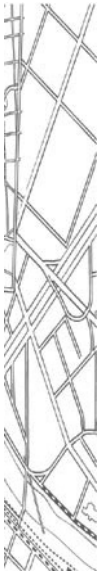
ROAD TRANSPORT ASSESSMENT

APPENDIX C

NEWCASTLE COAL INFRASTRUCTURE GROUP COAL EXPORT TERMINAL



Road Transport Assessment

Newcastle Coal Export Terminal

May 2006

Prepared for

Newcastle Coal Infrastructure Group

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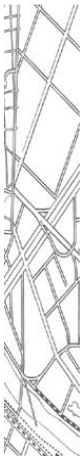

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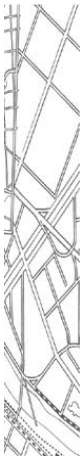

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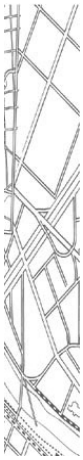

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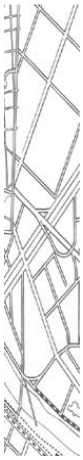


1. Introduction

Masson Wilson Twiney were appointed by Newcastle Coal Infrastructure Group (NCIG) to determine the road transport implications of the construction and operation of a 66 million tonnes per annum (Mtpa) coal export terminal (CET) on Kooragang Island in Newcastle, New South Wales.

It is intended to develop the terminal in two phases. The first phase would provide a CET with a 33 Mtpa capacity. When market demand is sufficient, capacity would then be progressively increased up to 66 Mtpa.

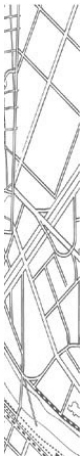
This report has been prepared in accordance with the Roads and Traffic Authority of New South Wales (RTA) *Guide to Traffic Generating Developments, 2002* to examine the road transport impacts of the proposal during both construction and operational phases. Traffic impacts are assessed for the construction of the initial 33 Mtpa capacity and also for the future operation of the full 66 Mtpa capacity CET. Construction phase vehicle access and the on-going operation phase vehicular access are described.

In accordance with the Project Environmental Assessment Requirements issued by the Department of Planning, an Environmental Risk Analysis (ERA) was undertaken to identify the key environmental risk groups for the construction and operation of the Project (Safe Production Solutions, 2006). Specifically, the ERA concluded that the potential transport impacts of the construction and operation of the Project should be assessed and mitigation measures developed. This assessment addresses this requirement where relevant.

The remainder of the report is structured as follows:

- Chapter 2 – describes the existing situation in terms of the site use and the adjoining road network;
- Chapter 3 – discusses the development proposal, the forecast traffic generation for both construction and operation and the proposed traffic access arrangements;

- Chapter 4 – examines the potential traffic impact that the construction and operation would have on the surrounding road network; and
- Chapter 5 – provides a summary and conclusions.



2. Existing Situation

2.1 Site Location

The development site is located on Kooragang Island in Newcastle, New South Wales. The site location is shown on Figure 1.

Kooragang Island is an industrial area which was developed by the placement of dredged sand fill and other fill materials on several low level islands between the north and south arms of the Hunter River.

The Port of Newcastle, via the Hunter River, provides an excellent water based transportation route for the import of raw materials and products and the export of finished products and materials to the benefit of the industrial development in Newcastle.

Kooragang Island has existing railway facilities and deep water wharves associated with the existing Port Waratah Coal Services (PWCS) Kooragang Island Terminal and other bulk material loaders, unloaders and storage yards.

2.2 Surrounding Land Uses

The largest development on Kooragang Island is the PWCS Kooragang Island Terminal. The Terminal includes coal stacking/blending areas and coal loaders which provide a current export capacity of about 64 Mtpa. PWCS has Development Consent to expand the terminal to approximately 77 Mtpa capacity on Kooragang Island.

Other major industries which the island supports include fertiliser import, manufacture and distribution complexes, oilseed facilities and cement grinding/manufacture.

2.3 Surrounding Road Network

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

- Arterial Road - typically a main road carrying over 15,000 vehicles per day and fulfilling a role as a major inter-regional link (over 1,500 vehicles per hour).
- Sub-arterial Road - defined as secondary inter-regional links, typically carrying volumes between 5,000 and 20,000 vehicles per day (500 to 2,000 vehicles per hour).
- Collector Road - provides a link between local roads and regional roads, typically carrying between 2,000 and 10,000 vehicles per day (250 to 1,000 vehicles per hour). At volumes greater than 5,000 vehicles per day, residential amenity begins to decline noticeably.
- Local Road - provides access to individual allotments, carrying low volumes, typically less than 2,000 vehicles per day (250 vehicles per hour).

In recent years the RTA has adopted a classification system relating to funding purposes. It defines roads as:

- State Roads – performing an important state function for which the RTA funds one hundred percent of the maintenance cost. State roads are essentially arterial roads.
- Regional Roads – roads performing a significant regional function and for which the RTA and Council contribute fifty percent each towards maintenance. Regional roads are essentially sub-arterial roads.
- Local Roads – roads performing a local or collector function and for which the Council funds one hundred percent of the maintenance cost.

The key roads in the vicinity of the site are described below:

Pacific Highway

The Pacific Highway is a regional arterial road which links New South Wales and Queensland. From the north, connections to Cormorant Road (Kooragang Island) can be made via the Pacific Highway/Industrial Drive Intersection (a distance of approximately 3 kilometres [km]). From the south, connections to Cormorant Road (Kooragang Island) can be made via the Pacific Highway/Hanell Street Intersection and then along Industrial Drive (a distance of approximately 7.5km).

The Newcastle City Centre is located approximately 2.5km to the east of the Pacific Highway.

Cormorant Road

Cormorant Road is part of Main Road (MR) 108 and is a State Road under the jurisdiction of the RTA. It is an arterial road whose primary function is to cater for through traffic movements and heavy industrial access. MR 108 comprises a number of individually named sections (i.e. Tourle St, Cormorant Road, Teal St, Nelson Bay Road). The road connects to Industrial Drive (MR316) and hence to the Pacific Highway at Mayfield in the south, to Williamtown, the Newcastle Airport and Nelsons Bay in the north. It provides the main arterial link between Newcastle, the Newcastle Airport and Nelsons Bay. The suburb of Stockton to the south-east of Kooragang Island is accessed via Fullerton St which intersects MR 108 at the eastern side of the Stockton Bridge (Figure 1).

At its southern extent, Cormorant Road connects to Industrial Drive via a traffic signal controlled intersection. To the east of the CET, Cormorant Road connects to Teal Street via a three leg roundabout (Figure 2).

Cormorant Road is formed as a two lane undivided road over the Tourle Street bridge with a 60 kilometres per hour (kph) posted speed limit. North of the bridge the road follows a 90 degree curve and has a speed limit of 80 kph in its central section. Just before its intersection with Egret Street it widens to a four lane undivided carriageway, which continues to the roundabout at the connection with Teal St. To the east and north of the Teal Street roundabout the road continues as a two lane undivided road (no longer part of MR108).

A right turn pocket is provided at the intersection of Cormorant Road with an access road to provide access to the Windmill.

Cormorant Road is under the control of the RTA.

Egret Street

Egret Street is a local road and is within the jurisdiction of the Newcastle City Council (NCC).

Egret Street has a posted speed limit of 60 kph. It connects to Cormorant Road at its southern extent via a priority controlled intersection. A left turn deceleration lane and a right turn pocket are provided to assist with turning movements from Cormorant Road. At it northern extent, Egret Street connects to Raven Street from which connections can be made to Teal Street or using Curlew Street onto Cormorant Road (Figure 2).

Pacific National Access Road

The Pacific National access road connects to Cormorant Road approximately midway between Egret Street and Tourle Street. It is signed as a private road and has a posted 40kph speed limit.

The intersection of the Pacific National access road with Cormorant Road is priority controlled and a left turn deceleration lane and right turn pocket are provided to assist turning movements onto and off Cormorant Road.

Delta Access Road

The Delta access road connects to Cormorant Road to the north of the Tourle Street bridge. A gated entry is provided and a separate exit is provided to the east.

2.4 Existing Traffic Volumes

The RTA publishes traffic data for the NSW region every 3 years. In 2004 the RTA recorded the following levels of Annual Average Daily Traffic (AADT) flows:

- Pacific Highway (West of Maud Street) – 22,902 vehicles
- Industrial Drive (east of Tourle Street) – 30,717 vehicles
- Nelsons Bay Road (Stockton Bridge) – 18,966 vehicles

The RTA also operates a sample traffic count site on Tourle Street to the north of Industrial Drive which provides an estimate of the AADT flows.

The Tourle Street traffic count site recorded the following AADT values over the years 1995-2004:

- 1995 23,393 vehicles
- 1998 24,637 vehicles
- 2001 23,650 vehicles
- 2004 24,052 vehicles

The above data show that there has been negligible traffic growth in the area over the last nine year period with an average of about 0.2% per annum. In fact daily traffic flows in 1998 were higher than those in 2004.

A traffic report produced by traffic consultant Stapes Pty Ltd in September 2005 in support of the application for the extended Cargill Oilseed Processing Plant contained manual classified turning counts undertaken at the Cormorant Road/Egret Street and Cormorant Road/Teal Street intersections during August 2005.

The surveys identified that the AM peak period occurred during 7.15am to 8.15am whilst the PM peak hour occurred during 4.00pm to 5.00pm. The surveys recorded two-way peak hour volumes on Cormorant Road, to the west of Egret Street, of 1,996 and 2,126 vehicles during the AM and PM peak hour periods respectively.

However, peak traffic activity at the proposed CET development is expected to take place between the hours of 7.00am to 6.00pm with staff tending to arrive before 7.00am and depart after 6.00pm (particularly during the construction period, when peak project traffic flows are anticipated). Therefore assessment periods were conservatively selected as 6.30am to 7.30am and 5.00pm to 6.00pm. During these times the recorded volume of traffic on Cormorant Road at a similar location was 1,859 and 1,889 vehicles per hour during the AM and PM peak hour respectively. During operations, depending on the shift roster adopted, workforce movements may occur outside of peak periods altogether. However, the same peak hour periods were conservatively assumed as for construction.

A summary of the flows for assessment time periods are shown on Figure 3.

2.5 Existing Intersection Performance

The performance of the Cormorant Road/Egret Street and Cormorant Road/Teal Street intersections were assessed using the intersection analysis computer program SIDRA (Signalised & unsignalised Intersection Design and Research Aid).

SIDRA determines the average delay that vehicles encounter at an intersection. The results of the assessment can be summarised using the performance criteria set out in Table 2-1.

Table 2-1 – Level of Service Criteria

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

Adapted from RTA Guide to Traffic Generating Developments, 2002.

The results of the analysis of existing operations using the 2005 surveyed traffic flows are presented in Table 2-2. The surveyed flows were converted to passenger car units (PCU) by assuming that one truck movement was the equivalent of two car movements. For the Cormorant Rood through movements which were not classified into light or heavy vehicles a 15% heavy truck composition was estimated.

Table 2-2 – Existing Intersection Operation

Intersection	Control	Movement	Weekday AM Peak Hour		Weekday PM Peak Hour	
			Average Delay (s)	Level of Service	Average Delay (s)	Level of Service
Cormorant Road/ Teal Street	Roundabout	Cormorant Road (east)	11.6	A	11.3	A
Cormorant Road/ Egret Street	Priority	Egret Street Left turn	16.5	B	15.7	B
		Egret Street Right turn	858	F	902	F

Table 2-2 shows that the Cormorant Road/Egret Street intersection suffers peak hour congestion problems for particular turning movements. Vehicles wishing to turn right out of Egret Street suffer large delays as a result of the volume of passing traffic and the lack of suitable gaps for traffic to pull into.

In practice right turn delays are not as long as the theoretical ones calculated by SIDRA as the mixing of traffic at the Teal Street roundabout tends to bunch the westbound Cormorant Road traffic at times and this assists right turn exit movements from Egret Street. Nevertheless the analysis does show very limited capacity. The left turn out of Egret Street onto Cormorant Road however operates at a satisfactory level of service.

The Cormorant Road/Teal Street intersection (roundabout) operates satisfactorily with significant spare capacity.

2.6 Existing Rail Network

The Kooragang Island mainline is adjacent to the site (Figure 1). It is currently used for the transportation of coal from various sources in the Hunter Valley to the existing PWCS coal loader facility.

The Kooragang Island mainline also connects to the NSW rail network and interstate freight network which provides rail transport links to Sydney, Brisbane etc.

A rail spur line off the Kooragang Island mainline crosses Cormorant Road at an uncontrolled level crossing close to Egret Street. The RTA has advised this crossing will be upgraded at some time in the future and full traffic signal control at the level crossing will be introduced.

2.7 Existing Public Transport

Port Stephens coaches operates a service between Newcastle and Port Stephens which includes MR 108 (Cormorant Road). On a typical weekday there are a total of 11 services in either direction. The service operates on an approximate hourly frequency during peak periods.

There are no bus stops located along Cormorant Road.

2.8 Existing Pedestrian/Cycleway Facilities

There are no footpaths provided along Cormorant Road.

On street marked cycle lanes are provided along Cormorant Road. These are provided between Stockton Bridge and Industrial Drive. The route then connects to the existing cycle network within the residential area of Mayfield.

The cycle network in the area is shown on Figure 4.

2.9 Current Site Planning Consents

The western part of the site area is a licensed landfill site. The eastern part is largely unused at present.

A development application for a proposed Protech cold mill facility was approved in 2001. The traffic report produced in support of the proposal assessed the traffic that the proposal could generate during both construction and operation phases. The report identified that during its operational phase the development could generate 70 truck and 600 car two-way daily movements plus some other deliveries based upon demand. The report also identified that higher traffic flows would be experienced during the construction phase. This development has not proceeded.

A development application for the Extension of Shipping Channels within the Port of Newcastle (including dredging, excavation, treatment and disposal of sediments from the south arm of the Hunter River) was approved in 2005. The traffic assessment included in the development application and accompanying Environmental Impact Statement (Waterways Authority, 2003) considered potential traffic impacts associated with dredging, treatment and disposal of sediments from the south arm of the Hunter River.

That project will involve mainly disposal of dredged material by pipeline and by barge for disposal at sea. However, an estimated 580,000m² of contaminated and inert material is to be processed and then disposed of from the BHP Closure site.

Of relevance to the CET proposal will be the need to transport about 200 truckloads of dredging pipeline to the Kooragang Island site. A small amount of imported rock (rip-rap) to protect the new shoreline may also be needed at the wharf. However NCIG plans to obtain the majority of rock fill required for wharf construction directly from the dredging activities.

The management and handling of contaminated and related material that is removed from the south side of the south arm of the Hunter River is the responsibility of BHP Billiton and would be undertaken at the BHP closure site. A number of options are available for the treatment of the contaminated material and for its final disposal following remediation; however this activity is outside of the control of NCIG.

One of the possible sites for disposal of the contaminated material once it has been treated is the Kooragang Island Waste Emplacement Facility, however, the fate and timing of disposal of this material has not yet been determined. If the Waste Emplacement Facility is to be the final fate of the material, it would be trucked across the Tourle Street Bridge.

This study does not include the transport of material from the BHP closure site to the Waste Emplacement Facility for the following reasons:

- The fate of the material is unknown and it may not be transferred to Kooragang Island Waste Emplacement Facility, or the timing of its transfer may not coincide with NCIG construction activities.
- Condition B2.29 of the consent for the dredging is that the proponent is to prepare a Dredged Material Transport Study, this study is required to be prepared in consultation with RTA and NCC and include *"establishment of traffic movement scheduling to avoid conflicts with peak traffic flows, sensitive road users and to distribute traffic flows to distribute impacts to the greatest extent reasonably possible"* (it is understood that this study is not yet complete).

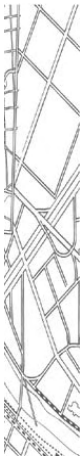
- In preparing the Dredged Material Transport Study, the proponent for the transport would be required to consider the scheduling of the activity and NCIG development activities, and minimise the potential for traffic conflicts. If relevant, NCIG would work with the proponent to ensure that a conflict in peak traffic flows does not occur.

2.10 Planned Infrastructure Improvements

The RTA have produced designs for the upgrading of the two lane section of Cormorant Road to provide two traffic lanes in either direction separated by a central median. At this time the RTA have not advised a specific timeframe within which the improvement is likely to occur. However, site access planning needs to take this future widening and upgrade of the road into account.

The existing Tourle Street bridge is near the end of its effective life. The RTA have advised a replacement bridge will be constructed to the east of the existing Tourle Street Bridge, which will then be demolished. Cormorant Road to the north of the bridge will be realigned to tie into the new structure until such time as the above road widening is implemented. At that time, a second new bridge is to be built on the alignment of the existing bridge. The RTA has advised that the first new bridge structure could be in place in about five years.

The Egret Street/Cormorant Road intersection currently allows all movements. As a condition of consent on the planning approval for the expansion of the Cargill Oilseed Processing Facility (approved April 2006), the operator has been requested to review haulage routes for truck movements to ameliorate impacts on this intersection. NCC have also raised concern over the intensification of turning traffic movements through this intersection (particularly right turns onto Cormorant Road). The future operation of the intersection is discussed further in Section 4.3 of this report.



3. Proposed Development

3.1 Development Proposal

The proposed development involves the construction and operation of a 66 Mtpa CET. The proposed layout is shown in Figure 2.

Construction

The main activities associated with the development of the CET would include:

- foundation preparation/capping of a rail corridor traversing the existing Kooragang Island Waste Emplacement Facility for the development of the rail spurs, rail sidings and rail loops;
- construction of rail spurs, rail sidings and rail loops, rail overpass, train unloading stations and connecting conveyors;
- re-use of dredged materials from the south arm of the Hunter River as preload and engineering fill for construction of the coal storage area, rail corridor and wharf facilities;
- construction of a coal storage area including coal stockpiles, conveyors, transfer points and combined stacker/reclaimers;
- construction of wharf facilities, shiploaders, conveyors and buffer bins;
- development of water management infrastructure including site drainage works, stormwater settlement ponds, primary and secondary settling ponds, site water pond, water tanks and stockpile spray system;
- installation of electricity supply, reticulation and control systems;
- development of access roads and internal roads;
- construction of administration and workshop buildings; and
- other associated minor infrastructure, plant, equipment and activities.

The CET construction phase would involve the construction and commissioning of rail infrastructure, coal storage area, wharf facilities and ship loaders.

An initial 33 month construction phase is expected for the CET to reach its initial 33 Mtpa capacity. Construction activities with the potential to be audible at surrounding residential areas would be undertaken during daytime hours up to seven days per week. The timing of further progressive expansion of the CET to reach 66Mtpa capacity would be dependant upon market demand.

A main site construction area would be established adjacent to the proposed coal storage area. Smaller construction areas would be erected at the wharf and rail areas.

Rail spurs are proposed connecting to the Kooragang Island mainline with five rail sidings and two rail loops. A rail overpass would be constructed to carry the track over the Delta access road.

Construction of the rail spur, sidings and first rail loop is expected to take 18 months. The second rail spur line and rail loop would be constructed when the throughput capacity of the CET is progressively increased up to 66Mtpa.

Construction activity for the initial 33 Mtpa facility is forecast to require up to 500 people working 7 days per week between 7.00 am to 6.00 pm.

Operation

All coal handled by the CET would arrive at the site by rail.

The coal storage area would provide a series of stockpile pads. Rail mounted combined stackers/reclaimers would serve the stockpiles.

A series of belt conveyors and transfer points would facilitate the transport of coal from the train unloading stations to the coal storage area and to the wharf facilities and shiploaders. The general arrangement of the main conveyors and transfer points is shown on Figure 2. Conveyor overpasses would be constructed over the Pacific National access road and Cormorant Road. The overall length of the conveyor overpass structure across Cormorant Road would be approximately 120 m and the structure would be up to 16 m wide. Both conveyor overpasses would be designed and constructed in accordance with the NCC and RTA requirements.

At the wharf three berths would be served by two rail-mounted ship loaders. Initially only one ship loader would be required to serve two berths.

The operational phase workforce would include up to 20 administration workers and operational crews totalling approximately 80 staff.

3.2 Vehicular Access - Construction Phase

The proposed CET would be constructed in three distinct site areas as follows:

- Main site area – the location for the coal storage area which would include coal stockpiles, transfer points, conveyors and combined stackers/reclaimers;
- Wharf area – the location for wharf facilities and ship loaders; and,
- Rail area – the location for the rail spurs and loops, rail overpass, train unloading stations and connecting conveyors.

The general arrangement of the CET is provided in Figure 2.

Figure 5 summarises the construction phase access arrangements.

Construction traffic access to the three site areas during construction is described in the following paragraphs.

Main Site Area

The main site area would be accessed from one of two possible routes:

- Egret Street.
- Pacific National access road.

It is proposed to provide left in/left out of Egret Street only at the Cormorant Road intersection. Vehicles wishing to turn right into Egret Street would be able to turn left at the Cormorant Road/Teal Street roundabout and use Cormorant Road/Curlew Street/Raven Street. Vehicles wishing to turn right out of Egret Street could also use this route or turn left onto Cormorant Road and u-turn at the Cormorant Road/Teal Street roundabout.

The Pacific National access road would also provide vehicle access during construction to the southwest area of the main site.

A temporary set of lights would also be installed for access from the wharf area across Cormorant Road to the main site during construction. This temporary access would only be used for movement of fill and oversize machinery parts and would not be utilised during peak periods.

Wharf Area

Construction vehicle access to the wharf area is proposed via a left in/left out priority controlled access with Cormorant Road.

Vehicles wishing to turn right into the wharf access would be able to u-turn at the Cormorant Road/Teal Street roundabout and turn left in. Traffic wishing to turn right out onto Cormorant Road would turn left onto Cormorant Road and then right turn into the Pacific National access road. A u-turn loop is proposed on the main site area to allow vehicles to turn (Figure 2). They would then be able to turn left out of the access road onto Cormorant Road.

Rail Area

Construction traffic access to the rail area would be available as follows:

- Heavy truck access would be available from Cormorant Road using existing access points immediately to the north of Tourle Street bridge (Delta access road). This would be via left turn northbound movements only. Exits from the Delta access road would be required to be made by way of a left turn onto Cormorant Road only. The existing footpath and cycleway which continues north from the western side of the bridge would be realigned to divert its route away from the main vehicular path and reduce the possibility of traffic conflicts.
- Almost all truck movements into the rail area are forecast to originate from the Newcastle area. However to reduce the possibility of right turns in there would be a contractual requirement placed upon the truck companies to route vehicles using the left in/left out arrangements. Turning restriction signage would also be imposed to ensure that trucks do not turn right into or out of the access point. Trucks would be able to return to the Newcastle area by turning left out of the access and performing a u-turn at the Cormorant Road/Teal Street roundabout.
- Light truck and car access to the rail construction area would be via the Pacific National access road (usage of the Delta access road by light vehicles would be limited as far as practicable). Right turns out of this road are also proposed to be restricted with return movements to Newcastle to be made via u-turns at the Teal Street roundabout.

3.3 Vehicular Access – Operation Phase

The main administration area is proposed as part of the main site area and would be accessed from Egret Street. The turning controls explained above for the construction traffic would be applicable.

The wharf area would also contain a small administration area and this be accessed from the wharf access road. This access would be used for customs and other visitors to the ships as required.

There would be a simple operations building and minor car park at the rail unloading stations. This building would be accessed from the main site via a crossing of the Pacific National access road. Any limited maintenance access requirements to the rail area would be met using the same access points as during construction.

Figure 6 summarises the operational phase access arrangements.

3.4 Traffic Generation

A number of scenarios are investigated within this report to examine the impact that the traffic generated by the CET on the surrounding road network.

A base year of 2007 is selected which is the proposed start date for the construction phase. A further design year of 2017 is selected to represent a time to assess the operational phase (66Mpta capacity CET) against potential baseline traffic growth.

Four scenarios are assessed as follows:

- Scenario 1 – 2007 background traffic conditions (with 2 years traffic growth at 1% per year) with inclusion of development traffic from approved developments.
- Scenario 2 – 2007 background traffic (with 2 years traffic growth at 1% per year) including development traffic from approved developments) plus construction traffic for development of the initial 33 Mtpa capacity CET.
- Scenario 3 – 2017 background traffic conditions (with 12 years traffic growth at 1% per year plus inclusion of development traffic from approved developments).
- Scenario 4 – 2017 background traffic conditions (with 12 years traffic growth at 1% per year, inclusion of development traffic from approved developments) and operation of the full 66Mtpa capacity CET.

The timing of the expansion from 33 Mtpa to 66 Mtpa and the rate of expansion is unknown at this stage. It is likely that the expansion would be undertaken in a progressive manner, however, if undertaken rapidly it could involve traffic flows of a similar magnitude to the initial establishment of the 33 Mtpa CET. It is also possible that this could occur at a time when Cormorant Road has been upgraded to two lanes in either direction.

It is recommended that for the progressive expansion from 33 Mtpa capacity up to 66 Mtpa capacity, a Construction Traffic Management Plan (CTMP) be prepared in consultation with the RTA and NCC. A CTMP should: review the outcomes of this study; compare predicted versus actual road usage levels; consider the road network configuration existing at that time; and make recommendations for further traffic controls if necessary.

Estimates of the daily and peak hour traffic generation levels for the construction of the initial 33 Mtpa capacity CET and the operation of the full 66 Mtpa capacity CET were obtained by the following process:

- Truck movement estimates provided by NCIG.
- Daily traffic levels for each type of traffic movement were established. Yearly construction traffic estimates were converted to daily levels by assuming a 50 week working year with seven working days per week.

- Peak hour estimates were obtained by assuming that all staff arrivals occurred during 6.30am to 7.30am and depart between 5.00pm and 6.00pm. In reality a significant number of departures would occur after 6.00pm. The assessment of these departures at the background traffic peak hour is a conservative approach for impact assessment.
- All truck movements and visitor/representative movements were assumed to distribute evenly throughout the nominal 11 hour working day (7.00am to 6.00pm).
- For vehicle movements calculated to occur less than once per hour it was assumed that one movement would occur in each peak hour period.

The following traffic movements are forecast for construction of the initial 33Mtpa capacity CET:

- AM and PM peak hours — 419 cars and 23 truck movements.
- Daily — 1000 cars and 158 truck movements.

The following traffic movements are forecast for operation of the 66Mtpa capacity CET:

- AM and PM peak hours — 27 cars and 1 truck movements.
- Daily — 80 cars and 10 truck movements.

It is noted that the above operational traffic levels are significantly lower than were approved for use of the site as a cold mill facility as described in the *Proposed Cold Mill Facility Kooragang Island Environmental Impact Statement* (Protech Steel, 2001).

3.5 Traffic Distribution

NCIG/Connell Hatch advises that for the construction and operation phases that the sources of consumables/deliverables would be:

- Construction — 85% Newcastle — 15% other
- Operation — 95% Newcastle — 5% other

The employee movements are expected to be 85% to/from the Newcastle direction and 15% to/from Stockton and to the north.

NCIG advise that the split of construction traffic at each of the construction area accesses would generally be in the following proportions:

- 50% to the main site construction area
- 30% to the wharf construction area
- 20% to the rail construction area

It is also assumed that the construction employee movements would also split to each construction area in accordance with the above proportions.

Operational employee movements are expected to be mainly to the main site area. Some minor movement is expected to the wharf area. No significant movement is expected to the rail area during the operational phase.

3.6 Traffic Assignment

Construction Traffic Movements

Table 3-1 forecasts the total number of daily traffic movements to each of the site area accesses for initial 33Mtpa capacity CET construction phase.

Table 3-1 – Total Daily Two-Way Movements Construction Traffic Split Between Access Points

Vehicle type	PCU value	Vehicles Movements Main Site Construction		Vehicles Movements Wharf Construction		Vehicles Movements Rail Construction	
		Vehicles	PCU	Vehicles	PCU	Vehicles	PCU
Employee	1	400	400	240	240	160	160
Visitors/representatives*	1	100	100	60	60	40	40
Fuel deliveries	2	3	6	2	4	1	2
Machine parts/ Container trucks	3	4	12	3	9	2	6
Other deliveries	2	50	100	30	60	20	40
Delivery truck (20t)	3	17	51	11	33	6	18
Concrete trucks	2	4	8	2	4	3	6
Total		578	677	348	410	232	272

* Monday to Friday only

PCU = Passenger Car Units

In addition to the above there are forecast to be 10 oversize deliveries per week. These movements are not included in the above since they would require special arrangements and would avoid the background peak hours.

Table 3-1 can be summarised as follows:

- Main site construction access – 500 car and 78 truck daily two-way vehicle movements;
- Wharf construction access – 300 car and 48 truck daily two-way vehicle movements; and,
- Rail construction access – 200 car and 32 truck daily two-way vehicle movements.

Peak period movements are forecast to be split between the access points as shown in Table 3-2.

Table 3-2 - Peak Hour Two-Way Construction Movements Split Between Access Points

Vehicle type	PCU value	Vehicles Movements Main Site Construction		Vehicles Movements Wharf Construction		Vehicles Movements Rail Construction	
		Vehicles	PCU	Vehicles	PCU	Vehicles	PCU
Employee	1	200	200	120	120	80	80
Visitors/representatives*	1	9	9	6	6	4	4
Fuel deliveries	2	1	2	1	2	1	2
Machine parts/ Container trucks	3	1	3	1	3	1	3
Other deliveries	2	5	10	3	6	2	4
Delivery truck (20t)	3	2	6	1	2	1	2
Concrete trucks	2	1	2	1	2	1	2
Total		219	232	133	141	90	97

* Monday to Friday only

PCU = Passenger Car Units

Table 3-2 can be summarised as follows:

- Main site construction access – 209 car and 10 truck peak hour two-way vehicle movements;
- Wharf construction access - 126 car and 7 truck peak hour two-way vehicle movements; and,
- Rail construction access – 84 car and 6 truck peak hour two-way vehicle movements.

66 Mtpa Capacity Operational CET Traffic Movements

Table 3-3 forecasts the total number of daily traffic movements to the main site area and the Wharf area for the operation of the 66Mtpa capacity CET.

Table 3-3 – Total Daily Two-Way Operations Movements Split Between Access Points

Vehicle type	PCU value	Vehicles Movements Main Site		Vehicles Movements Wharf Site	
		Vehicles	PCU	Vehicles	PCU
Employee	1	50	50	10	10
Visitors/representatives*	1	20	20	0	0
Fuel deliveries	2	2 per month			
Machine parts	3	1 per week			
Other deliveries	2	10	20	0	0
Total		80	90	10	10

* Monday to Friday only

PCU = Passenger Car Units

Table 3-3 can be summarised as follows:

- Main site access – 70 car and 10 truck daily two-way vehicle movements respectively; and,
- Wharf access – 10 car daily two-way vehicle movements.

Peak period movements are forecast to be split between the access points as shown in Table 3-4.

Table 3-4 - Peak Hour Two-Way Operation Movements Split Between Access Points

Vehicle type	PCU value	Vehicles Movements Main Site		Vehicles Movements Wharf Site	
		Vehicles	PCU	Vehicles	PCU
Employee	1	25	25	5	5
Visitors/representatives	1	2	2	0	0
Other deliveries	2	1	2	0	0
Total		28	29	5	5

PCU = Passenger Car Units

Table 3-4 can be summarised as follows:

- Main site access – 27 car and 1 truck two-way peak hour vehicle movements respectively; and,
- Wharf access – 5 car two-way peak hour vehicle movements.

3.7 Car Parking

Construction

Temporary car parks would be installed for the construction phase at each of the three main construction areas.

The number of spaces which would be required at each of the parking areas would be dependant upon the number of employees that each site area would need to accommodate. The maximum 500 person construction workforce has been assessed on the basis of 400 vehicles. Splitting these in accordance with the split between each work area, the following number of temporary car spaces would be required:

- Main Construction Area – 200 car spaces
- Wharf Construction Area – 120 car spaces
- Rail Construction Area – 80 car spaces

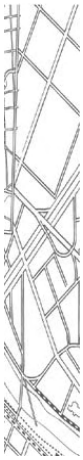
The layout of these temporary spaces would generally conform to the requirements of AS2890.1:2004 *Parking Facilities – Off-street Car Parking* (suitable for employee and general all day parking).

Operation

An 80 space car park is proposed adjacent to the administration building near Egret Street. Smaller car parks are also proposed at the Wharf and the rail unloading station. The capacity of each car park area would be designed in accordance with the NCC Development Control Plan (DCP) 2005 Element 4.1 Car Parking which requires industrial development to provide car parking at a rate of 1 space per 2 employees.

The 80 space car park at the main site area administration office for the workforce of 100 people complies with the requirements of the DCP.

The layout of these spaces would be designed in accordance with the requirements of AS2890.1:2004 (suitable for employee and general all day parking).



4. Traffic Impacts

4.1 Derivation of Assessment Flows

The derivation of the traffic flows for each of the four assessed scenarios is described below.

Scenario 1 - Estimated 2007 Traffic Flows (without CET)

The 2005 surveyed traffic flows were used and were pro-rated up to 2007 at 1% increase per year. Movements associated with the right turn into and out of Egret Street were re-assigned to the Teal Street roundabout on the assumption that this control is instigated for the Cargill facility traffic to improve intersection performance and safety.

The traffic from developments which currently have planning consents and remain to be implemented was considered.

The Cargill Oilseed Processing Plant has recently been given approval for expansion. The traffic report submitted in support of the development application forecasts that the operation of the development is likely to increase peak hour traffic flows along Cormorant Road by about 1 heavy and 53 light vehicle movements. These flows were added to the background traffic flows.

Along with the approved dredging activities in the south arm of the Hunter River (Section 2.9), another significant approved development in the area is for the construction of a multi-purpose terminal in the closure area of the BHP steelworks main site. The multi-purpose terminal described in the Development of a Multi-Purpose Terminal and Remediation of Closure Area, BHP Newcastle Steelworks Environmental Impact Statement (BHP Limited, 2000) was approved in 2001, however construction has not commenced. The multi-purpose terminal site is located on the Newcastle side of the South Arm of the Hunter River and as such development traffic associated with its operation is unlikely to utilise Cormorant Road to a significant extent.

The general traffic growth applied to the surveyed traffic flows (1% per annum) is considered to be sufficient to represent any traffic from the multi-purpose terminal which may use Cormorant Road and coincides with Project traffic assessment periods. As discussed above, in accordance with consent conditions traffic generated by approved dredging activities in the south arm of the Hunter River is required to be managed under a yet to be formulated management plan. To the extent that dredging activity traffic may impact on Kooragang Island the traffic management plan will need to have regard to the various development activities taking place on Kooragang Island at the time.

Traffic flows for Scenario 1 in PCU values are shown on Figure 7.

Scenario 2 - Estimated 2007 Traffic Flows plus CET Construction

The peak hour traffic flows for construction of the initial 33Mtpa capacity CET shown in Table 3-2 were added to the Scenario 1 flows.

Traffic flows for Scenario 2 in PCU values are shown on Figure 8.

Scenario 3 - Estimated 2017 Traffic Flows (without CET)

The 2005 surveyed traffic flows were increased to 2017 levels to represent a 12 year horizon to analyse potential impacts with long term baseline traffic growth.

The 2005 surveyed traffic flows were assumed to increase by a 1% per year. Therefore for a 10 year design horizon equates to 10% of total traffic growth. It is noted that the AADT counts described earlier in Section 2.4 show negligible traffic growth in the nine year period prior to the 2005 survey. This assumption of 10% growth in background traffic is therefore conservative.

It is expected that heavy vehicle proportions on Cormorant Road could rise to 15% given the expected industrial development which could occur within the 10 year horizon. PCU values were calculated by applying this percentage. One truck is taken to represent 2 PCU values.

The approved development traffic flows used in Scenario 1 were included.

Traffic flows for Scenario 3 in PCU values are shown on Figure 9.

Scenario 4 - Estimated 2017 Traffic Flows plus CET Operation at 66Mtpa

The peak hour traffic flows for operation of the 66Mtpa capacity CET shown in Table 3-4 were added to the Scenario 3 flows.

Traffic flows for Scenario 4 in PCU values are shown on Figure 10.

4.2 Daily Traffic Profile for Operation and Construction Phases

An assessment of the likely daily traffic flow impacts of both phases of the development is provided for each scenario in Table 4-1.

Table 4-1 – Daily Traffic Profile for Each Scenario

Location	Two-Way Vehicle Flows			
	Scenario 1 2007 Background	Scenario 2 2007 Background + CET Construction	Scenario 3 2017 Background	Scenario 4 2017 Background + CET Operation
Industrial Drive	32,208	32,700	35,280	35,321
Cormorant Road	25,343	26,327	27,748	27,831
Nelson Bay Road	19,535	19,709	21,432	21,439

The traffic increases associated with either the construction or operational phases would be greatest on Cormorant Road.

The two lane section of Cormorant Road is estimated to have a capacity of 27,000 to 28,000 vehicles. The construction phase daily traffic flows would increase the background AADT by 3.9% and operational phase daily traffic flows would increase the background AADT by 0.3%. These total daily traffic flow levels would still be below the capacity of the road. The level of service should therefore remain unchanged.

On Industrial Drive the construction phase daily traffic flows would increase the background AADT by 1.5% and operational phase daily traffic flows would increase the background AADT by 0.1%. These increases are considered negligible and should not result in any reduction in Level of Service.

On Nelson Bay Road the construction phase daily traffic flows would increase the background AADT by 0.9% and operational phase daily traffic flows would increase the background AADT by even less. No degradation in the Level of Service is expected.

4.3 Future Intersection Performance

The intersections and construction access points along Cormorant Road were assessed using SIDRA under the different scenario traffic flows conditions. Table 4 -2 summarises the results.

The Delta access road (large vehicle construction access) to the rail area was not subject to assessment since the oversize loads would be infrequent and a similar level of service would be experienced as forecast at the Pacific National access road intersection.

Table 4 -2– Existing and Proposed Intersection Operation

Intersection	Control	Scenario	Operational Performance			
			Weekday AM Peak Hour		Weekday PM Peak Hour	
			Average Delay (seconds)	Level of Service	Average Delay (seconds)	Level of Service
Cormorant Road / Teal Street	Roundabout	1	11.9	A	11.6	A
		2	12.7	A	13.0	A
		3	12.0	A	11.6	A
		4	12.1	A	11.8	A
Cormorant Road/ Egret Street	Priority (Egret Left in Left out)	1	18.1	B	17.3	B
		2	25.2	B	52.9	D
		3	29.5	C	27.6	B
		4	31.0	C	35.2	C
Cormorant Road/ Wharf Access	Priority	1	N/A	N/A	N/A	N/A
		2	13.7	B	22.4	B
		3	N/A	N/A	N/A	N/A
		4	24.0	B	36.2	C
Cormorant Road/ Pacific National Access Road	Priority	1	N/A	N/A	N/A	N/A
		2	44.0	D	22.0	B
		3	N/A	N/A	N/A	N/A
		4	N/A	N/A	N/A	N/A

Table 4 -2 shows that the Cormorant Road/Egret Street intersection would operate at Level of Service D during the PM assessment period with construction traffic. However this is considered acceptable given that an alternative route exists via Raven Street to which traffic could redistribute, if traffic congestion is perceived.

The Cormorant Road/Pacific National access road would also operate at Level of Service D during the morning peak hour period with construction traffic. However, this result relates to left turning vehicles and covers only the construction period so is considered to be satisfactory.

All intersections would operate at a satisfactory level of performance with operational phase traffic flows, even with significant baseline traffic growth.

4.4 Construction Works

To facilitate access to the various areas for both construction and the on-going operation the following infrastructure works are proposed:

- Improvements to the existing access north of Tourle Street bridge. These would include advance warning signage and a realignment of the existing footpath/cycleway.
- A right turn prohibition onto Cormorant Road from the Pacific National access road.

- A new intersection to the Wharf Area. This would require the installation of a central carriageway median island to prevent right turns. Suitable lengths of deceleration and acceleration lanes should be provided.
- Provision of a new turning loop on the Pacific National access road.
- Prohibition of right turn movements at the Cormorant Road/Egret Street intersection. This would require the installation of a central carriageway median island to prevent right turns.

All the above identified road works would be designed in accordance with the RTA Road Design Guide (RTA, 1996).

These roadworks would be undertaken by a suitably licensed contractor in consultation with the RTA and NCC.

A Traffic Management Plan would be developed prior to construction of the conveyor overpass of Cormorant Road.

4.5 Temporary Haulage of Fill Across the Pacific National Access Road

It is proposed to haul fill between the main site area and the rail area for a short period during construction. This would involve a crossing of the Pacific National access road and Delta access road.

It is estimated that fill haulage would require traffic movements of approximately 25 per hour for about three months during construction. To manage the potential conflicts between these movements and vehicles using the Pacific National access road and Delta access road, the roads could be temporarily reprioritised or controlled using temporary traffic management measures. Any measures would need to be subject to agreement between stakeholders prior to construction certification.

4.6 Temporary Haulage of Fill Across Cormorant Road

It is proposed to haul fill between the main site area and the wharf area for a short period during construction. This would involve trucks crossing Cormorant Road.

It is estimated that the fill haulage would require movements of approximately an average of 25 per hour over a three month period. To manage the potential conflicts between these movements and vehicles using Cormorant road, temporary traffic lights would be installed and the use of the crossing would be restricted to non-peak periods.

SIDRA was used to assess the potential delays that temporary off-peak traffic signals may create to through traffic on Cormorant Avenue using SIDRA. 2007 peak hour flows were adjusted to represent the lower-peak period flows based on the daily traffic profile of vehicles on Tourle Street.

The results of a preliminary analysis indicate that traffic movements on Cormorant Road would not suffer significant delay. The eastbound and westbound directions are forecast to have 3.1 and 4.6 average seconds delay per vehicle respectively during the short term operation of the temporary lights.

The location of the temporary crossing, and the specifications for any specific short term management measures would need to be subject to agreement between stakeholders prior to construction certification.

4.7 Temporary Haulage of Machine Parts Across Cormorant Road

It is proposed to haul machine parts across Cormorant Road from the Wharf area to the main site area. These low loader vehicle movements would use the temporary traffic lights. However since these movements would take some 10 to 15 minutes to complete it is proposed to undertake these movements late at night under police supervision. At this time there would be the least impact to traffic flows along Cormorant Road.

There would be a sporadic requirement for up to 2 trips per night which would occur over a period of 9 months, dependant upon the shipping of large parts from overseas.

4.8 Road Safety

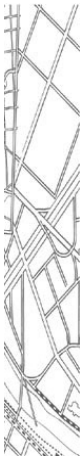
Accident data for the last complete three year period (January 2000 to December 2003) was obtained from the RTA. The study area included the length of Cormorant Road between the Stockton Bridge and the Tourle Street bridge.

Analysis of the data identified that there were a total of 24 reported personal injury accidents of which two were fatalities.

At the Cormorant Road/Teal Street roundabout nine injury accidents were recorded. Of these five involved rear ends/side swipes at the intersection and four were loss of control. Trucks were involved in two of the rear end accidents.

One injury accident was recorded at the Cormorant Road/Egret Street intersection and was a rear end shunt involving two cars.

No particular accident patterns or causation factors were identified. The proposal is not considered likely to significantly affect road safety performance.



5. Summary and Conclusions

Masson Wilson Twiney were appointed by Newcastle Coal Infrastructure Group (NCIG) to determine the road transport implications of the construction and operation of a 66 Mtpa CET on Kooragang Island in Newcastle, New South Wales.

It is intended to develop the terminal in two phases. The first phase would provide a CET with a 33 Mtpa capacity. When market demands are sufficient, the facility would be progressively expanded to increase total capacity to 66 Mtpa.

The report is summarised as follows:

- The RTA proposes to upgrade the existing two lane section of Cormorant Road, which provides the main vehicular access route through Kooragang Island, to four lane divided. The RTA has not provided a timeframe for the implementation of this upgrade or the duplication of the Tourle St Bridge and it has been assumed that the upgrade would not be in place prior to the first phase of the CET (i.e. construction and operation of a 33 Mtpa CET).
- NCIG has provided an estimate of the traffic it anticipates for the construction of the initial 33Mtpa capacity CET and the operation of the full 66Mtpa capacity CET.
- Construction traffic access is proposed to the following three main site access areas as follows:
  - Main Site Construction – Movements into Egret Street from Cormorant Road would be possible by left in and left out only. Right turns would be possible for traffic arrivals by routing via Raven Street and traffic departures by a u-turn at the Cormorant Road/Teal Street roundabout. A secondary access would be available from the Pacific National access road.

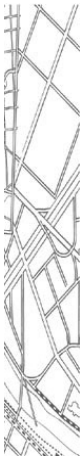
  - Wharf Site Construction – a new intersection would be formed with Cormorant Road which permits only left in and left out movements into the wharf. Arriving traffic would be able to access the site from Newcastle by a u-turn at the Cormorant Road/Teal Street roundabout. Traffic departing to Stockton would be able to u-turn via a turning loop to be accessed from the Pacific National access road.
  - Rail Construction Area – the main access would be via the Pacific National access road. Right turns out from this road would be prohibited and vehicle wishing to depart to Newcastle would have to u-turn at the Cormorant Road/Teal Street roundabout. An existing vehicular access point to the north of Tourle Street bridge would be used for large truck movements. The existing footpath/cycleway would need to be locally realigned to facilitate truck access.

- Vehicular access for the operational phase would be the same as construction traffic arrangements.
- Traffic flows for intersection analysis were prepared for the following traffic scenarios:
  - Scenario 1 – 2007 background flows including traffic from adjacent approved developments.
  - Scenario 2 – 2007 background flows including traffic from adjacent approved developments and construction traffic for the initial 33 Mtpa capacity CET.
  - Scenario 3 – 2017 background flows (with an estimated 10% traffic growth on 2005 levels) including traffic from adjacent approved developments.
  - Scenario 4 – 2017 background flows (with an estimated 10% traffic growth on 2005 levels) including traffic from adjacent approved developments and including the traffic associated with operation of the full 66Mtpa Capacity CET.
- The following traffic movements are forecast for construction of the initial 33Mtpa capacity CET:
  - AM and PM peak hours 419 cars and 23 truck movements.
  - Daily 1000 cars and 158 truck movements.
- The following traffic movements are forecast for operation of the 66Mtpa capacity CET:
  - AM and PM peak hours 27 cars and 1 truck movements.
  - Daily 80 cars and 10 truck movements.
- The number of traffic movements for operation is significantly less than the traffic levels approved for use of the site as a cold mill facility (Protech, 2001).
- During construction the existing and proposed intersections are considered to operate within acceptable levels of intersection performance making allowance for the number of movements and the timeframe for construction.

- The final design of the traffic controls required for short-term fill haulage between the rail and main site area across the Pacific National access road and between the main site and the wharf area across Cormorant Road would be undertaken in consultation with the RTA and NCC at construction certification stage.
- Night time crossings of Cormorant Road using the temporary traffic signals under police supervision would be required for the movement of large parts brought from overseas to the wharf. These movements are likely to be sporadic with up to 2 trips per night anticipated for a period of up to 9 months. The low loader movements would be undertaken at night to have the least impact on the vehicle movements along Cormorant Road.
- Road safety data was analysed and no particular accident patterns or causation factors were identified.

It is concluded that the proposed development:

- Would generate a lower volume of traffic than the previously approved use of the site as a cold mill facility (Protech, 2001).
- Would not create significant adverse traffic impacts on the surrounding road during either construction or operation.
- Is considered to be acceptable from a road transportation perspective.



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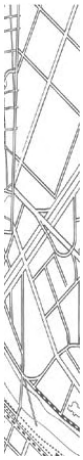
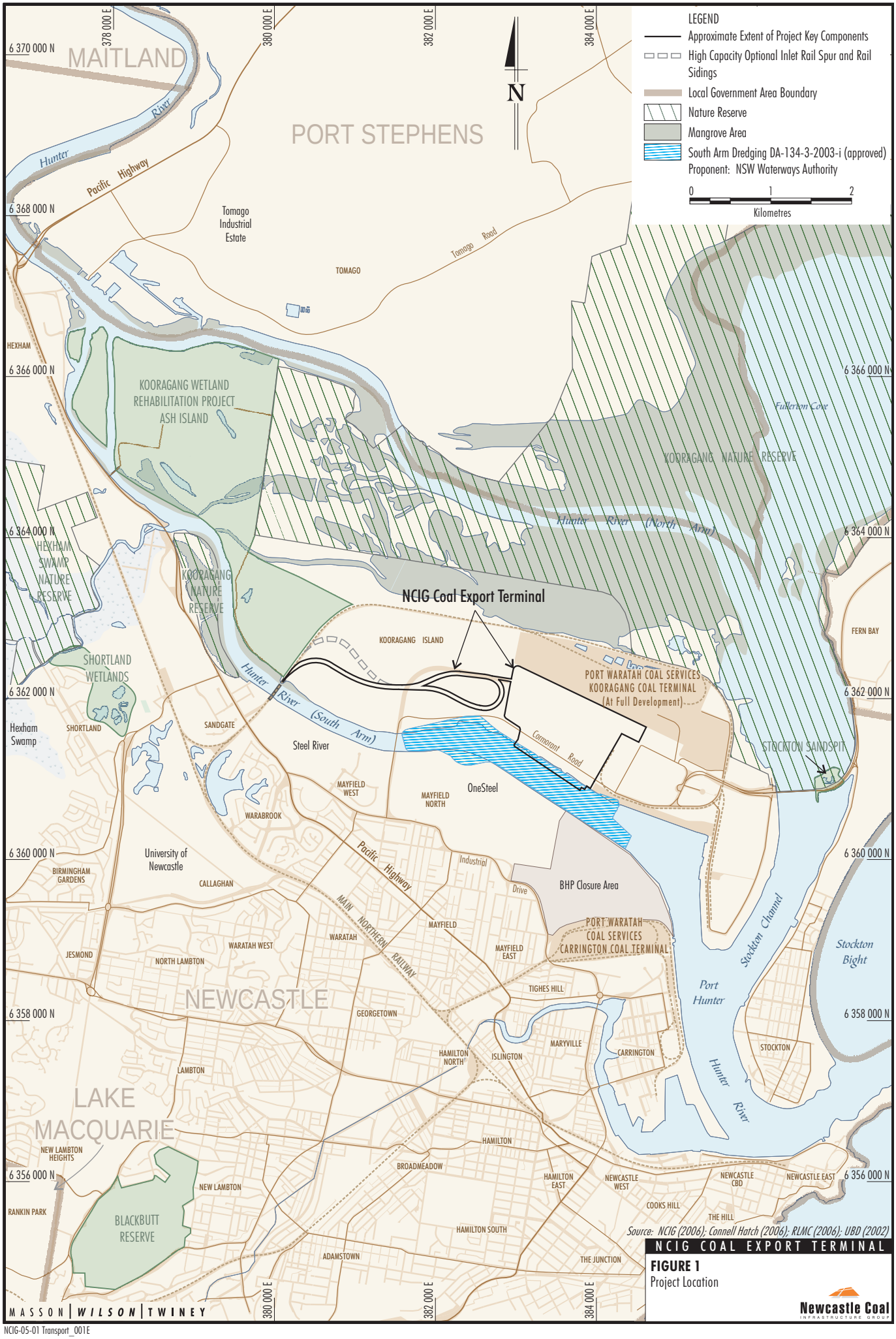


Figures



Source: NCIG (2006); Connell Hatch (2006); RLMC (2006); UBD (2002)

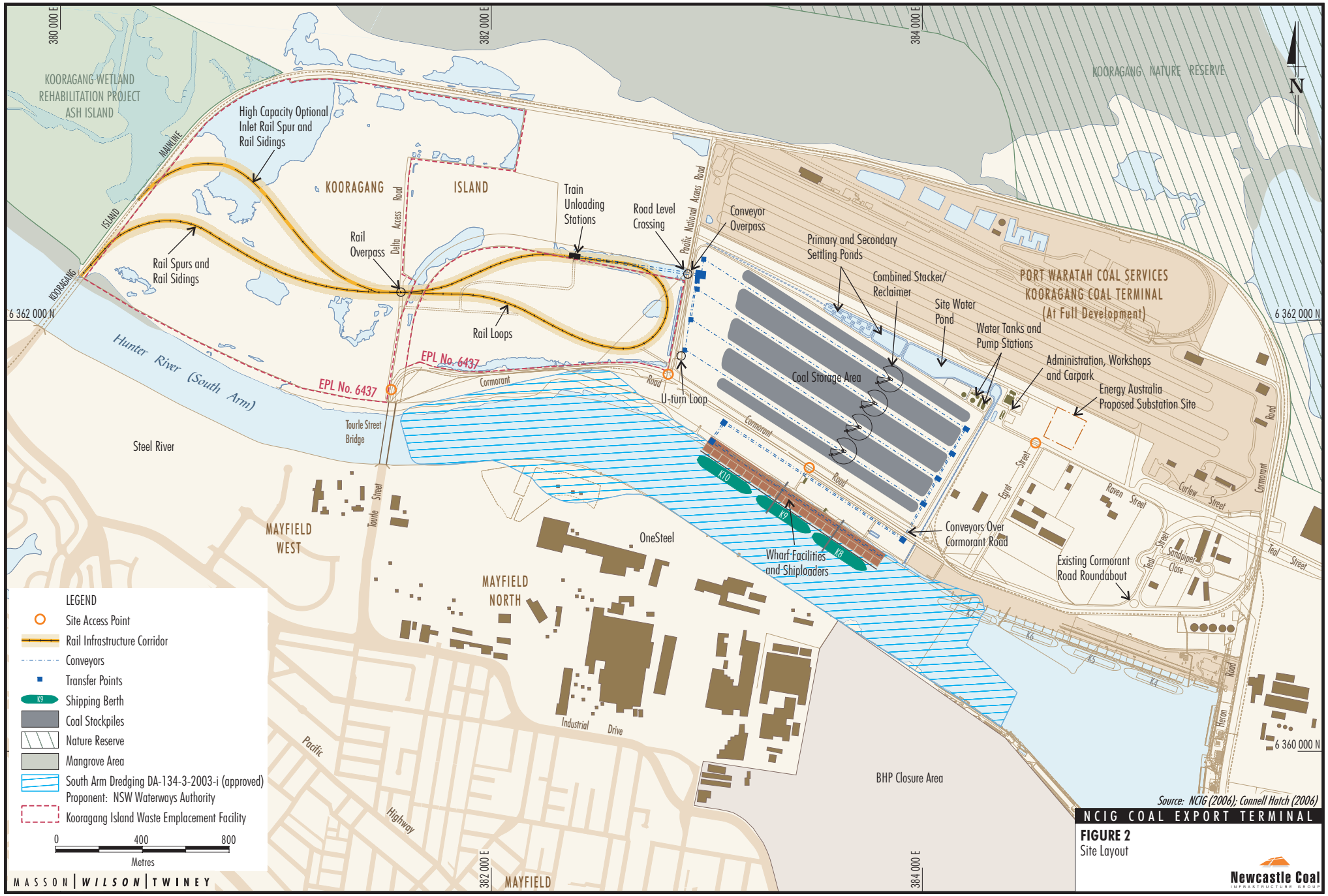
NCIG COAL EXPORT TERMINAL

FIGURE 1
Project Location

MASSON | WILSON | TWINEY

Newcastle Coal INFRASTRUCTURE GROUP

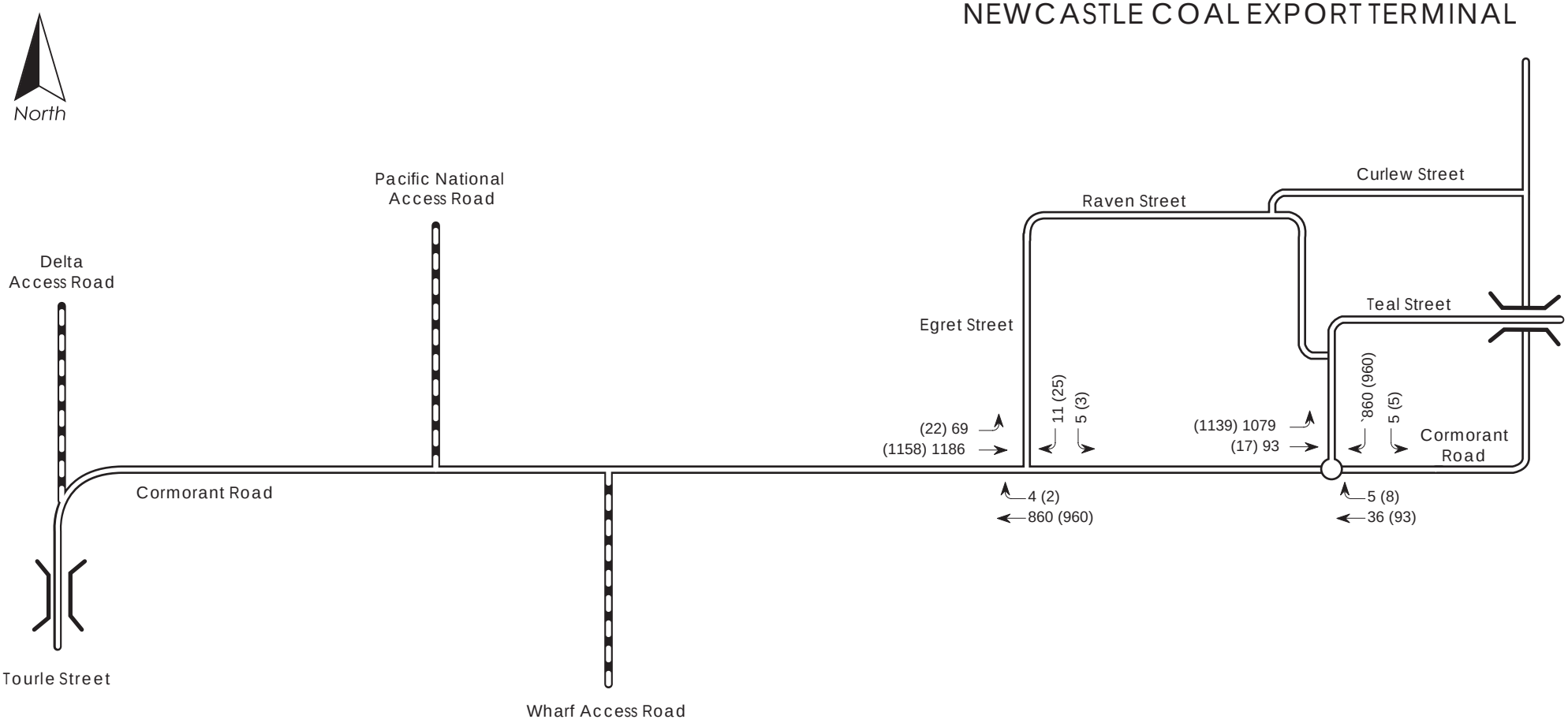
NCIG-05-01 Transport_001E



NCIG-05-01 Transport_002F

EXISTING PEAK HOUR TRAFFIC FLOWS

NEWCASTLE COAL EXPORT TERMINAL



Note

Traffic flows are passenger car units (PCU).

One truck is considered to represent 2 PCU

Key

5: AM Assessment Period (6:30 - 7:30am)

(5): PM Assessment Period (5:00 - 6:00pm)

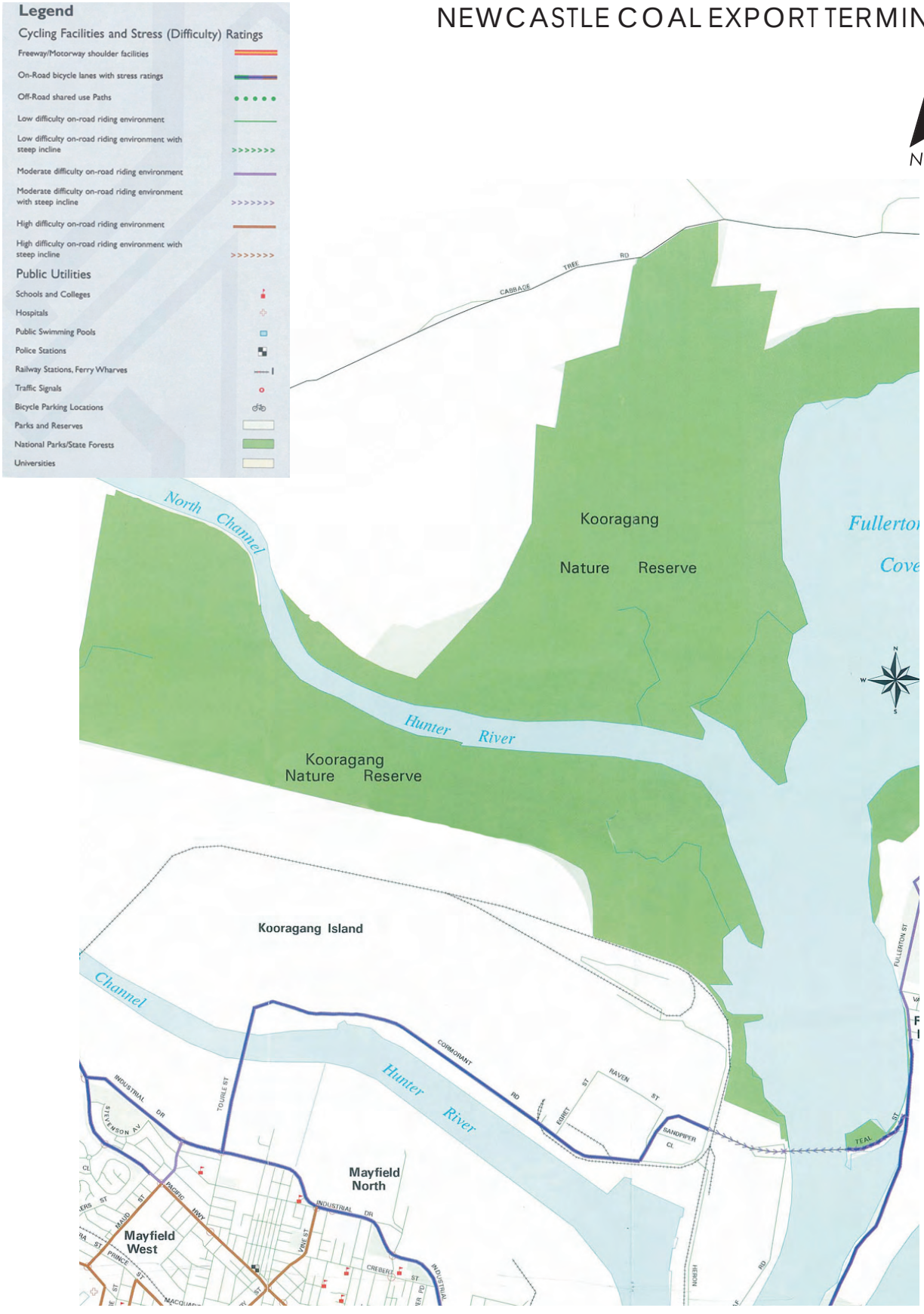
MASSON | WILSON | TWINEY

TRAFFIC AND TRANSPORT CONSULTANTS

Figure 3

EXISTING CYCLE FACILITIES

NEWCASTLE COAL EXPORT TERMINAL



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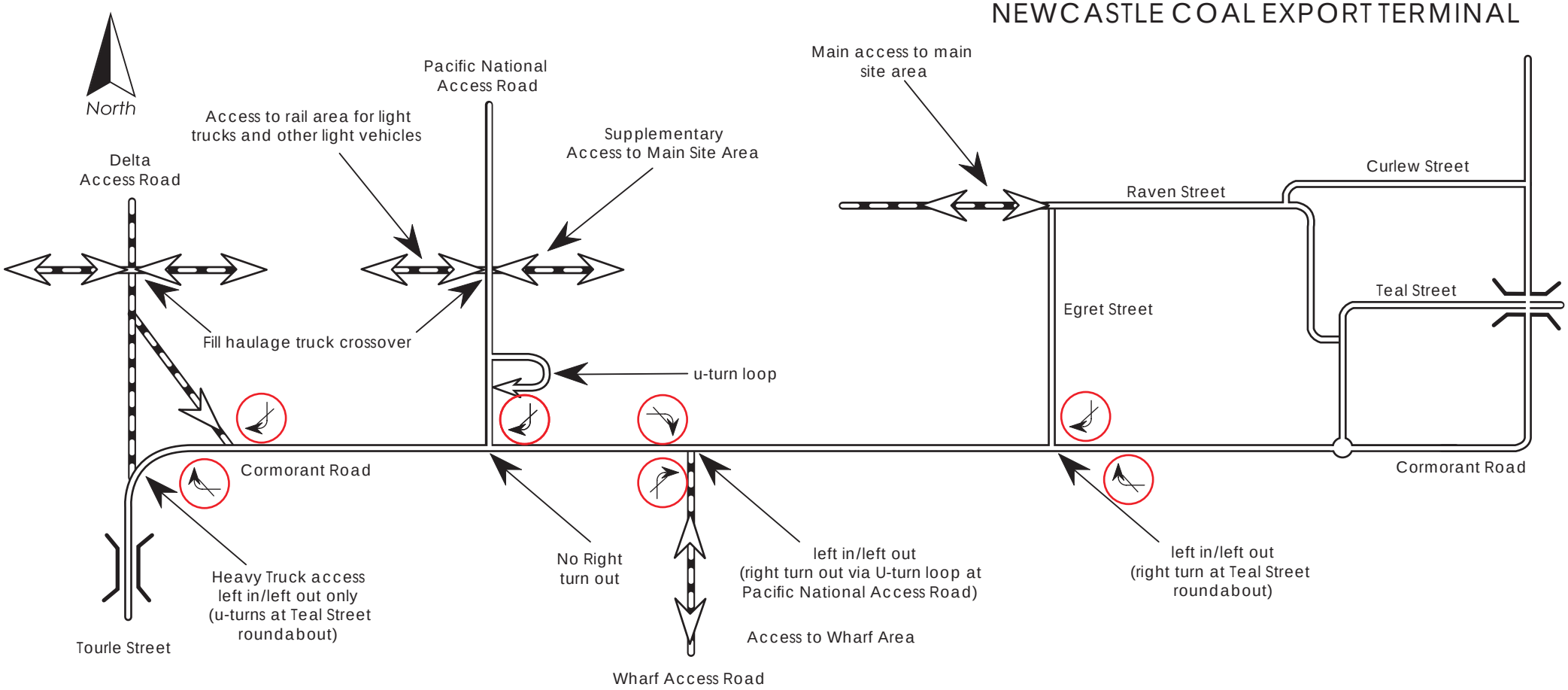
TRAFFIC AND TRANSPORT CONSULTANTS

Figure 4

CONSTRUCTION TRAFFIC ROUTES

NEWCASTLE COAL EXPORT TERMINAL



Key

Prohibited turning movement in direction shown

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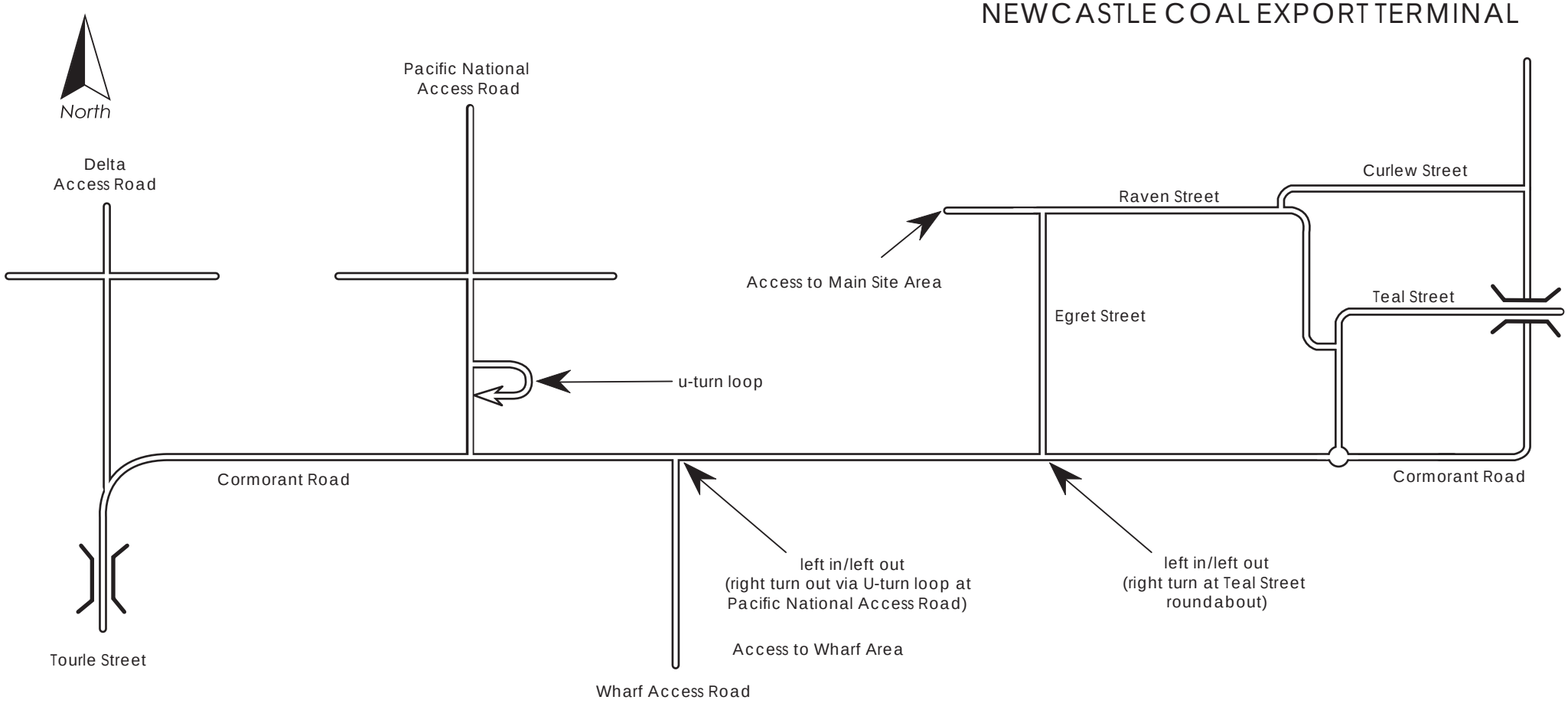
Figure 5

OPERATION PHASE TRAFFIC ROUTES

NEWCASTLE COAL EXPORT TERMINAL



MASSON | WILSON | TWINEY
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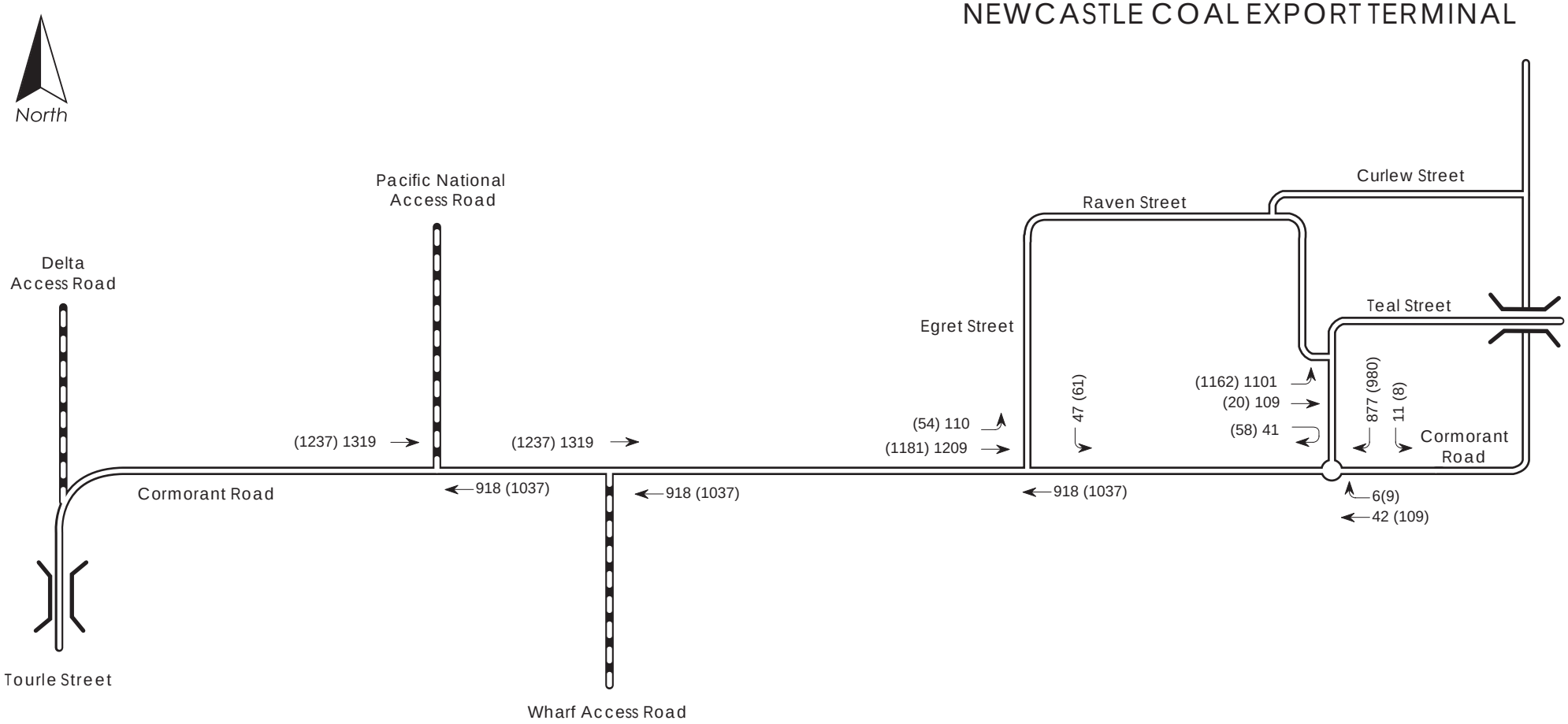
Figure 6

SCENARIO 1 - TRAFFIC FLOWS

NEWCASTLE COAL EXPORT TERMINAL



Note

Traffic flows are passenger car units (PCU).

One truck is considered to represent 2 PCU

Key

5: AM Assessment Period (6:30 - 7:30am)

(5): PM Assessment Period (5:00 - 6:00pm)

MASSON | WILSON | TWINEY

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Figure 7

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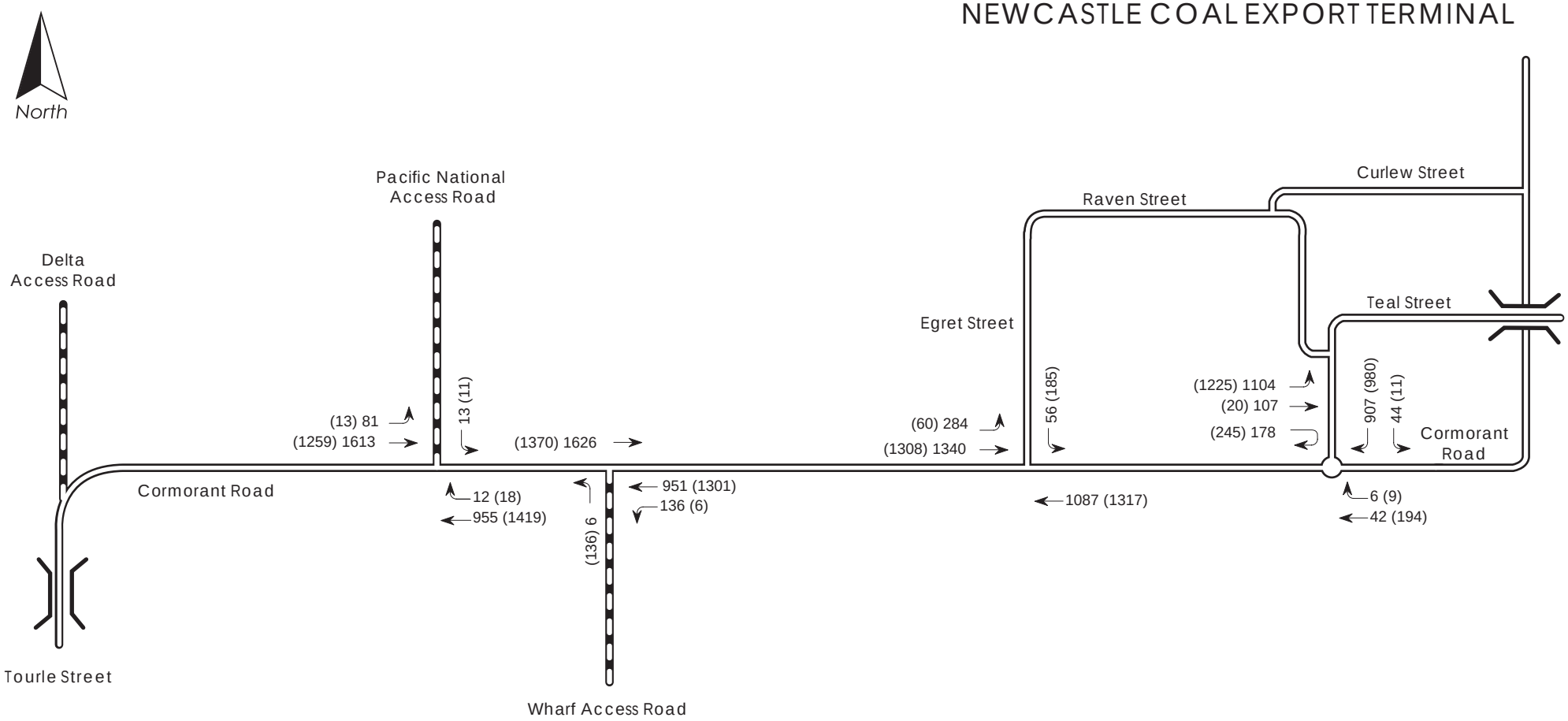
SCENARIO 2-TRAFFIC FLOWS

NEWCASTLE COAL EXPORT TERMINAL



Note

Traffic flows are passenger car units (PCU).

One truck is considered to represent 2 PCU

Key

5: AM Assessment Period (6:30 - 7:30am)

(5): PM Assessment Period (5:00 - 6:00pm)

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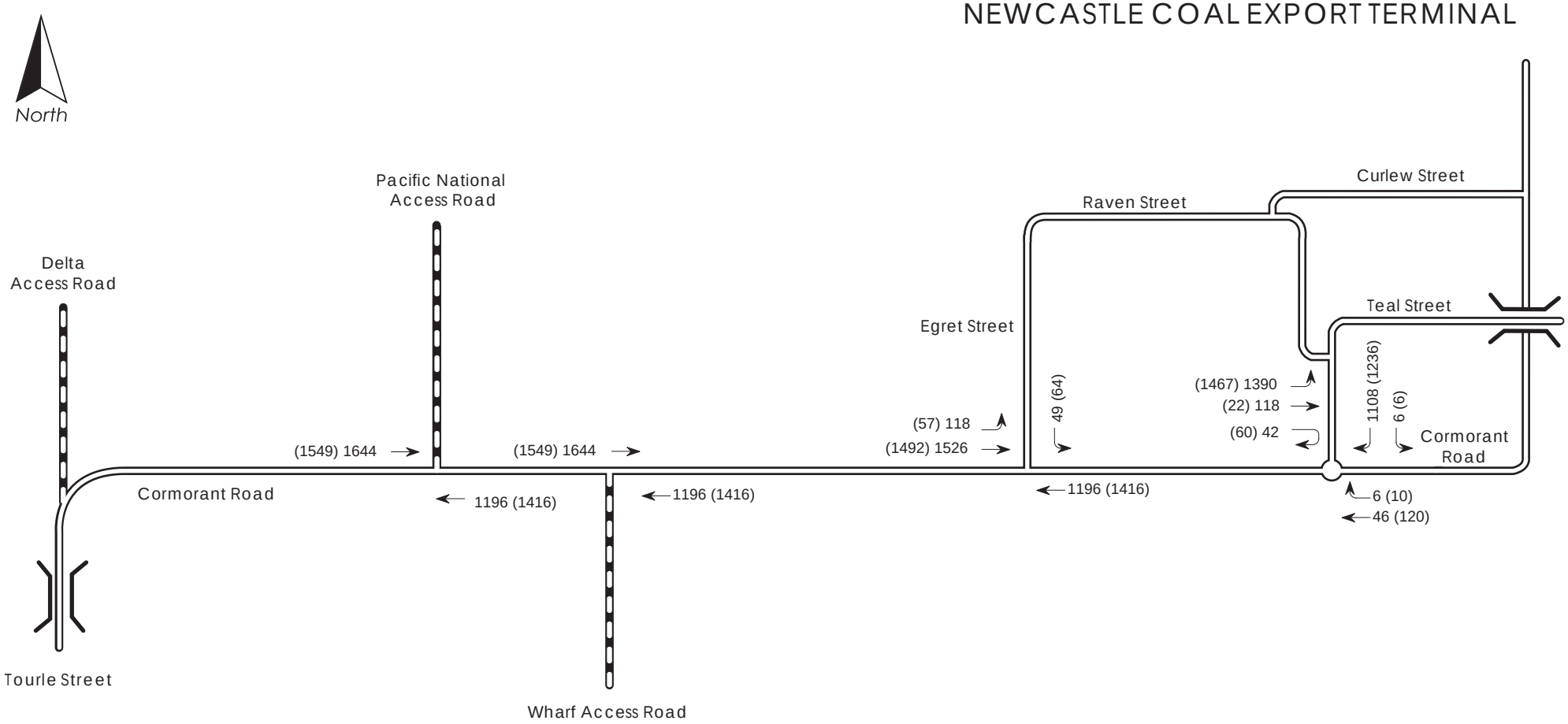
Figure 8

SCENARIO 3-TRAFFIC FLOWS

NEWCASTLE COAL EXPORT TERMINAL



Note

Traffic flows are passenger car units (PCU).

One truck is considered to represent 2 PCU

Key

5: AM Assessment Period (6:30 - 7:30am)

(5): PM Assessment Period (5:00 - 6:00pm)

MASSON | WILSON | TWINEY
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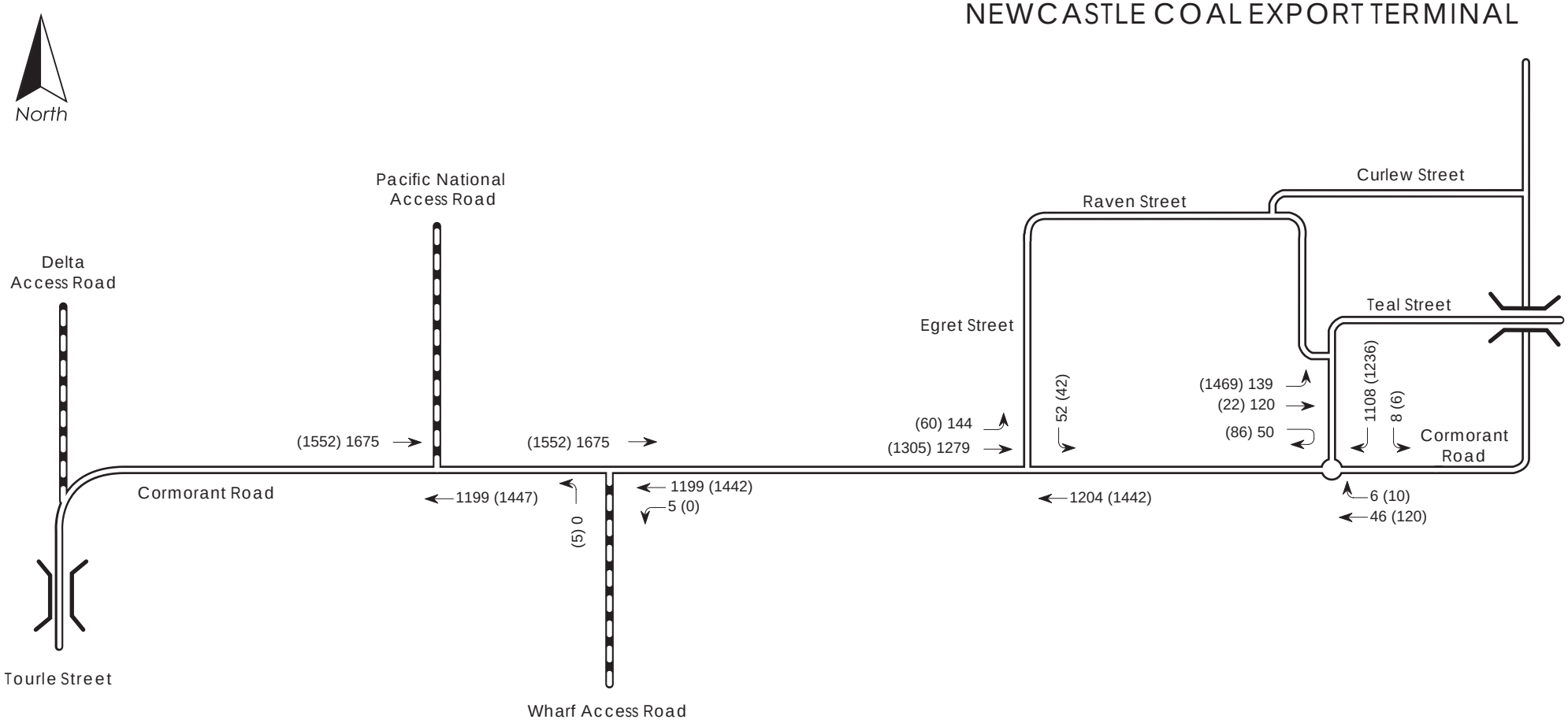
Figure 9

SCENARIO 4-TRAFFIC FLOWS

NEWCASTLE COAL EXPORT TERMINAL



Note

Traffic flows are passenger car units (PCU).

One truck is considered to represent 2 PCU

Key

5: AM Assessment Period (6:30 - 7:30am)

(5): PM Assessment Period (5:00 - 6:00pm)

MASSON | WILSON | TWINEY
TRAFFIC AND TRANSPORT CONSULTANTS

Figure 10