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27 July 2017

P0917 A&B Kooragang - Elgas Development TIA

Above & Beyond Consulting Group Pty Ltd
PO Box 3131
Merewether NSW 2291

Attn: Craig Cable

Dear Craig,

Proposed Elgas Storage Facility, 130 Cormorant Road, Kooragang, NSW.

Further to your email and following our site visit and a review of the documentation provided for the proposed construction of an Elgas LPG Depot in Kooragang, we provide the following traffic impact statement.

This assessment has been prepared in accordance with the Austroads Guidelines and Section 2.3 of the RTA Guide to Traffic Generating Developments which provides the structure for the reporting of key issues to be addressed when determining the impacts of traffic associated with a development. This guide indicates that the use of this format and checklist ensures that the most significant matters are considered by the relevant road authority.

The report has also taken into consideration the Newcastle Development Control Plan 2012 (NDCP) and AS2890 Parking Facilities.

The proposed development is located on Egret Street off Cormorant Road as shown in Figure 1.

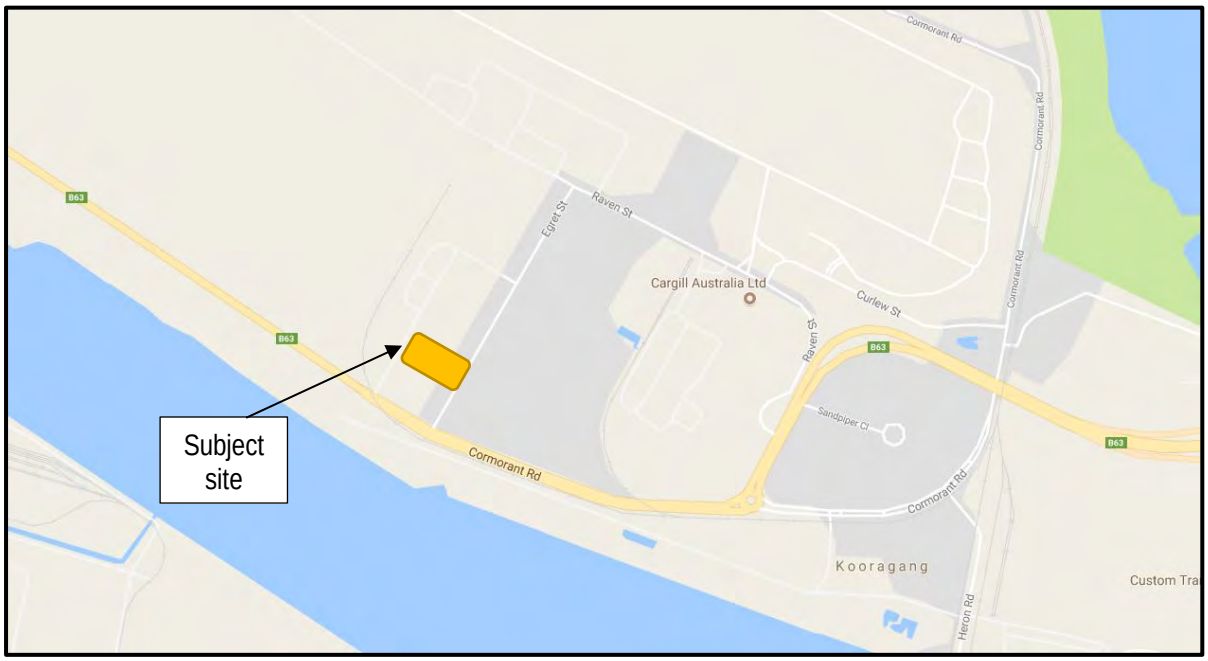


Figure 1 - Project site within the context of the local road network

Traffic Impact Assessment:

Item	Comment
Existing Situation	
2.1.1 Site Location and Access	The subject site is located within Kooragang Island, part of the Port of Newcastle which includes port facilitates, loading and rail infrastructure and heavy industry. It has frontage to Egret Street to the east, with a private road running close along the western boundary of the site. There is no current usage for the site and no driveway access currently available off Egret Street. The site is to the north of a recently developed petrol station, convenience store, take away food and car wash. This southern area of the site also has approval for a proposed Self-Storage Facility within this front site, which is currently under design.
2.2.1 Road Hierarchy	The main road through the locality is Cormorant Road which is a state road (MR108). In the vicinity of the site, and at its connection with Egret Street it provides a dual carriageway being the main thoroughfare between Newcastle and the region north of the Hunter River, including Stockton and Port Stephens. It is also the primary access road between Newcastle airport, the RAAF base at Williamtown and Newcastle inner city. As a state road, it carries a mixture of both local traffic and regional through traffic movements including freight traffic associated with the port. Cormorant Road forms a T-intersection with Egret Street, with Cormorant Road being the priority road. Turning lanes off Cormorant Road provide access into Egret Street for both eastbound and westbound traffic. The posted speed limit is 80 km/hr in the vicinity of the subject site Egret Street is a private road providing access to the subject site and other industry including but not limited to Boral, Port Waratah Coal and Newcastle Coal Infrastructure Group. It provides a sealed surface with a single lane of travel in both directions and a width of approximately 14 metres. No right turns are permitted from Egret Street which connects with Cormorant Road via a left turn out only. Further to the north-east Egret Street connects with Raven Street via a T-intersection. Raven Street provides a single lane of travel in both directions and provides an alternative traffic route to Egret Street. The relevant road authority for Cormorant Road is Newcastle City Council. Egret Street is a private road managed by the Port of Newcastle.
2.2.2 Roadworks	Roadworks are currently being undertaken along Cormorant Road beginning west of the proposed development. These works continue west along Cormorant Road and currently terminate on Tourle Street on the southern side of Tourle Street bridge. These works incorporate lane closures, providing one lane of travel in each direction. There is also presently a speed limit reduction on Cormorant Road in the vicinity of the proposed development, with a speed limit of 60km/hr instead of the normal 80km/hr.
2.2.3 Traffic Management Works	There are traffic management works currently underway on Cormorant Road, within the general locality of the subject site. The upgrade involves duplicating 3.8 kilometres of road between Industrial Drive at Mayfield West and Egret Street to provide two lanes in each direction. These works are to cater for forecast increases in traffic flows as a result of expansion

Item	Comment
	of Newcastle airport and growth of industrial development on Kooragang Island.
2.2.4 Pedestrian and Cycling Facilities	Current roadwork entails a widening of Cormorant Road to provide 2.5 metre shoulders to cater for on-road cyclists. No pedestrian facilities are provided along Cormorant Road or Egret Street.
2.3 Traffic Flows	A traffic survey was undertaken by Seca Solution at the intersection of Cormorant Road and Egret Street on Wednesday 21st June 2017. The peak hour was determined as being 7.30AM-8.30AM in the morning and 4.15PM-5.15PM in the afternoon. Two-way traffic flows west of Egret Street in this location are 2431vph in the morning and 2739vph in the afternoon with flows on Egret Street being much less with 201vph in the AM and 116 vph in the PM.
2.3.1 Daily Traffic Flows	Typically, peak hour flows represent between 8-12% of the daily flows. Therefore, daily flows on Cormorant Road would be in the order of 25,900 per day whilst daily flows on Egret Street would typically be 1600 vpd. This is consistent with AADT data from the permanent count station 05962 on Nelson Bay Road east of Greenleaf Road which shows 2017 data 25,261.
2.3.2 Daily Traffic Flow Distribution	A review of the traffic surveys shows that flows in the morning have a dominant flow westbound in the AM representing commuters travelling to work towards Newcastle. In the afternoon, the flows are more balanced with a slight eastbound bias. This would represent workers within the surrounding area travelling home at the end of the day as well as commuters returning towards Nelson Bay.
2.3.3 Vehicle Speeds	No speed surveys were completed as part of the survey work. From observations, due to the current roadworks drivers westbound along Cormorant Road are typically travelling below the signed 60km/hr during peak periods. This is a result of traffic congestion when merging from two-lane to one-lane traffic flow.
2.3.4 Existing Site Flows	The project site is currently unoccupied, and falls within leased land in Kooragang managed by the Port of Newcastle.
2.3.5 Heavy Vehicle Flows	Due to the industrial nature of the existing industry, a significant proportion of traffic is in the form of heavy vehicles. Survey results show that in the morning peak, heavy vehicles make up 8% of flows whilst in the afternoon they are between 3-4%.
2.3.6 Current Road Network Operation	Observations on site show that the road network in the vicinity of the subject site operates well, with few delays or congestion for existing road users. Under roadwork conditions minimal queueing may be observed travelling westbound along Cormorant Road during peak periods, resulting in a significant drop of speed below the posted limit as traffic flows through this area. The duplication of the Tourle Street bridge shall provide a significant improvement to the current road network removing this pinch point and increasing road capacity. Egret Street traffic flow is low and currently services other industry including Boral, Port Waratah Coal and Newcastle Coal Infrastructure Group, as well as the Coles Service Station.
2.4 Traffic Safety and Accident History	A review of accident data provided by the Transport for NSW Centre for Road Safety indicates that there has been 5 accidents recorded in the vicinity of the intersection of Cormorant Road and Egret Street in the period between 2011 and 2017.

Item	Comment
	Of these, one accident occurred near the intersection of Egret Street and Raven Street, involving a single out of control motorcycle (in wet surface conditions). No other accidents have been recorded at this location or along the length of Egret Street, indicating there are no safety concerns for this area. In the area approaching the intersection of Egret Street and Cormorant Road there have been 4 accidents recorded in this period. From a review of the causes there is no specific safety concern evident for traffic flow in this area, with the most common case being rear ends, with 2 recorded and a further 1 caused by lane change and 1 from a right through turn onto Egret Street. Therefore, given the volume of traffic passing through this area it is considered that Cormorant Road in the vicinity of the proposed site provides a good level of traffic safety.
2.5 Parking Supply and Demand	
2.5.1 On-street Parking Provision	On-street parking is currently available along the length of Egret Street. From observation, this on-street parking is primarily utilised by heavy vehicles as a makeshift truck stop.
2.5.2 Off-street Parking Provision	There are no public car parks within the area however the majority of vehicles are able to park within the various development sites.
2.5.3 Parking Demand and Utilisation	Observations on site show that there is little parking demand for light vehicles within the local streets however trucks use Egret Street to stand while waiting to progress to loading or unloading areas etc.
2.5.4 Set down or pick up areas	There are no set down or pick up areas noted within the vicinity of the subject site
2.6 Public Transport	
2.6.1 Rail Station Locations	The site is not serviced by a train station.
2.6.2 Bus Stops and Associated Facilities	There is no formal bus stop located in the vicinity of the subject site. There is an informal bus station located east of the subject site, approximately 20 minutes walking distance (1.2km) along Cormorant Road. This bus stop is operated by Port Stephens Coaches and contains no undercover waiting area or channelled lane for a bus to stop in, with the shoulder of the roadway used.
2.6.3 Transport Services	Three local bus services travel along Cormorant Road past the intersection with Egret Street. Two of these are operated by Port Stephens Coaches (Route 130 and 131), with the other being a Newcastle Buses service which runs on Friday and Saturday nights only.
2.7 Pedestrians Network	There are no pedestrian footpaths in this location.
2.8 Other Proposed Developments	Adjacent to the subject site there is a recently opened Coles Service Station, Coolabah Food and Bay Wash Car Wash. Traffic associated with this development has been included in the above survey results. There is also a Self-Storage Facility proposed within this front site, which is currently under design.
The Development	
3.1.1 Nature of Development	The proposed development is for a Liquefied Petroleum Gas (LPG) storage and cylinder filling and small truck loading facility. It is to include the following: • Administration office • Staff parking area • Loading docks • Designated Area for LPG Storage Tank – aboveground • Cylinder refilling dock

Item	Comment
	• Truck parking areas The development is being assessed on a stand alone basis, with all vehicle access to the site coming from Egret Street. No access is proposed from Cormorant Road and no internal connection is provided from the existing Coles Service Station adjacent to the site.
3.1.2 Access and Circulation Requirements	Vehicle access will be provided direct off Egret Street with a two-way driveway providing for all movements including B-double trucks. There is to be an electronically operated entry and exit security gate located internally on the site to gain entry to the rear yard. This is located directly in line with the site entry at approximately 50 metres from the edge of Egret Street. The gates are normally kept closed at all times with access through the site control process. The majority of bulk deliveries will occur during daylight hours however there will be an occastional need for after hours deliveries. The size of the site together with the configuration ensures that all vehicles can enter and exit the site in a forward direction. For the designated overnight truck parking area, adequate space has been provided to allow for a truck to reverse into a parking space within the site and drive in a forward direction out of the site. A turning area has been designated for delivery vehicles, designed for a 12.5 metre rigid truck, to accommodate movement into the delivery bay and safe exit from the site in a forward direction.
3.2 Access	
3.2.1 Driveway Location	The driveway on Egret Street is to be located approximately 150 metres north of the intersection with Cormorant Road. Access will be available travelling from both directions along Egret Street.
3.2.2 Sight Distances	For the posted speed limit on Egret Street of 60km/hr, AS2890.1 indicates a minimum sight distance requirement of 65 metres out of the access driveway, with an 83 metre desirable 5 second gap. This is to ensure drivers exiting the subject site can see traffic along Egret Street and adjust their vehicle movements accordingly. Adequate visibility is available in both directions at the point of site access, with the road having a straight horizontal and vertical alignment. Visibility in both directions exceeds 83 metres allowing for safe entry and exit movements for both cars and trucks. Cormorant Road provides good road alignment at the existing intersection with Egret Street, allowing for excellent visibility for drivers entering or exiting Egret Street. For the posted speed limit of 60 km/hr along the minor road (Egret Street), Austroads Guide to Road Design – Part 4A specifies an approach sight distance of 73 metres. Whilst a safe intersection sight distance along the major road (Cormorant Road) of 170 metres is specified for the posted speed limit of 80km/hr. Exit onto Cormorant Road is available as a left turn only. Visibility for exit onto Cormorant Road exceeds 170 metres, allowing safe exit movements for both cars and trucks. Entry into Egret Street from Cormorant Road is available in both directions, with visibility again exceeding 170 metres allowing for safe turn movements.

Item	Comment
	A minimum gap sight distance of 111 metres is required for safe turn movements, which is satisfied with visibility exceeding 170 metres.
3.2.3 Service Vehicle Access	The site provides a designated delivery bay for service vehicles, including a turning area to ensure safe entry and exit. All service vehicles required for the operation of the LPG storage tank and refilling dock have been designed for, with adequate turning areas provided on-site.
3.2.4 Queuing at entrance to site	No vehicle queues are expected at the site entry / exit point due to the relatively low traffic flows associated with the development and low traffic flows on Egret Street. There is an internal control point, in the form of an electronically operated security gate, which prevents unauthorised entry into the industrial area of the site. This control point is located directly in line with the site entry at a distance of approximately 50 metres. This gate will be closed during operating hours, with access through the site control process. Given the minimal movements into and out of this area of the site there is not expected to be queueing back onto Egret Street occurring at this point. There is adequate space to accommodate large vehicles, including B-Doubles in this area between the site access and the control gate. When exiting, any delays will occur within the site, however given the low flows on Egret Street outbound delays are considered to be minimal.
3.2.5 Comparison with existing site access	There is no existing site access.
3.2.6 Access to Public Transport	There is no formal pedestrian access to public transport facilities. The site is not considered a major attraction for public transport use.
3.3 Circulation	
3.3.1 Pattern of circulation	All vehicles will be able to enter and exit the site in a forward direction.
3.3.2 Road width	The entry / exit driveway has been designed to allow for the movement of B-Double trucks into and out of the site. There are no formal roadways provided on site with the layout and operation of the area meeting the specific requirements of the end user. Traffic management within the site will be controlled by the on-site WHS requirements and management plan. The width of road for the front parking area provides adequate space (6.2 metres) to allow for two-way movement of light vehicles.
3.3.3 Internal Bus Movements	No requirement for buses to access the development.
3.3.4 Service Area Layout	The site provides a designated delivery bay for service vehicles. The overall internal area within the site provides for the movement of large trucks including B-Double.
3.4 Parking	
3.4.1 Proposed Supply	Adequate car and truck parking is to be provided on-site to cater for the anticipated need. From plans provided there are 19 car spaces available in the car park on site, along with 8 overnight truck parking spaces available in the restricted access section of the facility.
3.4.2 Authority Parking	Although there is no specific requirement for parking nominated by the NDCP there is a parking rate for industrial uses. This rate requires parking at the rate of 1 space per 100m^2 GFA or 1 space per 2 staff, whichever is the greater.

Item	Comment
3.4.3 Parking Layout	The site provides a formal parking area for cars located at the front of the site. Further into the site, where access is restricted, there are parking spaces provided for heavy vehicles.
3.4.4 Parking Demand	The development will need to cater for: • 9 administration staff, • 2 depot drivers, • 8 drivers to drive the Bobtails / cylinder flat top trucks. Applying the NDCP rate of 1 space per 2 employees the proposed development is required to provide 10 parking spaces. The proposal to provide 19 spaces exceeds the DCP requirement and therefore no further assessment of the parking is required.
3.4.5 Service Vehicle Parking	One dedicated service bay is provided on the site. The bulk of deliveries will be to the rear of the site with general servicing demands minimal. This delivery bay is located to the front of the site adjacent to the car park which caters primarily for the parking demands of staff on site. Once staff are parked there will be little demand for them to come and go except drivers who will be in the delivery vehicles. The proposed development is not a destination for the public with little demands for visitors to the site so traffic movements into and out of the car park shall be typically associated with staff arrivals and departures. The operation of the car park and the delivery bay shall be included in the on-site management plan that shall provide for the control of movements associated with the car park whilst the delivery bay is in use reducing any potential conflict.
3.4.6 Pedestrian and Bicycle Facilities	It is considered that there will be little demand for pedestrians or cyclists to access the site. There is however a pedestrian access point provided off Egret Street, leading towards the administration office. Pedestrian access between the car park and the administration office can be safely managed due to the low traffic speeds on site, which allow for shared use of the roadways as needed. Cyclists if required can access the site via the road network including the new cycling lane to be constructed in conjunction with the current Cormorant Road upgrades.
Traffic Assessment	
4.1 Traffic Generation	The RMS Guide to Traffic Generating Developments provides no rates for this type of industrial development and so the traffic generation is being assessed from first principles. Based on information provided by the study team (from hazard analysis) the following has been determined. <u>Heavy Vehicle Flows:</u> • B-Double tanker deliveries = 5 per week • Bobtail distribution = 3 per day • Cylinder trucks (flat tops) = 5 per day • B-Double line haul cylinder distribution = 5 per week • TOTAL 20 truck movements per day (10 inbound and 10 outbound) <u>Employees</u> • Maximum office staff of 9 per day • 2 depot drivers for cylinder filling • 8 delivery drivers to drive Bobtails / cylinder flat top trucks. • TOTAL 38 movements per day (19 inbound and 19 outbound)

Item	Comment
	There is also the need for maintenance contractors to access the site, on an as needs basis and for preventative maintenance. This will be an infrequent occurrence and as such any associated vehicle movements will have negligible impact upon the local road network. This is consistent with the data provided by the end-user Elgas who has advised that total daily vehicle movements: • Light vehicles = up to 40 VPD • Heavy vehicles = <25VPD The proposed development shall operate between the hours of 8am and 5.30pm Monday to Friday, Saturdays 8am-12pm and after hours deliveries over a 7 day period. For depots such as this staff generally arrive across a number of start times with administration staff often starting later than delivery drivers. For the purpose of this assessment the worst case has been allowed for, assuming that all employees will arrive during the morning peak hour Allowing for this it has been calculated that in the morning peak hour traffic flows would be 19 inbound staff vehicles and up to 8 outbound heavy vehicles. Outbound movements account for the scenario where trucks have been loaded for delivery the previous day and sent out for delivery in the morning. In the afternoon peak period all movements are expected to be associated with outbound light vehicles, being staff leaving, accounting for 19 outbound movements. Heavy vehicles are typically expected to return to the depot before the afternoon peak enabling them to be loaded for the following days deliveries.
4.1.1 Daily and Seasonal Factors	No seasonal factors need to be considered for this development although there may be less demand during the Christmas period.
4.1.2 Pedestrian Movements	Given the nature of the development, there will be very few external pedestrian movements to and from the site. The location of the site does not encourage people to walk or cycle to work. There will be pedestrian movements associated with people walking around the site, including the carpark. All roads act as shareways, with low traffic speeds, allowing for safe combined pedestrian and vehicle movements within the site. Safe movement through the site shall be reinforced via the onsite safety management plan.
4.2 Traffic Distribution and Assignments	Traffic associated with the development will typically turn right out of the site and left at Cormorant Road. Vehicles traveling toward Newcastle will complete a u-turn at the roundabout approximately 800m to the east. Deliveries to the north will travel along Nelson Bay Road. The approved B-Double route for delivery of LPG, from Elgas Cavern facility in Port Botany, to the proposed development site involves approach from the west off the M1, John Renshaw Drive, through Hexham to Industrial Drive, left at Tourle Street with left turn off Cormorant Road onto Egret Street and then left turn into the site.
4.2.1 Origin / destinations assignment	Site access is provided off Egret Street only. Some trucks returning from the north-east (ie Williamtown, Nelson Bay) westbound may approach

Item	Comment
	Egret Street via Raven Street and avoid crossing two-lanes of traffic on Cormorant Road turning right into Egret Street. For the purpose of this assessment all traffic is assumed to approach / depart the site via Cormorant Road. Inbound traffic: • 80% employees travelling from the south and west (Newcastle, Lake Macquarie, Maitland) • 20% of employees coming from the north (Port Stephens, Stockton, Williamtown) Outbound traffic (for deliveries) is assumed 50% north and 50% south, given the presence of existing industry in both directions from the location. B-Double tanker deliveries will approach and depart the site via the approved route, approaching from the west.
4.3 Impact on Road Safety	The major impact of the development would be associated with the potential increase in traffic movements at the intersection of Egret Street and Cormorant Road. This is a T-Intersection, with Cormorant Road being the priority road. It is located on a straight (vertical and horizontal alignments) section of road and provides good visibility in both directions. Based on observations of the current intersection operation, and the accident data provided by the RMS, it is considered the minor increase in traffic flow from the proposed development will have a minimal impact upon road safety at the intersection of Egret Street and Cormorant Road. It is noted that although the exit movements from Egret Street are restricted to left out only, safety would be enhanced if this movement was physically restricted rather than by signage only.
4.4 Impact of Generated Traffic	
4.4.1 Impact on Daily Traffic Flows	It can be seen that the proposed development will have a minimal impact upon the daily traffic flow in the locality of the subject site. The level of traffic generated by the facility in the AM as a worst-case scenario is 19 inbound (light) and 8 outbound (heavy) movements with less in the PM peak. Daily flows have been assessed as 40 light movements (20 inbound 20 outbound) and less than 25 heavy movements (12 inbound 12 outbound). This is in the order of 65 movements per day. Existing daily flows along Cormorant Road have been documented as 33,000 daily (RMS Cormorant Road upgrade). The additional flows therefore represent less than 0.2% of the existing flows.
4.4.2 Peak Hour Impacts on Intersections	The major impact of the development will be at the intersection of Cormorant Road and Egret Street. This intersection has been assessed using Sidra Intersection 7 to determine its capacity to cater for the increased demands associated with the proposed development. This assessment is detailed below, following section 4.
4.4.3 Impact of Construction Traffic	All construction work will be contained within the site with minimal impact on the local road network. There will be a requirement for construction vehicles to access the site and additional traffic movements associated with workers during construction. These movements can be catered for within the local road network.

Item	Comment
	The site area is large and will be able to accommodate the parking needs of construction staff on site without impacting upon the external road network.
4.4.4 Other Developments	Adjacent Coles Service Station, Coolabah Food and Bay Wash Car Wash averages just over 2100 vehicle movements per day, including 100-200 truck movements. The majority of this traffic enters this site from Cormorant Road. This traffic has been accounted for in the traffic surveys. There has been a development application lodged for 13 industrial units on Site C and this application has been suspended with a view of lodging an amended offer to now include individual self-storage units. The self-storage units by nature will have a much lower visitation rate than what was first proposed which will be assessed when the amended plans are lodged. The upgrade of Cormorant Road in this location has been designed to accommodate future traffic flows of 40,000 vpd. There is no connection provided between this adjacent site and the subject site.
4.5 Public Transport	
4.5.1 Options for improving services	None required. The subject site is not considered to be a major generator of public transport use.
4.5.2 Pedestrian Access to Bus Stops	None required.
4.6 Recommended Works	
4.6.1 Improvements to Access and Circulation	None required
4.6.2 Improvements to External Road Network	Improvements are already underway designed to adequately cater for future traffic flow.
4.6.3 Improvements to Pedestrian Facilities	None required.
4.6.4 Effect of Recommended Works on Adjacent Developments	No works proposed that will impact on adjacent developments.
4.6.5 Effect of Recommended Works on Public Transport Services	Nil.
4.6.6 Provision of LATM Measures	None Required.
4.6.7 Funding	No external work required.

Sidra Modelling:

The key intersection that will be impacted upon by the development is the intersection of Cormorant Road / Egret Street. This intersection has been modelled using *Sidra Intersection 7* to determine its current operation and assess the capacity of this intersection to support the increased demands associated with the proposed development.

Three scenarios have been assessed:

- Existing situation (2017) based on surveyed traffic flows;
- 2017 traffic flows with full development of the subject site;
- Future design year (2027) allowing for ongoing growth along the Cormorant Road corridor.

The results of this Sidra modelling are provided below.

Table 1 - Sidra Results - 2017 Existing Situation (AM/PM)

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
E: Cormorant Road	Through	A / A	0.1 / 0.0	0.0 / 0.0
	Right	B / E	18.9 / 62.8	1.0 / 3.8
N: Egret Street	Left & Through	A / A	9.3 / 11.2	4.8 / 4.2
W: Cormorant Road	Left Only	A / A	0.8 / 0.2	0.0 / 0.0

As shown in Table 1, the intersection of Cormorant Road / Egret Street currently operates well with very minimal delays and congestion for all movements except the right turn into Egret Street in the PM peak. This right turn currently experiences delays because of the high demand for eastbound (opposing) traffic along Cormorant Road which creates insufficient gaps for vehicles to complete this turn.

Excluding this right turn, all movements currently operate at Level of Service A during both the morning and evening peak.

The intersection was then modelled to include the development traffic.

Table 2 - Sidra Results - 2017 Flows with Development (AM/PM)

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
E: Cormorant Road	Through	A / A	0.1 / 0.0	0.0 / 0.0
	Right	B / E	19.4 / 62.8	1.4 / 3.8
N: Egret Street	Left & Through	A / A	9.6 / 11.4	5.7 / 5.2
W: Cormorant Road	Left Only	A / A	0.9 / 0.2	0.0 / 0.0

Allowing for full development of the subject site, the intersection of Cormorant Road / Egret Street will continue to operate to the same standard as it does currently. The increased demands associated with this development will see only very minor increases in the average delays and queuing on all movements with no change to the current level of service.

The intersection was then modelled to allow for future background growth.

Table 3 - Sidra Results - 2027 design year with 12% growth on Cormorant Road (AM/PM)

Approach	Movement	Level of Service	Average Delay (s)	95% Queue (m)
E: Cormorant Road	Through	A / A	0.1 / 0.0	0.0 / 0.0
	Right	B / F	23.2 / 110.8	1.9 / 6.8
N: Egret Street	Left & Through	A / A	10.4 / 13.5	7.0 / 7.3
W: Cormorant Road	Left Only	A / A	0.9 / 0.2	0.0 / 0.0

The intersection was modelling for the future 2027 design year allowing for 12% growth along the Cormorant Road corridor (estimated at 1.2% per annum, consistent with forecasted growth on Tourle Street).

The Sidra modelling shows that the intersection will continue to operate to its current standard in the morning peak however the right turn into Egret Street will experience significant delays during the evening peak due to the increased demand for opposing through traffic. These increased delays will see drivers accept smaller gaps when completing this turn which could impact upon the overall safety of this intersection.

It is noted however that drivers associate with the subject site, approaching from the east, would have the option to avoid this right turn by using alternative access available via Raven Street (off Teal Street).

Overall it can be seen that the proposed development will have a negligible impact upon the performance of the Cormorant Road / Egret Street intersection with the increased demands only creating very minor increases in average delays and queuing during the network peak hours.

With forecast growth along Cormorant Road, the right turn into Egret Street will experience reduced levels of service with increases in the average delay for vehicles turning right. These increases are the result of ongoing growth along the road corridor with the proposed development having a negligible impact upon this movement.

Conclusion:

From the site work undertaken and the review of the development proposal and associated plans against the requirements of the RMS Guide to Traffic Generating Developments and Austroads Guide to Traffic Management, it is considered that the proposed development will have minimal impact upon the surrounding road network.

For the key intersection of Cormorant Road and Egret Street:

- It is recommended that the left turn only access onto Cormorant Road be reviewed to ensure the safe operation of this intersection through the physical restriction of right-turn movements.
- Future demands for the right turn into Egret Street shall be impacted upon by ongoing growth in opposing traffic flows.
- Alternate routes are available for vehicles wishing to turn right and so driver's behaviour for those familiar with the precinct will be to tend to utilise alternate routes available via Raven Street (off Teal Street) during peak hours.

Parking proposed for the development exceeds the DCP requirement which ensures there will be no impact on the external road network. The parking, primarily catering for the needs of staff, shall be included in the on-site management plan to provide for the control of movements whilst the delivery bay is operational.

Access and circulation for the site is appropriate for the development, providing for the swept paths of heavy vehicles including B-Doubles.

Site Photos:

Photo 1 – Subject site frontage onto Egret Street (1)

Photo 2 – Cross section looking north along Egret Street from near Cormorant Road

Photo 3 – Cross section looking south along Egret Street from northern end

Photo 4 – Proposed site access driveway location on Egret Street

Photo 5 – Sight lines out of proposed site access looking south towards Cormorant Road

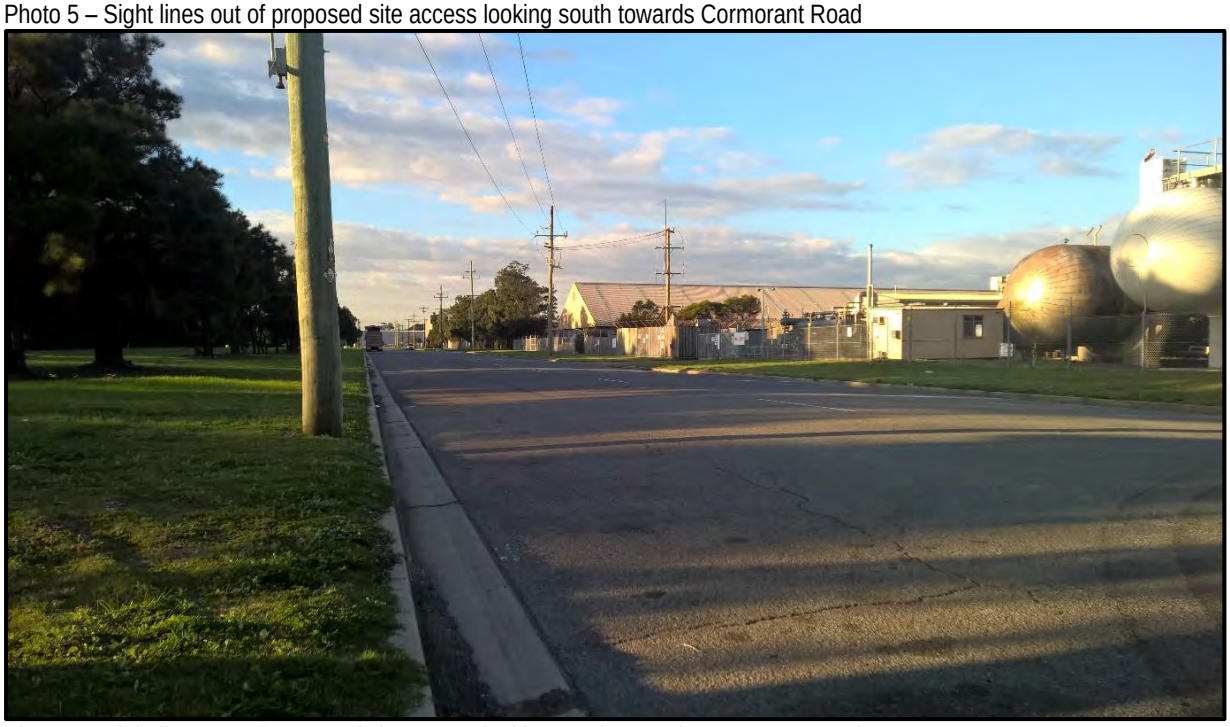
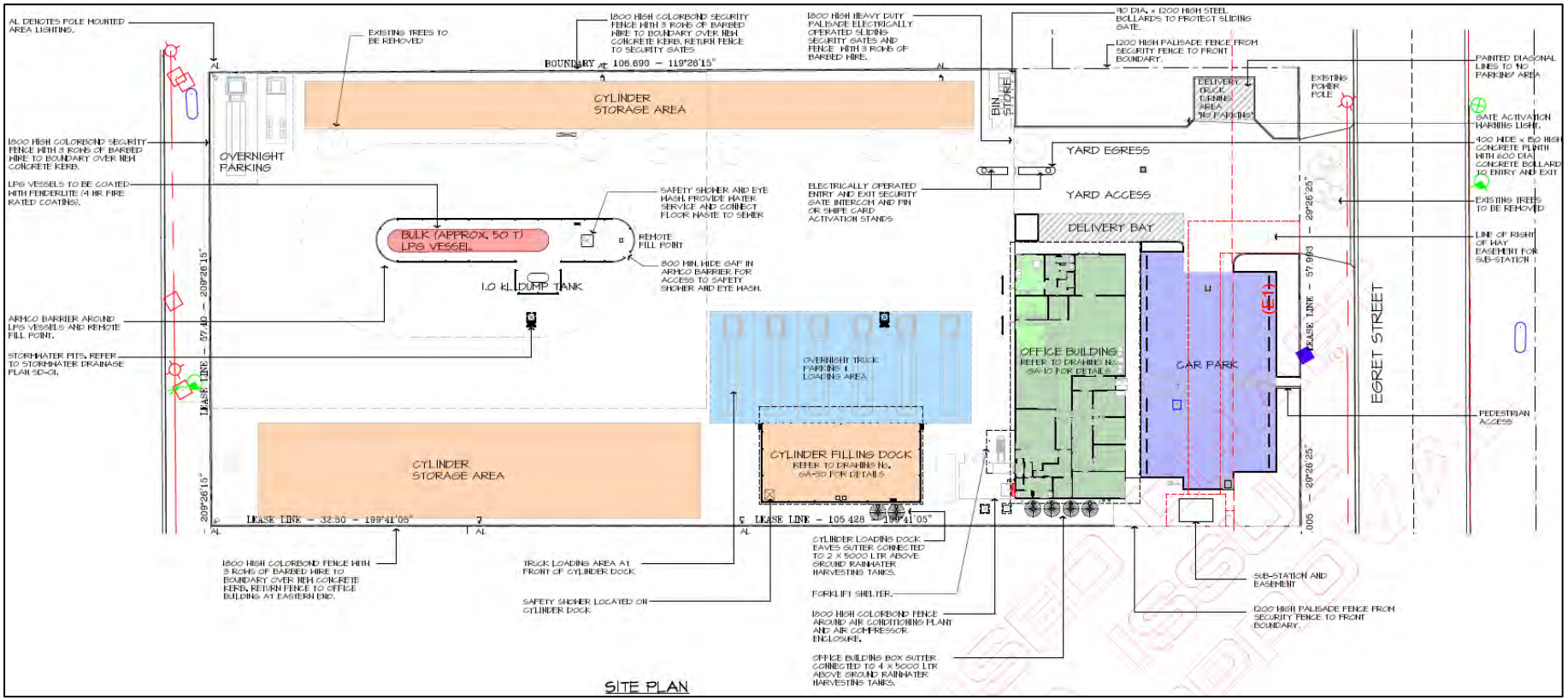


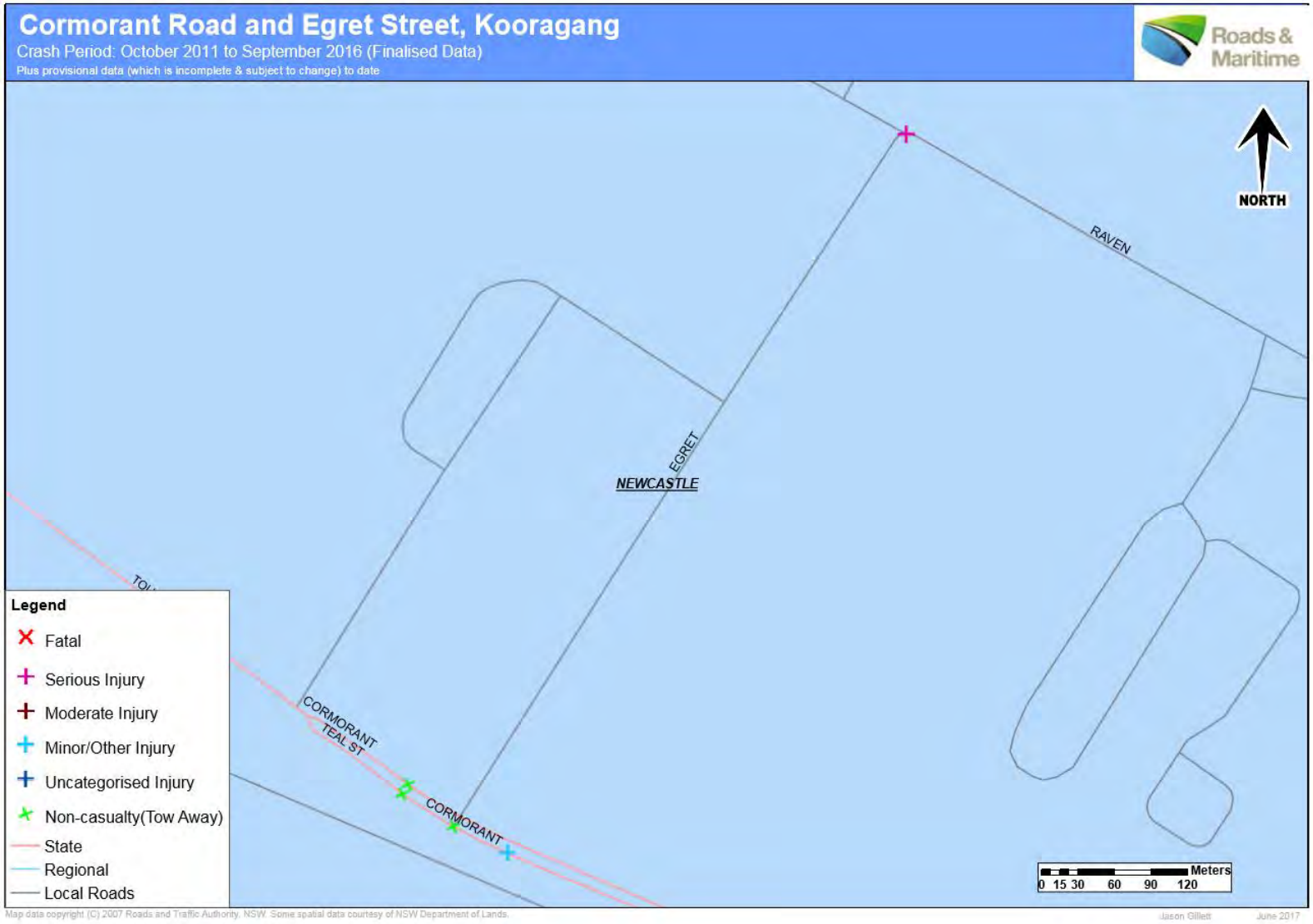
Photo 6 – Sight lines out of proposed site access looking south towards Cormorant Road

SECAsolution

Attachment A: Site Plan



Attachment B: Accident Data



SECAsolution

Summary Crash Report

Transport for NSW

# Crash Type		
Car Crash	4	80.0%
Light Truck Crash	1	20.0%
Rigid Truck Crash	1	20.0%
Articulated Truck Crash	0	0.0%
'Heavy Truck Crash	*(1)*	*(20.0%)*
Bus Crash	0	0.0%
"Heavy Vehicle Crash	*(1)*	*(20.0%)*
Emergency Vehicle Crash	0	0.0%
Motorcycle Crash	1	20.0%
Pedal Cycle Crash	0	0.0%
Pedestrian Crash	0	0.0%

' Rigid or Artic. Truck " Heavy Truck or Heavy Bus
These categories are NOT mutually exclusive

Location Type		
*Intersection	1	20.0%
Non intersection	4	80.0%

* Up to 10 metres from an intersection

Collision Type		
Single Vehicle	1	20.0%
Multi Vehicle	4	80.0%

Road Classification		
Freeway/Motorway	0	0.0%
State Highway	0	0.0%
Other Classified Road	4	80.0%
Unclassified Road	1	20.0%

Contributing Factors		
Speeding	1	20.0%
Fatigue	0	0.0%

Weather		
Fine	2	40.0%
Rain	3	60.0%
Overcast	0	0.0%
Fog or mist	0	0.0%
Other	0	0.0%

Road Surface Condition		
Wet	3	60.0%
Dry	2	40.0%
Snow or ice	0	0.0%

Natural Lighting		
Dawn	2	40.0%
Daylight	3	60.0%
Dusk	0	0.0%
Darkness	0	0.0%

Crash Movement		
Intersection, adjacent approaches	0	0.0%
Head-on (not overtaking)	0	0.0%
Opposing vehicles; turning	1	20.0%
U-turn	0	0.0%
Rear-end	2	40.0%
Lane change	1	20.0%
Parallel lanes; turning	0	0.0%
Vehicle leaving driveway	0	0.0%
Overtaking; same direction	0	0.0%
Hit parked vehicle	0	0.0%
Hit railway train	0	0.0%
Hit pedestrian	0	0.0%
Permanent obstruction on road	0	0.0%
Hit animal	0	0.0%
Off road, on straight	0	0.0%
Off road on straight, hit object	0	0.0%
Out of control on straight	1	20.0%
Off road, on curve	0	0.0%
Off road on curve, hit object	0	0.0%
Out of control on curve	0	0.0%
Other crash type	0	0.0%

Speed Limit					
40 km/h or less	1	20.0%	80 km/h zone	3	60.0%
50 km/h zone	0	0.0%	90 km/h zone	0	0.0%
60 km/h zone	1	20.0%	100 km/h zone	0	0.0%
70 km/h zone	0	0.0%	110 km/h zone	0	0.0%

~ 07:30-09:30 or 14:30-17:00 on school days	~ 40km/h or less		~ School Travel Time Involvement		
	0	0.0%		0	0.0%

Day of the Week								
Monday	1	20.0%	Wednesday	1	20.0%	Friday	0	0.0%
Tuesday	2	40.0%	Thursday	0	0.0%	Saturday	1	20.0%
Sunday	0	0.0%	WEEKEND	1	20.0%			
			WEEKDAY	4	80.0%			

CRASHES	5	
Fatal	0	0.0%
Serious inj.	1	20.0%
Moderate inj.	0	0.0%
Minor/Other inj.	1	20.0%
Uncategorised inj.	0	0.0%
Non-casualty	3	60.0%

Self Reported Crash	1	20%

Time Group		% of Day	
00:01 - 02:59	0	0.0%	12.5%
03:00 - 04:59	0	0.0%	8.3%
05:00 - 05:59	1	20.0%	4.2%
06:00 - 06:59	1	20.0%	4.2%
07:00 - 07:59	1	20.0%	4.2%
08:00 - 08:59	1	20.0%	4.2%
09:00 - 09:59	0	0.0%	4.2%
10:00 - 10:59	0	0.0%	4.2%
11:00 - 11:59	0	0.0%	4.2%
12:00 - 12:59	0	0.0%	4.2%
13:00 - 13:59	0	0.0%	4.2%
14:00 - 14:59	0	0.0%	4.2%
15:00 - 15:59	1	20.0%	4.2%
16:00 - 16:59	0	0.0%	4.2%
17:00 - 17:59	0	0.0%	4.2%
18:00 - 18:59	0	0.0%	4.2%
19:00 - 19:59	0	0.0%	4.2%
20:00 - 21:59	0	0.0%	8.3%
22:00 - 24:00	0	0.0%	8.3%

Street Lighting Off/Nil		% of Dark
0	of 0	in Dark 0.0%

CASUALTIES	2	
Killed	0	0.0%
Seriously inj.	1	50.0%
Moderately inj.	0	0.0%
Minor/Other inj.	1	50.0%
Uncategorised inj.	0	0.0%
^ Unrestrained	0	0.0%

^ Belt fitted but not worn, No restraint fitted to position OR No helmet worn

Crashes		Casualties
1	2016	0
1	2015	1
1	2014	0
2	2012	1

McLean Periods		% Week	
A	3	60.0%	17.9%
B	1	20.0%	7.1%
C	0	0.0%	17.9%
D	0	0.0%	3.5%
E	0	0.0%	3.6%
F	1	20.0%	10.7%
G	0	0.0%	7.1%
H	0	0.0%	7.1%
I	0	0.0%	12.5%
J	0	0.0%	10.7%

#Holiday Periods												
New Year	0	0.0%	Easter	0	0.0%	Queen's BD	0	0.0%	Christmas	0	0.0%	Easter SH	1	20.0%	Sept./Oct. SH	0	0.0%
Aust. Day	0	0.0%	Anzac Day	0	0.0%	Labour Day	0	0.0%	January SH	1	20.0%	June/July SH	0	0.0%	December SH	0	0.0%

Crashid dataset Cormorant Road and Egret Street, Kooragang - October 2011 to 2017*

Note: *Data for the 9 month period prior to the generated date of this report are incomplete and are subject to change.*
Crash self reporting, including self reported injuries began Oct 2014. Trends from 2014 are expected to vary from previous yrs. More unknowns are expected in self reported data.
Reporting yrs 1996-2004 and 2017 onwards contain uncategorised inj crashes.
Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.

Detailed Crash Report - sorted

Transport for NSW

Crash No.	Data Source	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Natural Lighting																					S F
Hunter Region			**Newcastle LGA**					**Kooragang Isla**							**Cormorant Rd**						
782219	P	23/01/2012	Mon	07:50	50 m W	EGRET ST	DIV	STR	Raining	Wet	60	3	CAR	M63	W in CORMORANT RD	60 Merging		N	0	0	
E47199229						Daylight	RUM	34	Lane change right				CAR	M59	W in CORMORANT RD	60 Proceeding in lane					
													CAR	F66	W in CORMORANT RD	Unk Proceeding in lane					
Hunter Region			**Newcastle LGA**					**Kooragang**							**Cormorant Rd**						
790310	P	10/04/2012	Tue	15:40	50 m E	EGRET ST	DIV	STR	Raining	Wet	60	3	WAG	F48	W in CORMORANT RD	60 Proceeding in lane		I	0	1	
E47169137						Daylight	RUM	30	Rear end				TRK	M19	W in CORMORANT RD	0 Stationary					
													CAR	M20	W in CORMORANT RD	0 Stationary					
Hunter Region			**Newcastle LGA**					**Kooragang**							**Cormorant Rd**						
1015117	P	19/03/2014	Wed	05:30	at	EGRET ST	TJN	STR	Fine	Dry	60	2	LOR	M62	E in CORMORANT RD	60 Turning right		N	0	0	S
E55083908						Dawn	RUM	21	Right through				CAR	M21	W in CORMORANT RD	80 Proceeding in lane					
Hunter Region			**Newcastle LGA**					**Kooragang**							**Egret St**						
1069024	P	16/05/2015	Sat	08:19	at	RAVEN ST	LJN	STR	Raining	Wet	40	1	M/C	M39	N in EGRET ST	40 Proceeding in lane		I	0	1	
E58456043						Daylight	RUM	74	On road-out of cont.												
Hunter Region			**Newcastle LGA**					**Kooragang**							**Cormorant Rd**						
1113146	S	06/09/2016	Tue	06:50	50 m W	EGRET ST	DIV	STR	Fine	Dry	60	2	CAR	M19	E in CORMORANT RD	Unk Proceeding in lane		N	0	0	
E62001336						Dawn	RUM	30	Rear end				CAR	M43	E in CORMORANT RD	Unk Proceeding in lane					

Report Totals: Total Crashes: 5 Fatal Crashes: 0 Injury Crashes: 2 Killed: 0 Injured: 2

Crashid dataset Cormorant Road and Egret Street, Kooragang - October 2011 to 2017*

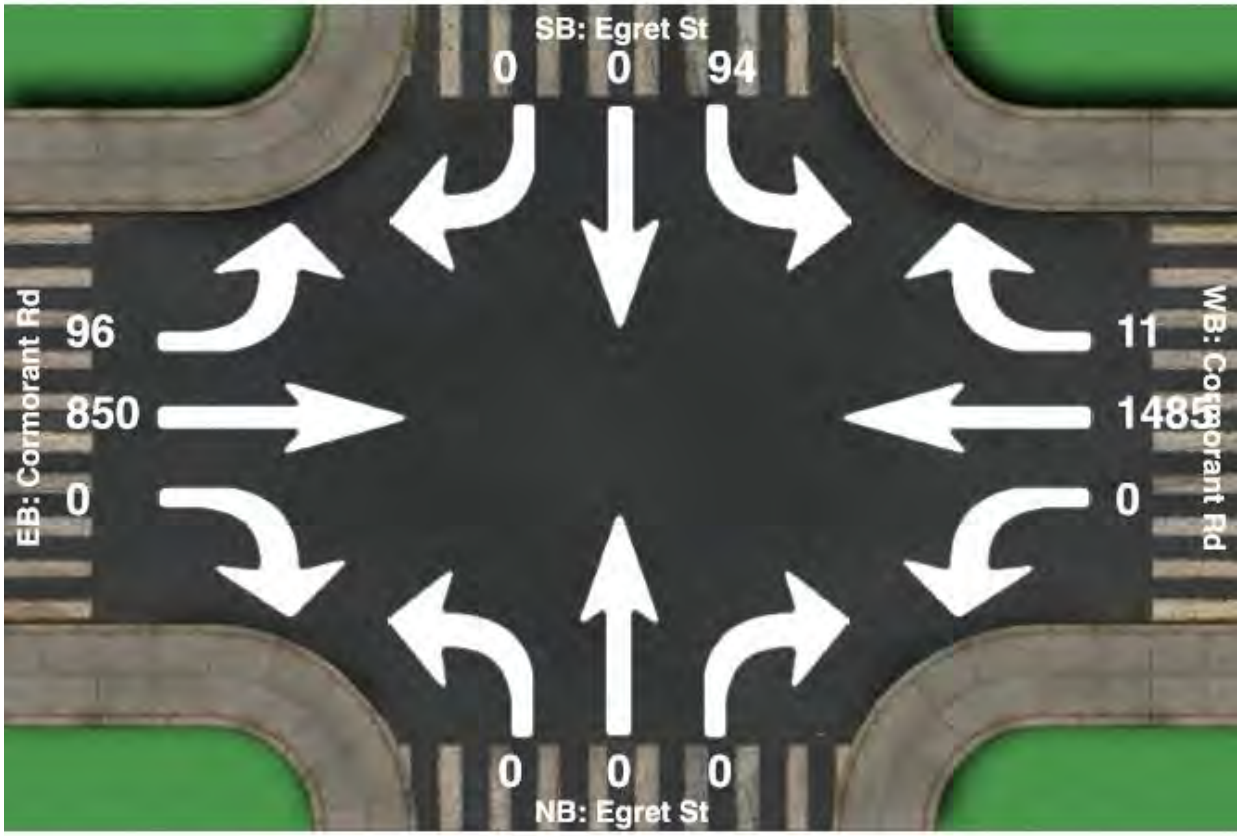
Note: *Ordered by: Crash Date. Data for the 9 month period prior to the generated date of this report are incomplete and are subject to change.*

Crash self reporting, including self reported injuries began in Oct 2014. Trends from 2014 are expected to vary from previous years. More unknowns are expected in self reported data. For further information refer to Data Manual or report provider.

Attachment C: Traffic Data

Intersection Peak Hour

Location: Egret St at Cormorant Rd, Newcastle
GPS Coordinates: Lat=-32.957915, Lon=151.657840
Date: 2017-06-21
Day of week: Wednesday
Weather: Clear
Analyst: TN



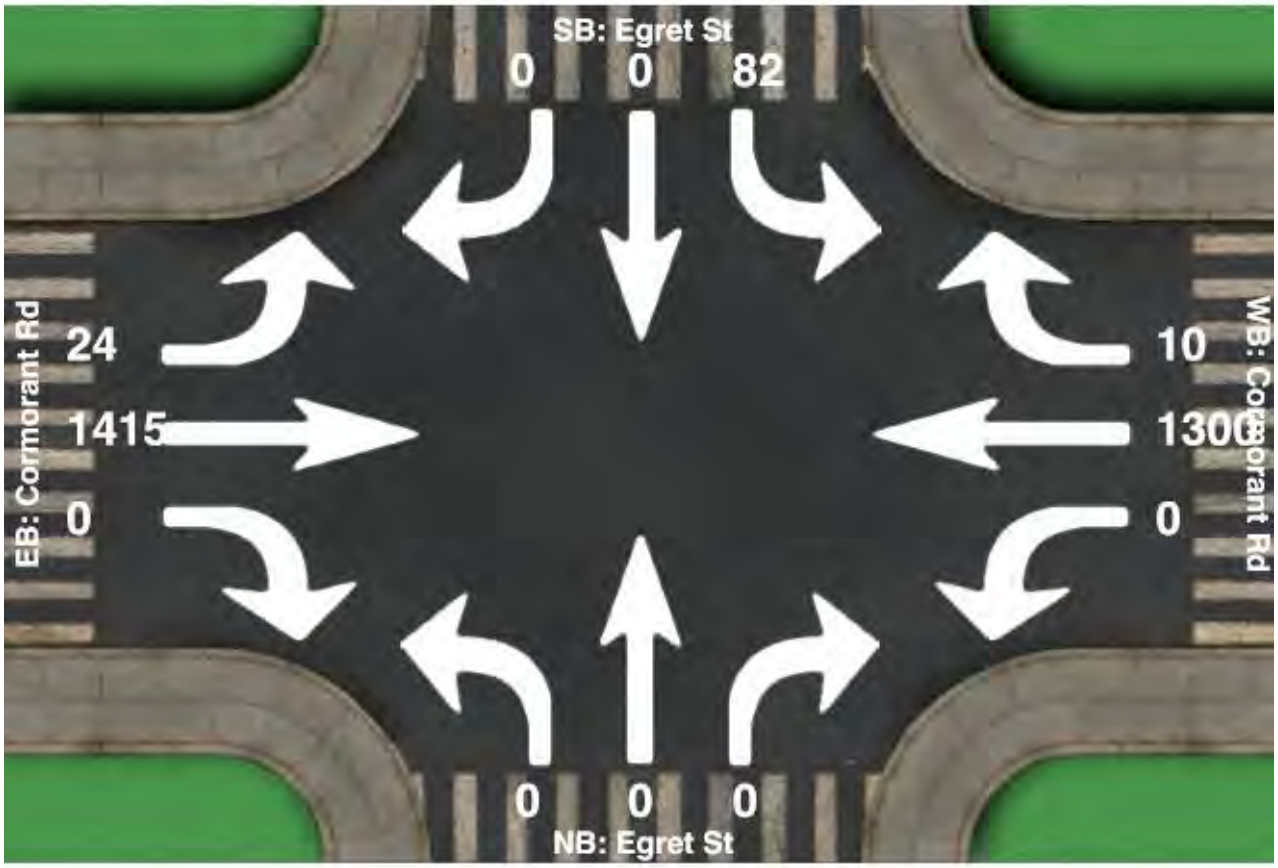
Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	94	0	0	0	1485	11	0	0	0	96	850	0	2536
Factor	0.73	0.00	0.00	0.00	0.96	0.46	0.00	0.00	0.00	0.71	0.87	0.00	0.96
Approach Factor	0.73			0.96			0.00			0.85			

Intersection Peak Hour

Location: Egret St at Cormorant Rd, Newcastle
GPS Coordinates: Lat=-32.884078, Lon=151.762225
Date: 2017-06-21
Day of week: Wednesday
Weather: Clear
Analyst: TN



Intersection Peak Hour

16:15 - 17:15

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	82	0	0	0	1300	10	0	0	0	24	1415	0	2831
Factor	0.68	0.00	0.00	0.00	0.98	0.62	0.00	0.00	0.00	0.86	0.98	0.00	0.99
Approach Factor	0.68			0.97			0.00			0.99			

Attachment D: Sidra Results

Criteria for interpreting Sidra results:

1-Level of Service (LoS)

LoS	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Good	Good
B	Good, with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but requires accident study
D	Operating near capacity	Near capacity and requires accident study
E	At capacity, excessive delay: roundabout requires other control method	At capacity, requires other control mode
F	Unsatisfactory, requires other control mode or additional capacity	Unsatisfactory, requires other control mode

2-Average Vehicle Delay (AVD)

The AVD is a measure of operational performance of an intersection relating to its LoS. The average delay should be taken as a guide only for an average intersection. Longer delays may be tolerated at some intersections where delays are expected by motorists (e.g. those in inner city areas or major arterial roads).

LoS	Average Delay / Vehicle (secs)	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Less than 15	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28 to 42	Satisfactory	Satisfactory but accident study required
D	42 to 56	Operating near capacity	Near capacity, accident study required
E	56 to 70	At capacity, excessive delays: roundabout requires other control mode	At capacity; requires other control mode
F	Exceeding 70	Unsatisfactory, requires additional capacity	Unsatisfactory, requires other control mode

3-Degree of Saturation (D/S)

The D/S of an intersection is usually taken as the highest ratio of traffic volumes on an approach to an intersection compared with the theoretical capacity, and is a measure of the utilisation of available green time. For intersections controlled by traffic signals, both queues and delays increase rapidly as DS approaches 1.0. An intersection operates satisfactorily when its D/S is kept below 0.75. When D/S exceeds 0.9, queues are expected.

INTERSECTION SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - Existing Situation (AM)]

Intersection of Cormorant Road / Egret Street
Existing Situation 2017 (AM)
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	**Vehicles**	**Persons**
Travel Speed (Average)	77.2 km/h	77.2 km/h
Travel Distance (Total)	2658.2 veh-km/h	3189.9 pers-km/h
Travel Time (Total)	34.5 veh-h/h	41.3 pers-h/h
Demand Flows (Total)	2669 veh/h	3203 pers/h
Percent Heavy Vehicles (Demand)	8.0 %	
Degree of Saturation	0.414	
Practical Spare Capacity	136.8 %	
Effective Intersection Capacity	6450 veh/h	
Control Delay (Total)	0.55 veh-h/h	0.66 pers-h/h
Control Delay (Average)	0.7 sec	0.7 sec
Control Delay (Worst Lane)	18.9 sec	
Control Delay (Worst Movement)	18.9 sec	18.9 sec
Geometric Delay (Average)	0.5 sec	
Stop-Line Delay (Average)	0.2 sec	
Idling Time (Average)	0.1 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.5 veh	
95% Back of Queue - Distance (Worst Lane)	4.8 m	
Queue Storage Ratio (Worst Lane)	0.01	
Total Effective Stops	149 veh/h	179 pers/h
Effective Stop Rate	0.06 per veh	0.06 per pers
Proportion Queued	0.02	0.02
Performance Index	35.4	35.4
Cost (Total)	873.78 $/h	873.78 $/h
Fuel Consumption (Total)	228.6 L/h	
Carbon Dioxide (Total)	549.4 kg/h	
Hydrocarbons (Total)	0.051 kg/h	
Carbon Monoxide (Total)	1.005 kg/h	
NOx (Total)	1.375 kg/h	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - Existing Situation (AM)]

Intersection of Cormorant Road / Egret Street
Existing Situation 2017 (AM)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Cormorant Road											
5	T1	1563	6.7	0.414	0.1	LOS A	0.0	0.0	0.00	0.00	79.8
6	R2	12	0.0	0.046	18.9	LOS B	0.1	1.0	0.76	0.91	47.4
Approach		1575	6.6	0.414	0.2	NA	0.1	1.0	0.01	0.01	79.5
North: Egret Street											
7	L2	99	29.8	0.150	9.3	LOS A	0.5	4.8	0.51	0.76	47.0
Approach		99	29.8	0.150	9.3	LOS A	0.5	4.8	0.51	0.76	47.0
West: Cormorant Road											
10	L2	101	16.7	0.061	7.3	LOS A	0.0	0.0	0.00	0.63	58.9
11	T1	895	7.1	0.236	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		996	8.0	0.236	0.8	NA	0.0	0.0	0.00	0.06	77.6
All Vehicles		2669	8.0	0.414	0.7	NA	0.5	4.8	0.02	0.06	77.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INTERSECTION SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - Existing Situation (PM)]

Intersection of Cormorant Road / Egret Street
Existing Situation 2017 (PM)
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	**Vehicles**	**Persons**
Travel Speed (Average)	78.1 km/h	78.1 km/h
Travel Distance (Total)	2989.8 veh-km/h	3587.7 pers-km/h
Travel Time (Total)	38.3 veh-h/h	45.9 pers-h/h
Demand Flows (Total)	2980 veh/h	3576 pers/h
Percent Heavy Vehicles (Demand)	3.6 %	
Degree of Saturation	0.383	
Practical Spare Capacity	156.0 %	
Effective Intersection Capacity	7785 veh/h	
Control Delay (Total)	0.55 veh-h/h	0.65 pers-h/h
Control Delay (Average)	0.7 sec	0.7 sec
Control Delay (Worst Lane)	62.8 sec	
Control Delay (Worst Movement)	62.8 sec	62.8 sec
Geometric Delay (Average)	0.3 sec	
Stop-Line Delay (Average)	0.4 sec	
Idling Time (Average)	0.3 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.6 veh	
95% Back of Queue - Distance (Worst Lane)	4.2 m	
Queue Storage Ratio (Worst Lane)	0.01	
Total Effective Stops	100 veh/h	120 pers/h
Effective Stop Rate	0.03 per veh	0.03 per pers
Proportion Queued	0.02	0.02
Performance Index	39.6	39.6
Cost (Total)	899.69 $/h	899.69 $/h
Fuel Consumption (Total)	214.6 L/h	
Carbon Dioxide (Total)	510.1 kg/h	
Hydrocarbons (Total)	0.053 kg/h	
Carbon Monoxide (Total)	1.111 kg/h	
NOx (Total)	0.706 kg/h	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - Existing Situation (PM)]

Intersection of Cormorant Road / Egret Street
Existing Situation 2017 (PM)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Cormorant Road											
5	T1	1368	3.8	0.356	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
6	R2	11	20.0	0.170	62.8	LOS E	0.5	3.8	0.94	0.98	27.5
Approach		1379	4.0	0.356	0.5	NA	0.5	3.8	0.01	0.01	78.9
North: Egret Street											

7	L2	86	3.7	0.168	11.2	LOS A	0.6	4.2	0.65	0.85	51.5
Approach		86	3.7	0.168	11.2	LOS A	0.6	4.2	0.65	0.85	51.5
West: Cormorant Road											
10	L2	25	37.5	0.017	7.6	LOS A	0.0	0.0	0.00	0.63	54.8
11	T1	1489	2.8	0.383	0.1	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		1515	3.3	0.383	0.2	NA	0.0	0.0	0.00	0.01	79.3
All Vehicles		2980	3.6	0.383	0.7	NA	0.6	4.2	0.02	0.03	78.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INTERSECTION SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - With Development (AM)]

Intersection of Cormorant Road / Egret Street
2017 Flows (AM) with Development.
Staff inbound, delivery trucks outbound.
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	**Vehicles**	**Persons**
Travel Speed (Average)	76.8 km/h	76.8 km/h
Travel Distance (Total)	2696.3 veh-km/h	3235.6 pers-km/h
Travel Time (Total)	35.1 veh-h/h	42.1 pers-h/h
Demand Flows (Total)	2713 veh/h	3255 pers/h
Percent Heavy Vehicles (Demand)	8.3 %	
Degree of Saturation	0.418	
Practical Spare Capacity	134.3 %	
Effective Intersection Capacity	6485 veh/h	
Control Delay (Total)	0.64 veh-h/h	0.77 pers-h/h
Control Delay (Average)	0.8 sec	0.8 sec
Control Delay (Worst Lane)	19.4 sec	
Control Delay (Worst Movement)	19.4 sec	19.4 sec
Geometric Delay (Average)	0.6 sec	
Stop-Line Delay (Average)	0.3 sec	
Idling Time (Average)	0.1 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.6 veh	
95% Back of Queue - Distance (Worst Lane)	5.7 m	
Queue Storage Ratio (Worst Lane)	0.01	
Total Effective Stops	171 veh/h	205 pers/h
Effective Stop Rate	0.06 per veh	0.06 per pers
Proportion Queued	0.03	0.03
Performance Index	36.2	36.2
Cost (Total)	901.71 $/h	901.71 $/h
Fuel Consumption (Total)	236.9 L/h	
Carbon Dioxide (Total)	570.0 kg/h	
Hydrocarbons (Total)	0.053 kg/h	
Carbon Monoxide (Total)	1.025 kg/h	
NOx (Total)	1.489 kg/h	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - With Development (AM)]

Intersection of Cormorant Road / Egret Street
2017 Flows (AM) with Development.
Staff inbound, delivery trucks outbound.
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Cormorant Road											
5	T1	1578	6.9	0.418	0.1	LOS A	0.0	0.0	0.00	0.00	79.8
6	R2	16	0.0	0.064	19.4	LOS B	0.2	1.4	0.77	0.92	47.0
Approach		1594	6.8	0.418	0.3	NA	0.2	1.4	0.01	0.01	79.3
North: Egret Street											
7	L2	107	35.3	0.169	9.6	LOS A	0.6	5.7	0.53	0.77	45.7
Approach		107	35.3	0.169	9.6	LOS A	0.6	5.7	0.53	0.77	45.7
West: Cormorant Road											
10	L2	117	14.4	0.069	7.2	LOS A	0.0	0.0	0.00	0.63	59.3
11	T1	895	7.1	0.236	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		1012	7.9	0.236	0.9	NA	0.0	0.0	0.00	0.07	77.4
All Vehicles		2713	8.3	0.418	0.8	NA	0.6	5.7	0.03	0.06	76.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INTERSECTION SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - With Development (PM)]

Intersection of Cormorant Road / Egret Street
2017 Flows (PM) with Development.
Staff outbound only
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values		
Performance Measure	**Vehicles**	**Persons**
Travel Speed (Average)	77.9 km/h	77.9 km/h
Travel Distance (Total)	3022.1 veh-km/h	3626.5 pers-km/h
Travel Time (Total)	38.8 veh-h/h	46.5 pers-h/h
Demand Flows (Total)	3016 veh/h	3619 pers/h
Percent Heavy Vehicles (Demand)	3.6 %	
Degree of Saturation	0.383	
Practical Spare Capacity	156.0 %	
Effective Intersection Capacity	7879 veh/h	
Control Delay (Total)	0.61 veh-h/h	0.74 pers-h/h
Control Delay (Average)	0.7 sec	0.7 sec
Control Delay (Worst Lane)	62.8 sec	
Control Delay (Worst Movement)	62.8 sec	62.8 sec
Geometric Delay (Average)	0.3 sec	
Stop-Line Delay (Average)	0.4 sec	
Idling Time (Average)	0.3 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.7 veh	
95% Back of Queue - Distance (Worst Lane)	5.2 m	
Queue Storage Ratio (Worst Lane)	0.01	
Total Effective Stops	118 veh/h	141 pers/h
Effective Stop Rate	0.04 per veh	0.04 per pers
Proportion Queued	0.03	0.03
Performance Index	40.4	40.4
Cost (Total)	914.47 $/h	914.47 $/h
Fuel Consumption (Total)	217.5 L/h	
Carbon Dioxide (Total)	516.9 kg/h	
Hydrocarbons (Total)	0.054 kg/h	
Carbon Monoxide (Total)	1.125 kg/h	
NOx (Total)	0.709 kg/h	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - With Development (PM)]

Intersection of Cormorant Road / Egret Street
2017 Flows (PM) with Development.
Staff outbound only
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Cormorant Road											
5	T1	1384	3.8	0.360	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
6	R2	11	20.0	0.170	62.8	LOS E	0.5	3.8	0.94	0.98	27.5
Approach		1395	3.9	0.360	0.5	NA	0.5	3.8	0.01	0.01	78.9
North: Egret Street											
7	L2	106	3.0	0.206	11.4	LOS A	0.7	5.2	0.66	0.86	51.6
Approach		106	3.0	0.206	11.4	LOS A	0.7	5.2	0.66	0.86	51.6
West: Cormorant Road											
10	L2	25	37.5	0.017	7.6	LOS A	0.0	0.0	0.00	0.63	54.8
11	T1	1489	2.8	0.383	0.1	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		1515	3.3	0.383	0.2	NA	0.0	0.0	0.00	0.01	79.3
All Vehicles		3016	3.6	0.383	0.7	NA	0.7	5.2	0.03	0.04	77.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INTERSECTION SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - 2027 Design Year (AM)]

Intersection of Cormorant Road / Egret Street
2027 Flows (AM) with 12% Growth on All Legs.

Giveway / Yield (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Intersection Performance - Hourly Values		
Performance Measure	**Vehicles**	**Persons**
Travel Speed (Average)	76.7 km/h	76.7 km/h
Travel Distance (Total)	3019.9 veh-km/h	3623.9 pers-km/h
Travel Time (Total)	39.4 veh-h/h	47.3 pers-h/h
Demand Flows (Total)	3038 veh/h	3646 pers/h
Percent Heavy Vehicles (Demand)	8.3 %	
Degree of Saturation	0.469	
Practical Spare Capacity	109.2 %	
Effective Intersection Capacity	6485 veh/h	
Control Delay (Total)	0.77 veh-h/h	0.92 pers-h/h
Control Delay (Average)	0.9 sec	0.9 sec
Control Delay (Worst Lane)	23.2 sec	
Control Delay (Worst Movement)	23.2 sec	23.2 sec
Geometric Delay (Average)	0.6 sec	
Stop-Line Delay (Average)	0.3 sec	
Idling Time (Average)	0.2 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	0.8 veh	
95% Back of Queue - Distance (Worst Lane)	7.0 m	
Queue Storage Ratio (Worst Lane)	0.01	
Total Effective Stops	197 veh/h	236 pers/h
Effective Stop Rate	0.06 per veh	0.06 per pers
Proportion Queued	0.03	0.03
Performance Index	40.7	40.7
Cost (Total)	1011.75 $/h	1011.75 $/h
Fuel Consumption (Total)	265.4 L/h	
Carbon Dioxide (Total)	638.6 kg/h	
Hydrocarbons (Total)	0.059 kg/h	
Carbon Monoxide (Total)	1.147 kg/h	
NOx (Total)	1.668 kg/h	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - 2027 Design Year (AM)]

Intersection of Cormorant Road / Egret Street
2027 Flows (AM) with 12% Growth on All Legs.

Giveway / Yield (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Cormorant Road											
5	T1	1767	6.9	0.469	0.1	LOS A	0.0	0.0	0.00	0.00	79.7
6	R2	18	0.0	0.089	23.2	LOS B	0.3	1.9	0.82	0.93	44.3
Approach		1785	6.8	0.469	0.3	NA	0.3	1.9	0.01	0.01	79.2
North: Egret Street											
7	L2	120	35.3	0.207	10.4	LOS A	0.8	7.0	0.56	0.81	45.1
Approach		120	35.3	0.207	10.4	LOS A	0.8	7.0	0.56	0.81	45.1
West: Cormorant Road											
10	L2	131	14.4	0.077	7.2	LOS A	0.0	0.0	0.00	0.63	59.3
11	T1	1002	7.1	0.265	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		1133	7.9	0.265	0.9	NA	0.0	0.0	0.00	0.07	77.3
All Vehicles		3038	8.3	0.469	0.9	NA	0.8	7.0	0.03	0.06	76.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

INTERSECTION SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - 2027 Design Year (PM)]

Intersection of Cormorant Road / Egret Street
2027 Flows (AM) with 12% Growth on All Legs.
Giveway / Yield (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Intersection Performance - Hourly Values		
Performance Measure	**Vehicles**	**Persons**
Travel Speed (Average)	77.5 km/h	77.5 km/h
Travel Distance (Total)	3384.7 veh-km/h	4061.7 pers-km/h
Travel Time (Total)	43.7 veh-h/h	52.4 pers-h/h
Demand Flows (Total)	3378 veh/h	4053 pers/h
Percent Heavy Vehicles (Demand)	3.6 %	
Degree of Saturation	0.429	
Practical Spare Capacity	128.6 %	
Effective Intersection Capacity	7879 veh/h	
Control Delay (Total)	0.92 veh-h/h	1.11 pers-h/h
Control Delay (Average)	1.0 sec	1.0 sec
Control Delay (Worst Lane)	110.8 sec	
Control Delay (Worst Movement)	110.8 sec	110.8 sec
Geometric Delay (Average)	0.3 sec	
Stop-Line Delay (Average)	0.7 sec	
Idling Time (Average)	0.5 sec	
Intersection Level of Service (LOS)	NA	
95% Back of Queue - Vehicles (Worst Lane)	1.0 veh	
95% Back of Queue - Distance (Worst Lane)	7.3 m	
Queue Storage Ratio (Worst Lane)	0.01	
Total Effective Stops	139 veh/h	167 pers/h
Effective Stop Rate	0.04 per veh	0.04 per pers
Proportion Queued	0.03	0.03
Performance Index	45.9	45.9
Cost (Total)	1032.19 $/h	1032.19 $/h
Fuel Consumption (Total)	243.9 L/h	
Carbon Dioxide (Total)	579.7 kg/h	
Hydrocarbons (Total)	0.060 kg/h	
Carbon Monoxide (Total)	1.260 kg/h	
NOx (Total)	0.796 kg/h	

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

NA: Intersection LOS for Vehicles is Not Applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

MOVEMENT SUMMARY

Site: 101 [Int. Cormorant Rd / Egret St - 2027 Design Year (PM)]

Intersection of Cormorant Road / Egret Street
2027 Flows (AM) with 12% Growth on All Legs.
Giveway / Yield (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Cormorant Road											
5	T1	1550	3.8	0.403	0.1	LOS A	0.0	0.0	0.00	0.00	79.8
6	R2	12	20.0	0.312	110.8	LOS F 11	0.8	6.8	0.97	1.00	19.0
Approach		1562	3.9	0.403	0.9	NA	0.8	6.8	0.01	0.01	78.3
North: Egret Street											
7	L2	119	3.0	0.271	13.5	LOS A	1.0	7.3	0.73	0.92	49.7
Approach		119	3.0	0.271	13.5	LOS A	1.0	7.3	0.73	0.92	49.7
West: Cormorant Road											
10	L2	28	37.5	0.019	7.6	LOS A	0.0	0.0	0.00	0.63	54.8
11	T1	1668	2.8	0.429	0.1	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		1697	3.3	0.429	0.2	NA	0.0	0.0	0.00	0.01	79.3
All Vehicles		3378	3.6	0.429	1.0	NA	1.0	7.3	0.03	0.04	77.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.