUMMARY OF REQUIREMENTS AND MANAGEMENT MEASURES

ISSUE	SPECIFICS	DESIGN PHASE ACTION (Relevant acceptable measures from CairnsPlan are in bold)	CONSTRUCTION PHASE ACTION	OPERATION PHASE ACTION
Light management	Light emissions can potentially interfere with a pilot's navigational ability. CAPL and CASA requirements are in the (former) SPP 01/02 which is incorporated into CairnsPlan.	Ensure that the design complies with the requirements of the SPP (documented above). Develop contract conditions and an Environmental Management Plan (Construction) (EMP (Construction)) that specifies lighting requirements that comply with SPP requirements. **No upward facing lights, search lights, laser lights, volcanos or flashing lights.** **No light sources stronger than 450 Candela.** **No external lighting in parallel lines of between 500 m and 1000 m long.** **No reflective cladding.**	Implement the EMP (Construction) and ensure that contractors are complying with contract requirements.	Ensure that the operation continues to comply with light requirements particularly in relation to special events (e.g. fireworks).

(Continued over)

ISSUE	SPECIFICS	DESIGN PHASE ACTION (Relevant acceptable measures from CairnsPlan are in bold)	CONSTRUCTION PHASE ACTION	OPERATION PHASE ACTION
Wildlife management	There is the potential for the water body to attract large birds (particularly pelicans) and waders.	Ensure the water bodies have steep sides to discourage use by waders. Develop a concept level wildlife management strategy to implement during operation to minimise the potential to attract high risk birds. Develop an EMP (Construction) that addresses and minimises the attraction of birds to temporary water bodies that may develop during the construction process.	Implement the EMP (Construction) and ensure that contractors are complying with contract requirements.	Refine and implement the wildlife management strategy.
	The flying fox camp at Yorkeys Knob does not currently pose a risk to aircraft. However, the project could potentially result in a change to the feeding and flight patterns.	Use existing information to determine factors most likely to cause alteration to behaviour of flying foxes and ensure that design elements minimise the risk of altering current behaviour. Develop a concept level wildlife management strategy to implement during operation to minimise the potential to attract high risk birds. Develop an EMP (Construction) that minimises risk of construction activities impacting on flying fox behaviour in such a way that causes impacts on the operation of the airport.	Implement the EMP (Construction) and ensure that contractors are complying with contract requirements.	Refine and implement the wildlife management strategy.
	Potential for land uses associated with the project to attract wildlife that pose a strike risk to aircraft. Potential for aquaculture ponds (if retained) to contribute to bird strike risk.	Use design elements that reduce the risk of attracting wildlife. Develop a concept level wildlife management strategy to implement during operation to minimise the potential to attract high risk birds.	Implement the EMP (Construction) and ensure that contractors are complying with contract requirements.	Refine and implement the wildlife management strategy

ISSUE	SPECIFICS	DESIGN PHASE ACTION (Relevant acceptable measures from CairnsPlan are in bold)	CONSTRUCTION PHASE ACTION	OPERATION PHASE ACTION
		Consider the acceptability of retaining the aquaculture ponds that are currently used as bird habitat. Develop an EMP (Construction) that reduces the risk of attracting wildlife during construction activities. **Cover potential food and waste sources to prevent wildlife foraging.**		
Noise management	It is possible that noise associated with aircraft flying overhead will cause nuisance to visitors.	Incorporate noise mitigation measures into the design of accommodation buildings. Ensure that aspects of the design do not amplify the volume of noise generated by aircraft (through resonance). **Acoustically insulate to minimum standards AS 2021.**		Aircraft noise must be accepted as a condition of approval of the development and that the development does not lead to pressure to modify airport operations (reduced noise levels, curfews etc.)
Air management	It is possible that air emissions from the project may affect operations at the airport.	Ensure the design does not include structures that emit gaseous plumes at high velocities or excessive smoke or steam. Develop an EMP (Construction) that includes a detailed dust management strategy to minimise dust emissions from the site during construction. **No gaseous plume at a velocity exceeding 4.3 m/s.** **No smoke, dust, ash or steam.**	Implement the EMP (Construction) and ensure that contractors are complying with contract requirements.	

(Continued over)

ISSUE	SPECIFICS	DESIGN PHASE ACTION (Relevant acceptable measures from CairnsPlan are in bold)	CONSTRUCTION PHASE ACTION	OPERATION PHASE ACTION
Navigational issues	Height restrictions are imposed to ensure that both temporary and permanent structures do not pose a safety risk to aircraft approaching the airport. CairnsPlan documents CAPL and CASA requirements. PANS-OPS maps are also produced by Airservices Australia and included in the CairnsPlan overlays.	Ensure the design does not incorporate permanent structures that contravene the requirements of CairnsPlan. Liaise with CAPL, CASA and Airservices Australia to ensure that temporary breaches of height restrictions are complied with. Develop contract conditions and an EMP (Construction) that ensures that construction activities comply with SPP. **Building heights to be below OLS and PANS-OPS (varies across site from 50 m to 120 m).** **At the southern extent of the site (within 4 km of the airport) buildings not to exceed 21 m.** **Max height of buildings on southern part of Resort Complex Precinct not to exceed 62 m (see 'radar' below).** **Max height of buildings on southern part of Resort Complex Precinct not to exceed 70 m (see 'radar' below).** **Allow for construction – i.e. cranes will most likely not be permitted to compromise the OLS.**	Implement the EMP (Construction) and ensure that contractors are complying with contract requirements.	Ensure that the operation of the resort does not result in breaching of height restrictions.

(Continued over)

ISSUE	SPECIFICS	DESIGN PHASE ACTION (Relevant acceptable measures from CairnsPlan are in bold)	CONSTRUCTION PHASE ACTION	OPERATION PHASE ACTION
Interference with land based navigational aids.	Navigational aids (markers, transmitters, beacons and radar) are located at Redden Creek, Machans Beach and Yorkeys Knob. It is a Performance Criteria under CairnsPlan that the project does not create physical obstruction, electrical or electro-magnetic interference and deflection of signals. CairnsPlan (A8.1 – 8.10), documents acceptable measures for ensuring structures do not impair the operation of the aids.	Ensure that the design of the project complies with CairnsPlan requirements. Ensure that methods and equipment required to construct the project do not interfere with land based navigational aids. If necessary liaise with CAPL to ensure that the Performance Criteria are complied with. **Ensure that buildings on Resort Complex Precinct do not interfere with radar**.	Ensure that contractors are aware of any potential for interference with navigational aids.	
Use of helicopters to/from the project	The option of including a helipad in the project scope has been considered and will result in particular requirements being placed on the project.	Locate the helipad in an area that ensures anticipated flight paths do not pass over residential/public areas. Ensure that the helipad complies with the requirements of CASA and Airservices Australia.	If helicopters are required for the construction of the project ensure they comply with CASA and Airservices Australia requirements.	Ensure helicopters remain within flight paths identified during the design phase to minimise impacts on the surrounding community (see 'neighbour-friendly' guidelines (**Appendix O**).

Source: Appendix O (Table 3-1).

d) Quantum of Existing Aircraft Movements

The airport services general aviation, domestic and international air operations which are primarily regular passenger transport (RPT) services. There is a relatively small volume of dedicated freight services that operate out of the airport.

The 2013 figures for domestic and international arrivals and departures for Cairns Airport as supplied by Cairns Airport Limited are summarised in **Table 24-17.**

TABLE 24-17 CAIRNS INTERNATIONAL AIRPORT AIRCRAFT MOVEMENTS (2013)

Total 2013 International and Domestic Movements	
International Pax	554,651
Domestic Pax	3,600,971
Total	4,155,622
Airport Operations Breakdown	
International Flights / Year	6,400
Domestic Flights / Year	40,600
Total Flights / Year	**47,000**

Cairns Airport have indicated in recent consultation that the airport enjoys significant latent capacity at international apron parking and terminal facilities and can cater for growth of future passenger and aircraft numbers.

The Cairns Airport has planning in place for the proposed Airport Enterprise Precinct and are currently looking at staged development from 2015 for an undefined number of years. This development will provide a significant new commercial development opportunity for the airport servicing airport and non-airport related commercial industries.

24.4.2 Impacts

a) Summary of Impacts and Project Implications

Based on the Concept Land Use Plan, impacts with respect to aircraft and airport issues and project implications are as summarised in **Table 24-18** below. Key issues are discussed further following the table.

TABLE 24-18 SUMMARY OF IMPACTS AND PROJECT IMPLICATIONS

ISSUE	IMPACT	IMPLICATIONS
Primary light control / bird and bat strike hazard (lighting)	Unknown. Mitigation of any impacts is essential.	Ensure that project lighting complies with guidelines. In particular, no upward facing lights, search lights, laser lights.
Primary light control / bird and bat strike hazard (bird and bat strike)	Unknown. Mitigation of any impacts is essential.	Ensure that detailed design of lake, other water bodies and all landscaping contribute to mitigating possible bird and bat strike hazards. The abandoned aquaculture ponds will be drained and filled to reduce habitat that is attractive to birds of concern.

ISSUE	IMPACT	IMPLICATIONS
Australian Noise Exposure Forecasts (ANEF) 2005	Aircraft noise presents constraints to protect architecture which must accommodate likely noise without user complaint.	Ensure that buildings are designed to accommodate predicted noise levels.
Air management	Unknown. Mitigation of any impacts is essential.	Ensure the design does not include structures that emit gaseous plumes at high velocities or excessive smoke or steam. Develop an EMP (Construction) that includes a detailed dust management strategy to minimise dust emissions from the site during construction.
Airport public safety zone	Nil.	Nil.
Obstacle Limitation Surfaces (OLS)	Nil. Proposed structures are well below the OLS: northern island limited to 65 m AHD (70 m allowable) southern to 45.5 m AHD (62 m allowable).	Ensure that temporary obstacles (i.e. construction cranes) do not penetrate the OLS.
Aviation facilities	Resort Complex Precinct penetrates 'area of interest' radar surface by 8 m. This may be of little consequence given the other radar shadows in the area but this needs to be confirmed.	Confirm effect of Resort Complex Precinct buildings on radar. Mitigation is feasible (e.g. relocate radar infrastructure).
PANS-OPS	Nil. Proposed structures are well below the PANS-OPS surface.	Ensure that temporary obstacles (i.e. construction cranes) do not penetrate the PANS-OPS surface.
Helicopter use	No impact if operations are in accordance with approved procedures.	Locate the helipad in an area that ensures anticipated flight paths do not pass over residential/public areas. Ensure that the helipad complies with the requirements of CASA and Airservices Australia.
Airport capacity issues	No impacts. There is ample capacity for additional flights although landside operations may need upgrading.	Nil (a CAPL issue).
Emergency management planning and policies	No impacts. While any growth will require commensurate growth in all landside operations, this is not considered to be an issue of concern. Current plans are adequate for any Aquis Resort growth.	Nil (a CAPL issue).

Source: Study team compilation based on **Appendix J** and **Appendix O**.

b) Wildlife Strike

With respect to wildlife strike:

- the Aquis Resort site is located within Area 2 (3 km to 8 km radius of Cairns Airport)
- within Area 2, the desired land uses are permitted but actions are required to mitigate wildlife strike (the relevant performance criterion P3 is 'Development and the design of facilities and landscaping in the immediate environs of the airport does not compound the potentially serious hazard from wildlife (bird or bat) strike')

- the design of the lake (and other water bodies) and all site landscaping needs to take into account the need to manage habitat for target species
- a suite of management measures will be required to further mitigate risk during construction and operation.

The terrestrial ecology study (**Appendix J**) also considered bird strike issues in detail, referring to current Cairns Airport planning and that from other areas. This report concludes that, given the diversity of species present in the project area, a broad suite of measures are likely to be required to limit the potential for collisions between aircraft and flying birds and mammals. This includes measures to compensate for changes to species diversity and abundance in relation to aquatic (freshwater and saline) and terrestrial habitats.

c) Aviation Facilities

As part of consultation regarding Cairns International Airport issues, Airservices Australia (ASA) was supplied with details of the project on 12 November 2013, as it was then conceived. This assessment concluded that the development on what is now the Resort Complex Precinct would not be acceptable as it significantly penetrates the radar 'area of interest' and would cause an unacceptable loss of coverage, especially at lower flight levels where REK is the only radar with PSR (Primary Surveillance Radar) coverage and reliable SSR (Secondary Surveillance Radar) coverage.

All other aspects of the Aquis Resort were acceptable in terms of ASA services.

Subsequent to this advice, specialist radar consultant Aviation & Airspace Design Solutions (AADS) was appointed to help resolve this issue. AADS (2014) reviewed the available ASA information and found that:

- the Aquis Resort site lies within the *Area of interest* defined by a circle with a radius of 15,000 m centred on the radar antenna and inclined upward at 0.25° above the horizon
- the tall buildings would penetrate the 'area of interest' by up to 8 m.

Further analysis of the surrounding obstacle environment by AADS (2014) found that:

- A large radar shadow area is likely to already exist to the west of Cairns Airport due to extensive terrain intrusions.
- The magnitude of the Aquis Resort radar shadow is most likely to be experienced at low level.
- The level that radar performance would be degraded is also most likely to be below normal aircraft approach and departure profiles. Assessment of the nominal approach path to Runway 15 indicated that an aircraft would be approximately 1000 ft. (300 m) above mean sea level over the Aquis Resort. This would equate to the approaching aircraft having approximately 230 m clearance over the highest building within the proposed development and potentially clear of any radar shadow likely to present at that point.

Discussions with Cairns ATC staff documented in AADS (2014) indicate that, while low level shadow areas were already present as a result of the terrain associated with Earl Hill located 8.9 km from the radar head, based on normal approach profiles this did not present an operational issue. AADS conclude that a number of existing penetrations of a greater magnitude than that of the Aquis Resort already exist. These include:

- substantial areas of terrain immediately to the west of the airport and within the Sensitive Zone
- buildings and terrain within the area of interest and associated with the Cairns populous area
- potential shipping associated with that of the Port of Cairns and operations at HMAS Cairns – these may be of a similar magnitude as the proposed development and to a large extent 'uncontrolled'.

In summary, the radar shadow produced as a result of the Aquis Resort development would be experienced at low level and below normal aircraft approach and departure profiles. AADS conclude that, although the radar shadow may exist, it will have limited impact on normal operations.

The final assessment into any operational impacts as a result of the Aquis development will be subject to Airservices internal assessment on a more advanced project design.

d) Airport Capacity Issues

Given the Aquis Resort is largely targeted towards the international tourist market, it can be anticipated that the principal mode of transport to Cairns will be via aircraft.

In order to understand the likely demands on air travel into Cairns below is a comparison of 2013 passenger volumes and the anticipated increase associated with the operation of Aquis.

TABLE 24-19 CURRENT AND ANTICIPATED AIR TRAFFIC

PASSENGER TYPE	2013	Aquis Stage 1	Aquis Stage 2	TOTAL	AVG. PASSENGERS PER AIRCRAFT	Aquis ADDITIONAL FLIGHTS
International Pax	554 651	424 130	795 244	1 774 025	300	4065
Domestic Pax	3 600 971	72 562	136 054	3 809 587	170	1227

To give some context to the significance of the increase in aircraft movements into Cairns, **Table 24-20** provides an analysis of the relative increase in aircraft traffic.

TABLE 24-20 RELATIVE INCREASES IN AIRCRAFT TRAFFIC

AIRPORT OPERATIONS	2013	Aquis	COMBINED	INCREASE
International				
Arrivals/year	3200	4065	7265	127%
Domestic				
Arrivals/year	20 300	1227	21 527	6%
Combined				
Arrivals/year	23 500	5292	28 792	22%

The analysis illustrates that the number of international departures / arrivals will more than double and there will be only a minor increase in domestic movements. Overall there will be a 22% increase in flights arriving and departing from Cairns International Airport.

There will be a negligible increase in air freight arising from the operation of Aquis as the type and quantum of goods could not be transported cost effectively by air.

North Queensland Airports as the owner and operator of the Cairns Airport have provided written confirmation that there is sufficient capacity at the airport to cater for the increase in demand arising from Aquis. A copy of the advice is provided in **Figure 24-36**.

In relation to the construction workforce it is anticipated that the significant portion of the workforce will be either workers currently residing in Cairns or workers that will permanently relocate to Cairns. Hence the anticipated FIFO workforce is expected to negligibly small.

NQA

6 December 2013

Pat Flanagan
Managing Director
Flanagan Consulting Group
138 Spence Street
CAIRNS QLD 4870
Email: pat@flanaganconsulting.com.au

Dear Pat

CAIRNS AIRPORT - CAPACITY TO ACCOMMODATE ANTICIPATED GROWTH GENERATED BY AQUIS

On behalf of Cairns Airport Pty Ltd (CAPL) I acknowledge and confirm our appreciation of the ongoing dialogue and consultation with Cairns Airport operational staff in the preparation of the AQUIS Environmental Impact Statement.

I note your advice that AQUIS will be designed to conform with the purpose and performance criteria of the *"Operational Aspects of the Cairns International Airport Code"* in the Cairns Regional Council's Planning Scheme.

I also confirm that Cairns Airport is well equipped to cater for the anticipated increase in aircraft and passenger numbers (both domestic and international) expected to be generated by the AQUIS development without any requirement for significant upgrade or expansion of core aviation infrastructure. The development will be factored into CAPL's strategic business plans of pursuing new route development to meet increased demand.

I extend my best wishes to the AQUIS team for the progress of the project through the approvals process.

Yours sincerely

Kevin Brown
NORTH QUEENSLAND AIRPORTS
CHIEF EXECUTIVE OFFICER

Enquiries: Brett Rose, (07) 4080 6784
Email: brett.rose@cairnsairport.com.au
Our Ref: CAPL AQUIS

A PO Box 57 | Airport Administration Centre | Cairns Airport | Q | 4870 P + 61 7 4080 6703 E enquiries@cairnsairport.com.au

Operating Cairns & Mackay Airports

Figure 24-36 Letter from North Queensland Airports.

e) Emergency Management Planning and Policies

Advice received from CAPL (P Lamont pers. comm. 1 October 2013) is that the extra flights required by Aquis Resort are insignificant in terms of emergency management planning and policies. In summary, the advice was that any passengers or aircraft using Cairns Airport will be adequately covered under the current Airport Emergency Plan. Specific comments are as follows:

- New aircraft type – are expected to be the same or similar to existing aircraft types operating at Cairns. The size of the aircraft capable of operating to Cairns is determined by the design standard of the runway and taxiway infrastructure. Cairns Airport is currently designed for Code E aircraft i.e. B747 – 400 size aircraft.
- New airline operators – possibly several of the existing airline operators may also operate on new China routes. However new airlines are regularly welcomed to Cairns Airport. All airlines are members of the Cairns Airport Emergency Committee. Each is provided a copy of Cairns Airports Airport Emergency Plan (AEP). Each airline operating into Cairns is required to provide a copy of their Airline Emergency Plan to CAPL.
- Airport rescue and fire-fighting (ARFF) coverage – ARFF currently operates to a level capable of covering Code E aircraft.
- Increased passenger numbers – an overall increase in passenger numbers is not critical to Cairns Airports AEP response. It is the size of the aircraft and maximum number of passengers in it that determines the level of response to any aircraft emergency. It is not expected the Aquis Resort will vary what is already provided for in the Cairns Airport AEP.
- Foreign nationals – CAPL already has a large number of foreign nationals operating through Cairns Airport which is recognised as an international gateway. CAPL recognises the importance of responding appropriately when any foreign nationals are involved in an airport emergency. Cairns Airport's AEP already addresses this issue.
- Natural disasters – the airport's response to natural disasters under the AEP will not be impacted by Aquis Resort.

24.4.3 Mitigation and Management

a) Wildlife Strike

Principal features of such a mitigation strategy may include the following (this is a summary of the more detailed advice):

- Design lake and lake margin to have minimal shallow water surface area.
- Steep sided banks would be preferred. Any sloping surface should either be replanted to a dense mangrove community, or covered by a ground surface such as rock that does not support plant growth or provide the substrate preferred by birds of concern.
- Maintaining a brackish to saline water column which deters the establishment specified semi-aquatic plants that are intolerant of salt water, and provides fewer niches for birds implicated in bird-strike to nest, rest, feed or hide / escape. It would also be preferable to maintain a consistent water level. Rises and falls in water levels may encourage development of a plant community in the 'inter-tidal zone' which attracts a range of water birds and facilitates build-up of organic material that might favour colonisation by dotterels, sandpipers, plovers, herons, ducks, lapwings etc.
- Minimising the habitat value of the lake shore (particularly at the southern end of the development where there is a larger expanse of water that may not receive the same degree of disturbance as areas to the north).

- Open shore areas should be more hostile i.e., concentrated recreational use, hardened abrupt surfaces, while any ecologically restored margins should have an appropriate density of woody stems to deter birds that are more common in open (anthropogenic) areas. There may be trade-offs between creating functional habitat within the immediate lake environs, and the need to restrict the attractiveness of such vegetation to vertebrates and invertebrates.
- Minimising new or novel foraging opportunities – ensuring birds are not attracted to artificial food sources that arise during or after the construction process, either within the artificial lake or in adjacent (man-made and natural) habitats. This would include deterring exotic/scavenging species during the construction phase to reduce potential habituation, and maintaining a level of hygiene around the development which minimises food scavenging opportunities.
- Minimising the attraction of the lake surface – generating a level of random, anthropogenic disturbance that reduces the likelihood of usage, either through automated (aquatic drone) devices, or by incorporating a water taxi/gondola system or recreational water-sports such as wind/kite surfing, canoeing which create a level of disturbance that deters large birds from settling on the surface.
- Minimising the creation of breeding habitat on any vegetated portions of the artificial lake area – such areas e.g., islands, harbour fewer predators and offer sanctuary to nesting waterbirds so vegetation would require consideration to limit nesting habitat. Many species are highly intolerant of disturbance during nesting periods.
- Vegetated islands are likely to be highly attractive to birds because of the lower levels of disturbance and should be avoided.
- Using shallow sand-bunkers with sub-surface drainage on the golf course, in preference to water hazards, and ensuring there are few, if any, areas on the golf course where water-pooling may create suitable habitat for certain species known from the study area.
- There is a potential for aquaculture ponds (if retained) to contribute to bird strike risk. The preliminary recommendation is that draining and filling the abandoned aquaculture ponds be undertaken to reduce habitat that is attractive to birds of concern. As noted elsewhere in this report, there are additional water quality and river migration reasons for taking this action.

b) Aviation Facilities

Noting that there are already penetrations greater than that potentially involved with the Aquis Resort, further discussions will be held with ASA. Should a future ASA assessment find that the effect on radar is not acceptable, mitigation is possible. This will involve the relocation of radar facilities to a better location, perhaps as part of the Aquis Resort itself.

24.5 PUBLIC TRANSPORT

24.5.1 Existing Situation

Public transport facilities in the area constitute a bus service. The bus services currently operate between the Smithfield Shopping Centre and Yorkeys Knob and the Cairns CBD and Yorkeys Knob.

The bus route through Yorkeys Knob circulates down Varley Street, along Sims Esplanade and along Wattle Street back to Varley Street. There are a series of bus stops with shelters for patrons along the route.

Details of the bus route and bus stops are provided in **Figure 24-37**.

Figure 24-37 Yorkeys Knob bus route and bus stop locations.

The Smithfield bus interchange located within the Smithfield Shopping Centre complex has provision for local bus services and tour buses to pick up/drop off passengers. The size of the bus station is sufficient for current demand, but may require upgrading for future services required. The DTMR recently awarded a consultant commission to investigate alternative positioning opportunities for the bus interchange within the Smithfield Shopping Centre area.

A major upgrade of the Lake Street Bus interchange is planned by DTMR, however other than minor bus stop upgrades there are no plans for other public transport network or infrastructure upgrades by DTMR or CRC in the near future.

DTMR and CRC have released the Cairns Transit Network Study (CTNS) which examines corridors for the development of a dedicated bus way network for Cairns. **Figure 24-38** provides an extract from the CTNS study demonstrating the proposed positioning of the corridor in the vicinity of Yorkeys Knob

Road. DTMR advises that roll out of this study into a functional bus way network is well beyond 10 years into the future.

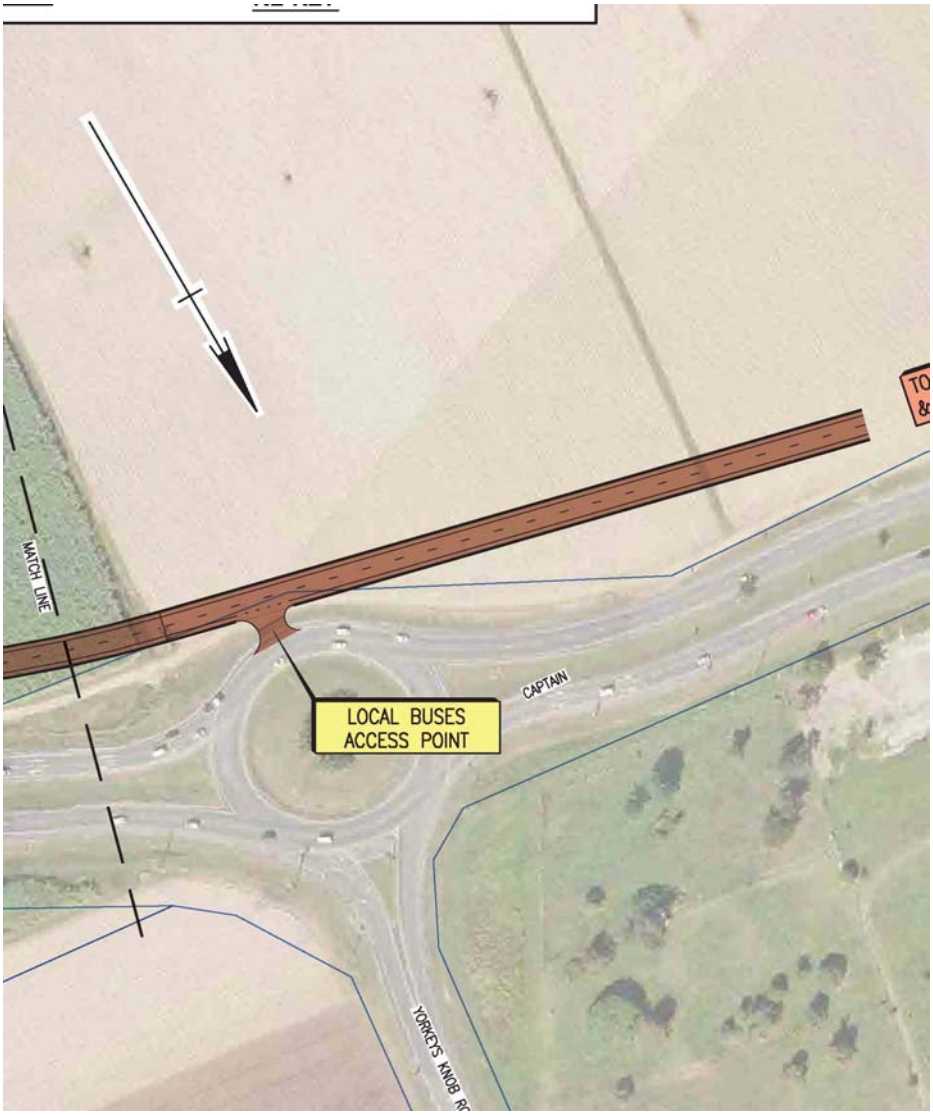


Figure 24-38 Cairns Transit Network study corridor.

24.5.2 Impacts

Transport needs of guests will be catered for by privately operated High Occupancy Vehicles, limousines, mini-buses, hire cars and taxis.

High Occupancy Vehicles which will be utilised for the transfer of guests to and from Cairns Airport and for transfer to other establishments in Cairns. Tour operators will provide coaches and buses for the transfer of resident guests on day tours. Non-resident guests from other accommodation houses that make day visit to Aquis will be transferred by mini bus, coach and taxi. Cairns locals that visit Aquis will typically travel by private vehicle or taxi.

It is anticipated that the impacts on public transport facilities will not be significant. The Aquis resort has been configured to provide up to 4000 car parking spaces which is adequate to meet construction worker and operational staff parking needs. In the event of there being an increased demand for public

transport, it is expected that the current public transport operator would respond by increasing frequency of services to Yorkeys Knob.

24.5.3 Augmentation

Aquis will provide a bus pull over facility as part of the development to facilitate pick up and drop off of staff and occasional visitors.

24.6 ACTIVE TRANSPORT

24.6.1 Existing Situation

The Cairns Pedestrian and Cycle Movement Overlay for the Cairns Beaches District Plan indicates that Dunne Road and Yorkeys Knob Road are District Pedestrian and Cycle Routes. The Captain Cook Highway and Cairns Western Arterial are District Pedestrian and Cycle Trunk Routes and are also identified as Key Links in the DTMR Cycle Network Plan.

The majority of the existing cycle facilities are on-road bicycle paths as part of the road shoulder. The Kuranda, Caravonica and Yorkeys Knob roundabouts are recognised as being statistically over represented by bicycle accidents with motor vehicles.

The Cairns Walking and Cycling Strategy has identified (subject to further investigation) a number of potential local walking routes from Yorkeys Knob Road to the Southern Beaches area, mainly being Holloways Beach through Acacia Street in the north and Cassia Street adjacent to the Holloways Beach Sporting Complex. It is envisaged that these paths are to be provided more as recreational walking trails to Holloways Beach.

The Cairns Active Transport Study discusses the proposed future cycling network and off-road cycle facilities provided on the Captain Cook Highway between Cairns and Smithfield – i.e. across the southern beach access roads, as well as the Yorkeys Knob Road, Caravonica and Kennedy Highway intersections. The Cairns Active Transport Study also identified that Yorkeys Knob Road would have on-road cycle facilities provided between the Captain Cook Highway and the Yorkeys Knob Beach recreation area through Wattle Drive and The Esplanade. Additionally, on-road cycle facilities have been identified for Dunne Road and MacGregor Road, between Yorkeys Knob Road and the Captain Cook Highway.

24.6.2 Impacts

Aquis Resort will be seeking to encourage active transport options for staff employed at the resort. A target of 10% of staff trips is a desired minimum outcome, resulting in approximately 800 pedestrian and cycle movements per day.

24.6.3 Augmentation

Aquis Resort will provide suitable trip end facilities to allow secure parking of bicycles, showering and change rooms for staff to encourage active transport.

It is anticipated the majority of bicycle and pedestrian movements would originate from Yorkeys Knob and other urban areas from within a notional 15 km radius of the site. Off road facilities will be provided between Yorkeys Knob and the site. The Captain Cook Highway currently has wide shoulders suitable for bicycle movements, though bicycle movements through roundabouts are problematic. Dunne Road and Yorkeys Knob Road have inadequate shoulder width to safely cater for on road bicycle needs. The shoulders of Dunne Road and Yorkeys Knob Road will have sufficient width when reconstructed to provide on road cycleways.