TRAFFIC IMPACT ASSESSMENT

MANDALONG MINE
MANDALONG TRANSMISSION LINE TL24 RELOCATION PROJECT

PREPARED FOR: CENTENNIAL MANDALONG PTY LTD

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TRAFFIC IMPACT ASSESSMENT
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CENTENNIAL MANDALONG PTY LTD

Intersect Traffic Pty Ltd (ABN: 43 112 606 952)

Address:
Shop 7 Metford Shopping Village
Cnr Chelmsford Drive and Tennyson Street
Metford NSW 2323
PO Box 268
East Maitland NSW 2323

Contact:
(ph) 02 4936 6200
(mob) 0423 324 188
email: jeff@intersecttraffic.com.au

QUALITY ASSURANCE

This document has been prepared, checked and released in accordance with the Quality Control Standards established by Intersect Traffic Pty Ltd.

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Date 11th January 2016

EXECUTIVE SUMMARY

Intersect Traffic Pty Ltd (Intersect) has been engaged by Centennial Mandalong Pty Ltd (Centennial Mandalong) to undertake a traffic impact assessment for the relocation of transmission line TL24 in the vicinity of Mandalong Road and Chapman's Road, Mandalong with the Project known as the Mandalong Transmission Line TL24 Relocation Project (the Project).

The Mandalong Southern Extension Project proposes to extend Mandalong Mine's existing underground mining operations into the area covered by EL 6317 in order to access, develop and extract the additional coal reserves identified within the West Wallarah Seam and Wallarah-Great Northern Seam. In developing this project it has been determined TransGrid's 330 kV electricity line within EL 6317 represents a significant constraint to the mine layout for which approval under the Mandalong Southern Extension Project (SSD-5144) has been obtained. Therefore this Project proposes to remove 12 existing steel lattice towers and establish 8 new steel lattice towers to the east of the existing transmission line alignment.

The traffic impacts of the proposal will be from the additional construction traffic associated with the construction and wiring of the new towers as well as the demolition of the redundant section of TL24. As it is likely this work will be carried out at the same time as the construction of the new Mandalong South Surface Site the cumulative impacts of construction traffic for both projects were considered in this assessment.

This report has assessed the impact this proposal and the cumulative impact of the Mandalong Southern Extension Project (SSD-5144) will have on the local road network in regard to network efficiency and safety and found the following;

- The local road network likely to be impacted on by the proposal is Mandalong Road between the M1 Pacific Motorway and 700 metres south of Chapman Road.
- The current road network around the site is typically two lane two way rural roads with a likely desirable road network capacity of up to 870 vtph (LoS C or better).
- Traffic data collected on the local road network indicates that Mandalong Road has spare midblock capacity to cater for additional traffic from the Project as well as the Mandalong Southern Extension Project.

- The peak traffic generation periods associated with the Project will occur in the AM and PM peak hour periods associated with construction employees commencing and finishing work at would be expected to be in the order of 30 vtph.
- As this Project is likely to run concurrently with the construction of the Mandalong South Surface Site which also forms part of the Mandalong Southern Extension Project the construction traffic associated with the Mandalong South Surface Site construction also needs to be considered.
- The cumulative traffic generation from this Project and the Mandalong South Surface Site construction would be of the order of up to a maximum of 79 vtph of which it would be expected that 15 % to 20 % would be heavy vehicle traffic.
- The increase in traffic on the local road network as a result of the Project and the Mandalong South Surface Site construction will not cause the midblock capacity of the local road network to be reached therefore the Project will not adversely impact on the local road network.
- By observation it is considered that Mandalong Road from the M1 Pacific Motorway to the access to the new Mandalong South Surface Site south of Chapman Road is of a standard suitable for existing and future traffic generated by the Project.
- Whilst the actual traffic volumes generated by the construction activities are unlikely to impact on the road network efficiency, the large number of heavy vehicle movements may impact on the condition of the road pavement. It would be recommended that Centennial Mandalong in consultation with Lake Macquarie City Council undertake a road dilapidation review/report prior to and on completion of construction activities to identify areas of road pavement deterioration requiring maintenance treatment that could be directly attributed to the construction activities. These areas would then need to be rehabilitated to Council's satisfaction by Centennial Mandalong.
- The proposed access location to the new Mandalong South Surface Site off Mandalong Road at Mandalong located approximately 700 metres south of Chapman Road, which will be utilised by construction traffic for this Project, is to be constructed as a BAR/CHL intersection which is considered appropriate given its likely use by heavy vehicles. A Construction Traffic Management Plan should be prepared for the Project and be included within the Environmental Management Plans for the proposal prior to commencement of construction.
- Suitable on-site car parking areas need to be provided for construction traffic within the Project Application Area and this should be identified within the Construction Traffic Management Plan. However given the large area covered by the Project Application Area it is reasonable to conclude that there is sufficient area within the construction zone to provide adequate and suitable on-site parking for construction traffic
- The site is currently not serviced by public transport. This Project will not generate any additional demand for public transport services therefore no additional public transport infrastructure and / or services is required as a result of the Project.
- As there will be little if any additional pedestrian / cyclist traffic generated by the Project no additional pedestrian or bicycle infrastructure is required as a result of the Project.

Having carried out this traffic impact assessment for the Mandalong Transmission Line TL24 Relocation Project it is recommended that the Project can be supported as it will not adversely impact on the local road network It is also recommended that a construction traffic management plan be prepared for the Project prior to commencement of construction to manage the short term impact these construction works will have on the local road network.

ABBREVIATIONS

AUL – Auxiliary Left Turn

BAR – Basic Right Turn

DCP – Development Control Plan

EL – Exploration Licence

Intersect Traffic – Intersect Traffic Pty Ltd.

LOS – Level of Service

MMSEP – Mandalong Mine – Southern Extension Project

Mtpa – Million tonnes per annum

RMS – NSW Roads and Maritime Services

ROM – Run of mine

SISD – Safe Intersection Sight Distance

vtpd – vehicle trips per day

vtph – vehicle trips per hour

REFERENCES

- RMS's RTA Guide to Traffic Generating Developments, Austroads Guide to Road Design (2010);
- Lake Macquarie City Council's Development Control Plan Number 1 Principles of Development (Part 2.6 Transport, Parking, Access and Servicing);
- AUSTROADS (2010) Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections
- Traffic Impact Assessment – Mandalong Mine Southern Extension Project – Intersect Traffic (2013).
- TransGrid's Principles for the Clearing of Transmission Line Easements (GD AS G3 015).
- TransGrids Maintenance of Easements Policy (GM AS L1 002)

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1. INTRODUCTION

Intersect Traffic Pty Ltd (Intersect) has been engaged by Centennial Mandalong Pty Ltd (Centennial Mandalong) to undertake a traffic impact assessment for the relocation of transmission line TL24 in the vicinity of Mandalong Road and Chapman's Road, Mandalong.

Centennial Mandalong have approval to extend Mandalong Mine's existing underground mining operations into the area covered by EL 6317 in order to access, develop and extract the additional coal reserves identified within the West Wallarah Seam and Wallarah-Great Northern Seam. In developing this project it has been determined TransGrid's 330 kV electricity line within EL 6317 represents a significant constraint to the mine layout for which approval under the Mandalong Southern Extension Project (SSD-5144) has been obtained. Therefore this Project proposes to remove 12 existing steel lattice towers and establish 8 new steel lattice towers to the east of the existing transmission line alignment.

This report has assessed the impact this proposal will have on the local road network in regard to network efficiency and safety and has been carried out with reference to the RMS's *RTA Guide to Traffic Generating Developments*, Austroads *Guide to Road Design (2010)* and Lake Macquarie City Council's *Development Control Plan Number 1 Principles of Development (Part 2.6 Transport, Parking, Access and Servicing), (DCP)* as well as utilising information provided by Centennial Mandalong.

Mandalong Road near new surface facilities site

2. SITE LOCATION

Mandalong Mine is an existing underground longwall coal mining operation located approximately 130 kilometres north of Sydney near Morisset, NSW. The Project Application Area of the Mandalong Transmission Line TL24 Relocation Project includes:

- The proposed new TL24 route encompassing a 60 metre wide easement;
- The existing TL24 infrastructure that will be required to be decommissioned;
- The general boundaries are Mandalong Road to the west, land owned by Centennial Coal to the south and east and Chapmans Road to the north;

Figure 1 below shows the Mandalong Transmission Line TL24 Relocation Project Application Area. ***Figure 2*** below shows the existing and proposed routes of the TL24. The Project Application Area has been designed to encompass all required laydown areas and access tracks to be utilised or upgraded during the construction period. The Project Application Area encloses a total area of approximately 540 hectares.

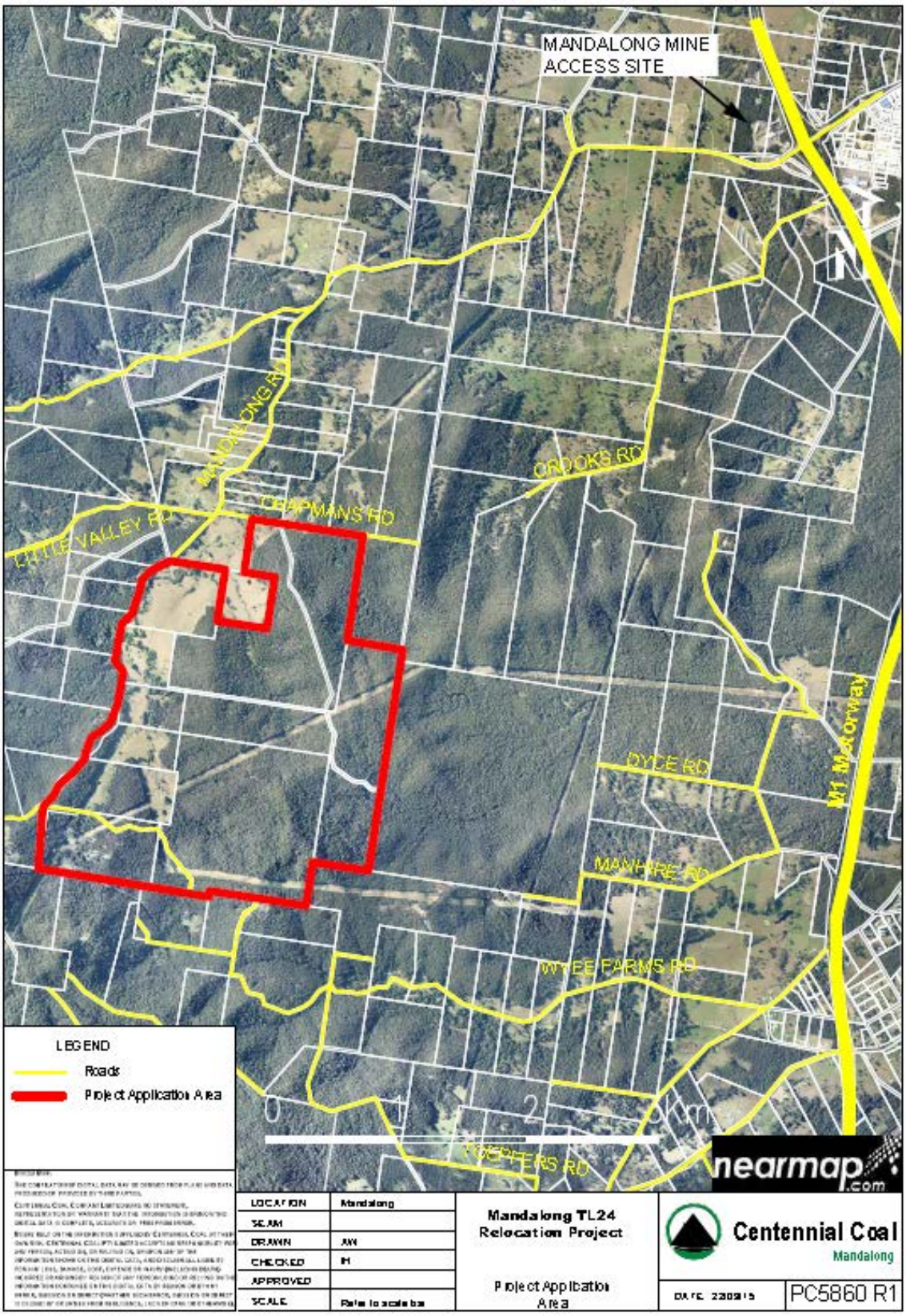


Figure 1 – Mandalong Transmission Line TL24 Relocation Project Application Area

3. DEVELOPMENT PROPOSAL

Centennial Mandalong is seeking to modify its existing development consent for the Mandalong Transmission Line TL24 Relocation Project. To achieve optimum coal extraction and limit subsidence effects on surface infrastructure, Mandalong Mine proposes to relocate a 2.4 kilometre section of TransGrid's 330kV Transmission Line (TL) 24. As part of this project, it is proposed to remove 12 existing steel lattice towers and establish eight new tension and suspension steel lattice towers.

TransGrid's 330kV electricity transmission line in EL6317 represents a significant constraint to the mine layout, approved under the Mandalong Southern Extension Project (SSD-5144). Suspension towers, which are those where the line passes through without changing direction, can withstand a certain amount of tilt and strain and can be protected from subsidence to a certain extent. Tension towers, where the line is fixed to the towers, are installed where there is a change of direction or a clearance issue and these towers have very low tolerance to tilt and strain due to the line being tightened or slackened and instability of the structure due to the change in line angle. Impact to TransGrid's infrastructure has been minimised by the mine layout, however it was not possible to avoid the lines altogether. As such, a feasibility study has been undertaken by TransGrid which has determined that the best option is to relocate a section of TL24 to avoid undermining of the tension towers.

Approximately 8.5 hectares of vegetation clearing is required for the new section of TL24 which includes a 60 metre wide easement entirely on freehold land owned by Centennial Mandalong Pty. Ltd. Following the establishment of the eight new towers and relocation of the transmission line, the redundant 12 towers will be decommissioned, dismantled and removed in consultation with key stakeholders. The location of the existing and proposed TL24 is illustrated in **Figure 2**. Upon completion of the line, the easement for the redundant section of TL24 will be relinquished and a new easement will be created over the new section of TL24.

The Project is summarised into the following key stages:

- Establishment of access tracks and clearing of required 60m wide easement;
- Construction of proposed tower foundations and establishment of towers for new section of TL24;
- Stringing and cutting in of lines on new section of TL24;
- Removal and remediation of redundant TL24 structures; and

All on-site construction activities will occur within the Project Application Area. Light and heavy vehicle access will be via Mandalong Rd. The majority of the heavy vehicles movements will be related to deliveries of:

- Plant and equipment (low loaders);
- Road base and ballast (truck and dog combination);
- Concrete for foundations (concrete agitators);
- Tower steel, wire and drainage products (flat-bed semi-trailers AV's); and
- Removal of old towers (flat-bed semi-trailers AV's).

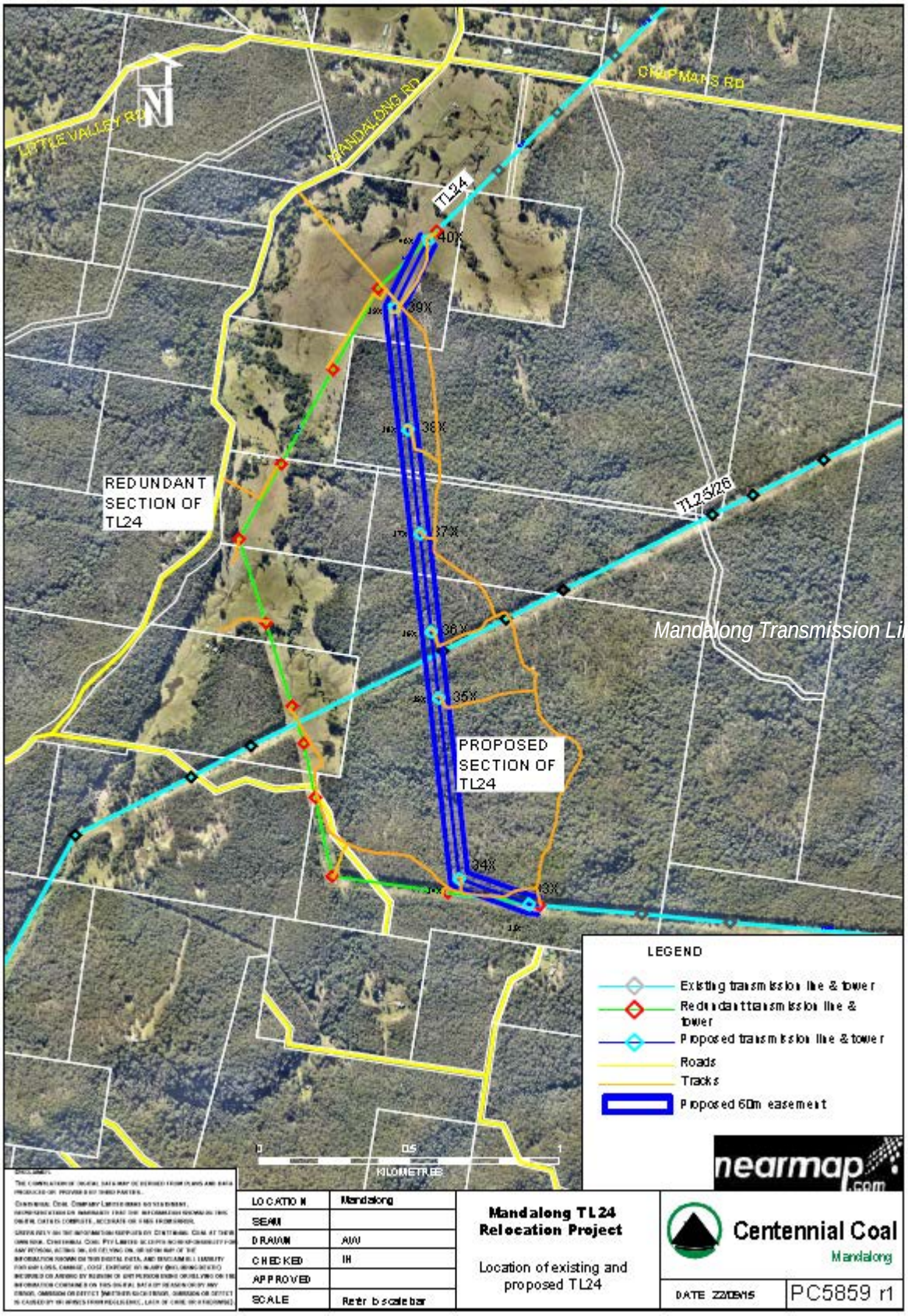


Figure 2 – Mandalong Transmission Line TL24 existing and proposed routes

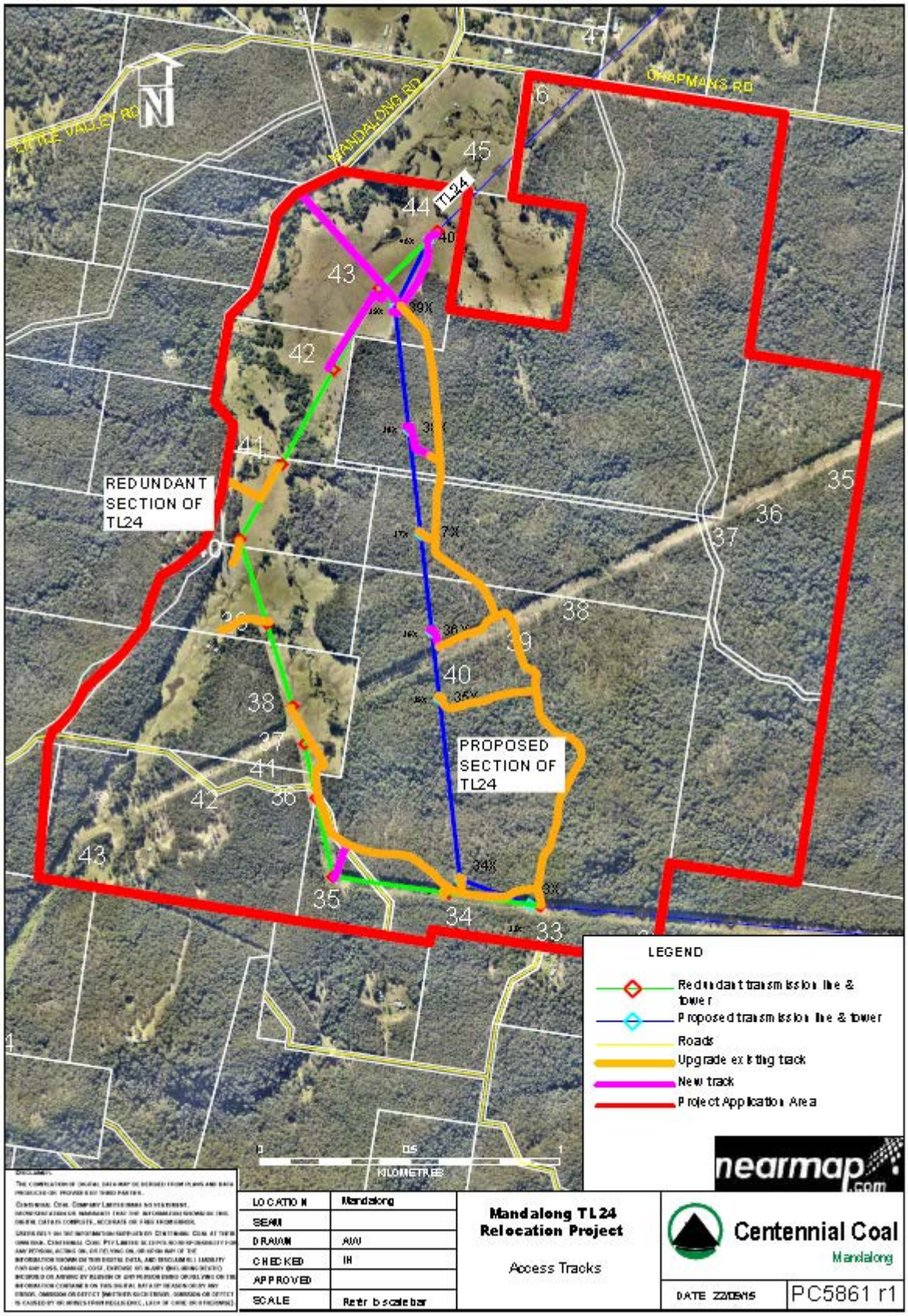


Figure 3 – Proposed Access Tracks

New surface facility- existing site access

4. EXISTING ROAD NETWORK

4.1 Mandalong Road

Mandalong Road is a two way two lane local rural road that connects the Mandalong area to Morisset and the M1 Pacific Motorway. As a local road it is under the care and control of Lake Macquarie City Council at least in the section of road impacted by this Project. The majority of the road is sealed however a short section of unsealed road (3.5 km) exists within the Project Application Area though it is south of the proposed access to the new Mandalong South Surface Site near Chapman Road and not expected to be used by any traffic generated by this development.

Under a functional road hierarchy this road performs the function of a minor collector road in that it collects traffic from a number of tributary local access roads and distributes traffic to the main arterial road network (M1 Pacific Motorway and MR 217 at Morisset).

Mandalong Road is speed zoned 80 km/h and at the time of inspection was considered to be in good to fair condition.

Photograph 1 – Mandalong Road

4.2 Chapman Road

Chapman Road is a two way two lane local unsealed rural road that provides access to a small number of properties. It has a narrow carriageway and a small timber bridge currently in a poor state of repair over a small creek. It is likely that construction traffic would use this road to access the existing transmission line TL24 infrastructure as well as the new route alignment.

Chapman Road would be suited only to slow speeds 50 km/h and at the time of inspection was considered to be in poor condition.

Photograph 2 – Chapman Road

5. TRAFFIC VOLUMES AND NETWORK CAPACITY

As part of a previous traffic assessment (2009) for exploration drilling in the Mandalong Southern Extension area Intersect Traffic sourced existing traffic data from the RMS and Lake Macquarie City Council but found this data was either non-existent or too old to be relevant to the study. Therefore Intersect Traffic collected some base traffic data via automatic tube counters and manual intersection counts as part of a 2009 assessment for exploration drilling in the area. This data is considered relevant to this study. To complement this data Intersect Traffic also undertook an additional automatic tube count on Mandalong Road near Chapman Road from Thursday 30th July 2015 to Wednesday 12th August 2015.

A summary of the traffic data collected and considered relevant to this study is provided in ***Table 1*** below. Relevant traffic data is also provided in ***Appendix 1***.

Table 1 – Existing Traffic Volume Data – Existing Traffic Volume Data

Road	Location	Source	Count Year	AADT (vtpd)	Peak Hour (vtph)
Mandalong Road	East of Deaves Road	Intersect	2009 (manual)		185
Mandalong Road	East of Deaves Road	Intersect	2012 (manual)		275
Mandalong Road	East of Mine entrance	Intersect	2012 (manual)		423
Mandalong Road	West of Mine entrance	Intersect	2012 (manual)		281
Mandalong Road	South of Deaves Road	Intersect	2009 (tube)	660	60
Mandalong Road	South of Deaves Road	Intersect	2009 (manual)		48
Mandalong Road	South of Deaves Road	Intersect	2012 (manual)		99
Mandalong Road	North of Chapman's Road	Intersect	2015 (tube)	318	45

The data extracted from the 2015 tube count near Chapman's Road indicates the peak road network period in the vicinity of the Project Application Area is the AM peak between 8 am and 9 am when a two way traffic volume of 45 vtph was recorded. The PM peak periods had similar traffic volumes with the peak period being recorded as between 5 pm and 6 pm at 44 vtph.

For assessment purposes a background traffic growth rate given existing and likely future development along the road network (except the subject mine extension) of 3 % per annum has been adopted which is considered typical for a developing area.

From a review of the aerial map it is noted that Chapmans Road currently provides access to approximately 2 – 3 dwellings therefore is only likely to have traffic volumes of the order of 3 vtph during peak periods and 30 vtpd.

The capacity of roads is generally governed by the capacity of intersections on the road however Table 4.5 of the RMS' *Guide to Traffic Generating Developments* gives some guidance on the mid block capacity and expected levels of service (LOS) on rural roads. This table is reproduced below. The RMS' *Guide to Traffic Generating Developments* also provides the following definitions for level of service A to F.

Level of Service A.

This, the top level is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.

Level of Service B.

This level is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is little less than that of the level of Service A.

Level of Service C.

This service level is also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.

Level of Service D.

This level is close to the limit of stable flow but is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.

Level of Service E.

This occurs when traffic volumes are at or close to capacity and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause a traffic-jam.

Level of Service F.

This service level is in the zone of forced flow. With it, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow break-down occurs and queuing and delays result

Table 4.5
peak hour flow on two-lane rural roads (veh/hr)
(Design speed of 100km/hr)

Terrain	Level of Service	Percent of Heavy Vehicles			
		0	5	10	15
Level	B	630	590	560	530
	C	1030	970	920	870
	D	1630	1550	1480	1410
	E	2630	2500	2390	2290
Rolling	B	500	420	360	310
	C	920	760	650	570
	D	1370	1140	970	700
	E	2420	2000	1720	1510
Mountainous	B	340	230	180	150
	C	600	410	320	260
	D	1050	680	500	400
	E	2160	1400	1040	820

The data for Table 4.5 assumes the following criteria:

- *terrain level* with 20% no overtaking.
- *rolling* with 40% no overtaking.
- *mountainous* with 60% no overtaking.
- 3.7 m traffic lane width with side clearances of at least 2m.
- 60/40 directional split of traffic.

It is noted that the table provides for speed limits of 100 km/h but does indicate that capacity volumes for a design speed of 80 km/hr represent between 85 % and 95 % of the figures quoted. Assuming an 80 km/h design speed, 10 % heavy vehicles (determined from 2015 tube counts) and rolling terrain the likely LOS thresholds on the rural road network being assessed would be as shown in ***Table 2*** below.

Table 2 – Likely Level of Service thresholds – local road network (90% of 100km/hr thresholds) thresholds)

Level of Service	Traffic volume (vtph)
B	320 - 579
C	580 - 869
D	870 - 1539
E	1540

Therefore given current traffic volumes it can be seen that the local road network currently operates with the following Levels of Service.

Table 3 – Current Levels of Service – local road network

Road	Level of Service
Mandalong Road – east of Mandalong Mine entrance	B
Mandalong Road – west of Mandalong Mine entrance	A
Mandalong Road south of Deaves Road	A
Mandalong Road north of Chapman's Road	A
Chapman's Road	A

If it is assumed that a desirable level of service C or better on the local rural road network during the weekday peak is considered satisfactory as recommended in the RMS' *RTA Guide to Traffic Generating Developments* then this data indicates that the local road network has spare capacity to cater for additional traffic generated by this project. It is noted that a desirable LOS C or better is achieved if traffic volumes remain less than 870 vtph.

6. TRAFFIC GENERATION AND DISTRIBUTION

This Project will not generate any change to the full time employment numbers to be approved under SSD-5144 therefore the traffic impacts generated by the Project will only relate to construction traffic. It is envisaged that the Mandalong Transmission Line TL24 Relocation Project will require up to 25 temporary construction personnel throughout the construction period which is expected to be completed by early 2018.

Further Centennial Mandalong have advised that the following plant is likely to be used during each phase of the Project;

Possession of site

- Backhoes;
- Bobcats;
- Bulldozers;
- Scrapers;
- Forklifts;
- Franna cranes;
- Generators;
- Light vehicles (4WDs).

Clearing and Access tracks

- chainsaws / brush cutters;
- Backhoes;
- Bobcats;
- Dump trucks;
- Bulldozers;
- Scrapers;
- Light vehicles (4WDs).

Foundations

- Bulldozers;
- Franna cranes;
- Drilling rigs / Soilmecs;
- Compaction plates / whacker packers;
- Cranes (80 – 100 tonnes);
- Transport / delivery trucks (including semi-trailers, flatbeds, in-transit concrete mixers etc.);
- Light vehicles (4WDs).

Tower erection / assembly

- • Transport / delivery trucks (including semi-trailers, water tankers, flatbeds, in-transit concrete mixers etc.);
- • Generators;
- • Air compressors / hand tools, rattle guns etc.;
- • Franna cranes;
- • Elevated work platforms (up to 75m reach);
- • Light vehicles (4WDs).

Stringing works

- • Elevated work platforms (up to 75m reach);
- • Brake and winch machinery for stringing purposes;
- • Possible helicopter use for the laying out of the draw wire;
- • Light vehicles (4WDs).

Cut in works

- • Elevated work platforms (up to 75m reach);
- • Brake and winch machinery for stringing purposes;
- • Possible helicopter;
- • Cranes (80 – 100 tonnes);
- • Light vehicles (4WDs).

Demolition

- • Excavators;
- • Franna cranes;
- • Cranes (80 – 100 tonnes);
- • Generators;
- • Air compressors / hand tools, grinders, rattle guns etc.;
- • Brake and winch machinery for de-stringing purposes;
- • Transport trucks (including semi-trailers and/or flatbeds to remove steel and line equipment from site);
- • Light vehicles (4WDs).

If it is assumed each construction employee drives their own car to the work site each day and an allowance is made for material delivery and a plant floating within the AM and PM peak hour periods associated with construction employees commencing and finishing work it is reasonable to conclude that the peak hour traffic generation for the proposed construction works would be in the order of 30 vtph of which up to 15% to 20% would be heavy vehicle traffic.

It is also reasonable to conclude that all construction traffic would access the site via Mandalong Road from the M1 Pacific Motorway. Note: A requirement for this Project should be that Chapman Road not be used for access to the Project Application Area as the road is unsuitable for increased traffic usage and in particular heavy vehicle traffic. Full access from Mandalong Road is possible and should be used by all construction traffic.

As this Project is likely to run concurrently with the construction of the Mandalong South Surface Site which forms part of the Mandalong Southern Extension Project the construction traffic associated with the Mandalong South Surface Site construction also needs to be considered. Within Intersect Traffic's Traffic Impact Assessment (2013) for the Mandalong Southern Extension Project it was identified that the likely construction traffic associated with the Mandalong South Surface Site construction would be in the order of up to 79 vehicle trips per hour during the AM and PM peak hours. Again the majority of this traffic would access the Project Application Area via Mandalong Road from the M1 Pacific Motorway. Therefore the cumulative traffic generation from this Project and the Mandalong South Surface Site construction was calculated to be of the order of up to a maximum of 109 vtph of which it would be expected that 15 % to 20 % would be heavy vehicle traffic.

Since 2013 Centennial Mandalong have progressed with planning and design of the proposed construction of the Mandalong South Surface Site and associated Access Rd and better understand the traffic associated with each stage of construction. It has been determined that with both projects happening concurrently, it will be possible to limit the peak construction traffic to **79 vtph** by scheduling work such that certain stages of each Project are not occurring concurrently. For example activities such as concrete pouring and ballast delivery which both involve significant heavy vehicles can be scheduled for different days.

Construction traffic only has a short term impact on the road network and in most cases can be easily managed through the provision of Construction Traffic Management Plans which would form part of the overall Construction Environmental Management Plan. Construction traffic management plans detail the strategies that are to be adopted to minimise the impacts of the construction works on the local road network and ensure suitable safe conditions occur during the construction period.

They can include such measures as;

1. Temporary signage and line marking;
2. Designated access routes;
3. Regulated construction and delivery times and periods;
4. Provision of suitably qualified traffic marshals;
5. Dust and noise mitigation measures;
6. Temporary works e.g. shoulder sealing, construction accesses etc.

It would be expected that any approval of this Project would include a requirement to prepare and submit a suitable Construction Traffic Management Plan prior to commencement of construction works. A concept Construction Traffic Management Plan has been provided in ***Appendix 2***.

7. TRAFFIC AND TRANSPORT IMPACTS

7.1 Road Network

The traffic counts carried out by Intersect Traffic (2012) indicate that existing maximum peak hour traffic volumes on Mandalong Road are in the order of 420 vtph (see ***Section 5***) between the Mandalong Mine surface site entrance and the M1 Pacific Motorway. This assessment has also determined that the likely additional peak hour traffic volumes generated by this Project and the construction of the Mandalong South Surface Site on this section of Mandalong Road is 79 vtph.

There are also no other major developments known to be proposed that would result in higher than normal background traffic growth on this section of Mandalong Road. Therefore the resultant traffic volumes on Mandalong Road near the Mandalong Mine Access Site entrance, during this Project will be in the order of 500 vtph and in the order of 570 vtph in 2017 (completion of the Project) if a background traffic growth rate of 3 % per annum is adopted. Therefore based on the data provided in ***Table 2*** (***Section 5***) a LoS C is still likely to be experienced by motorists. This is considered satisfactory for operational efficiency of a rural collector road.

Peak traffic volumes on Mandalong Road near the construction site near Chapman's Road have been determined as 45 vtph (Intersect Traffic 2015). With the addition of 79 vtph associated with this Project and the construction of the Mandalong South Surface Site and assuming a background traffic growth of 3 % per annum the likely peak hour traffic volumes would be in the order of 127 vtph in 2017. Based on the data provided in ***Table 2*** (***Section 5***) a LoS A is still likely to be experienced by motorists. This is considered satisfactory for operational efficiency of a rural collector road.

Overall it is concluded that Mandalong Road has sufficient spare mid-block capacity to cater for the additional construction traffic generated by this Project.

Whilst the actual traffic volumes generated by the construction activities are unlikely to impact on the road network efficiency, the large number of heavy vehicle movements may impact on the condition of the road pavement. The increased heavy vehicle traffic will result in accelerated pavement deterioration with particular impact on the lower standard roads such as Mandalong Road south of the Mandalong Mine Access Site. It would be recommended that Centennial Mandalong in consultation with Lake Macquarie City Council undertake a road dilapidation review/report prior to and on completion of construction activities to identify areas of road pavement deterioration requiring maintenance treatment that could be directly attributed to the construction activities. These areas would then need to be rehabilitated to Council's satisfaction by Centennial Mandalong.

7.2 Road Safety

The road network impacted on by this Project is from observation considered to be suitable to carry the increase in traffic volumes resulting from the Project.

Mandalong Road between the existing Mandalong Mine Access Site entrance and the M1 Pacific Motorway is constructed to a high standard and no upgrading is required.

Construction and maintenance traffic will also utilise Mandalong Road south west of the Mandalong Mine Access Site entrance to the south of Chapman Road. Again by observation this section of Mandalong Road being at least 6 to 7 metres wide and sealed is considered suitable for future traffic volumes on the road i.e. less than 600 vtph.

The proposed new Mandalong South Surface Site access will be located directly off Mandalong Road approximately 700 metres south of Chapman Road. An existing access gate is currently located at this location (see ***Photograph 5***). Centennial Mandalong propose to construct this as an at-grade BAR/CHL intersection providing a left turn turning lane into the site. A right turn lane is not considered necessary at this location as nearly all traffic generated by the new surface site facility will have its origin / destination from the existing Mandalong Mine Access Site to the north. Whilst operational traffic volumes probably do not warrant such a high standard access the likely use of the access by heavy

vehicles during construction of infrastructure would justify the construction of this standard of access. This access would be suitable for use by construction traffic associated with this Project as well as the construction of the Mandalong South Surface Site. It should be identified as the only site access for the Project within the Construction Traffic Management Plan.

The access would need to be constructed in accordance with Austroads (2009) *Guide to Road Design Part 4A – Design of Unsignalised and Signalised Intersections.* As previously stated Table 3.2 of this Guide states the SISD for an 80 km/h design speed is 180 metres desirable and 175 metres absolute minimum.

By observation the proposed access location off Mandalong Road is located at the crest of a slight rise and provides in excess of 250 metres sight distance to the north but only about 110 metres to the south (see ***Photographs 3 and 4***). This will be managed by the clearing of trees along the road to the south to achieve the required sight distances. Advanced warning signage on Mandalong Road during construction works would also be recommended and should be included within the Construction Traffic Management Plan.

Given that construction and maintenance traffic is likely to include some heavy vehicle traffic, the new access should be designed to cater for the appropriate turning templates for articulated vehicles. This may require localised widening of the access road at Mandalong Road.

7.3 On-site Car Parking

Suitable on-site car parking areas need to be provided for construction traffic within the Project Application Area and this should be identified within the Construction Traffic Management Plan.

However for this assessment given the large area covered by the Project Application Area it is reasonable to conclude that there is sufficient area within the construction zone to provide adequate and suitable on-site parking for construction traffic. The Project will not result in any on-road parking on Mandalong Road therefore will not impact on the safety and efficiency of the public road network.

Photograph 3 – Site distance at proposed access to new Mandalong South Surface Site – looking south.

Photograph 4 – Site distance at proposed access to new Mandalong South Surface Site – looking north.

Photograph 5 – Existing conditions at proposed access to Mandalong South Surface Site.

Mandalong Transmission Line TL24

8. ALTERNATE TRANSPORT MODES

The site is currently not serviced by public transport. This Project will not generate any additional demand for public transport services therefore no additional public transport infrastructure and / or services is required as a result of the Project.

By observation there are no on or off road pedestrian and cycle way facilities in the vicinity of the site. Therefore pedestrians and cyclists accessing the site would need to share the travel lanes or use the grass shoulders / verge on Mandalong Road. As there will be little if any additional pedestrian / cyclist traffic generated by the Project no additional pedestrian or bicycle infrastructure is required as a result of the Project.

9. CONCLUSIONS

This traffic assessment of the Mandalong Transmission Line TL24 Relocation Project has determined the following;

- The local road network likely to be impacted on by the proposal is Mandalong Road between the M1 Pacific Motorway and 700 metres south of Chapman Road.
- The current road network around the site is typically two lane two way rural roads with a likely desirable road network capacity of up to 870 vtph (LoS C or better).
- Traffic data collected on the local road network indicates that Mandalong Road has spare midblock capacity to cater for additional traffic from the Project as well as the Mandalong Southern Extension Project.
- The peak traffic generation periods associated with the Project will occur in the AM and PM peak hour periods associated with construction employees commencing and finishing work at would be expected to be in the order of 30 vtph.
- As this Project is likely to run concurrently with the construction of the Mandalong South Surface Site which also forms part of the Mandalong Southern Extension Project the construction traffic associated with the Mandalong South Surface Site construction also needs to be considered.
- The cumulative traffic generation from this Project and the Mandalong South Surface Site construction would be of the order of up to a maximum of 79 vtph of which it would be expected that 15 % to 20 % would be heavy vehicle traffic.
- The increase in traffic on the local road network as a result of the Project and the Mandalong South Surface Site construction will not cause the midblock capacity of the local road network to be reached therefore the Project will not adversely impact on the local road network.
- By observation it is considered that Mandalong Road from the M1 Pacific Motorway to the access to the new Mandalong South Surface Site south of Chapman Road is of a standard suitable for existing and future traffic generated by the Project.
- Whilst the actual traffic volumes generated by the construction activities are unlikely to impact on the road network efficiency, the large number of heavy vehicle movements may impact on the condition of the road pavement. It would be recommended that Centennial Mandalong in consultation with Lake Macquarie City Council undertake a road dilapidation review/report prior to and on completion of construction activities to identify areas of road pavement deterioration requiring maintenance treatment that could be directly attributed to the construction activities. These areas would then need to be rehabilitated to Council's satisfaction by Centennial Mandalong.
- The proposed access location to the new Mandalong South Surface Site off Mandalong Road at Mandalong located approximately 700 metres south of Chapman Road, which will be utilised by construction traffic for this Project, is to be constructed as a BAR/CHL intersection which is considered appropriate given its likely use by heavy vehicles. A Construction Traffic Management Plan should be prepared for the Project and be included within the Environmental Management Plans for the proposal prior to commencement of construction.
- Suitable on-site car parking areas need to be provided for construction traffic within the Project Application Area and this should be identified within the Construction Traffic Management Plan. However given the large area covered by the Project Application Area it is reasonable to conclude that there is sufficient area within the construction zone to provide adequate and suitable on-site parking for construction traffic
- The site is currently not serviced by public transport. This Project will not generate any additional demand for public transport services therefore no additional public transport infrastructure and / or services is required as a result of the Project.
- As there will be little if any additional pedestrian / cyclist traffic generated by the Project no additional pedestrian or bicycle infrastructure is required as a result of the Project.

10. RECOMMENDATIONS

Having carried out this traffic impact assessment for the Mandalong Transmission Line TL24 Relocation Project it is recommended that the Project can be supported as it will not adversely impact on the local road network.

It is recommended however that a Construction Traffic Management Plan be prepared for the construction work to manage the short term impact these construction works will have on the local road network.

JR Garry BE (Civil), Masters of Traffic
Director
Intersect Traffic Pty Ltd

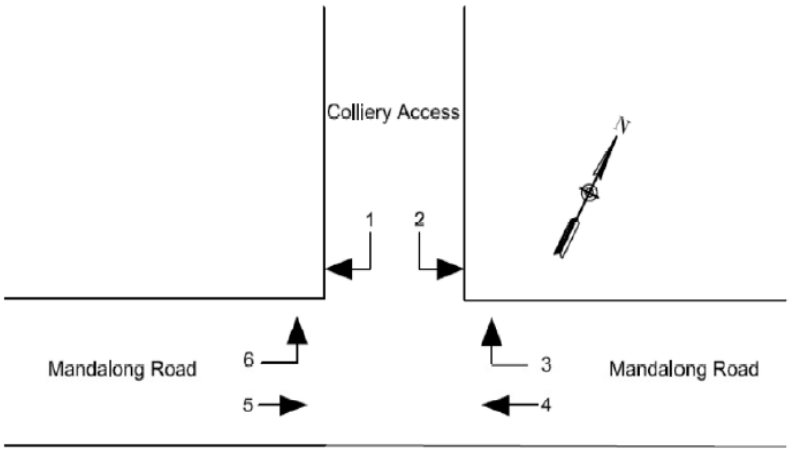
Mandalong Road

APPENDIX 1
TRAFFIC COUNT DATA

Date	6th February 2012
Day	Monday
Time	3 pm to 6 pm
Weather	Overcast
Conducted by:	Brad

MOVEMENT	1	2	3	4	5	6	HOURLY VOLUMES	Access Peaks
3:00 - 3.15	0	10	17	16	16	3		
3.15 - 3.30	1	9	29	22	13	3		
3.30 -3.45	0	9	31	37	22	5		
3.45 - 4.00	0	11	26	40	18	2	340	156
4.00 - 4.15	4	20	16	48	44	2	412	168
4.15 - 4.30	7	39	10	25	27	0	443	182
4.30 - 4.45	4	37	9	20	26	1	436	188
4.45 - 5.00	1	25	5	25	32	1	428	181
5.00 - 5.15	0	20	7	23	20	1	365	167
5.15 - 5.30	0	10	9	29	20	0	325	130
5.30 - 5.45	1	8	5	17	21	1	281	94
5.45 - 6.00	0	4	5	17	23	0	241	71
	18	202	169	319	282	19		

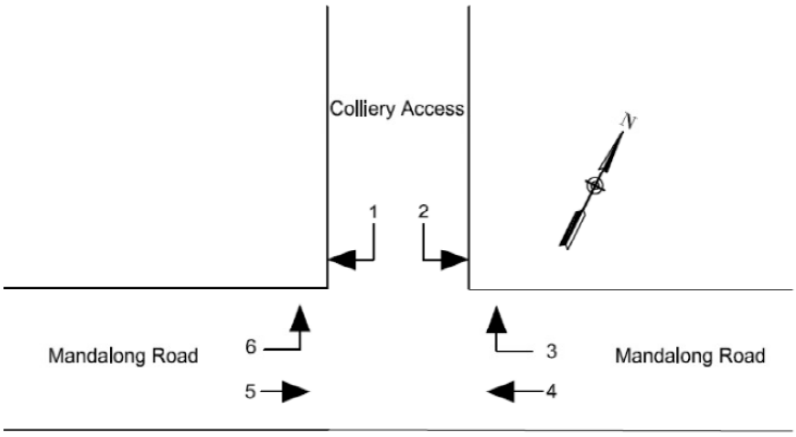
PEAK	11	79	83	150	111	9
Access peak	15	107	61	133	115	5



Road Section	PHT (vph)
Mandalong Road east	423
Mandalong Road west	281
Mine access	188

Date	6th February 2012
Day	Monday
Time	6 am to 9 am
Weather	Overcast
Conducted by:	Brad

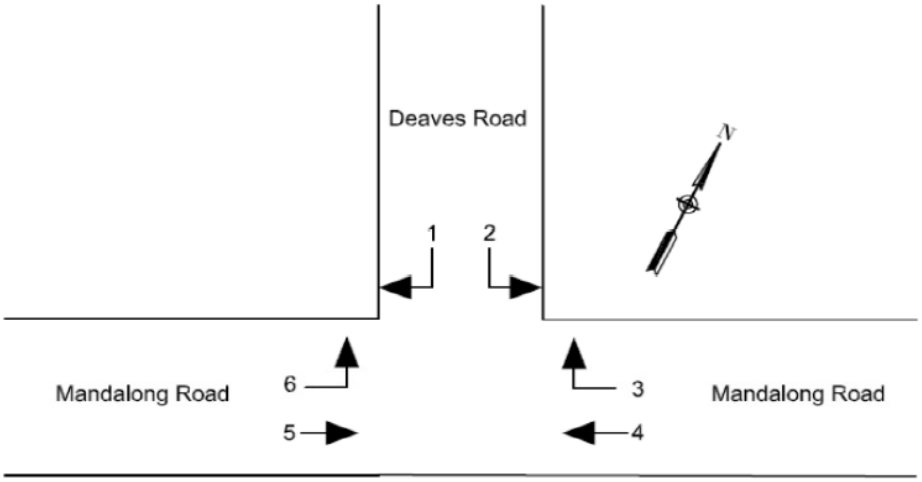
MOVEMENT	1	2	3	4	5	6	HOURLY VOLUMES	Access peak
6.00 - 6.15	2	25	18	11	12	1		
6.15 - 6.30	0	9	43	12	14	3		
6.30 - 6.45	0	4	52	10	25	5		
6.45 - 7.00	0	1	18	13	22	3	303	184
7.00 - 7.15	0	1	8	11	19	0	273	147
7.15 - 7.30	0	21	3	10	26	2	254	118
7.30 - 7.45	0	27	3	13	26	1	228	88
7.45 - 8.00	2	14	1	17	27	0	232	83
8.00 - 8.15	3	11	1	15	29	0	252	89
8.15 - 8.30	1	8	2	17	31	1	250	75
8.30 - 8.45	1	5	0	12	22	0	220	50
8.45 - 9.00	2	3	1	10	25	1	201	40
	11	129	150	151	278	17		
PEAK	2	39	131	46	73	12		



Road Section	PHT (vph)
Mandalong Road east	289
Mandalong Road west	133
Mine access	184

Date	6th February 2012
Day	Monday
Time	3 pm to 6 pm
Weather	Overcast
Conducted by:	Nic

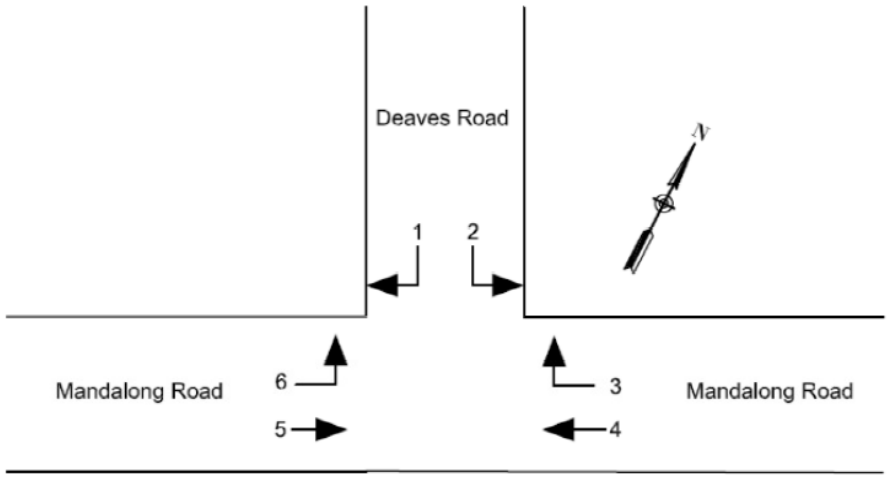
MOVEMENT	1	2	3	4	5	6	HOURLY VOLUMES
3:00 - 3.15	1	13	12	7	6	0	
3.15 - 3.30	1	11	15	9	6	0	
3.30 - 3.45	0	22	21	15	7	2	
3.45 - 4.00	2	15	25	18	5	1	214
4.00 - 4.15	1	32	29	21	14	1	273
4.15 - 4.30	0	17	22	1	11	0	282
4.30 - 4.45	0	20	18	5	9	0	267
4.45 - 5.00	3	26	17	9	7	0	263
5.00 - 5.15	3	14	13	12	7	1	215
5.15 - 5.30	2	17	15	17	5	0	220
5.30 - 5.45	1	18	12	8	5	0	212
5.45 - 6.00	0	25	11	10	3	0	199
	14	230	210	132	85	5	
PEAK	3	86	97	55	37	4	



Road Section	PHT (vph)
Mandalong Road east	275
Mandalong Road west	99
Deaves Road	190

Date	6th February 2012
Day	Monday
Time	6 am to 9 am
Weather	Overcast
Conducted by:	Nic

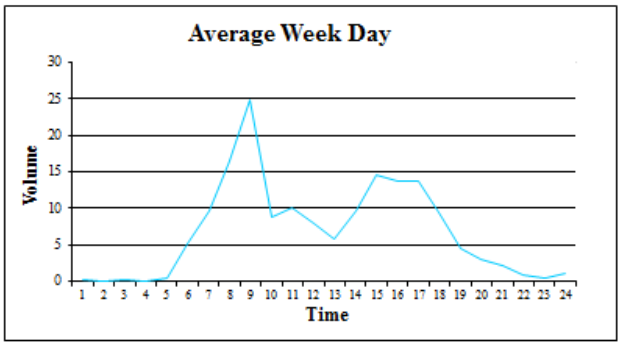
MOVEMENT	1	2	3	4	5	6	HOURLY VOLUMES
6.00 - 6.15	0	10	2	1	5	0	
6.15 - 6.30	0	10	4	0	9	0	
6.30 - 6.45	1	21	8	1	6	1	
6.45 - 7.00	1	15	10	4	7	0	116
7.00 - 7.15	0	16	3	3	3	0	123
7.15 - 7.30	1	22	4	6	5	1	139
7.30 - 7.45	1	15	9	5	10	5	146
7.45 - 8.00	1	20	8	6	9	1	154
8.00 - 8.15	0	22	11	8	7	1	178
8.15 - 8.30	1	25	17	10	8	1	201
8.30 - 8.45	1	14	15	8	10	0	204
8.45 - 9.00	1	18	10	9	9	1	207
	8	208	101	61	88	11	
PEAK	3	79	53	35	34	3	



Road Section	PHT (vph)
Mandalong Road east	201
Mandalong Road west	75
Deaves Road	138

MANDALONG RD 100M EAST OF CHAPMAN RD **Eastbound**

Day	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*Tue*	*Wed*	*W/Day*	*W/End*	*7 Day*
Time	30/07/2015	31/07/2015	1/08/2015	2/08/2015	3/08/2015	4/08/2015	5/08/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	0	0	0	0	0	1	0	0	0
1:00	0	0	0	1	0	0	0	0	1	0
2:00	0	0	0	0	1	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0
4:00	0	1	1	0	1	0	0	0	1	0
5:00	5	5	1	0	4	6	6	5	1	4
6:00	13	10	1	2	9	9	7	10	2	7
7:00	20	18	5	3	12	13	20	17	4	13
8:00	21	29	20	8	24	27	23	25	14	22
9:00	6	10	14	13	8	11	9	9	14	10
10:00	11	5	18	16	17	4	14	10	17	12
11:00	10	6	13	14	9	9	6	8	14	10
12:00	6	10	5	17	5	4	4	6	11	7
13:00	10	10	13	9	6	12	10	10	11	10
14:00	13	11	12	8	22	14	13	15	10	13
15:00	14	12	7	13	13	16	14	14	10	13
16:00	16	16	12	12	11	16	10	14	12	13
17:00	7	10	16	6	14	4	12	9	11	10
18:00	1	14	10	7	2	3	3	5	9	6
19:00	4	4	2	3	1	3	3	3	3	3
20:00	3	6	2	0	0	1	1	2	1	2
21:00	0	2	0	3	2	0	0	1	2	1
22:00	0	0	1	0	0	1	1	0	1	0
23:00	0	3	0	0	1	1	1	1	0	1
Total	**160**	**182**	**153**	**135**	**162**	**154**	**158**	**163**	**144**	**158**

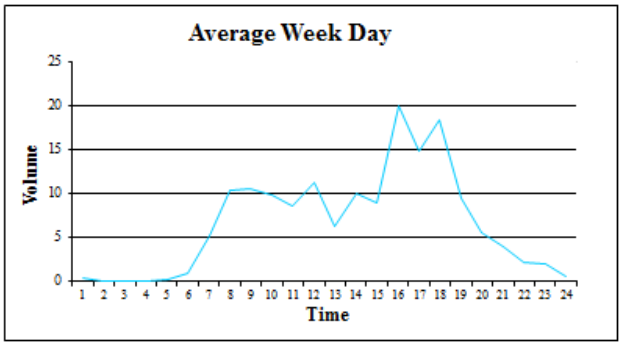


Summary

	from	to	
AM Peak	8:00 AM	9:00 AM	**29**
PM Peak	2:00 PM	3:00 PM	**22**
		Week Day Average	**163**
		Weekend Day Average	**144**
		7 Day Average	**158**

MANDALONG RD 100M EAST OF CHAPMAN RD **Westbound**

Day	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*Tue*	*Wed*	*W/Day*	*W/End*	*7 Day*
Time	30/07/2015	31/07/2015	1/08/2015	2/08/2015	3/08/2015	4/08/2015	5/08/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	0	1	0	0	1	1	0	1	0
1:00	0	0	2	1	0	0	0	0	2	0
2:00	0	0	0	0	0	0	0	0	0	0
3:00	0	0	0	0	0	0	0	0	0	0
4:00	0	1	0	0	0	0	0	0	0	0
5:00	0	1	0	0	1	2	1	1	0	1
6:00	8	4	1	0	5	4	5	5	1	4
7:00	7	14	3	3	10	8	13	10	3	8
8:00	16	9	6	1	11	10	7	11	4	9
9:00	7	7	13	11	18	6	11	10	12	10
10:00	7	6	17	16	10	11	9	9	17	11
11:00	10	9	20	18	13	11	13	11	19	13
12:00	10	6	13	10	3	6	6	6	12	8
13:00	11	6	10	10	8	9	16	10	10	10
14:00	3	11	26	11	12	8	11	9	19	12
15:00	17	23	11	15	20	21	19	20	13	18
16:00	22	22	10	9	6	9	15	15	10	13
17:00	9	19	9	17	21	26	17	18	13	17
18:00	13	11	10	6	8	5	10	9	8	9
19:00	4	6	1	7	7	7	4	6	4	5
20:00	3	6	4	1	3	3	5	4	3	4
21:00	3	4	0	1	2	1	1	2	1	2
22:00	2	7	1	0	0	1	0	2	1	2
23:00	0	2	1	0	0	1	0	1	1	1
Total	**152**	**174**	**159**	**137**	**158**	**150**	**164**	**160**	**148**	**156**

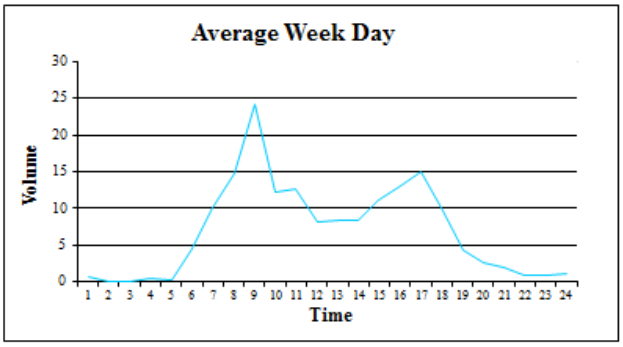


Summary

	from	to	
AM Peak	9:00 AM	10:00 AM	**18**
PM Peak	5:00 PM	6:00 PM	**26**
		Week Day Average	**160**
		Weekend Day Average	**148**
		7 Day Average	**156**

MANDALONG RD 100M EAST OF CHAPMAN RD **Eastbound**

Day	Thu	Fri	Sat	Sun	Mon	Tue	Wed	W/Day	W/End	7 Day
Time	6/08/2015	7/08/2015	8/08/2015	9/08/2015	10/08/2015	11/08/2015	12/08/2015	Ave.	Ave.	Ave
0:00	0	1	0	2	1	0	1	1	1	1
1:00	0	0	0	0	0	0	0	0	0	0
2:00	0	0	0	0	0	0	0	0	0	0
3:00	1	1	0	0	0	0	0	0	0	0
4:00	1	0	2	0	0	0	0	0	1	0
5:00	4	3	1	0	5	5	6	5	1	3
6:00	12	6	1	2	10	9	14	10	2	8
7:00	12	12	8	1	17	17	16	15	5	12
8:00	16	25	5	7	23	33	24	24	6	19
9:00	7	13	20	12	12	17	12	12	16	13
10:00	11	15	13	13	6	15	16	13	13	13
11:00	7	5	7	17	10	10	9	8	12	9
12:00	12	10	5	14	9	9	2	8	10	9
13:00	9	5	10	14	6	8	14	8	12	9
14:00	11	10	8	12	16	10	9	11	10	11
15:00	13	16	17	15	12	14	10	13	16	14
16:00	13	15	13	14	17	12	18	15	14	15
17:00	8	10	15	11	11	15	7	10	13	11
18:00	4	5	6	4	2	6	5	4	5	5
19:00	4	2	2	4	2	3	2	3	3	3
20:00	3	1	5	2	1	1	4	2	4	2
21:00	0	2	1	1	1	1	0	1	1	1
22:00	1	1	1	1	1	0	2	1	1	1
23:00	1	1	0	0	3	0	1	1	0	1
Total	**150**	**159**	**140**	**146**	**165**	**185**	**172**	**166**	**143**	**160**

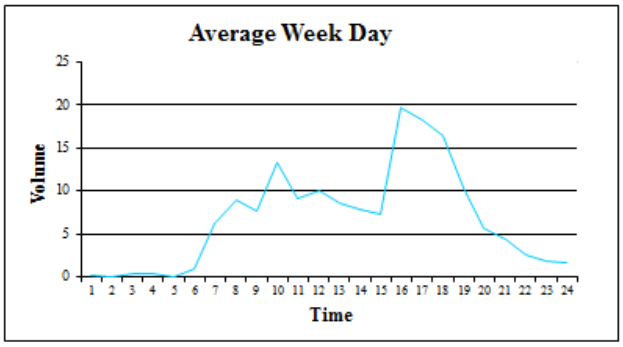


Summary

	from	to	
AM Peak	8:00 AM	9:00 AM	**33**
PM Peak	4:00 PM	5:00 PM	**18**
		Week Day Average	**166**
		Weekend Day Average	**143**
		7 Day Average	**160**

MANDALONG RD 100M EAST OF CHAPMAN RD **Westbound**

Day	*Thu*	*Fri*	*Sat*	*Sun*	*Mon*	*Tue*	*Wed*	*W/Day*	*W/End*	*7 Day*
Time	6/08/2015	7/08/2015	8/08/2015	9/08/2015	10/08/2015	11/08/2015	12/08/2015	*Ave.*	*Ave.*	*Ave*
0:00	0	0	2	1	0	0	1	0	2	1
1:00	0	0	1	0	0	0	0	0	1	0
2:00	1	0	0	0	0	1	0	0	0	0
3:00	1	1	0	0	0	0	0	0	0	0
4:00	0	0	0	0	0	0	0	0	0	0
5:00	1	2	0	1	0	1	1	1	1	1
6:00	3	4	1	1	9	7	8	6	1	5
7:00	6	8	4	1	11	13	7	9	3	7
8:00	8	4	9	6	9	12	5	8	8	8
9:00	10	13	10	11	11	16	17	13	11	13
10:00	8	15	10	14	5	9	9	9	12	10
11:00	7	9	9	15	15	11	8	10	12	11
12:00	10	16	16	12	5	2	10	9	14	10
13:00	11	6	9	19	6	6	10	8	14	10
14:00	10	5	13	13	6	7	9	7	13	9
15:00	24	16	20	20	17	27	15	20	20	20
16:00	10	11	13	8	23	21	26	18	11	16
17:00	12	14	15	16	18	18	20	16	16	16
18:00	9	13	2	4	10	12	8	10	3	8
19:00	4	8	7	2	4	7	5	6	5	5
20:00	2	4	1	1	6	4	6	4	1	3
21:00	2	3	1	5	2	3	3	3	3	3
22:00	1	2	2	1	1	3	2	2	2	2
23:00	3	1	2	1	2	2	0	2	2	2
Total	**143**	**155**	**147**	**152**	**160**	**182**	**170**	**162**	**150**	**158**



Summary

	from	to	
AM Peak	9:00 AM	10:00 AM	**17**
PM Peak	3:00 PM	4:00 PM	**27**
		Week Day Average	**162**
		Weekend Day Average	**150**
		7 Day Average	**158**

APPENDIX 2
CONCEPT CONSTRUCTION TRAFFIC MANAGEMENT PLAN

CONCEPT CONSTRUCTION TRAFFIC MANAGEMENT PLAN

MANDALONG TRANSMISSION LINE TL24 RELOCATION PROJECT

MANDALONG ROAD, MANDALONG

TABLE OF CONTENTS

INTRODUCTION

This document provides concept details of the management of traffic and pedestrian movements to be implemented during construction of the proposed Mandalong Transmission Line TL24 Relocation Project (the Project), Mandalong Road, Mandalong immediately south of Chapman's Road.

The project involves the following construction works associated with the Project.

- Establishment of access tracks and clearing of required 60m wide easement;
- Construction of proposed tower foundations and establishment of towers for new section of TL24;
- Stringing and cutting in of lines on new section of TL24; and
- Removal and remediation of redundant TL24 structures.

The plan covers the following areas:

- Ingress and egress of vehicles to the site.
- Details on loading and unloading areas.
- On-site parking measures during construction.

Normal working hours should be between the following:

1. Between 7:00 am and 6:00 pm, Mondays to Fridays inclusive;
2. 8:00 am and 1:00 pm, Saturdays,
3. No work on Sundays, public holidays or on a Saturday or Sunday adjacent to a public holiday.

If works are required to be undertaken outside these hours approval will be obtained from the Project Manager prior to the carrying out of the works.

INGRESS AND EGRESS OF VEHICLES TO THE SITE

The factors that have been considered in preparing this Construction Traffic Management Plan are:

- The work site has direct frontage to Mandalong Road and Chapman's Road.
- There will be on site car parking provided in the vicinity of the site compound near the construction site.
- All deliveries and workers will approach the site from Mandalong Road via the proposed new Mandalong South Surface Facilities Site entrance.
- Chapman's Road will not be used by construction traffic associated with this Project.

The construction contractor will employ the use of a professional traffic control crew when there will be impacts on the local traffic flow. As part of the pre-works setup, the professional traffic crew will develop and implement a traffic management plan specific to the task at hand, based on the parameters of the Construction Traffic Management Plan adopted in his document and approval from the relevant authorities.

DETAILS OF LOADING AND UNLOADING ZONES

Mandalong Road will be the access for deliveries, loading and unloading, and heavy logistics associated with the construction work. All loading / unloading will occur on-site at the construction site.

PEDESTRIAN TRAFFIC MANAGEMENT METHODS

Pedestrian movements in the vicinity of the site will be minimal. Construction will not interfere with pedestrian movements in the area.

PARKING MEASURES DURING CONSTRUCTION

The construction traffic parking demand will be fully accommodated on site. Site induction documentation will alert all construction employees and contractors for the need to park on site during construction. The site is large enough to accommodate the expected parking demand within the proposed site compound designated on the site plan attached as ***Appendix 1***.

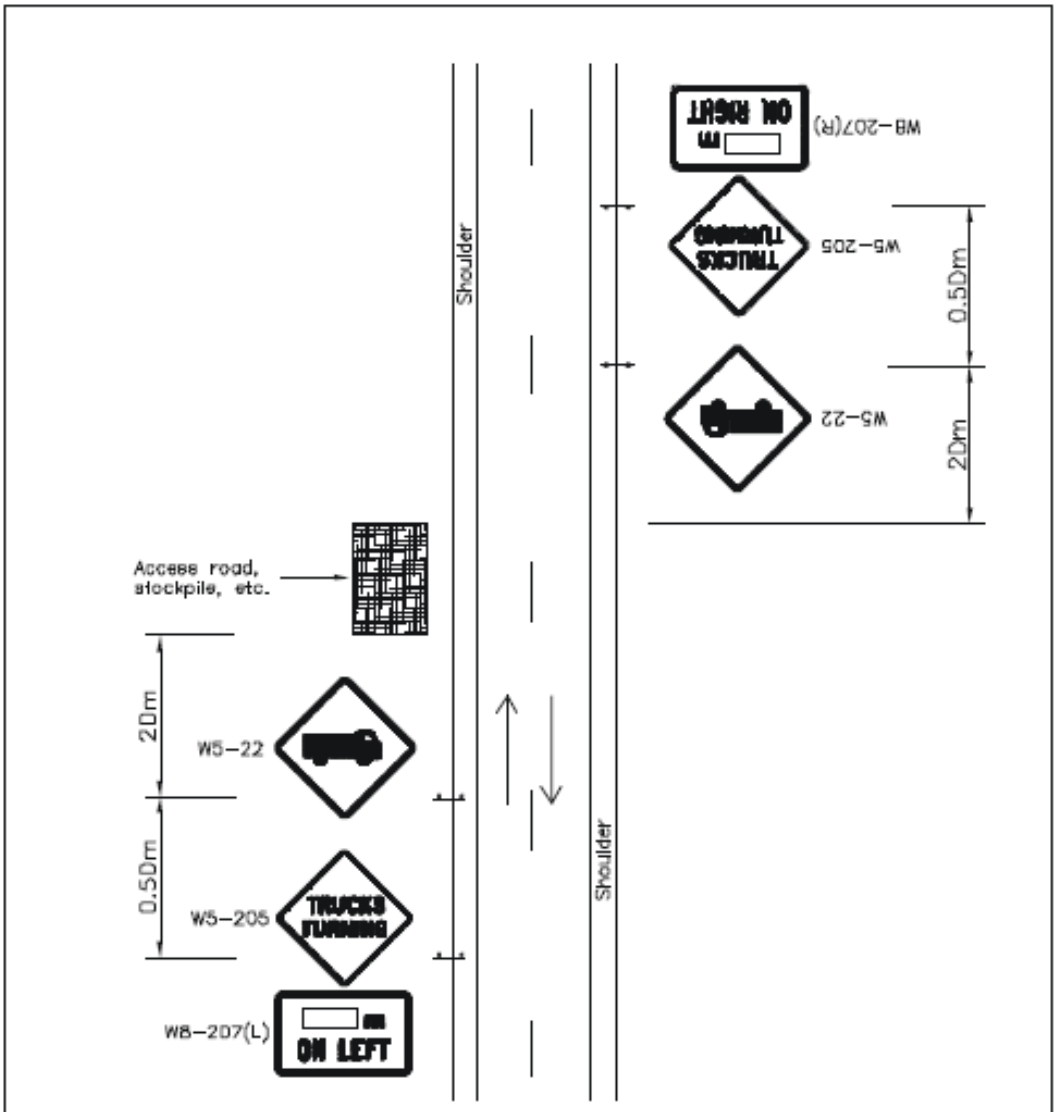
TRAFFIC CONTROL SIGNS

Traffic control signage will be placed on Mandalong Road either side of the site access off Mandalong Road advising of construction traffic entering and exiting Mandalong Road. Signage will be in accordance with the approved traffic control plans developed for each stage of construction. An example of a traffic control plan is provided in ***Appendix 2***.

APPENDIX 1 – SITE PARKING AREAS

TO BE PROVIDED BY CONTRACTOR PRIOR TO COMENCEMENT OF CONSTRUCTION

APPENDIX 2 – EXAMPLE TRAFFIC CONTROL PLAN



NOTE:

① For use where roadside is generally undeveloped, ADT is more than 1,500 vehicles per day, sight distance is restricted and there are more than 20 truck movements per shift.

② See *Traffic Control at Work Sites*, Section 7, *Providing for works traffic*.

③ See *Traffic Engineering Manual*, Section 19, *Miscellaneous devices*.

ACCESS TO DEPOT, STOCKPILE, QUARRY, GRAVEL PIT ETC.
ALL ROADS

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