Hyder
An ARCADIS Company

Hydro Kurri Kurri Aluminium Smelter

Demolition and Remediation Project

Traffic Impact Assessment

CONTENTS

FIGURES

Acronyms and Abbreviations

DA	Development Application
DS	Degree of Saturation
EP&A Act	*Environmental Planning and Assessment Act 1979*
LOS	Level of Service
RMS	Roads and Maritime Services
TMP	Traffic Management Plan prepared in consultation with RMS with the objective of identifying measures to minimise the impacts of construction and operational traffic on the road network. The TMP shall include: • a risk assessment to identify hazards to traffic control associated with the Project site, the level of risk posed and control measures to be implemented; • a Vehicle Movement Plan for the management of construction traffic; and • a Traffic Control Plan in accordance with the RMS' Traffic Control at Work Sites manual.

Glossary of Terms

Council	Cessnock City Council
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
Hydro land	The Smelter and surrounding land owned by Hydro
The Project	Demolition of remaining buildings and structures (and associated activities) at the Smelter, as described in section 2 of this Report
The Smelter	The former Hydro Aluminium Kurri Kurri Pty Ltd aluminium smelter at Hart Road, Loxford

Executive Summary

This Traffic Impact Assessment has been prepared by Hyder Consulting Pty Ltd on behalf of Hydro Aluminium Kurri Kurri Pty Ltd to support an Environmental Impact Statement for submission to the Department of Planning and Environment prepared to assess for the Demolition and Remediation Project (the Project) at the former Hydro Aluminium Kurri Kurri aluminium smelter at Hart Road Loxford (the Smelter).

This assessment was undertaken with consideration to the following:

- Roads and Maritime Services *Guide to Traffic Generating Developments* (2002)
- Austroads *Guide to Traffic Management* (2009)

This report has been prepared for the Proposal to identify any impact on the safety or operation of the adjacent road network during construction and operation activities. The assessment concluded that the Project would comply with the applicable guidelines and requirements and would not have an adverse traffic impact on the surrounding network.

Traffic volume estimates are based on the proposed schedule for the Project and the estimated volume of material to be moved during the phases of work for the Project.

The number of daily car movements would vary between 24 and 75 car trips depending on the work phase. The number of daily truck movements would vary between 5 and 54 truck trips depending on the work phase. The highest vehicle movements are expected to be during demolition activities with about 75 car trips and 54 truck trips per day.

During the Project, it is anticipated that the vast majority of traffic would travel via the Hunter Expressway to /from Newcastle and to/from the south to Port Kembla. A small volume of traffic (mostly light vehicles for staff/contractors) is likely to travel west along Hart Road to Weston/Kurri Kurri.

At each peak construction work phase, it is expected that approximately 28 vehicles (25 cars and 3 trucks) would be travelling to the site during the AM peak hour. Approximately 28 vehicles (25 cars and 3 trucks) would be also departing the site during the PM peak hour. This estimation represents the predicted peak traffic generation for the Project.

The volume and intensity of truck movements will increase over varying amounts during the Project. The short-term increases in traffic volumes on the road network and their duration have been determined. Based on the nominal capacity of the road network, the additional construction traffic due to the project can be adequately accommodated at acceptable levels of service. The movement of materials and equipment that will be spread over the construction period can be arranged to minimise impact on the local community.

The analysis has determined that the construction activities associated with the Project would have minimal impacts on the road network with only minor impact to traffic operation at Loxford Interchange at Hart Road and the Kurri Kurri Interchange at Main Road-Cessnock Road in both the AM and PM peak period. The analysis indicated that Project traffic would not adversely impact through traffic operation on the Hunter Expressway.

Overall, the impact of the Project is anticipated to be minor and a Traffic Management Plan would be applied to mitigate any impacts to an acceptable level. The TMP would be developed during the detailed design phase in consultation with Council and Roads and Maritime Services.

The TMP would address key safety and logistical issues that may arise due to: heavy vehicle manoeuvres at major and minor road intersections; safety risks brought about by increased heavy vehicle traffic and temporary lane closures along Hart Road. The TMP will address issues pertaining to site access, on-site car-parking and internal access arrangements. Mitigation measures would be identified to address each of these issues.

1 Introduction

This Traffic Impact Assessment has been prepared by Hyder Consulting Pty Ltd on behalf of Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) to support an Environmental Impact Statement for submission to the Department of Planning and Environment prepared to assess for the Demolition and Remediation Project (the Project) at the former Hydro Aluminium Kurri Kurri aluminium smelter at Hart Road Loxford (the Smelter).

1.1 Background

The former Hydro Aluminium Kurri Kurri Smelter (the Smelter) is located on Hart Road, Loxford near Kurri Kurri in New South Wales, Australia. The area owned and managed by Hydro incorporates the former smelter area comprising approximately 60 hectares, and the surrounding Hydro owned lands, comprising approximately 1,940 hectares (the Hydro land).

Smelting activities ceased in September 2012, and in May 2014 Hydro formally announced the closure of the Smelter.

It is Hydro's strategic vision for the Hydro land to play a key role in allowing the Hunter Region to achieve the economic, employment and environmental objectives identified in the NSW Government NSW State Plan 2021 and the Hunter Regional Action Plan. Hydro aims to achieve this strategic vision by facilitating the rezoning and development of the Project site for significant employment, residential, rural and biodiversity conservation purposes.

Hydro has commenced a number of decommissioning activities to facilitate demolition and remediation of the Smelter. In addition Hydro has received Development Consent from Cessnock City Council for the demolition of the majority of the Smelter (Stage 1 Demolition) excluding buildings used for material storage, various workshops, offices and storage sheds, the three concrete stacks and the main water tower

The remaining activities that would make the Smelter suitable for future employment and industrial land uses are the following:

- The Works. The Works are the activities required to make the Project site suitable for future use. The key element of the Works is the construction of a waste management facility, comprising a state of the art, modern and purpose built containment cell.

Other ancillary elements of the Works are:

  - Demolition of the remaining Smelter buildings and structures.
  - Site remediation.
  - Leachate and groundwater treatment

- Containment Cell Management. Following completion of the Works, the containment cell would be subject to a monitoring and management program.

These activities form the Project, which is the subject of the Environmental Impact Statement and this Traffic Impact Assessment.

1.2 Objectives

The purpose of the traffic impact assessment is to assist the Department of Planning and Environment in assessing the Project in accordance with Section 79(c)(1) of the Environmental Planning and Assessment Act 1979 (EP&A Act).

This report has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (ref: SSD 14-6666 and dated November 2014).

The objectives of this Traffic Impact Assessment are to:

- Assess the potential traffic and transport impacts of the Proposal.
- Identify any additional management measures to mitigate impacts of the Proposal on sensitive receivers/ local traffic.

The study area is shown in Figure 1-1.

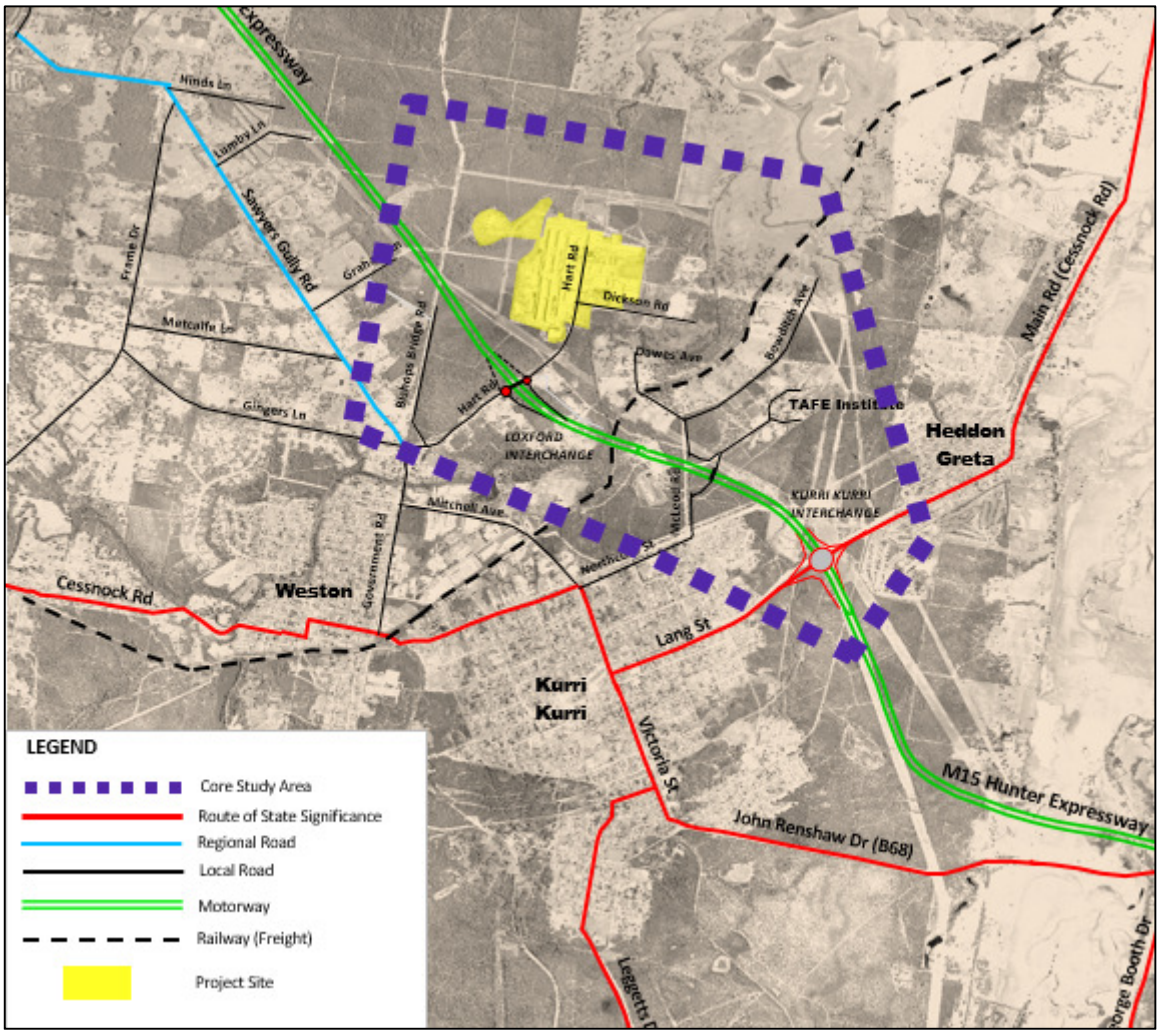


Figure 1-1 Study Area

1.3 Secretary Environmental Assessment Requirements (SEARs)

The SEARs for the environmental assessment for the Project were issued in November 2014.

This report forms the Traffic Impact Assessment prepared to address potential impacts associated with the Project

Table 1-1 shows the requirements listed under item 11 of the SEARs related to the transport and access and identifies where individual matters are addressed in this report.

This assessment also considers demolition traffic impacts as required by item 5(f) of the SEARs.

Table 1-1 Traffic and Access SEARs

Requirements	Where addressed in this report
Accurate predictions of the traffic generated by all phases of the proposal	Section 5, Section 5.1.4
A detailed assessment of the potential impacts of the proposal on the capacity, efficiency and safety of the road network, including the truck routes and cumulative traffic generated	Section 5, Section 5.2.
Details of any required upgrades to road infrastructure; and	Not applicable. No upgrades are required.
Site access, internal roads and vehicular parking required as a result of the development	Section 5.2.4

In addition, this assessment considers the Roads and Maritime Services' Response and Requirements (RMS Requirements) which were attached to the SEARs.

Table 1-2 shows the requirements listed under the RMS Requirements and identifies where individual matters are addressed in this report

Table 1-2 Traffic and Access SEARs

Requirements	Where addressed in this report
Identify all relevant vehicular traffic routes and intersections for any accesses to/from the sites for each stage of the construction process.	Section 3.2.1
Current traffic counts for the above traffic routes and intersections.	Section 3.2.2
Estimated light and heavy vehicular traffic generation and distribution for each stage of the construction process.	Section 5.1

Requirements	Where addressed in this report
Traffic analysis of any major/relevant intersections impacted, using SIDRA or similar traffic model, including: • Current traffic counts; • 95th percentile back of queue lengths on all legs; • Delays and level of service on all legs; • Use of SIDRA or similar traffic model; and Electronic input/output date files for RMS review.	Section 5.2
Any other impacts upon the regional and state road network and bridges, including consideration of pedestrian, cyclist and public transport facilities	(Not applicable to Crown Lands)

1.4 Report Structure

This Traffic Impact Assessment report contains the following sections providing an assessment of the traffic issues relating to the Proposal.

- Section 1: Introduction - provides background information on the Proposal and study objectives.
- Section 2: Proposal Description - provides an overview of the Proposal and describes the Project components.
- Section 3: Existing Environment - outlines the existing environment including road network and traffic volumes.
- Section 4: Assessment Criteria and Methodology - outlines the assessment criteria and methodology.
- Section 5: Traffic and Transport Impact Assessment - quantifies the expected traffic movements during the Project Works, and identifies traffic impact to key access points. Section 6: Mitigation Measures - identifies measures to mitigate the identified impacts.
- Section 7: Conclusions - provides the summary of findings from the traffic investigation.
- Section 8: References – list references referred to in this assessment

2 Project Description

The Project would be located within the existing Hydro Aluminium Kurri Kurri Smelter site (the Smelter) at Hart Road Loxford. The Smelter location is shown in Figure 1-1.

Figure 2-2 shows the Project layout, as well as the proposed locations of the key activities.

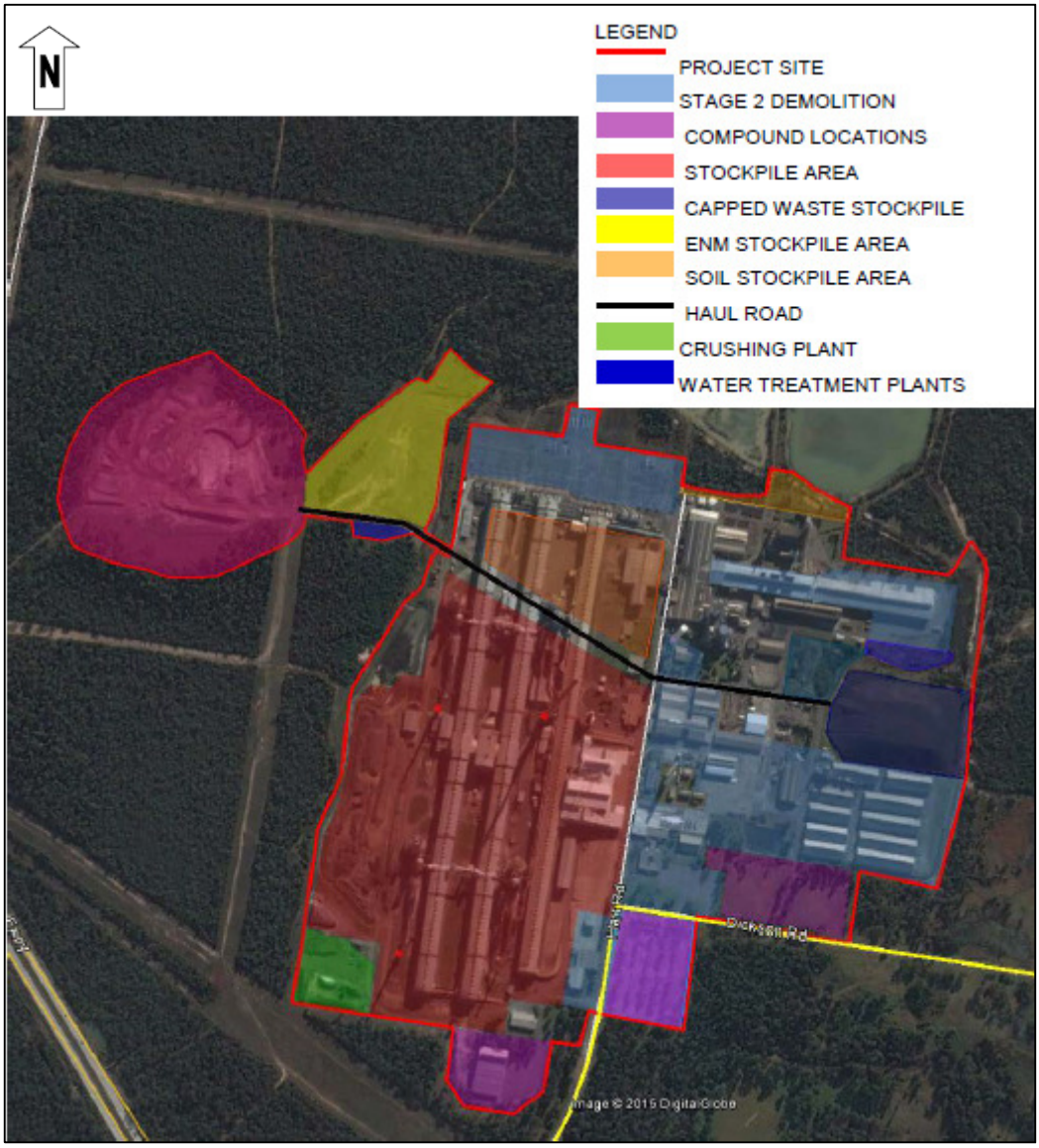


Figure 2-2 Overall Layout

2.1 Project Components

Table 2-1 outlines the major elements of the Project and the key activities. A detailed description of the Project is provided in **Chapters 8** and **9** of the Environmental Impact Statement.

Table 2-1 Outline of Project

Element	Key Activities
The Works	
Project Site Establishment	• Establishment of environmental controls (erosion and sediment controls, water quality controls). • Construction of the containment cell haul road. • Continued use of Stage 1 Demolition compounds. • Continued use of Stage 1 Demolition stockpile and storage areas.
Containment Cell Construction	• Vegetation clearance. • Site preparatory works. • Establishment and implementation of environmental controls (erosion and sediment controls, water quality controls). • Construction of the containment cell base layers. • Construction of internal cell walls within the containment cell. • Transport and placement of remediation and demolition materials to the containment cell. • Leachate and stormwater management. • Construction of the final containment cell capping layers.
Stage 2 Demolition	• Completion of hazardous materials removal. • Establishment and implementation of environmental controls (dust mitigation and water quality management). • Demolition of three concrete stacks and a water tower using detonation. • Mechanical demolition of remaining buildings and structures. • Material collection, separation, processing and storage. • Transportation of recyclable metals offsite. • Transport non-recyclable demolition material to the containment cell. • Grading of former building footprints.
Demolition Material Management	• Operation of a concrete and refractory crushing plant processing of up to 140 tonnes per day. • Manage a large stockpile area in the west of the Smelter. • Ferrous (steel) and non-ferrous (predominantly aluminium and copper) metals would be sorted and sized before being transported off site for recycling. It is anticipated that there would be up to 20 truck movements per day.
Contamination Remediation	• Removal of the capped waste stockpile. • Excavation of the contaminated soils within the Smelter (including stockpiled soils sourced from other Hydro land). • Transport to the containment cell. • Filling and grading following removal of contaminated materials.

Element	Key Activities
Leachate and Groundwater Treatment	• Establish and operate water treatment plants (capped waste stockpile and containment cell). • Groundwater monitoring. • Water treatment plant, pumping well network and dam decommissioning.
Environmental Controls	• Dust controls during demolition would include: ➢ Accumulated fines from within the buildings would be removed where safe, reasonable and feasible to do so. ➢ Pre-wetting of buildings prior to undertaking the induced collapse and use of water sprays for dust suppression (as required due to wind conditions) during induced collapse. ➢ Ceasing activities that have the potential to generate significant dust that could have adverse impacts on sensitive receivers. • Watering of the demolition areas, unsealed access roads and other unsealed areas. • Vehicles would use (where possible) existing sealed roads. • Erosion and sediment controls would be installed, monitored and managed to reduce sediment run off entering the existing drainage system. • The existing site water management system would capture runoff. • Where possible, clean water would be diverted from Works areas.
Containment Cell Management	
Monitoring	• Monitoring of leachate generation within the containment cell.
Maintenance	• Mowing of the containment cell grass cover. • Maintenance (if required) of the capping layers.

The Works component of the Project would take approximately three years to complete.

Project traffic would predominantly travel to and from the Smelter via Hart Road and the Hunter Expressway (using the Hart Road interchange). A small number of vehicles (predominantly small vehicles used by Works personnel) are likely to continue to the intersection with Sawyers Gully Road, Gingers Lane and Government Road and along one of these roads.

Works activities that would generate an audible noise at the nearest sensitive receiver would be undertaken between 7:00 am to 6:00 pm, Mondays to Fridays and 7:00 am to 1:00 pm on Saturdays. Based on the findings of the noise and vibration impact assessment there are a number of the activities listed in Table 2.2 that could occur outside these standard hours that would not generate an audible noise at the nearest sensitive receiver.

2.2 Concurrent Activities

In May 2015 Hydro submitted a Development Application (supported by a Statement of Environmental Effects) to Cessnock City Council requesting approval of the following:

- Demolition of all buildings and structures at the Smelter excluding:
  - Buildings used for the storage of materials.
  - Three concrete stacks, and one concrete water tower (structures requiring the use of explosives).
  - The transformer yard and major power supply infrastructure in the north of the Smelter.
- Establishment of a contractor's compound, either within an existing building located in the south of the Smelter (the former Building 77A Pot Rebuild building), or in the car park near the main entrance to the Smelter.
- A concrete and refractory crushing plant processing up to 28,000 tonnes per year or 140 tonnes per day.
- A demolition materials stockpile area.
- The sorting of recyclable metallic demolition materials and transportation to a metal recycling facility.

The works addressed in this Development Application is known as Stage 1 Demolition.

It is proposed that the contractor's compound, the demolition materials stockpile area and the concrete and refractory crushing plant included in this Development Application would continue to be used for the Project. It is anticipated that some Stage 1 Demolition activities would occur concurrently with the early stage of the Works.

So that the potential cumulative traffic impacts of Stage 1 Demolition activities are considered when assessing the Project, these activities have been included as appropriate in Chapter 5 (Impact Assessment) of this report.

3 Existing Environment

3.1 General

As shown in Figure 2, the Project would impact the fenced Smelter footprint and the area currently known as the clay borrow pit to the immediate west.

Land uses in the vicinity of the Project include:

- Native vegetation: native ecological communities (with some cleared or disturbed areas) generally surround the Smelter and are within the Hydro owned land. Security fencing separates the Proposal site from the vegetation.
- Electricity infrastructure: overhead power lines are located within easements to the north, west, southwest and northwest of the Proposal.
- Recreation: the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club facility are approximately 500 metres to the east of the Proposal.
- Roads: The key roads in the vicinity of the Proposal are:
  - Hart Road is used to access the Smelter and is immediately adjacent to the western section of the Proposal.
  - Dickson Road intersects with Hart Road approximately 120 metres south of the Smelter security gate and immediately adjacent to the western section of the Proposal.
  - The Hunter Expressway is approximately 380 metres southwest of the Proposal.
  - [The Smelter includes a network of sealed and unsealed roads.
- Residential: the Proposal is approximately 440 metres to the north of the nearest sensitive receiver, which is a rural residence owned by Hydro. The nearest rural residence not owned by Hydro is approximately 500 metres to the southeast, and the next nearest is approximately 750 metres to the southeast. There are approximately 24 rural residences within 1000 metres of the Proposal, of which 15 are on Hydro land.

  The nearest residential area to the Proposal is Weston, which is approximately 1800 metres to the southwest.
- Education: The Kurri Kurri TAFE is located approximately 1500 metres to the southeast of the Proposal and Kurri Kurri High School is approximately 1900 metres to the southeast of the Proposal.

3.2 Existing Transport Environment

This section of the report provides a description of existing transport network in the vicinity of the Project site. Analysis of transport network has been undertaken based on a desktop analysis with main focus on:

- Road hierarchy;
- Traffic volumes and directional flows; and
- Public transport;
- Internal access arrangements including Crown Lands roads

3.2.1 Road Hierarchy and Key Roads

The road hierarchy of key roads in the Project site is summarised in the Table 3-2. Figure 1-1 shows road hierarchy graphically.

Table 3-2 Road hierarchy in the study area and road characteristics

ID*	Road	Hierarchy	Main characteristics
1	M15 Hunter Expressway	Motorway	• M15 Hunter Expressway opened to traffic on 22 March 2014. • It is a dual carriageway motorway with two lanes in each direction running in southeast-northwest direction from M1 Motorway at the Newcastle Link Road (A15) interchange to the New England Highway (A43) north of Branxton. • Within the study area, M15 Hunter Expressway is connected with key strategic road network via two interchanges as follows: ○ *Loxford Interchange*. Loxford interchange is constructed as a half interchange with east-facing ramps at Hart Road. Traffic traveling towards Branxton can exit the expressway at this interchange to access Hart Road. Traffic on Hart Road can use the on-ramp to travel southeast towards Newcastle; and ○ *Kurri Kurri Interchange*. Kurri Kurri interchange is constructed as a full interchange with east and north facing on/off ramps at Main Road-Cessnock Road.
2	Hart Road	Local	• Currently Hart Road is a local road with the main purpose to provide access to/from the existing Hydro Aluminium facility, Kurri Kurri; • Hart Road is undivided road with two travel lanes (one lane in each direction); • It has post speed limit of 70 km/h; • Hart Road is connected with M15 Hunter Expressway *via Loxford Interchange*. An overbridge (one lane in each direction) is constructed to maintain access on Hart Road, with traffic on Hart Road travelling over M15 Hunter Expressway; and • Hart Road connects with Government Road and Sawyers Gully Road to the west of the Hunter Expressway.
3	Dickson Road	Local	• Dickson Road is a local road which intersects with the northern end of Hart Road and provides access to the eastern parts of the Hydro land, including properties leased by the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club; • Dickson Road is undivided road with two travel lanes (one lane in each direction); • Dickson Road is currently a No through Road, and is being used with on-street parking permitted.

ID*	Road	Hierarchy	Main characteristics
4	Main Rd-Cessnock Road	Route of State Significance	• Main Road-Cessnock Road is arterial route providing connection between Maitland and Cessnock via Gillieston Heights, Cliftleigh, Heddon Greta, Kurri Kurri, Weston and Abermain; • Main Road is connected with M15 Hunter Expressway via *Kurri Kurri Interchange;* • Through Kurri Kurri town centre Main Rd-Cessnock Rd is passing via Lang Street, part of Mitchell Avenue and Northcote Street. • Main Road-Cessnock Road is undivided road with two travel lanes (one lane in each direction); • It has various sign post speed limits between 60-80 km/h along the entire route.

3.2.2 Traffic Volumes

New traffic count surveys were undertaken in February 2015 for the purpose of the traffic assessment of the Proposal. Table 3-3 below shows existing peak hour traffic volumes on Hart Road, Cessnock Road (Main Road) and the Hunter Expressway. These roads are likely to be impacted by the Project traffic.

Table 3-3 Peak Hour Traffic Volumes on Key Roads in 2014

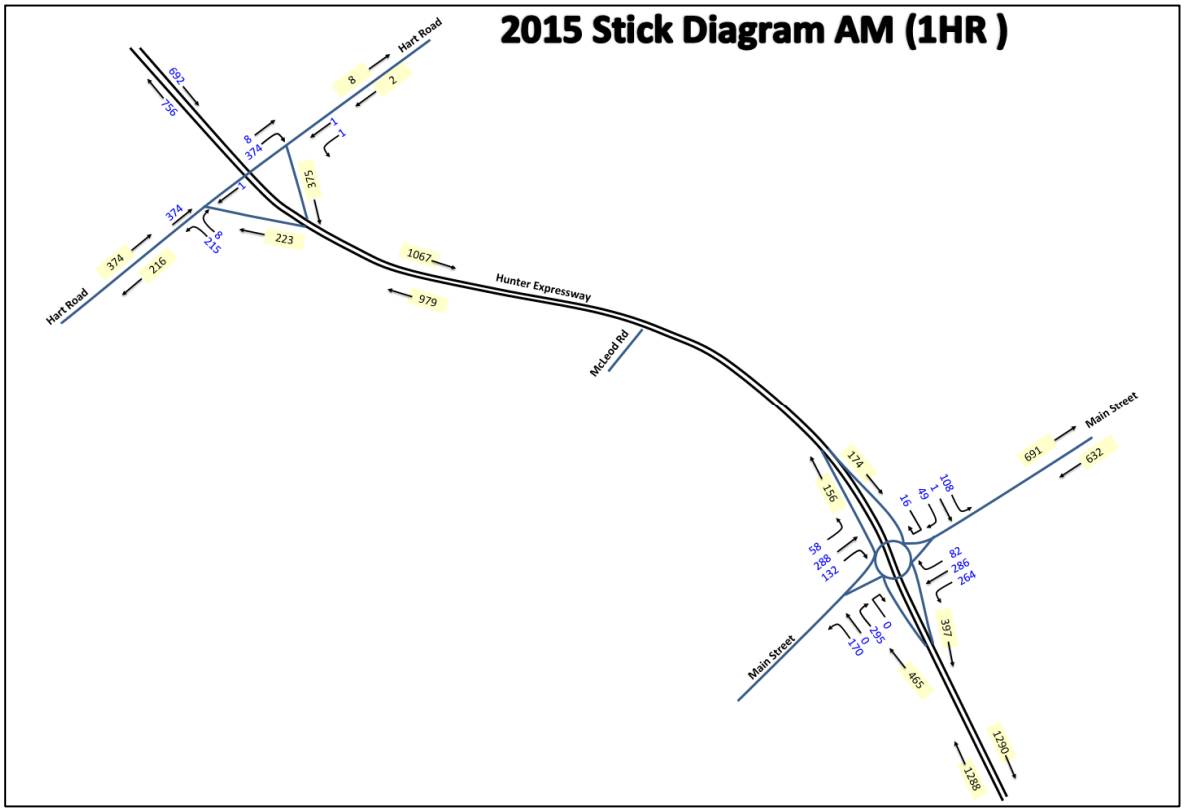
Site ID	Locations	AM Peak		PM Peak	
		NB/EB(1)	SB/WB(1)	NB/EB(1)	SB/WB(1)
M-1	Hart Road, East of Hunter Expressway	8	2	3	7
M-2	Hart Road, West of Hunter Expressway	374	216	237	350
M-3	Hunter Expressway, Between Loxford Interchange and Kurri Kurri Interchange	979	1,067	875	1,240
M-4	Hunter Expressway, South of Kurri Kurri Interchange	1,288	1,290	1,209	1,549
M-5	Main Road-Cessnock Road, East of Hunter Expressway	691	632	862	804
M-6	Main Road-Cessnock Road, West of Hunter Expressway	478	505	615	582

Source: February 2015 traffic survey, Hyder's analysis File: file:///F:\AA006291\CTMP\D-Calculations\1-Data%20Processing\2013%20Stick%20Diagram.xlsx
Note: (1) Northbound (NB), Eastbound (EB), Southbound (SB), Westbound (WB)

In both the AM and PM peak, traffic volumes on Hart Road (East of the Hunter Expressway) were substantially low in both the northbound and southbound directions indicating very little traffic activity to and from the Project site. In the AM peak on Hart Road (west of the Hunter Expressway, there are approximately374 vehicles per hour in the northbound direction and 216 vehicles per hour in the southbound direction. The order of magnitude is reversed for the PM peak with 237 vehicles per hour in the northbound direction and 350 vehicle per hour in the southbound direction. In the AM peak, the traffic volumes on the Hunter Expressway were approximately 980 vehicles per hour in the northbound direction and 1,290 vehicles per hour in the southbound direction. In the PM peak, the highest traffic volume was observed in the

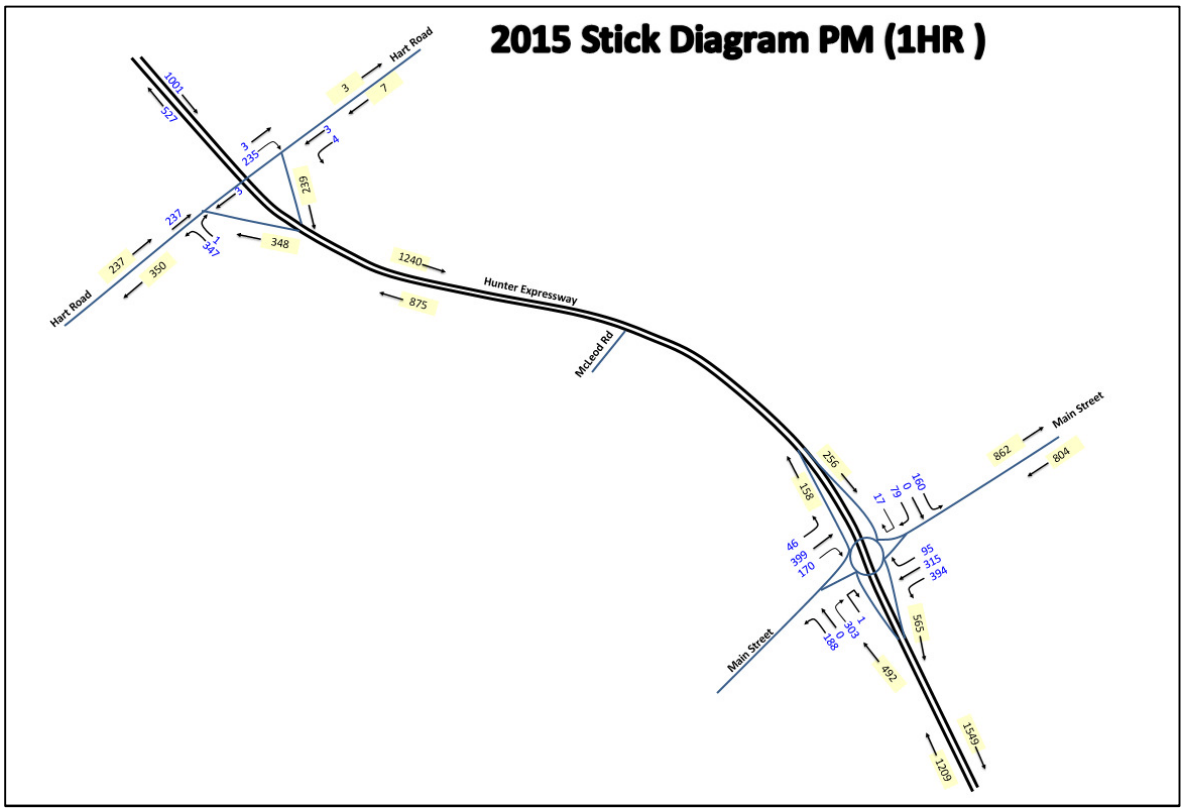
southbound direction approximately 1,549 vehicles. Similarly in the PM peak, about 1,209 vehicles per hour were observed in the northbound direction.

Figure 3-3 and Figure 3-4 graphically shows existing (2015) traffic volumes for AM peak (one hour) and PM peak (one hour) respectively.



Source: February 2015 traffic survey, Hyder's analysis, File: file:///F:\AA006291\CTMP\D-Calculations\1-Data%20Processing\2013%20Stick%20Diagram.xlsx

Figure 3-3 Existing AM Peak 1 Hour Flows (vehicles) in 2015



Source: February 2015 traffic survey, Hyder's analysis, File: file:///F:\AA006291\CTMP\D-Calculations\1-Data%20Processing\2013%20Stick%20Diagram.xlsx

Figure 3-4 Existing PM Peak 1 Hour Flows (vehicles) in 2015

3.2.3 Public Transport

Currently, there is no bus or rail service in the immediate vicinity of the Project site. There is no bus stop located within walking distance of the Project site.

Access to nearby available bus routes is very limited. The nearest bus stop is located on Main Road-Cessnock Road approximately 2,400 metres to the south where Bus Route 164 traverses servicing Cessnock and Maitland.

4 Assessment Criteria and Methodology

4.1 Criteria

An analysis of the road impacts have been undertaken with consideration given to the following factors:

- The capacity of the intersections that would be largely impacted by the construction activities including the Loxford interchange on Hart Road.
- Capacity of site access intersections.
- Access / egress.
- Carriageway restrictions.

4.1.1 Intersection Capacity

The Level of Service criteria set by the Roads and Maritime Services (RMS)[1] is outlined in Table 4-4. In analysing intersection performance, a Level of Service (LoS) "D" or better is generally acceptable to the RMS.

Table 4-4 Level of Service Criteria for Intersections

Level of Service	Average Delay (seconds/ vehicle)	Traffic Signals, Roundabout	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 and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity, requires other control mode
F	More than 70	Roundabouts require other control mode	

Source: Guide to Traffic Generating Developments, RMS 2002

The Roads and Maritime's guideline has recommended that with roundabout, Stop and Give Way sign control intersections, the LoS value is determined by the critical movement with the highest delay per vehicle. With this type of intersection control, some movements suffer high levels of delay while other movements have minimal delay. Degree of saturation is defined as the ratio of demand (arrival) flow to capacity (also known as volume/capacity, v/c, and ratio).

[1] Guide to Traffic Generating Developments, Roads and Maritime 2002

Average Vehicle Delay (AVD)

AVD is a measure of the operational performance of a road network or an intersection. AVD is determined globally over a road network or within a cordon during an assignment model run. The AVD exhibited on comparable network models, for analogous peak periods, forms the basis of comparing the operational performance of the road network.

AVD is used in the determination of an intersection's Level of Service. Generally, the total delay incurred by vehicles through an intersection, is averaged to give an indicative delay on any specific approach. Longer delays do occur but only the average over the peak hour period is reported.

Degree of Saturation (DS)

The Degree of Saturation (DS) of an intersection is usually taken as the highest ratio of traffic volume on an approach to the intersection, compared with its theoretical capacity and is a measure of the utilisation of available green time. The DS reported is generally of a critical movement through the intersection, rather than the DS of the intersection, unless equal saturation occurs on all approaches.

For intersections controlled by traffic signals, generally both queue length and delay increase rapidly as DS approaches 1.0. An intersection operates satisfactorily when its DS is kept below 0.875. Degrees of saturation above 1.0 represent oversaturated conditions when demand exceeds capacity. When the DS exceeds 0.9, extensive queues can be expected.

4.1.2 Mid-Block Capacity and Thresholds

Mid-block capacity and thresholds are based on the particular road links or intersections to ensure a satisfactory LoS of D, or better.

These thresholds represent the 'Capacity' of specific road types. Traffic volumes observed on the road that are higher than the prescribed thresholds will be perceived by the community and road users as being over saturated.

While generally a single trafficable lane may carry up to 1900 vehicles per hour, the capacity of each particular road type has been determined by considering a number of key factors noted in Austroads 'Roadway Capacity' manual including, but not limited to:

- Vehicle speed;
- Volume of vehicles demanding to use the carriageway (linked to road classification);
- Potential for lane changing (higher vehicle volumes reduce the incidence of lane changing);
- Available lane widths and lateral clearances;
- Surrounding land use characteristics (industrial, residential, retail, commercial, etc);
- Vertical carriageway alignment;
- Horizontal carriageway alignment;
- Carriageway condition; and,
- Carriageway access (driveways, side street intersections, etc).

Subsequently, varying lane capacities apply to each classification and road type, adopted during the course of this assessment, as shown in Table 4-5.

As a consequence, road links reporting a volume in excess of the adopted thresholds, should be considered for remedial treatment and reclassification in order to achieve their specific volume threshold.

Table 4-5 Typical One-way Mid Block Capacities for Urban Roads with Interrupted Flow

Road Type Conditions	Lane Capacity (vehicle per hour)
Median or inner lane for undivided road	900
Outer or kerb lane with clearway conditions	900
Outer or kerb lane with occasionally parked vehicles	600

Source: Table 7.1, Austroads Roadway Capacity

From Table 4-5, it can be assumed that Hart Road during the AM and PM peak periods would have a capacity of 900 vehicles per hour per direction. Traffic volumes observed at the intersections (shown in Figure 3-3 and Figure 3-4) suggest that the existing volumes in the AM and PM peak on Hart Road to the east of the Hunter Expressway is minimal and suggests Hart Road (east of the Loxford Interchange) would have some spare capacity to accommodate more than 800 vehicles in the peak direction and on the overbridge around 520 to 670 vehicles per hour in the peak direction (NB) for the AM and PM peak, respectively.

The Hunter Expressway is estimated to have the capacity to accommodate approximately 4,000-4400 vehicles per hour. The traffic counts undertaken for the Project indicate there is sufficient spare capacity to accommodate additional traffic.

4.2 Methodology

The methodology employed in this report mainly consisted of desktop studies to establish baseline conditions in the study area. This entailed a review of aerial photography and other mapping information provided by the Client to identify the access roads and other transport infrastructure in the study area.

New traffic count data was obtained through peak hour traffic counts undertaken for the purpose of this study.

The traffic impact assessment has been undertaken with reference to the Roads and Maritime's Guide to Traffic Generating Developments and the Austroads Guide to Traffic Management. The traffic operation assessment process outlined in the guidelines stipulates that the operating characteristics need to be compared with performance criteria. The main performance criteria adopted for the assessment is detailed in Section 4.1.

5 Traffic and Transport Impact Assessment

5.1 Construction Traffic Movements

5.1.1 Key Activities

Construction traffic volume estimates are based on the proposed construction schedule and the estimated volume of material to be moved during the six phases of the Works, including:

- Project site establishment
- Containment cell construction
- Stage 2 demolition
- Demolition material management
- Containment remediation
- Leachate and groundwater treatment

5.1.2 Construction Hours

Standard hours for the duration of the Works are anticipated to be between 7:00 am and 6:00 pm, Monday to Friday and 7:00 am to 1:00 pm Saturday. Where possible, a number of activities that would not generate an audible noise at the nearest residence could be undertaken outside of these standard hours. These activities are identified in the Noise and Vibration Impact Assessment prepared for the Project.

5.1.3 Construction Vehicles and Equipment

Various types of machinery would be necessary for the Works. Heavy equipment that would most likely be required at the Project site are as follows:

- Standard 19-m dump trucks, water truck, refuelling vehicle;
- Prime mover;
- Telehandler;
- Machinery service vehicle;
- Excavation machinery (230t, 120t, 70t, 46t, 36t);
- Graders and bulldozers;
- Rollers/compactors;
- Boomlifts (80ft); and,
- Concrete crushing plant.

Trucks used for the delivery of the demolition equipment would be travelling on the Hunter Expressway and accessing the Site via Loxford Interchange at Hart Road. When on site, demolition equipment may be stationary in areas where work is being undertaken and transferred between areas for the duration of the construction.

5.1.4 Construction Traffic Generation

Table 5-1 shows estimated truck loads and number of staffs for each phase being a conservative estimate for impact assessment purpose.

Table 5-6 Estimated Truck Loads and Number of Staff Car Trips by Works Period

Phase	Activity	Duration (weeks)	Estimated Number of Car trips for Workers on a typical day	Estimated Number of Daily Truck Trips
Stage 2 Demolition	Site Establishment	4	15	5
	Demolition Activities	26	75	57
Containment Cell Construction	Vegetation clearance	4	15	5
	Preparatory works	18	24	5
	Cell Base liner Construction	26	48	17
	Internal Cell Wall Construction		36	5
	Cell Material Acceptance and Placement	126	36	5
	Leachate/Rainwater Management (Material Placement Phase)		6	3
	Containment Cell Cap Construction	56	42	17
Contaminated Soil Remediation and Smelter Waste Removal	Contaminated Soil Excavation	6	30	5
Capped Waste Stockpile Removal	Site Establishment	10	12	4
	Cap Removal	16	36	5
	Material Removal	80	36	5
Leachate and Groundwater Management	Operate water treatment plant (installed as part of capped waste stockpile removal Key Task).		6	4
	Decommission water treatment infrastructure	10	6	3

Source: Environ, Hyder Analysis, file:///F:\AA006291\CTMP\Data%20from%20Client\Traffic%20Generation.xlsx

The following assumptions have been made in relation to the Project traffic generation:

- About 30 working days per month

- Under Site Establishment, there would be about eight workers on site
- During demolition activities, there would be 25 workers on site
- A total of 20 truck loads per day per direction for transporting metals for recycling
- During containment cell construction, the following construction materials will be imported over a duration of 26 weeks:
  - An estimated 30,000 m^3 of sand (equivalent to 400 truckloads)
  - An estimated 15,000 m^3 of rounded gravel (equivalent to 400 truckloads)
  - HDPE liners (approximately 10 truckloads)
  - Filter fabrics (approximately 10 truckloads)
- One refuelling vehicle once a day
- Six trucks per day for miscellaneous deliveries and waste removals
- Delivery and removal of equipment occurs over the first and last 10 working days of the construction stage
- The number of truck loads means number of trucks visiting the site for construction activities. Each truck load would generate two truck trips a day.
- Each staff car would generate on average around three car trips a day.

The number of daily truck movements would vary between 2 to 57 truck trips depending on the work phase. The highest truck movements are expected to be during demolition activities with about 57 truck trips per day.

The number of daily car movements would vary between 6 and 75 car trips depending on the Project phase. In the event, all construction staff will drive a car, then about 25 parking spaces would be utilised on site. The highest car movements are expected to occur during the demolition phase of c Project activities and will be about 75 car trips per day.

5.1.5 Cumulative Traffic Generation

As noted earlier in Section 2.2, it is proposed that the contractor's compound, the demolition materials stockpile area and the concrete and refractory crushing plant included in Stage 1 Demolition would continue to be used for the Project. It is anticipated that some Stage 1 Demolition activities would occur concurrently with the early stages of the Works.

Where Stage 1 and Works activities occur concurrently, the 20 truckloads per day for transporting metals for recycling would remain constant. The same staff numbers are assumed to be maintained. Hence, the cumulative traffic would increase marginally with just the addition of the excavators. In total, it is anticipated that a total of 17 additional truck trips would occur.

5.1.6 Traffic Distribution

It is anticipated that the vast majority of traffic would travel via Hart Road and the Hunter Expressway to /from Newcastle and to/from the south to Port Kembla. A small amount of traffic (mostly light vehicles for staff/contractors) is likely to travel west along Hart Road to Weston and Kurri Kurri. The distribution of the trips generated by the construction works for the peak hour traffic are shown in Figure 5-5 and Figure 5-6, respectively.

The distribution of staff trips is assumed to be consistent with the JTW analysis undertaken previously for the Hydro Kurri Kurri Redevelopment *(Hydro Kurri Kurri Traffic Impact Assessment, Hyder, April 2014)*. The JTW analysis suggests the following trip distribution patterns and assuming one access on Hart Road (see Figure 5-5).

- About 15% trips towards north to Maitland via Hunter Expressway (Loxford and Kurri Kurri interchanges) and Cessnock Road,
- About 40% trips towards east to Newcastle, Lake Macquarie, M1 Pacific Motorway via Hunter Expressway (Loxford interchange);
- About 15% trips towards south to Kurri Kurri via Hart Road; and
- About 30% trips towards west to Branxton. This would require U-turns at Kurri Kurri interchange for westbound trips on the Hunter Expressway.

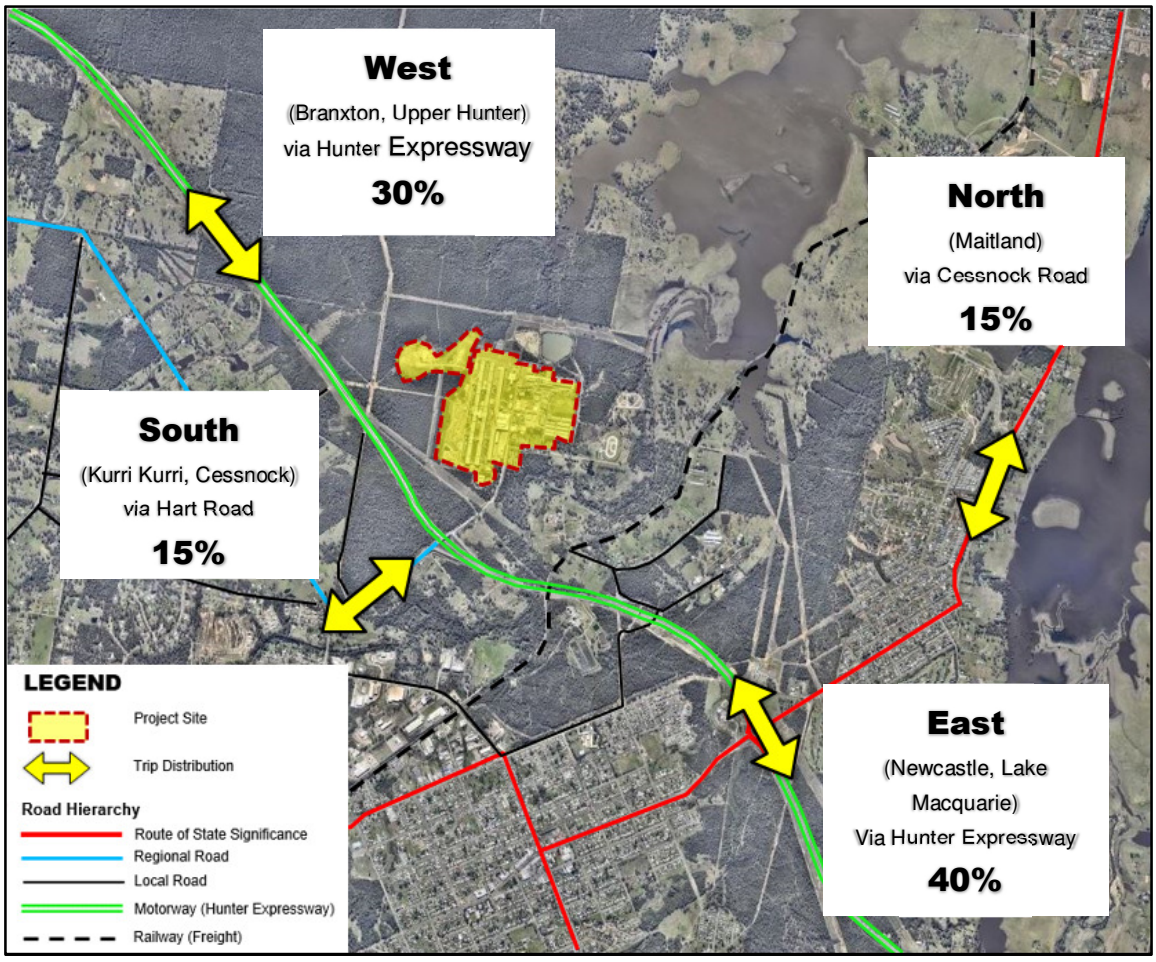


Figure 5-5 Trip Distribution for Staff/Contractors

For disposal of demolition waste and materials, all vehicles are expected to use the Hunter Expressway to travel towards Newcastle or Port Kembla. See Figure 5-6.

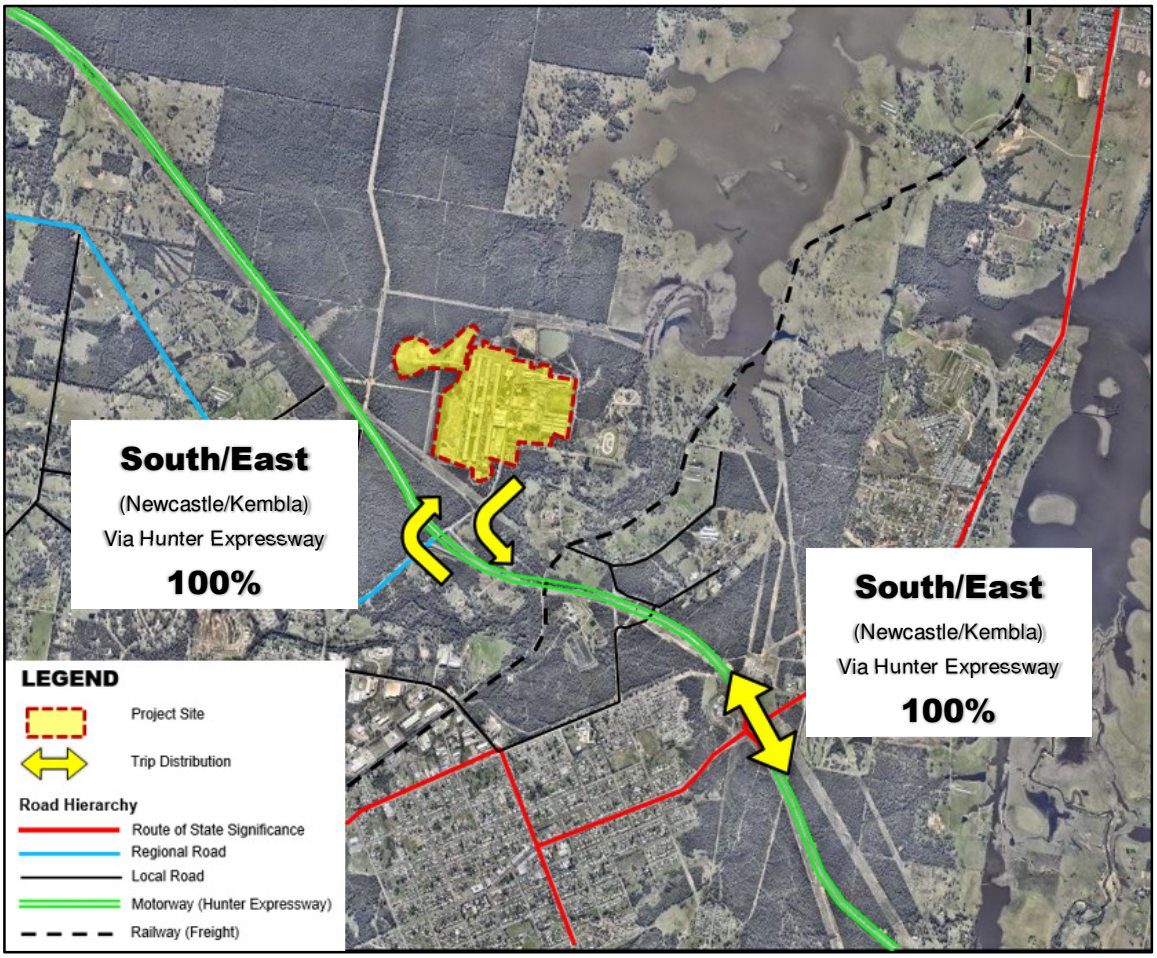


Figure 5-6 Trip Distribution for the Demolition Waste Disposal and Materials

5.1.7 Peak Hour Traffic Generation

The analysis has assumed that majority of construction workers would arrive at Project site during morning peak periods between 6 and 8 am on weekdays. Similarly the majority of workers would depart the Project site during afternoon peak periods between 3 and 6 pm on weekdays. This is assumed to be a conservative estimate for staff car. Given the location of the Project site, some lunchtime movements are also anticipated.

The construction truck movements each weekday are assumed to be evenly distributed over approximate 10 hour period, between 7 am and 5 pm on most weekdays.

Table 5-7 summarises weekday AM (one hour) and PM (one hour) peak hour construction traffic movements to and from the Project site.

Table 5-7 Weekday AM and PM Peak Hour Construction Traffic Movements

Construction Period		AM Peak Hour Construction Traffic Movements					
Phase	Activity	Staff Cars		Construction Trucks		Total Construction Vehicles (Car +Truck)	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Stage 2 Demolition	Site Establishment	5	0	1	1	6	1
	Demolition Activities	**25**	**0**	**3**	**3**	**28**	**3**
Containment Cell Construction	Vegetation clearance	5	0	1	1	6	1
	Preparatory works	8	0	1	1	9	1
	Cell Base liner Construction	16	0	1	1	17	1
	Internal Cell Wall Construction	12	0	1	1	13	1
	Cell Material Acceptance and Placement	12	0	1	1	13	1
	Leachate/Rainwater Management (Material Placement Phase)	2	0	1	1	3	1
	Containment Cell Cap Construction	14	0	1	1	15	1
Contaminated Soil Remediation and Smelter Waste Removal	Contaminated Soil Excavation	10	0	1	1	11	1
Capped Waste Stockpile Removal	Site Establishment	4	0	1	1	5	1
	Cap Removal	12	0	1	1	13	1
	Material Removal	12	0	1	1	13	1

Construction Period		AM Peak Hour Construction Traffic Movements					
Leachate and Groundwater Management	Operate water treatment plant (installed as part of capped waste stockpile removal Key Task).	2	0	1	1	3	1
	Decommission water treatment infrastructure	2	0	1	1	3	1

Source: Hyder's analysis, file:///F:\AA006291\CTMP\Data%20from%20Client\Traffic%20Generation.xlsx

Table 5-8 Weekday AM and PM Peak Hour Construction Traffic Movements

Construction Period		PM Peak Hour Construction Traffic Movements					
Phase	Activity	Staff Cars		Construction Trucks		Total Construction Vehicles (Car +Truck)	
		Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
Stage 2 Demolition	Site Establishment	0	5	1	1	1	6
	Demolition Activities	**0**	**25**	**3**	**3**	**3**	**28**
Containment Cell Construction	Vegetation clearance	0	5	1	1	1	6
	Preparatory works	0	8	1	1	1	9
	Cell Base liner Construction	0	16	1	1	1	17
	Internal Cell Wall Construction	0	12	1	1	1	13
	Cell Material Acceptance and Placement	0	12	1	1	1	13
	Leachate/Rainwater Management (Material Placement Phase)	0	2	1	1	1	3
	Containment Cell Cap Construction	0	14	1	1	1	15

Construction Period		PM Peak Hour Construction Traffic Movements					
Contaminated Soil Remediation and Smelter Waste Removal	Contaminated Soil Excavation	0	10	1	1	1	11
Capped Waste Stockpile Removal	Site Establishment	0	4	1	1	1	5
	Cap Removal	0	12	1	1	1	13
	Material Removal	0	12	1	1	1	13
Leachate and Groundwater Management	Operate water treatment plant (installed as part of capped waste stockpile removal Key Task).	0	2	1	1	1	3
	Decommission water treatment infrastructure	0	2	1	1	1	3

Source: Hyder's analysis, file:///F:\AA006291\CTMP\Data%20from%20Client\Traffic%20Generation.xlsx

At the peak construction work phase consisting of Demolition Activities, it is expected that approximately 28 vehicles (25 cars and 3 trucks) would be travelling to the site and 3 vehicles (trucks) leaving the site during the AM peak hour. In the PM peak, approximately 3 vehicles (trucks) would be arriving and 28 vehicles (25 cars and 3 trucks) would be departing the Project site. This estimation represents the predicted peak traffic generation for this work phase period and is considered to represent an overestimation of the traffic that would be generated in scenarios where construction works periods may overlap, as one Works period would be 'ramping down' while the subsequent Works period would be 'ramping up'.

Where Stage 1 and the Works occur concurrently, an additional 1 truck trip per direction (2 truck trips for both directions) is expected. Hence, the cumulative peak hour traffic generation is expected to be approximately 29 vehicles (25 cars and 4 trucks) would be travelling to the site and 4 vehicles (trucks) leaving the site during the AM peak hour. In the PM peak, approximately 4 vehicles (trucks) would be arriving and 29 vehicles (25 cars and 4 trucks) would be departing the site.

5.2 Traffic Impacts

The modelling assessment tested traffic capacity of the Loxford Interchange at Hart Road. The access intersection was assessed using SIDRA software modelling for assessing intersection capacity. The intersection performance was assessed against the criteria presented in **Table 4-4** in Section 4.1.1.

5.2.1 Impact on Loxford Interchange at Hart Road

Figure 5-7 shows the intersection layout modelled for on and off ramps at Hart Road.

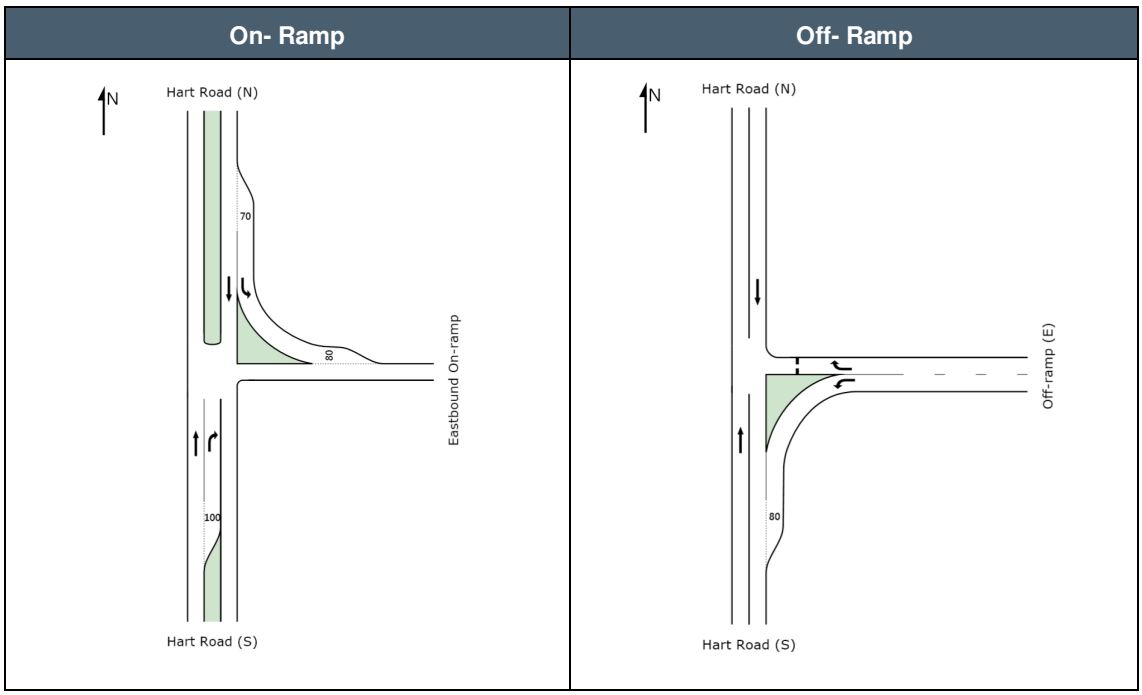


Figure 5-7 Intersection Layout on Hart Road

Table 5-9 shows the existing delay and level of service (LoS) results from SIDRA at Hart Road / Loxford surface interchange. Table 5-10 shows the predicted delay and level of service (LoS) at two analysed intersections with construction traffic.

Table 5-9 Modelled Level of Service for Existing Condition

ID	Intersections	Intersection Control	AM Peak		PM Peak	
			Avg. Delay (seconds)	LoS	Avg. Delay (seconds)	LoS
I-1	Hart Road/Off Ramp	Give Way/ Yield	11.1	A	12.5	A
I-2	Hart Road/On-Ramp	Give Way/ Yield	10.9	A	10.7	A

Source: SIDRA, Model: F:\AA006291\CTMP\D-Calculations\2-SIDRA\SIDRA Models Existing

Table 5-10 Modelled Level of Service with Construction Traffic

ID	Intersections	Intersection Control	AM Peak		PM Peak	
			Avg. Delay (seconds)	LoS	Avg. Delay (seconds)	LoS
I-1	Hart Road/Off Ramp	Give Way/ Yield	10.8	A	15.2	B
I-2	Hart Road/On-Ramp	Give Way/ Yield	10.9	A	10.7	A

Source: SIDRA, Model: F:\AA006291\CTMP\D-Calculations\2-SIDRA\SIDRA Models Stage 2 Traffic

The SIDRA model predicts LoS 'A' at Hart Road/On-Ramp priority intersection for the existing situation (without the construction traffic). A similar LoS A is also predicted for Hart Road/Off-Ramp priority intersection for existing situation (without the construction traffic). The SIDRA model predicts minor impact to delay and level of service at Hart Road/On-Ramp and Hart

Road/Off-Ramp at Loxford interchange with the construction traffic. Both intersections would operate at similar to the existing LoS A with construction traffic from the Project.

The analysis indicated that the construction traffic would have minor impact to traffic operation at Loxford interchange for On-ramp/Off-Ramp intersections in both AM and PM peak period.

5.2.2 Impact on Kurri Kurri Interchange at Cessnock Road

It is anticipated that the Kurri Kurri interchange of the Hunter Expressway at Cessnock Road would be utilised as access for staff/contractor vehicle trips. Figure 5-8 shows the intersection layout modelled for the Kurri Kurri Interchange at Main Road-Cessnock Road.

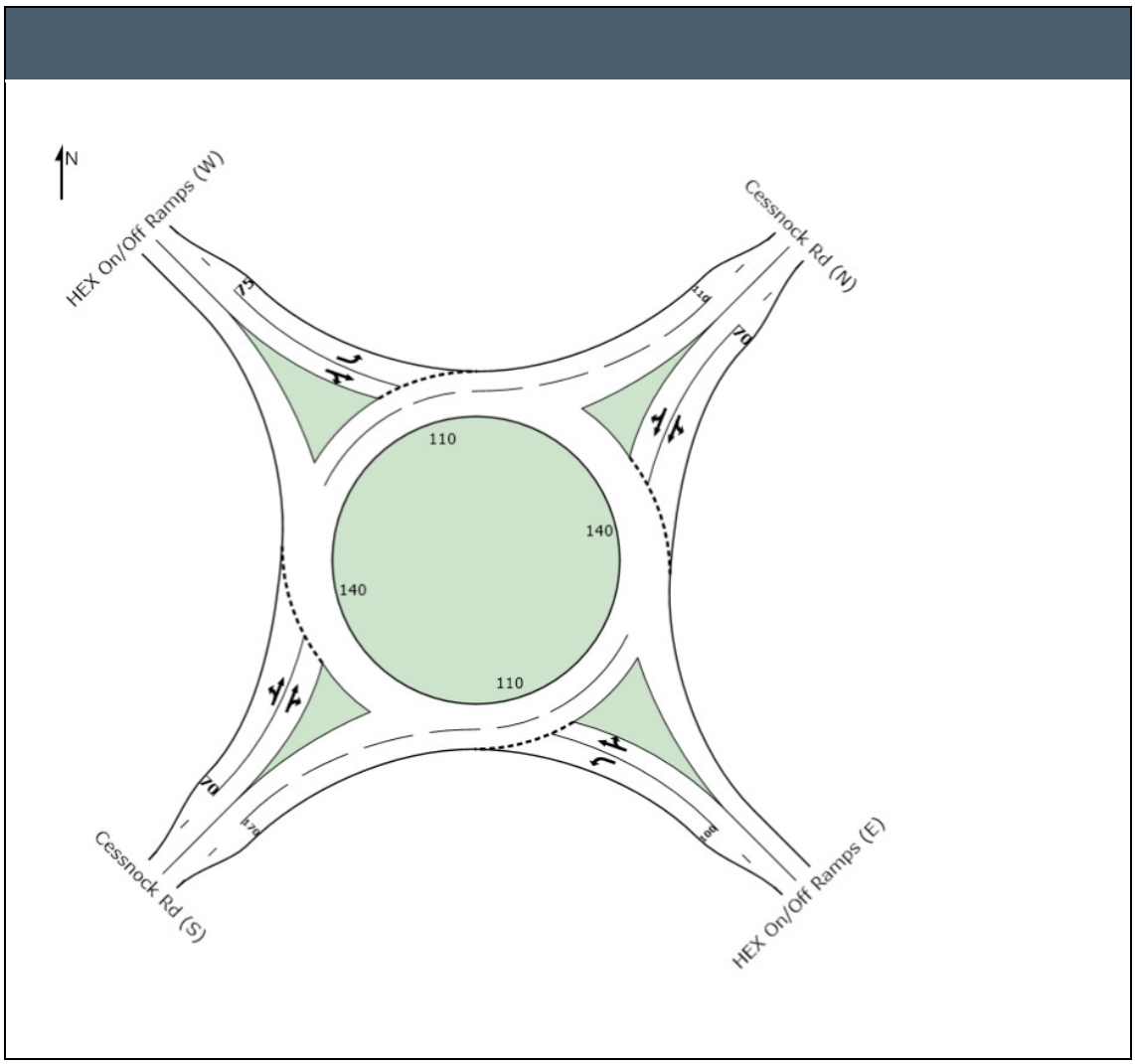


Figure 5-8 Kurri Kurri Interchange at Cessnock Road

Table 5-11 shows level of service results at Cessnock Road/Kurri Kurri Interchange predicted by SIDRA.

Table 5-11 Level of Service of Cessnock Road/Kurri Kurri Interchange

	AM Peak			PM Peak		
	LOS	Avg Delay (sec)	DoS	LOS	Avg Delay (sec)	DoS
Existing	A	9.3	0.216	A	9.3	0.274
The Works	A	9.4	0.217	A	9.4	0.275

Source: SIDRA, Model: F:\AA006291\CTMP\D-Calculations\2-SIDRA\SIDRA Models Stage 2 Traffic

5.2.3 Access and Egress

Access and egress to the Project site would be maintained on Hart Road using the existing access gates. The turning paths would be designed to promote safe and efficient access for the Works vehicles.

If larger vehicles are required to deliver materials, such as low loaders equipment and machinery, this will be specifically addressed in the TMP which would be submitted to Council and RMS for review and approval.

5.2.4 Internal Roads and on-site Parking

As discussed in Section 5.1.4, the number of daily car movements would vary between 6 and 75 car trips depending on phase period. In the event, all staff would drive a private vehicle, then about 25 parking spaces would be utilised on site.

Parking will be accommodated within the Contractor's compound. There is sufficient parking currently available at the Smelter to accommodate these requirements. The exact location will be determined prior to commencement of the construction works.

5.2.5 Public Transport

There is currently no bus service in the proximity of the Project site. Given that the majority of Works activities would be contained on site, it is considered unlikely that there would be any significant impacts to public transport services.

5.2.6 Local Property Access

The existing access to the Kurri Kurri Speedway and the Kurri Kurri Junior Motorcycle Club along Dickson Road would be maintained during the Works. Regular consultation with the Speedway and the Motorcycle Club would be undertaken to understand their planned activities and to advise of the proposed Works program.

Events at the Speedway and the Motorcycle Club are typically held on weekends outside of standard work hours. While there is the potential for activities to occur at the Project site outside standard hours, Works traffic leaving the Project site and passing through the intersection of Hart Road and Dickson Road at such times is expected to be minimal.

The signage to be installed on Hart Road and Dickson Road (as described in Section 6) would be sufficient to manage traffic at the intersection during events at the Speedway and the Motorcycle Club.

5.2.7 Emergency Vehicle Access

All access points for the Project site be made available for emergency vehicle access when the need arises. This would be considered as part of the Project site safety and incident management plans. As the Works are not encroaching onto the road network, this would be an internal site consideration, and is unlikely to have an impact on the surrounding road network.

6 Mitigation Measures

Key initiatives that would be undertaken as part of the Construction Traffic Management Plan include:

- A risk assessment to identify hazards to traffic control associated with the site, the level of risk posed and control measures to be implemented;
- A Vehicle Movement Plan for the management of construction traffic;
- A Traffic Control Plan in accordance with the Roads and Maritime Traffic Control at Work Sites manual;
- In consultation with Cessnock City Council and Roads and Maritime, general signposting of the access roads with appropriate (type and location) heavy vehicle and construction warning signs.
- Review of speed restrictions along Hart Road and additional signposting of speed limitations.
- Installation of specific warning signs at to the entrance to the Project site (at the intersection of Hart Road and Dickson Road) to warn existing road users of entering and exiting construction traffic.
- Distribution of day warning notices to advice local road users of scheduled construction activities.
- The promotion of car pooling for construction staff and other shared transport initiatives during the construction phase.
- Management of the transportation of construction and demolition materials to maximise vehicle loads to therefore minimise vehicle movements.
- Induction of truck and vehicle operators on the requirements of the Traffic Management Plan.

7 Conclusion

This Traffic Impact Assessment has been prepared by Hyder Consulting Pty Ltd on behalf of Hydro Aluminium Kurri Kurri Pty Ltd to support an Environmental Impact Statement for submission to the Department of Planning and Environment prepared to assess for the Demolition and Remediation Project (the Project) at the former Hydro Aluminium Kurri Kurri aluminium smelter at Hart Road Loxford (the Smelter).

This report has been prepared for the Project to identify any impact on the safety or operation of the adjacent road network during Project activities. The assessment concluded that the Project would comply with the applicable guidelines and requirements and would not have an adverse traffic impact on the surrounding network.

The volume and intensity of truck movements would increase over varying amounts during the Project. The short-term increases in traffic volumes on the road network and their duration have been determined. Based on the nominal capacity of the road network, the additional traffic due to the Project can be adequately accommodated at acceptable levels of service. The movement of materials and equipment that would be spread over the construction period can be arranged to minimise impact on the local community.

The analysis has determined that the activities associated with the Proposal would have minimal impacts on the road network with only minor impact to traffic operation at Loxford Interchange at Hart Road and the Kurri Kurri Interchange at Main Road-Cessnock Road in both the AM and PM peak period. The analysis indicated that Project traffic would not adversely impact through traffic operation on the Hunter Expressway.

Overall, the impact of the Project is anticipated to be minor and a Traffic Management Plan (TMP) would be applied to mitigate the impact. The TMP would be developed during the detailed design phase in consultation with Cessnock City Council and Roads and Maritime. The TMP would address key safety and logistical issues that may arise due to: heavy vehicle manoeuvres at major and minor road intersections; safety risks brought about by increased heavy vehicle traffic and temporary lane closures along Hart Road. Mitigation measures will be identified to address each of these issues.

8 References

Roads and Maritime Services, Guide to Traffic Generating Developments, Version 2.2, October 2002.

Austroads, Guide to Traffic Management, AGTM, Austroads 2009.