



**REVITALISING
NEWCASTLE**

Newcastle Light Rail Associated Road Upgrades

Technical Paper 1 – Traffic assessment

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Abbreviations

Term	Definition
LoS	level of service
Light rail REF	Newcastle Light Rail Review of Environmental Factors
Light rail project	Newcastle Light Rail project

1. Introduction

A revised traffic assessment has been undertaken to assess proposed changes in the road network following approval of the Newcastle Light Rail project (light rail project).

A package of road improvements is proposed that is designed to complement the development of the light rail project. The road improvements would seek to remove existing pinch points in the road network and ensure that traffic continues to move freely and efficiently.

The proposed works would occur at the following locations:

- Stewart Avenue (between Church Street to the north, Hebburn Street to the south and Parry Street to the west and including Honeysuckle Drive).
- King Street (east) (between Union Street and Darby Street).

The works generally involve capacity upgrades to the selected intersections by reducing the extent of the central road medians, realignment of existing lanes, adjustment of kerb lines and in some locations, removal of parking and property acquisition. The key features of the proposed works are described as follows, with full descriptions of the works provided in the REF:

1.1 Stewart Avenue (including works on Parry Street, Hunter Street and Honeysuckle Drive)

The key changes in this precinct involve providing an additional travel lane northbound along Stewart Avenue between Hunter Street and Honeysuckle Drive, which becomes a right turn lane into Honeysuckle Drive. The additional lane can be provided by widening the west side between Parry Street and Bishopgate Street and new footpath construction between Hunter Street and Bishopgate Street.

Additionally, a southbound slip lane is provided on Stewart Avenue for left turns into Honeysuckle Drive.

1.2 King Street (east)

The key change in this precinct involves providing two traffic lanes in each direction along King Street between Union Street and Darby Street by reallocating use of the existing roadway and removing parking in both directions during the AM and PM peak period.

2. Methodology

The purpose of the assessment is to:

- Assess the potential changes to traffic and transport performance resulting from the proposed roadworks.
- Identify measures to mitigate any potential impacts, if necessary.

To provide consistency with the *Newcastle Light Rail Review of Environmental Factors* (light rail REF) (GHD 2016), the SIDRA model developed for the REF was used for this analysis. The only changes to the model used in the REF was the addition of the new roadway geometry for each of the precincts with all other variables remaining constant.

No new signal phasing data was available and therefore, the signal arrangements used in the light rail REF were adopted.

No change to traffic volumes were considered in this analysis. The proposed works defined for each precinct would not result in a change in traffic volumes from those that were identified in the REF. The primary effect of the proposed works would be evidenced by changes in the intersection level of service (LoS), which is therefore the focus of this assessment.

The LoS provided to motorists is a measure of intersection performance, factoring in traffic volumes, intersection geometry, turning facilities and traffic signal phasing. It is derived from the overall delay to vehicles averaged over the whole intersection and allocated on an alphabetical scale as defined in Table 2-1. The LoS calculations and definition are also able to be applied on any given leg of the intersection or any movement (through or turning) on individual approaches.

Table 2-1 LoS criteria for intersections

LoS	Average delay per vehicle (seconds/vehicle)	Intersection performance
A	< 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	Incidents would cause excessive delays
F	> 70	At capacity

Source: Roads and Maritime traffic modelling guidelines, 2013

As traffic volumes grow into the future, some intersections begin to approach capacity and become saturated and the demand exceeds capacity. Several issues can arise, including:

- Vehicles unable to navigate through the intersection causing queuing that impacts upstream intersections. These queued vehicles reduce the performance of the upstream intersection.
- Vehicles unable to navigate through the intersection causing a reduction in the expected traffic volumes at downstream intersections. The reduction in traffic can improve the reported performance of the downstream intersection.

3. Impact assessment

Table 3-1 and Table 3-2 compare the performance of the 2018 and 2028 road networks respectively with the performance following implementation of light rail with and without the proposed road improvements.

The 2018/ 2028 ‘without light rail’ and 2018/ 2028 ‘with light rail no roadworks’ LoS are the same as those shown in the REF.

As shown in Table 3-1, the results indicate that the majority of intersections would operate at LoS C or better in the AM peak (compared to LoS D without roadworks) and LoS E or better in the PM peak following implementation of the package of additional road improvements.

Table 3-1 Summary of intersection performance at key locations in 2018

Location	2018 without light rail		2018 with light rail no roadworks		2018 with light rail and roadworks	
	AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
Throsby Street / Hannell Street	A	B	B	B	B	B
Honeysuckle Drive / Hannell Street	C	F	B	C	B	B
Hunter Street / Stewart Avenue	F	F	C	C	C	D
King Street / Stewart Avenue	C	D	D	D	C	D
Hunter Street / Steel Street	A	B	B	C	B	C
King Street / Steel Street	A	C	B	B	B	C
Hunter Street / Union Street	B	C	B	B	B	B
King Street / Union Street	D	D	D	E	C	E
Hunter Street / Merewether Street	B	C	B	B	B	B
Hunter Street / Darby Street	C	B	C	C	C	C
King Street / Darby Street	C	C	B	C	B	C

Compared to the ‘with light rail no roadworks’ scenario, there are three intersections that improve performance in 2018. These intersections are at:

- Honeysuckle Drive/ Hannell Street (PM peak only)
- King Street/ Stewart Avenue (AM peak only)
- King Street/ Union Street (AM peak only)

Some deterioration is predicted at the following intersections in 2018:

- Hunter Street/ Stewart Avenue (PM peak only)
- King Street/ Steel Street (PM peak only)

Generally, the deterioration at these locations is very minor and due to the fact that the proposed roadworks package has enabled higher traffic volumes at these intersections by improving flows at upstream intersections. For this reason, these outcomes are not considered to be adverse.

Overall, the traffic performance on the road network in 2018 is considered satisfactory and improved as a result of the proposed roadworks.

Table 3-2 provides a summary of predicted intersection performance in 2028.

Table 3-2 Summary of intersection performance at key locations in 2028

Location	2028 without light rail		2028 with light rail no roadworks		2028 with light rail and roadworks	
	AM peak	PM peak	AM peak	PM peak	AM peak	PM peak
Throsby Street / Hannell Street	A	F	B	C	B	F#
Honeysuckle Drive / Hannell Street	C	F	B	F	B	C
Hunter Street / Stewart Ave	F	F	C	D	C	C*
King Street / Stewart Avenue	C	C	E	D	E	C
Hunter Street / Steel Street	A	B	B	D	B	C
King Street / Steel Street	B	C	C	B	C	C
Hunter Street / Union Street	B	C	C	B	B	B
King Street / Union Street	D	D	D	F	D	F
Hunter Street / Merewether Street	B	C	B	B	B	B
Hunter Street / Darby Street	C	B	C	D	C	C
King Street / Darby Street	C	C	C	D	B	C

This LoS value is worse at this location than what was stated in the light rail REF. This worsening of performance is due to improvements at the intersection of Honeysuckle Street and Stewart Avenue allowing an increased traffic demand to access the intersection of Throsby Street and Hannell Street. This lower northbound demand in the REF allowed the intersection of Throsby Street and Stewart Avenue to perform better. In response to the poor performance at the intersection of Honeysuckle Drive and Stewart Avenue in the REF, SIDRA reduced the demand flows for northbound travel on Stewart Avenue (i.e. the demand at the intersection with Honeysuckle Drive was greater than the intersection capacity, therefore demand was reduced to meet the capacity).

*The LoS at Hunter Street and Stewart Avenue changes from a D to a C between 2018 and 2028. This is not necessarily an indication of improvements to the intersection itself, but also a result of the performance of surrounding intersections that feed traffic to the Hunter Street and Stewart Avenue intersection. In such instances, SIDRA reduces the demand flows to simulate the performance of the upstream intersection, in this case the Stewart Avenue intersection with Hunter Street (i.e. the demand was greater than the road capacity, therefore demand was reduced to meet the capacity).

Table 3-2 indicates that the package of proposed roadworks results in an improved performance at seven intersections in 2028 compared to the 'with light rail no roadworks' scenario. This is greater than the 2018 improvement and indicates that the proposed roadworks package provides better long term benefits. The intersections where performance improvement is identified includes:

- Honeysuckle Drive/ Hannell Street (PM peak only)
- Hunter Street/ Stewart Ave (PM peak only)
- King Street/ Stewart Avenue (PM peak only)
- Hunter Street/ Steel Street (PM peak only)
- Hunter Street/ Union Street (AM peak only)
- Hunter Street/ Darby Street (PM peak only)
- King Street/ Darby Street (AM and PM peaks)

Deterioration is expected at the following intersections:

- Throsby Street/ Hannell Street (PM peak only)
- King Street/ Steel Street (PM peak only)

The intersection of Throsby Street and Hannell Street in the PM peak period is estimated to operate at a LoS F in 2028 - the same as without the light rail scenario. The proposed network relief provided by roadworks at the intersection of Honeysuckle Drive/ Hannell Street has relocated the existing congestion issue from Honeysuckle Drive to Throsby Street.

The performance at the intersection of King Street/ Steel Street shows only a minor deterioration, mainly because the proposed roadworks package has enabled higher traffic volumes by improving flows at upstream intersections.

The intersection of King Street and Union Street in the PM peak period is estimated to operate at an LoS F in 2028 – the same as without the roadworks. This is due to the poor performance of Union Street on the southern approach to the intersection.

With the exception of the Throsby Street/ Hannell Street intersection and the King Street / Union Street intersection, traffic performance on the road network in 2028 is otherwise considered satisfactory for peak hour traffic volumes. Consistent with the Roads and Traffic Authority (RTA) *A Guide to Traffic Generating Developments* (2002), LoS E conditions are acceptable where traffic signals operate with a 120 second cycle time.

Overall, the proposal is considered to improve the road network performance in both 2018 and 2028 when compared with the 'with light rail no roadworks' scenarios at these key intersections.

4. Mitigation measures

The proposed package of road improvements provides for satisfactory network performance in both 2018 and 2028 improving upon the 'with light rail no roadworks' scenarios at key selected intersections.

Table 3-2 shows the intersection of Throsby Street/ Hannell Street in the 2028 PM peak period operating at LoS F, which is caused by a high traffic demand. Also, the capacity of the King Street/ Union Street intersection is predicted to deteriorate to LoS F by 2028. There is sufficient time post 2018 for these issues to be confirmed and necessary mitigation measures designed and implemented prior to substantial network performance deterioration.

5. References

GHD Pty Ltd (GHD), 2016, *Newcastle Light Rail Review of Environmental Factors*, report prepared for Transport for NSW

Roads and Traffic Authority (RTA), 2002, *A Guide to Traffic Generating Developments*, Sydney.

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