

## Appendix D – Traffic, transport and access





# SITA Australia

## Lucas Heights Resource Recovery Park Project

### Traffic Impact Assessment

September 2015



# Executive Summary

SITA Australia (SITA) is proposing a number of activities at the Lucas Heights Resource Recovery Park (LHRRP) in Lucas Heights (referred to in this report as 'the proposal'). This report has been prepared by GHD Pty Ltd on behalf of SITA to provide an assessment of the Traffic Impact Analysis associated with the proposal as an input to the environmental impact statement.

This report examines the capacity of the current road network to support the proposed future development within the precinct and provides guidance on the types and levels of future traffic and transport infrastructure required to support these modifications. It addresses the Secretary's Environmental Assessment Requirements and concludes that the proposal would meet the following objectives:

- Minimises disruption to local traffic
- No queuing on public roads
- Ensures road safety

The report identifies the existing conditions, identifies the impacts of the proposal, provides an assessment of the traffic impact and identifies infrastructure works required to mitigate any impacts of the development.

The Traffic Impact Assessment report for the 1999 EIS provides estimated traffic generation for the current approved waste operations, including during the AM peak:

- 88 truck movements (44 arriving and 44 departing), and
- 30 light vehicle movements (15 arriving and 15 departing)
- 118 vehicle movements in total during the AM peak hour

The above traffic generation estimates of 118 vehicle movements includes only waste transferred to the site by bulk waste transfer vehicles and by council waste vehicles.

Based on the assessment undertaken as part of this proposal, the technical analysis indicates that 105 vehicle movements (trucks and light vehicles) in total would occur during the AM peak hour (for the year where maximum level of traffic movements is expected - 2027). This assessment has taken into consideration waste delivery vehicles as well as vehicles associated with operations and capping activities

Therefore this proposal is expected to generate less traffic movements than that approved in the 1999 consent (105 compared to 118 vehicle movements during the AM peak hour).

This Traffic Impact Assessment (TIA) has been undertaken with reference to *Guide to Traffic Generating Development* (RTA 2002). Traffic counts and weekday AM and PM peak hour intersection modelling using SIDRA 6 was undertaken for:

- Heathcote Road / New Illawarra Road intersection
- Little Forest Road / New Illawarra Road (site access) intersection

The assessment found that:

- As a result of the proposal, approximately 4% of the vehicles using New Illawarra Road would be accessing the LHRRP in 2027 which is the expected peak year for traffic movements

- Assuming all facilities are operated at maximum capacity (worst case), the forecast increase in the number of vehicles in 2027 using New Illawarra Road during the AM peak hour and PM peak hour respectively are 1.4% and 1.8%, or 63 additional vehicles during each period, above what would occur in the absence of the proposal
- Key intersections (Heathcote Road / New Illawarra Road and Little Forest Road / New Illawarra Road) are able to accommodate both the forecast growth in baseline traffic plus the additional traffic associated with the proposal
- SITA has invested in High Mass Load trailers to transport waste. These trailers can carry approximately 20% more waste than the older trailers.

The assessment also concluded that the proposal is expected to have

- Negligible impacts to pedestrians
- Negligible impacts to cyclists
- No impacts to public transport operations.

A number of mitigation measures have been identified to ensure that transport and traffic impacts associated with the construction and operation of the Lucas Heights Landfill Project are minimised. These measures include initiation of a community information and awareness program prior to construction and preparation of a Traffic Management Plan.

In addition, SITA would engage an independent traffic expert to perform a safety review in both 2020 and 2025 of the Little Forest Road / New Illawarra Road intersection. The expert would be jointly selected by SITA and SSC.

Should the report indicate either of the following:

- That the measured average delay per vehicle is equal to or greater than 56 seconds for any of the turning movements to and from Little Forest Road from New Illawarra Road, or
- That the Benefit Cost Ratio for the provision of a controlled intersection is equal to or greater than 1, then

SITA would modify the Little Forest Road / New Illawarra Road intersection to address any issues identified, subject to the approval of RMS and SSC. All costs associated with upgrading of the intersection (if required) would be borne by SITA.

# Table of contents

Executive Summary .....	i
Glossary .....	vii
1. Introduction.....	1
1.1 Purpose of this report.....	1
1.2 Objectives .....	1
1.3 Proposal overview.....	1
1.4 Definitions .....	5
1.5 Location of the proposal .....	5
1.6 Secretary's Environmental Assessment Requirements and agency requirements .....	9
1.7 Scope and structure of the report .....	10
2. Methodology.....	12
2.1 Scope.....	12
2.2 Consultation .....	12
2.3 Methodology .....	12
3. Planning context.....	14
3.1 Planning controls .....	14
3.2 Planning approvals .....	14
4. Existing conditions .....	16
4.1 Existing land uses .....	16
4.2 Existing LHRRP operations .....	17
4.3 Existing road network characteristics .....	18
4.4 Public transport.....	21
4.5 Existing daily and peak hour traffic volumes .....	21
4.6 Intersection capacity assessments.....	23
4.7 Existing travel characteristics .....	23
4.8 Crash statistics.....	25
5. The proposal .....	27
5.1 Proposal overview.....	27
5.2 Traffic generation .....	28
5.3 Traffic estimates associated with existing consents .....	30
6. Impact assessment .....	32
6.1 Scope.....	32
6.2 Baseline traffic volumes.....	32
6.3 Trip distribution and assignment of development traffic .....	32
6.4 SIDRA analysis .....	32
6.5 Traffic distribution sensitivity testing .....	38
6.6 Review of SIDRA analysis using traffic microsimulation .....	39



6.7	Future residential traffic generation at Barden Ridge .....	42
6.8	Parking and access.....	46
6.9	Walking .....	48
6.10	Cycling .....	48
6.11	Public transport .....	48
7.	Mitigation measures .....	49
7.1	Overview .....	49
7.2	Mitigation measures.....	49
8.	Conclusions.....	51
8.1	Traffic impact assessment .....	51
8.2	Parking and access.....	52
8.3	Other potential impacts .....	52
8.4	Overall findings .....	52
9.	Limitations .....	53

## Table index

Table 1-1	Secretary's Environmental Assessment Requirements.....	9
Table 2-1	Measures of effectiveness for level of service definition for intersections.....	12
Table 2-2	Intersection level of service assessment criteria .....	13
Table 4-1	LHRRP current operational hours.....	17
Table 4-2	Heavy vehicles – February 2013 .....	21
Table 4-3	Average and 85th percentile speeds on Heathcote Road – February 2013 .....	22
Table 4-4	2014 surveyed weekday peak hourly traffic volumes on New Illawarra Road .....	22
Table 4-5	SIDRA results - 2014 surveyed traffic flows .....	23
Table 5-1	Proposed site operational hours.....	27
Table 5-2	Annual traffic generation .....	28
Table 5-3	Annual vehicle trip generation from the proposal .....	29
Table 5-4	Derivation of AM & PM peak hour traffic volumes (one-way) .....	30
Table 5-5	Consented AWT Traffic generation during operation (pre 2025) .....	31
Table 5-6	Consented AWT Traffic generation during operation (post 2025).....	31
Table 6-1	Heathcote Road/New Illawarra Road SIDRA results summary.....	34
Table 6-2	Right turn from New Illawarra Road to Little Forest Road results .....	35
Table 6-3	Right turn from Little Forest Road to New Illawarra Road results .....	36
Table 6-4	2027 AM Peak hour forecast increase in traffic.....	37
Table 6-5	2027 PM Peak hour forecast increase in traffic.....	37
Table 6-6	Heathcote Road/New Illawarra Road sensitivity test results .....	38



Table 6-7	Right turn from New Illawarra Road to Little Forest Road sensitivity test results.....	39
Table 6-8	Right turn from Little Forest Road to New Illawarra Road sensitivity test results.....	39
Table 6-9	Heathcote Road/New Illawarra Road Intersection Paramics Model Results – 2027 AM peak.....	40
Table 6-10	Little Forest Road/New Illawarra Road Intersection Paramics Model Results – 2027 AM peak.....	40
Table 6-11	2027 AM Peak hour forecast increase in traffic (sensitivity test).....	41
Table 6-12	2027 PM Peak hour forecast increase in traffic (sensitivity test).....	41
Table 6-13	Number of proposed residential lots at Barden Ridge.....	42
Table 6-14	Trip generation calculations – proposed residential development .....	43
Table 6-15	Heathcote Road and New Illawarra Road .....	43
Table 6-16	2027 Heathcote Road / New Illawarra Road intersection Paramics output.....	44
Table 6-17	2027 Little Forest Road/New Illawarra Road intersection Paramics Output .....	44
Table 6-18	ARRT and GO facility on-site car parking provision .....	46

## Figure index

Figure 1-1	Key existing infrastructure and proposed facilities layout.....	3
Figure 1-2	Proposed parkland master plan .....	4
Figure 1-3	The proposal site .....	7
Figure 1-4	Surrounding land uses .....	8
Figure 1-5	Study area.....	11
Figure 4-1	LEP 2015 Existing land zoning .....	16
Figure 4-2	Little Forest Road Access to LHRRP, facing northwest .....	19
Figure 4-3	New Illawarra Road southwest of Little Forest Road, facing west .....	20
Figure 4-4	Heathcote Road north of New Illawarra Road, facing south.....	20
Figure 4-5	2013 Surveyed Traffic Volumes on Heathcote Road (Two-way) .....	21
Figure 4-6	Journey to work explorer travel zone location .....	23
Figure 4-7	How people working in Lucas Heights travel to work .....	24
Figure 4-8	Residence of people working in Lucas Heights .....	24
Figure 4-9	Crash incidents around the LHRRP site .....	25
Figure 6-1	Existing Heathcote Road/New Illawarra Road intersection layout .....	33
Figure 6-2	Existing Little Forest Road/New Illawarra Road intersection layout .....	35
Figure 6-3	Platoon dispersion from the Heathcote Road / New Illawarra Road intersection (Paramics model screenshot) .....	40
Figure 6-4	Gaps between the platoons (Paramics model screenshot) .....	41

Figure 6-5 Platoon dispersion from the Heathcote Road / New Illawarra Road intersection  
(Paramics model screenshot) .....45

Figure 6-6 Gaps between the platoons (Paramics model screenshot) .....45

Figure 6-7 Concept plan of proposed car parking arrangements .....47

# Appendices

Appendix A – Traffic Survey Data

Appendix B – Crash Data

Appendix C – SIDRA Results

Appendix D – Background Traffic Growth Factors from RMS

Appendix E – Weighted Delay Methodology and Results

Appendix F – Sensitivity Testing SIDRA Results

# Glossary

Term	Definition
ANSTO	Australian Nuclear Science and Technology Organisation
ARRT facility	Advanced Resource Recovery Technology facility
DCP	Development Control Plan
EIS	Environmental Impact Statement
EPA	New South Wales Environment Protection Authority and any successor body.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
Currently approved landform	The currently approved landform heights and contours outlined in the 1999 EIS
GIS	Geographic Information Systems
GO facility	The Garden Organics facility at LHRRP, that undertakes composting of waste including green and garden waste, but excluding waste types such as food waste and biosolids
GLALC	Gandangara Local Aboriginal Land Council
Landform reprofiling	Proposed changes to currently approved landform at the LHRRP.
LHRRP	Lucas Heights Resource Recovery Park
Mitigation	The application of techniques to reduce environmental impacts arising from the proposal
OEMP	Operational Environment Management Plan and all relevant future documents, these will be provided for the landfill, GO and ARRT and will detail how these projects can be managed to meet the environmental outcomes for the site
PCYC Mini-Bike Club	The mini-bike club operated by the Police and Community Youth Clubs NSW Limited (PCYC).
SSC	Sutherland Shire Council
SEAR	Secretary's Environmental Assessment Requirements (formerly known as Director-General's Requirements or DGRs)
SICTA	Sydney International Clay Target Association and any successor body
SITA	SembSITA Australia Pty Ltd (SembSITA) is the holding company for the SITA Australia (SITA) group of companies in Australia. SembSITA is the parent company of both SITA and WSN Environmental Solutions Pty Ltd (WSN). WSN owns part of the land on which the LHRRP is situated, and leases the remainder from ANSTO. SITA holds the environmental protection licence (EPL), and so is the operator of the facilities at LHRRP. For simplicity, the term 'SITA' is used to refer to all of these organisations in this report.
Trip	A trip is two movements (in and out of the site)
TMP	Traffic Management Plan



# 1. Introduction

## 1.1 Purpose of this report

SITA Australia (SITA)<sup>1</sup> is proposing a number of activities at the Lucas Heights Resource Recovery Park (LHRRP) in Lucas Heights (referred to in this report as 'the proposal'). This report has been prepared by GHD Pty Ltd on behalf of SITA to provide an assessment of potential traffic impacts associated with the proposal as an input to the environmental impact statement. Due to the existing operational arrangements at LHRRP, Sutherland Shire Council (SCC) is a joint applicant for the proposal. The environmental impact statement is being prepared by GHD in accordance with the requirements of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (the EP&A Act).

The report addresses the requirements of the Secretary of the NSW Department of Planning and Environment (the Secretary's Environmental Assessment Requirements (SEARs No SSD-6835) dated 3 February 2015 (as outlined in Section 1.6).

In addition to addressing the SEARs requirements, this report provides an assessment of how well the proposal design meets SITA's objectives of having no significant impacts on the community or environment. Environmental management and mitigation measures related to air quality are proposed (where necessary) to mitigate potential impacts and ensure that they are managed in accordance with statutory requirements, regulations and community expectations.

## 1.2 Objectives

The following objectives have been identified:

- Minimises disruption to local traffic
- No queuing on public roads
- Ensures road safety

## 1.3 Proposal overview

The LHRRP consists of approximately 205 hectares (ha) in two ownerships. 89 ha is owned by SITA and 116 ha owned by Australian Nuclear Science and Technology Organisation (ANSTO) and leased to SITA for waste management or other agreed purposes. The following activities are proposed at the LHRRP and are collectively referred to as 'the proposal'. The proposal would not have a significant impact on the community. In addition to the proposal detailed below, SITA is committed to better environmental outcomes by the application of best practice prevention, mitigation and rectification measures:

- **Reprofiling of existing landfill areas to provide up to 8.3 million cubic metres of additional landfill airspace capacity.** This is equivalent to approximately 8.3 million tonnes of waste, assuming 1 tonne of waste utilises 1 cubic metre of waste disposal airspace. As the process of reprofiling would include removal and replacement of capping material over previously landfilled waste and augmentation of gas and leachate collection systems, the environmental performance of the site would be ultimately improved by

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<sup>1</sup> SembSITA Australia Pty Ltd (SembSITA) is the holding company for the SITA Australia (SITA) group of companies in Australia. SembSITA is the parent company of both SITA and WSN Environmental Solutions Pty Ltd (WSN). WSN owns part of the land on which the LHRRP is situated, and leases the remainder from ANSTO. SITA holds the environmental protection licence (EPL), and so is the operator of the facilities at LHRRP. For simplicity, the term 'SITA' is used to refer to all of these organisations in this report.

reducing the infiltration of stormwater into the landfill (resulting in reduced landfill leachate in the longer term) and increase the overall amount of landfill gas recovered from the site.

As part of the proposal, SITA is seeking permission to increase the approved quantity of waste landfilled at the site from 575,000 to 850,000 tonnes per year. This would enable the reprofiling of the site to be completed in 2037.

- **Relocation and expansion of the existing garden organics (GO) facility.** The existing garden organics facility would be relocated to the western side of the site adjacent to Heathcote Road. Approval is being sought to increase the approved capacity from 55,000 to 80,000 tonnes of green waste and garden waste received per year at the facility. The new facility would include the partial enclosure, active aeration and covering of the first four weeks of the active composting process, which coincides with the period of highest potential for odour generation, to enable more effective control of odour. Relocation of the facility would result in increased separation distances from the current nearest occupied land at ANSTO, existing residential areas and the proposed new residential area at West Menai.
- **Construction and operation of a fully enclosed advanced resource recovery technology (ARRT) facility.** The ARRT would be located on the western side of the site adjacent to the GO facility and would process and recover valuable resources from up to 200,000 tonnes of general solid waste per year, reducing the amount of waste disposed to landfill to approximately 60,000 tonnes per year. This would divert up to 140,000 tonnes of waste per year from landfill. SSC and other councils would have the opportunity to have their municipal waste processed by the ARRT facility.
- **Community parkland.** The landfill reprofiling would increase the area available for future passive recreation following site closure from 124 ha (existing approved parkland) to a total of 149 ha, an increase of approximately 25 ha. Landfilling would cease in 2037 after which time the site would be rehabilitated and converted to a community parkland, with capping and landscaping to be completed and the site made available for community use in 2039.

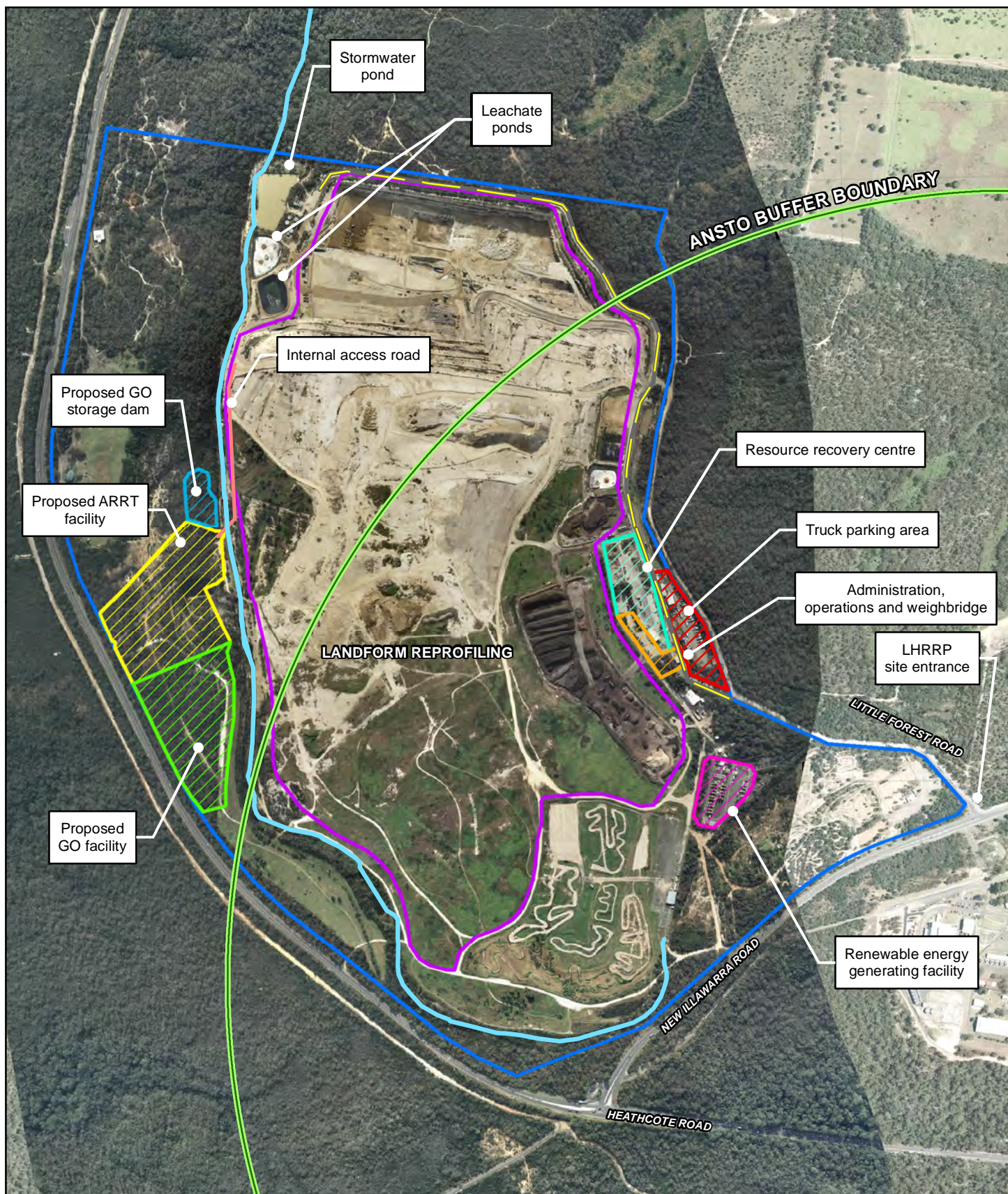
As part of the proposal SITA has committed to entering into an agreement with SCC in the form of a Voluntary Planning Agreement which includes 'environmental undertakings'. In addition operational environmental management plans have been prepared for the landfill, GO facility, ARRT facility and post closure measures to manage potential environmental impacts, reflect regulatory requirements and provide guidance for site operators to undertake activities in an environmentally sound manner.

A Planning Proposal is being submitted in parallel with this State Significant Development Application. The Planning Proposal seeks to include new local provisions on the LHRRP site within the Sutherland Local Environmental Plan 2015 (SLEP), which would allow the proposal (a waste or resource management facility) to be undertaken on the proposal site.

The expansion of the LHRRP which is outlined in this EIS would permit the proposed future use of the land for recreational purposes, which is currently approved and would occur when the existing facility ceases operation in 2025. The proposal would however extend the timeframe for which the land would be unavailable for recreational purposes until 2037, due to the extension of operations at the proposed LHRRP.

These key components of the proposal are shown on Figure 1-1. The proposed final landform and preliminary masterplan for the parkland is shown in Figure 1.2.

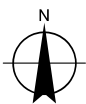




#### LEGEND

ANSTO buffer boundary	Proposed GO facility	Renewable energy generating facility
Mill Creek	Proposed ARRT facility	Lucas Heights Resource Recovery Park boundary
Internal access road	Resource Recovery Centre	Landform reprofiling boundary
Existing access road	Administration, operations and weighbridge	Truck parking area

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Map Projection: Transverse Mercator  
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Grid: GDA 1994 MGA Zone 56



SITA Australia  
Lucas Heights Resource Recovery Park

Job Number 21-23482  
Revision A  
Date 28 May 2015

#### Key existing infrastructure and proposed facility layout

Figure 1.1

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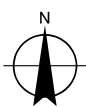
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Proposed parkland master plan **Figure 1.2**

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## 1.4 Definitions

The following terms are used within this report when referring to the proposal site and surrounding areas:

- The 'LHRRP' refers to the entire Lucas Heights Resource Recovery Park. The boundary of the LHRRP is shown as the blue line on Figure 1.3
- The 'proposal site' refers to the areas where the activities described in Section 1.2 would be located. The boundary of the proposal site is shown as the red line on Figure 1.3

## 1.5 Location of the proposal

### 1.5.1 Existing

The proposal would be located within the boundary of the existing LHRRP. The LHRRP is located within the Sutherland local government area, approximately 30 kilometres (km) south west of the Sydney city centre. The LHRRP is bound to the west by Heathcote Road and New Illawarra Road to the south.

Specifically, the proposal would be located on:

- Lot 101 DP 1009354
- Lot 3 DP 1032102
- Lot 2 DP 605077

It is noted that the proposal directly affects only a portion of each of these lots. There is minimal encroachment into the SICTA leased land (part of Lot 3 DP 1032102).

The proposal site, within the boundary of the LHRRP, is shown on Figure 1.3..

The site is currently accessed from Little Forest Road, off New Illawarra Road.

Current facilities at the LHRRP include:

- Landfill
- Resource recovery centre and waste collection point
- GO facility for processing garden organics
- Renewable energy production (operated by Energy Developments Ltd)
- Truck parking area
- Community use areas (mini bike area at the southern extent of the site run by the Sutherland Police Citizens Youth Club and the Sydney International Clay Target Association (SICTA) leased land on the north western side of the site)

There are also several ancillary buildings and structures (e.g. weighbridge, machinery workshop, administration offices, stormwater and leachate dams).

The following land uses are located in the immediate vicinity of the LHRRP:

- Bushland areas that form part of ANSTO's exclusion zone (to the east and south)
- ANSTO's facilities (to the east on the opposite side of New Illawarra Road)

Land uses in the surrounding area include:

- Holsworthy Military Reserve (to the west, northwest and southwest)

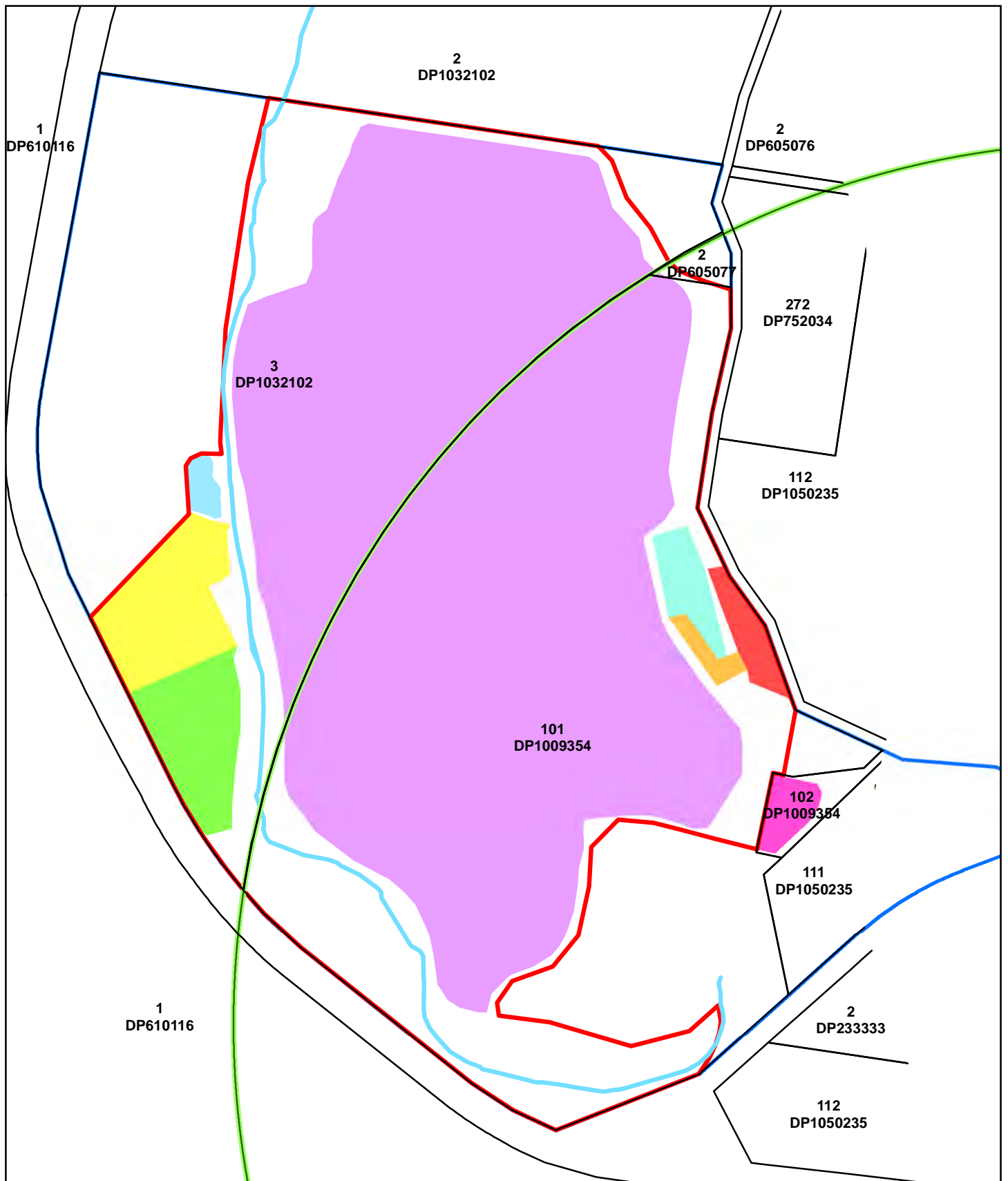
- The Ridge Sports Complex, a major regional sporting facility being developed on the site of the former Lucas Heights Waste and Recycling Centre (approximately 2.5 km to the north east)
- Lucas Heights Conservation Area (immediately to the north of the LHRRP)
- The suburbs of North Engadine (approximately 2 km to the east) and Barden Ridge (approximately 3 km to the north east)

Figure 1-4 shows these key areas.

#### 1.5.2 Potential future surrounding land uses

The Gandangara Local Aboriginal Land Council (GALC) is proposing a development in the West Menai area. The West Menai State Significant Site contains 849 ha of mostly undeveloped land, covering parts of Menai, Barden Ridge and Lucas Heights.

The western boundary of the proposed development is Heathcote Road and the site extends east across Mill Creek to the edge of the existing Menai residential area close to New Illawarra Road. The location of the proposed West Menai State Significant Site is shown on Figure 1-4.



#### LEGEND

ANSTO buffer boundary

Mill Creek

Cadastre

Proposal site boundary

Lucas Heights Resource Recovery Park boundary

Truck parking area

Proposed GO facility

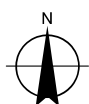
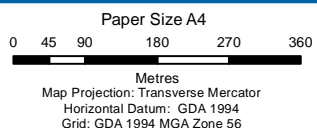
Proposed ARRT facility

Resource Recovery Centre

Administration, operations and weighbridge

Renewable energy generating facility

Landform reprofiling boundary



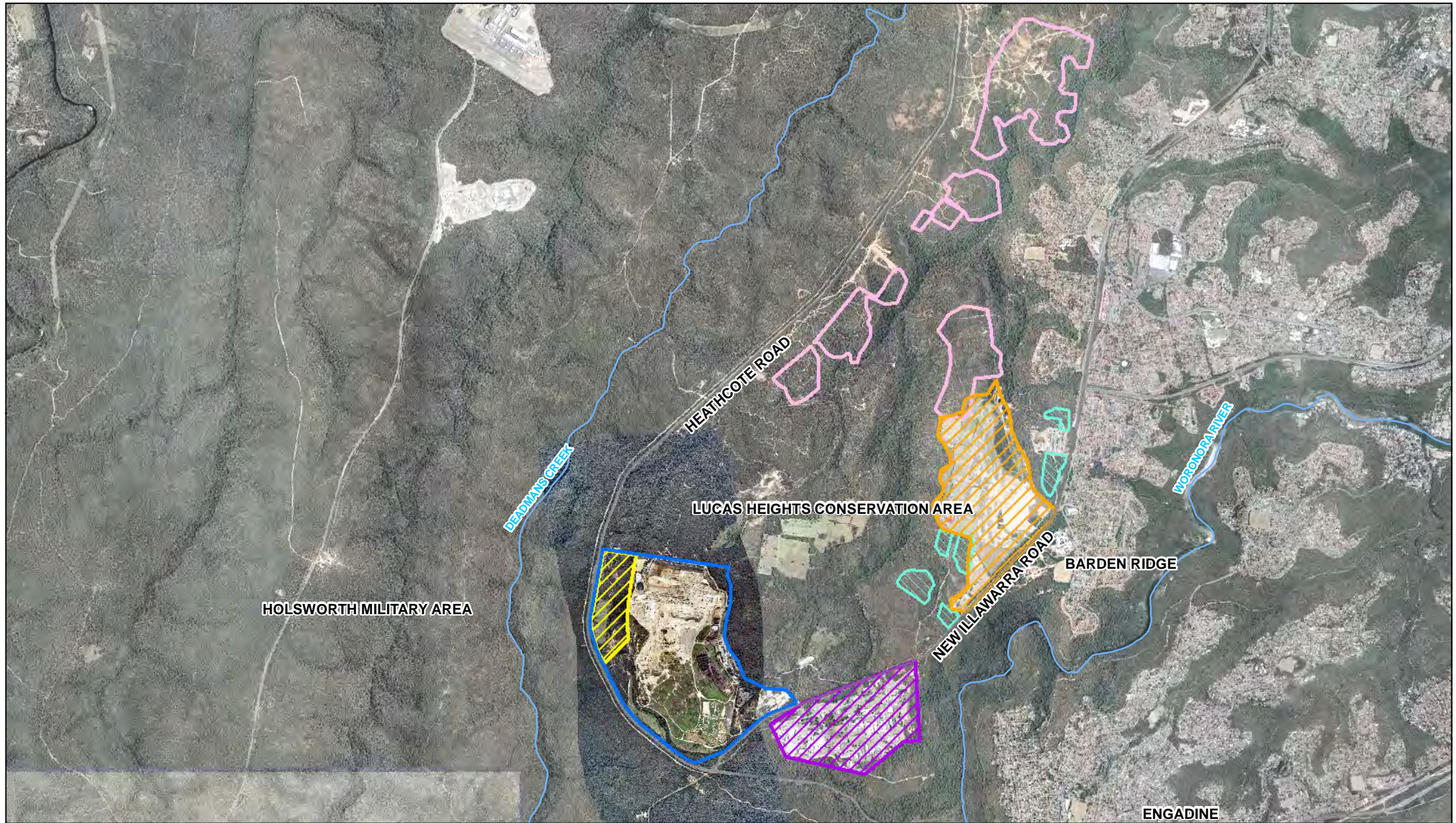
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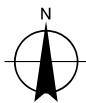
The proposal site

Figure 1.3





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Map Projection: Transverse Mercator  
Horizontal Datum: GDA 1994  
Grid: GDA 1994 MGA Zone 56



#### Legend

- LHRRP boundary
- SICTA boundary
- ANSTO
- Barden Ridge Sports Complex

- Potential future receptors
- Future receptors – Residential



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Surrounding landuses

Figure 1.4

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## 1.6 Secretary's Environmental Assessment Requirements and agency requirements

The specific SEARs and agency requirements addressed in this report are summarised in Table 1-1.

Table 1-1 Secretary's Environmental Assessment Requirements

Assessment requirements	Where addressed in report
Details of traffic types and volumes likely to be generated during construction and operation	Section 5.2, 6.3
Details of key transport routes, site access, internal roadways, infrastructure works and parking	Section 5.1
Detailed plans of the proposed layout of the internal road network and parking on site in accordance with the relevant Australian standards	Section 6.8
An assessment of the predicted impacts of this traffic on the safety and capacity of the surrounding road network, including consideration of cumulative traffic impacts from other developments, using SIDRA or a similar traffic model	Section 6.4
<b>Agency requirements (RMS)</b>	
Daily and peak traffic movements likely to be generated by the proposed development including the impact on nearby intersections and the need for associated funding for upgrading or road improvement works (if required).	Section 5.2.2
Details of the proposed accesses and the parking provisions associated with the proposed development including compliance with the requirements of the relevant Australian Standards (i.e. turn paths, sight distance requirements, aisle widths, etc).	Section 6.8
Proposed number of car parking spaces and compliance with the appropriate parking codes.	Section 6.8
Details of service vehicle movements (including vehicle type and likely arrival and departure times).	Section 5.2. Traffic generation estimates includes service vehicles.
To ensure that the above requirements are fully addressed, Roads and Maritime requests that traffic modelling be undertaken for the resource recovery facility to properly ascertain the traffic impacts associated with the development. The traffic modelling process provides an opportunity to identify a package of infrastructure measures required to support the proposed development. This traffic modelling shall assess the existing levels of service of surrounding intersections and identify local intersection and road improvements, vehicular access options, the timing and cost of any infrastructure works and the identification of funding responsibilities associated with the development.	Section 6.4
Roads and Maritime will require in due course the provision of a traffic management plan for all demolition/construction activities, detailing vehicle routes, number of trucks, hours of operation, access arrangements and traffic control measures.	Noted. Section <b>Error! Reference source not found.</b> identifies requirement for a traffic management plan.

## 1.7 Scope and structure of the report

### 1.7.1 Scope of report

This report examines the capacity of the current road network to support the proposed future development within the precinct and provides guidance on the types and levels of future traffic and transport infrastructure required to support these modifications.

The key objectives of this study are to:

- Identify existing conditions – a review of existing road features, adjacent developments, traffic volumes, sight distances and crash data.
- Identify impacts of the proposal – provides details of the proposal and a review of additional traffic generated as a result of the LHRRP modification.
- Traffic impact assessment – provides an assessment of the traffic impact on the surrounding road network and assesses the access and parking associated with construction.
- Identify the transport and parking infrastructure works required to mitigate the impacts of the development and ensure that the transportation network continues to operate at an acceptable level of amenity.

Given the strategic nature of the assessment, traffic modelling and traffic impact assessment has been undertaken based on a set of assumptions relating to the current traffic conditions, the future traffic demand and the future transportation network.

All source data employed in the preparation of the transport assessment has been diligently collated and checked by GHD. However, given the level of detail of the assessment and the reliance on assumptions, the accuracy of modelling forecasts will be influenced by unknowns or changes to what have been assumed to occur in the future.

The study has been limited by the following:

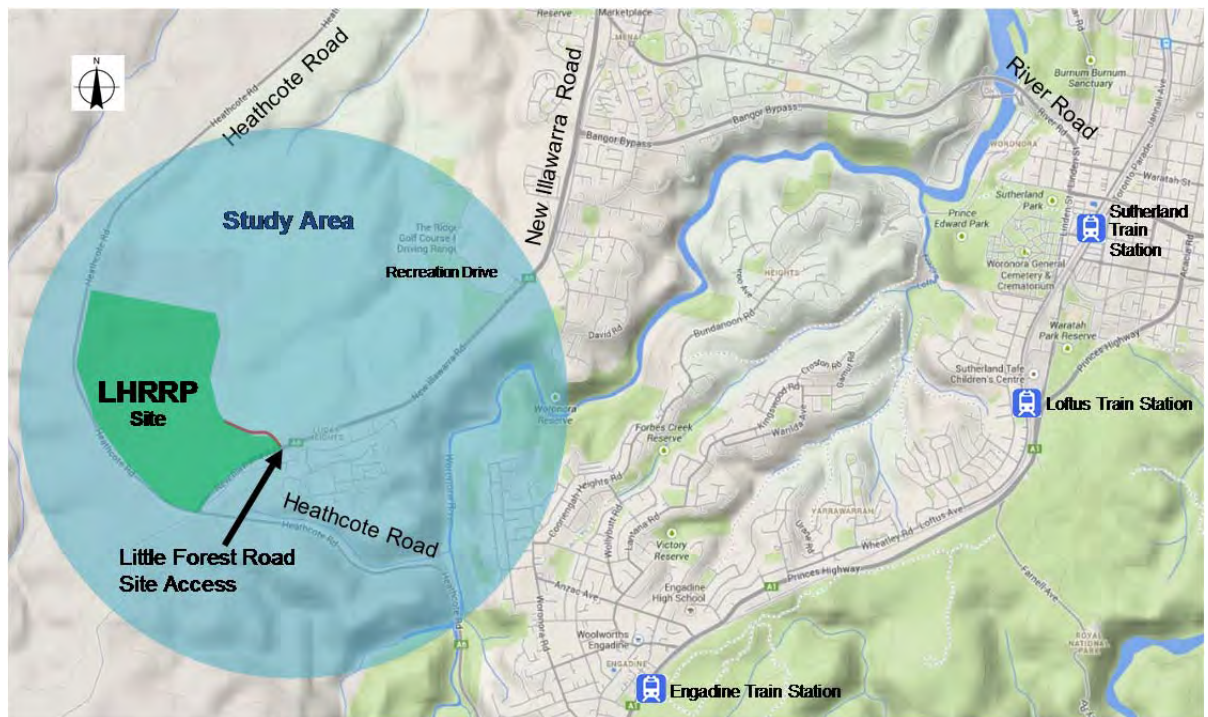
- Intersection modelling undertaken using the SIDRA 6.1 intersection modelling software, which is the industry standard software for modelling intersections.
- Expected traffic generation and traffic distribution has been provided by SITA.
- Forecast peak hour traffic generation was derived from annual traffic generation forecasts, provided by SITA, based on hourly existing arrival/departure rates from weighbridge data at the existing Lucas Heights Resource Recovery Park.
- Traffic growth factors were provided by NSW Roads & Maritime Services (RMS) from their EMME/2 model, which assumes that there will be no Bangor Bypass extension. These growth factors were applied to the 2014 traffic surveys to calculate the 2017 and 2027 baseline peak hour traffic conditions.

### Study area

The site is currently accessed from Little Forest Road, off New Illawarra Road.

The study area has been limited to the extent of 2 kilometres north and south along Heathcote Road, from the intersection of New Illawarra Road and Heathcote Road. The boundary of New Illawarra Road to the intersection Recreation Drive is also included in the study area. The site location and study area can be found in Figure 1-5.





Source: Google Maps 2014, modified by GHD

Figure 1-5 Study area

#### 1.7.2 Structure of report

The remainder of this report is structured as follows:

- Section 2 *Methodology* – defines the study area assessed in this report and describes the steps undertaken in the assessment.
- Section 3 *Planning Context* – broadly reviews the planning controls for the site and surrounding area.
- Section 4 *Existing Conditions* – provides a review of existing road features, adjacent developments, traffic volumes and crash data.
- Section 5 *Proposed Development* – provides details of the proposal and a review of additional traffic generated as a result of construction and operation of the proposed development.
- Section 6 *Impact Assessment* – examines the potential traffic and transport impacts associated with the construction and operation of the project.
- Section 7 *Summary and Recommendations* - provides a summary of the key findings and recommendations from the study.

## 2. Methodology

This section outlines the methodology and evaluation criteria used in the assessment of the project.

### 2.1 Scope

This report provides an assessment of traffic impacts during the operational and construction stages of the project and identifies mitigating measures to address identified impacts. The report focuses on the ultimate peak scenario (2027) during this period and the overall effect on the surrounding road network.

### 2.2 Consultation

This study has included and taken into consideration consultation with the following road authorities:

- Roads and Maritime Authority
- Sutherland Shire Council
- ANSTO

### 2.3 Methodology

This Traffic Impact Assessment (TIA) has been undertaken with reference to *Guide to Traffic Generating Development* (RTA 2002). While not mandatory, the guideline suggests a process and methodology to undertake the TIA. The traffic operation assessment process outlined in the guidelines stipulates that the operating characteristics need to be compared with agreed performance criteria.

The assessment criteria adopted for this report is outlined in the following sections.

#### 2.3.1 Intersection assessment criteria

The 'Level of Service' (or LoS) is the standard measure used to understand the operational performance of the network and intersections. This is defined as the qualitative assessment of the quantitative effect of factors such as speed, traffic volume, geometric features, delays and freedom of movement. The level of service concept is applied to intersections through measures of effectiveness, as summarised in Table 2-1.

Table 2-1 Measures of effectiveness for level of service definition for intersections

Intersection Control	Measure of effectiveness
Priority controlled	Degree of Saturation Delay to critical movements (sec/vehicle) Queue length for critical movements
Traffic signals	Average Delay (sec/vehicle) Delay to critical movements Degree of Saturation Cycle Length Queue length for critical movements
Roundabout	Average Delay (sec/vehicle) Delay to critical movements Degree of Saturation Queue length for critical movements

The assessment of intersection operation is based on criteria outlined in Table 2-2, as defined by the NSW Roads and Traffic Authority (*Guide to Traffic Generating Developments*, RTA 2002).

Table 2-2 Intersection level of service assessment criteria

LoS	Average delay/ vehicle (secs)	Traffic signals & roundabouts	Give-way & stop signs
A	Less than 15	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28 to 42	Satisfactory	Satisfactory, but accident study required
D	42 to 56	Operating near capacity	Near capacity, accident study required
E	56 to 70	At capacity, excessive delays; roundabout requires other control mode	At capacity; requires other control mode
F	exceeding 70	Unsatisfactory; requires additional capacity	Unsatisfactory, requires other control mode.

Source: *Guide to Traffic Generating Developments* (RTA 2002)

Note:

- The average delay assessed for signalised intersections is over all movements.
- For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule), the critical criterion for assessment is the movement with the highest delay per vehicle.
- Average delay is expressed in seconds per vehicle.

The operational performance of intersections has been assessed using SIDRA Intersection analysis software tool. The Level of Service criteria set by the RMS is outlined in Table 2-2 and it is noted that LoS 'D' is generally an accepted operating condition along urban roads.

### 2.3.2 Intersection assessment methodology

For this study, traffic counts were undertaken at the following locations in 2014:

- Heathcote Road / New Illawarra Road intersection
- Little Forest Road / New Illawarra Road intersection
- Classified seven day "tube" traffic counts at Heathcote Road, north of New Illawarra Road.

Weekday AM and PM peak hour intersection modelling was undertaken using SIDRA 6 of the above intersections under the following scenarios:

- 2014 base
- 2017 base
- 2017 + development
- 2027 base
- 2027 + development

Traffic growth factors were provided by RMS from their EMME/2 model, which assumes that there will be no Bangor Bypass extension, between New Illawarra Road and Heathcote Road. The growth factors were applied to the 2014 traffic surveys to calculate the 2017 and 2027 without development peak hour traffic conditions.

### 3. Planning context

This section of the report broadly outlines the planning controls relevant to this study.

According to the 2011 Census data, the Sutherland Shire Council has a population of 210,863 people, over an area of 370 kilometres square. It includes the suburbs of Kurnell, Caringbah, Cronulla, Bundeena, Miranda, Sylvania, Como, Alford's Point, Menai, Engadine, Heathcote and Waterfall. Sutherland Shire has the second largest population in NSW.

#### 3.1 Planning controls

A development application was submitted and approved in 1999 which permitted the expansion of waste disposal operations and also the development of composting and other resource recovery operations at the site. The final land-use was approved to be a parkland over the majority of the site and also on-going composting and other resource recovery operations located on the eastern side of the site.

A further development application was submitted and approved in 2010 for an Alternative Waste Treatment (AWT) Facility, to treat up to 100,000 tonnes per year of municipal solid waste. The project did not proceed and the approved location at the south eastern extent of the site is considered no longer suitable for this purpose.

SITA, in conjunction with Sutherland Shire Council (SSC) who is a co-applicant of this application, is proposing a number of activities at the LHRRP to help NSW Government achieve its waste strategy objectives and to improve environmental outcomes.

Planning controls for SSC are contained within the *Sutherland Shire Council Environment and Sustainability Strategy (2012)* and the Sutherland Shire Local Environmental Plan 2006. The principles for the street and environmental network include the following:

- Protecting the environment – the Strategy entails a broad range of policies which protect the native flora and fauna through resident volunteerism, Greenweb and policies which protect bushland and trees.
- Conserve natural resources – Sutherland Shire Council aims to reduce the amount of waste generation by increasing recycling and reducing landfill waste. The council offers alternate fortnightly green waste and co-mingled recycling services to residents, which help to minimise landfill waste.
- Deliver integrated transport options – the council promotes the use of sustainable transportation through the implementation of cycling routes, Pedestrian Access and Mobility Plans (PAMPs) and a high quality public transport infrastructure.

#### 3.2 Planning approvals

Initially, SSC was the consent authority for the LHRRP. In 1985, SSC granted approval for operation of the LHRRP (Consent No. 5482/85), commonly known as Lucas Heights 2. SSC also approved the upgrading of the entrance in 1996 (DA No 951337).

However, from 1999 onwards, the NSW Minister for Planning has determined all developments requiring approval. The consent granted by the Minister for Planning on 12 November 1999 (development consent DA No 11-01-99 consent ref R97/00029) applies to three contiguous areas being: Lucas Heights 1 (Ridges Sporting Complex), Lucas Heights 2 (LHRRP) and the conservation area in between these sites. This consent also permitted expansion of the LHRRP's capacity by 8.225 million tonnes and extension of the landfill life to 31 December

2024. The same consent also permits ongoing resource recovery operations at Lucas Heights 2 and an adjacent parkland facility for passive recreation by the community.

Since 1999 there have been a number of modifications to the conditions of consent (e.g. to remove restrictions on the sources of waste), and the LHRRP has been used for disposal of significant quantities of waste from outside the former Southern Sydney Waste Planning and Management Board (SSWPMB) region. Those modifications to the consent were granted by the Minister for Planning.

There have been other modifications to the consent in regard to the Ridges Sporting Complex. The following modifications to the consent relate to the LHRRP site.

#### **Modifications to the current consent**

- 5 June 2001 – Limits on amounts of waste received per annum and restrictions on access road to be used
- 21 April 2005 – Reduction in number of dams on site, modification of other dams
- 22 Sept 2005 – Removal of restriction to source 80% of waste from SSWPMB region
- 18 February 2009- construction and operation of the LHWRC truck parking area
- 26 July 2010 – Truck parking area modification for up to 32 waste collection trucks, and associated internal access roads, administration office and utilities
- 8 December 2010 – Additional excavation of Stages 5-2 and 5-3 and subsequent stockpiling of soil

#### **Other separate consents**

- Part 3A of the *Rivers and Foreshores Improvement Act 1948*, permit for Mill Creek rehabilitation works
- Approval in 2010 for an AWT facility to process up to 100,000 tonnes of municipal solid waste per year in the south-western area of the site. The location of this proposed facility is no longer considered suitable.
- Operation of a mini-bike club on a portion of the LHRRP site, operated by the Police Youth Citizens Club (PCYC)
- Operation of landfill gas engines for electricity generation

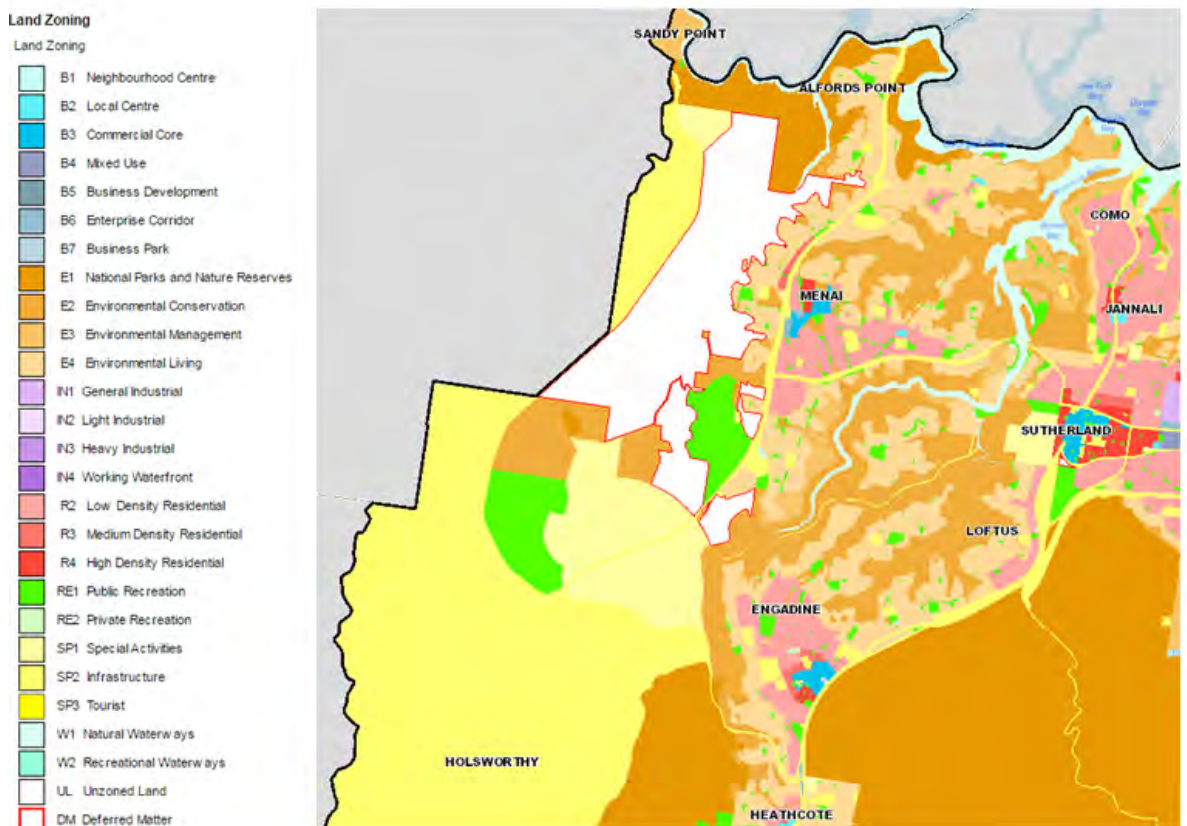


## 4. Existing conditions

This section outlines the existing conditions around the site including traffic conditions on roads in the vicinity of the site. This includes the existing transport and accessibility conditions and the existing road network performance.

### 4.1 Existing land uses

Existing land uses in the study area consist of mainly national parks and nature reserves. The closest residential area consists of mostly low density residential areas in Engadine, located approximately 3 kilometres to the east of the study area. An extract of the *Local Environment Plan (LEP) 2015*, shows the current land zoning around the study area, shown at Figure 4-1.



Source: Sutherland Shire Council LEP Land Zoning, modified by GHD

Figure 4-1 LEP 2015 Existing land zoning

## 4.2 Existing LHRRP operations

The current hours of operation for the LHRRP are summarised in Table 4-1.

Table 4-1 LHRRP current operational hours

Activity	Day	Hours
Construction and landfilling operations	Monday - Friday	6am – 4pm
	Saturday and Sunday	8am – 5pm
Any other activity	Monday - Sunday	Anytime

Over 157,000 cars and trucks currently visit the LHRRP each year, resulting in 314,000 vehicle movements.

The following facilities are available at the LHRRP.

### Resource Recovery Centre

The Resource Recovery Centre and Waste Collection point is an area for small vehicles to drop off recyclable materials including the following items:

- Recyclables; e.g. used plastic containers, paper, cardboard, E-waste
- Ferrous metal; e.g. washing machines, stoves, bicycles, scrap steel, etc.
- Hazardous items; e.g. paint, vehicle batteries, engine oil, LPG gas cylinders
- Mattresses
- Old clothing
- Household rubble e.g. bricks, concrete, roof tiles and terracotta pipes (which are all processed for reuse on site)

Deposited items that cannot be reused or recycled are deposited in the waste disposal area.

### Garden Organics facility

The current garden organics facility is located on the eastern side of the LHRRP. Here, garden organics collected from the kerbside from various local councils are received and processed. Householders and small businesses are also able to deliver garden organics to the facility. Open windrow composting is used on site to process the material into composts, mulches and other soil conditioning products. The facility also accepts clean untreated timber for recycling into mulches and biofuels.

Up to 55,000 tonnes of garden organics per year are currently approved to be processed on site to produce composts that meet the quality requirements of Australian Standard AS4454: Composts, soil conditioners and mulches. A wide variety of composts and mulches are produced on site and sold to Councils, landscapers, etc. for applications such as top dressing, landscaping and horticultural uses, mine rehabilitation and similar uses.

### Lucas Heights Road Waste Disposal Facility

The waste disposal facility accepts large quantities of general municipal waste (or mixed solid waste/ municipal solid waste) from various Council kerbside collections. Local council collection vehicles, waste contractors providing Council collection services and commercial waste contractors all deliver material to the LHRRP for disposal at the site. Waste from various waste transfer stations operated by SITA is also disposed of at the site. The maximum permissible acceptance rate to the LHRRP in accordance with the existing conditions of consent is currently 630,000 tonnes per year comprising 575,000 tonnes of waste for disposal and 55,000 tonnes of garden organics each year. Additionally the site has approved to receive a further 100,000



tonnes per year of waste for treatment at the approved AWT facility. There is no restriction placed on traffic movements for either consent.

A key part of SITA's environmental responsibilities is ongoing rehabilitation and long term management of closed landfill areas. Infrastructure located on site to manage the environmental aspects of waste disposal includes leachate collection ponds, stormwater basins, a biogas collection system and electricity generators (refer below).

### Green energy production

Decomposition of organics in the deposited waste results in the production of biogas. Wells are located at intervals on the surface, and used to extract the biogas from deep within the waste mass. The biogas is collected by a series of header pipes and piped to the south-eastern corner of the waste disposal area. Here it is converted into electricity using large reciprocating engines that are specially designed to run on the generated gas. The large-scale generation of green electricity from waste decomposition in Australia was pioneered at the Lucas Heights site in 1994.

## 4.3 Existing road network characteristics

This section outlines the existing traffic and transport conditions in the vicinity of the precinct.

### 4.3.1 Functional road hierarchy

Roads are classified according to the functions that they perform. The main purpose of defining a road's functional class is to provide a basis for establishing the policies, which guide the management of the road according to their intended service or qualities. Functional road classification involves the relative balance of the mobility and access functions.

NSW Roads and Maritime Services define four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility, to high accessibility and low mobility. These road classes are:

- **Arterial Roads** – controlled by RMS, typically no limit in flow and designed to carry vehicles long distance between regional centres.
- **Sub-Arterial Roads** – can be managed by either council or RMS under a joint agreement. Typically their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a sub region, or provide connectivity from arterial road routes (regional links).
- **Collector Roads** – provide connectivity between local sites and the-arterial road network, and typically carry between 2,000 and 10,000 vehicles per day.
- **Local Roads** – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

### Little Forest Road

Little Forest Road functions as a local road which provides access to LHRRP only. The road operates as a two-way road with a raised centre median from New Illawarra Road to the waste and recycling centre gates which are located approximately 100 metres from the intersection with New Illawarra Road.



Figure 4-2 Little Forest Road Access to LHRRP, facing northwest

#### **New Illawarra Road**

New Illawarra Road functions as an arterial road and forms part of the NSW State Road corridor (Metroad No. 6), providing connection between Carlingford to Heathcote.

New Illawarra Road has a sign posted speed limit of 80 km/h in the vicinity of the site. The road is approximately 10 m wide, providing a two way undivided, marked carriageway in the vicinity of the intersection with Little Forest Road.

New Illawarra Road has recently had the speed limit increased from 70 km/h to 80 km/hr between Heathcote Road and Recreation Drive.



Figure 4-3 New Illawarra Road southwest of Little Forest Road, facing west

#### **Heathcote Road**

Between New Illawarra Road and the Princes Highway, Heathcote Road functions as an arterial road and forms part of the NSW State road corridor (Metroad No. 6) providing connection between Carlingford to Heathcote.

To the north of New Illawarra Road, Heathcote Road provides a connection between Holsworthy and Heathcote.

Heathcote Road has a sign posted speed limit of 70 km/h south of New Illawarra Road, and 100 km/h north of New Illawarra Road, which reduces to 70 km/h on approach to the New Illawarra road signalised intersection. Heathcote Road is approximately 10 m wide, providing a two way undivided, marked carriageway.



Figure 4-4 Heathcote Road north of New Illawarra Road, facing south

## 4.4 Public transport

No public transport services currently facilitate LHRRP. Engadine train station is located approximately 8 kilometres from the LHRRP site.

## 4.5 Existing daily and peak hour traffic volumes

### 4.5.1 Midblock traffic counts

Traffic 'tube' count surveys were undertaken on Heathcote Road in the vicinity of the proposed access intersection. The traffic counts were undertaken between Monday 4<sup>th</sup> and Sunday 10<sup>th</sup> February 2013 and recorded classified (by vehicle type) directional traffic flows on Heathcote Road.

A profile of the two-way (northbound and southbound traffic flows combined) traffic flows is shown at Figure 4-5, with the traffic surveys provided in full in Appendix A.

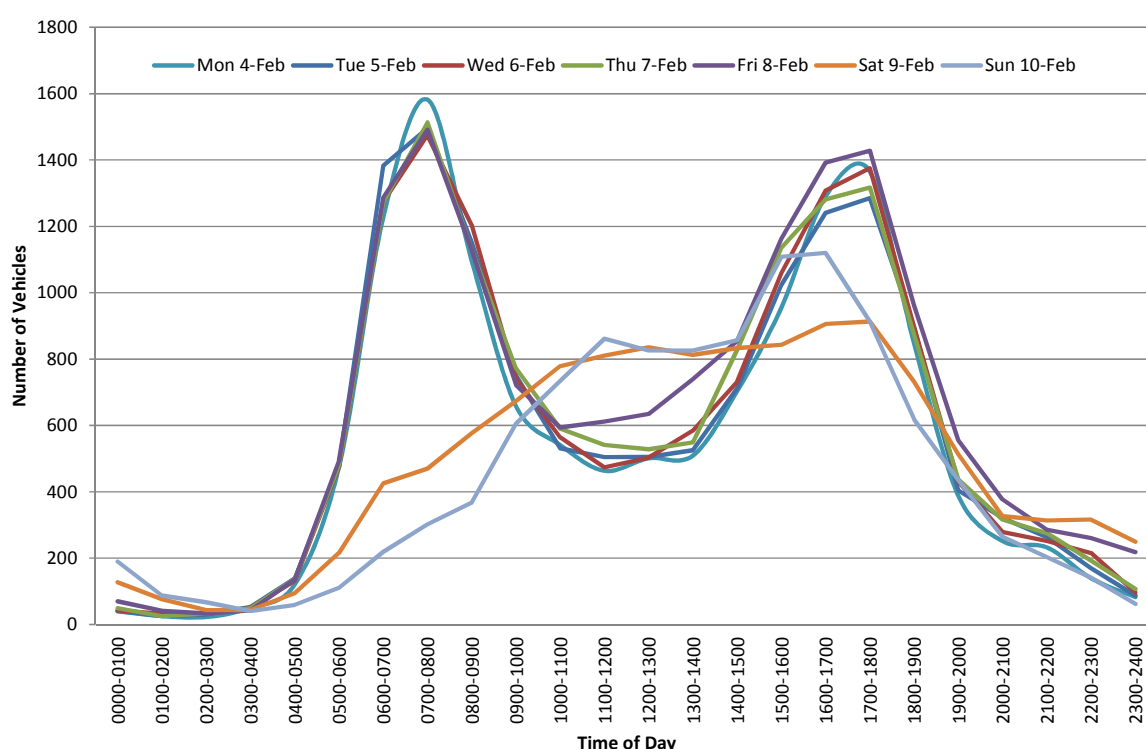


Figure 4-5 2013 Surveyed Traffic Volumes on Heathcote Road (Two-way)

With reference to Figure 4-5, the weekday AM and PM peak hours on Heathcote Road was found to occur between 07:00-08:00 and 17:00-18:00 respectively. Traffic volumes along Heathcote Road are generally lower on a Saturday and Sunday. The worst case AM and PM peak and daily traffic volumes are shown in Table 4-2.

Table 4-2 Heavy vehicles – February 2013

	Vehicles per hour	HCV* (vph)	HCV* %
Weekday AM Peak (07:00-08:00)	1,582	-	-
Weekday PM Peak (17:00-18:00)	1,428	-	-
Daily (24 hour)	15,518	1,498	9.7%

Note: \* HCV – heavy commercial vehicles

As shown in Table 4-2, heavy vehicle traffic on Heathcote Road accounts for approximately 10% of the daily traffic volumes. In addition, weekday peak hour traffic was observed to be approximately 10% of the total daily traffic volumes.

Table 4-3 provides a summary of the average and 85<sup>th</sup> percentile speeds observed on Heathcote Road during the traffic “tube” counts. This shows that the observed 85<sup>th</sup> percentile speed was found to be similar to the 100 km/h speed limit.

**Table 4-3 Average and 85th percentile speeds on Heathcote Road – February 2013**

Direction	Average Speed (km/h)	85th Percentile Speed (km/h)
Heathcote Road Northbound	93.8	101.5
Heathcote Road Southbound	94.9	102.6

### Intersection Traffic Counts

Classified intersection traffic surveys were undertaken at the following intersections on Tuesday 29<sup>th</sup> July 2014 between 6.30 and 9.30 AM and on Monday 9<sup>th</sup> February 2015 between 3.30 and 6.30 PM:

- Heathcote Road/New Illawarra Road signal controlled T-intersection; and
- Little Forest Road/New Illawarra Road priority controlled T-intersection.

The traffic surveys are provided in full in Appendix A.

A summary of the observed peak hours and two-way traffic volumes on New Illawarra Road in the vicinity of these intersections is shown in Table 4-4. Although the PM peak hour at the Little Forest Road/New Illawarra Road intersection was observed to occur between 5.30 and 6.30 PM, the LHRRP is not currently in operation during these hours. To properly assess the traffic impact of the proposal, the PM peak hour analysed will correlate with the final hour of operation (i.e. between 4.00 and 5.00 PM, refer to section 5.1.1). This is considered to be robust as the proportional impact of the traffic generated by the proposal in the afternoon is maximised in this way.

The highest weekday peak hour traffic volumes were observed during the morning peak hours on both New Illawarra Road and Heathcote Road.

**Table 4-4 2014 surveyed weekday peak hourly traffic volumes on New Illawarra Road**

Location	7.30 to 8.30 AM		4.00 to 5.00 PM	
	Two-way Traffic Volumes (veh/h)*	% Heavy Vehicles	Two-way Traffic Volumes (veh/h)*	% Heavy Vehicles
New Illawarra Road, north of Little Forest Road	1,951	4%	1,636	3%
New Illawarra Road, south of Little Forest Road	1,902	2%	1,631	2%
Little Forest Road	73	52%	51	27%
Heathcote Road, north of New Illawarra Road	1,603	2%	1,365	2%
Heathcote Road, south of New Illawarra Road	1,892	2%	1,603	2%

Note: \* veh/h – vehicles per hour



## 4.6 Intersection capacity assessments

The capacity and LoS analysis has been carried out for the intersections during AM and PM weekday peak period conditions using the SIDRA intersection model. SIDRA model calculates capacities, queue lengths and delays for traffic signals, roundabouts and priority controlled intersections. The following intersections have been analysed using SIDRA for the weekday AM and PM peak hours based on the 2014 traffic counts discussed in section 4.5:

- Heathcote Road/New Illawarra Road signal controlled T-intersection; and
- Little Forest Road/New Illawarra Road priority controlled T-intersection.

A summary of the results of the SIDRA intersection modelling is shown in Table 4-5, with detailed SIDRA outputs provided in Appendix C. Based on this SIDRA analysis, both of the key intersections currently operate with an acceptable level of service.

During the AM Peak, the Little Forest Road/New Illawarra Road intersection experiences a LoS D on the north approach where vehicles are turning right out of Little Forest Road. It has a queue length of 10 metres and an average delay of 46 seconds.

Table 4-5 SIDRA results - 2014 surveyed traffic flows

Intersection	AM Peak		PM Peak	
	Ave Delay (s)	LoS	Ave Delay (s)	LoS
Heathcote Road/New Illawarra Road	35	C	32	C
Little Forest Road/New Illawarra Road	27	B	17	B

## 4.7 Existing travel characteristics

An analysis of 2011 Journey-to-Work data was undertaken to develop an initial understanding of the travel market for the region. This information provides a broad understanding of the likely demand for different modes under the existing situation and can be used to review regional and/or external travel movements forecast.

Existing mode share statistics for people working in Lucas Heights have been derived based on BTS data for Journey to Work travel zone 2831 shown at Figure 4-6. This travel zone includes the existing ANSTO facility located south of the LHRRP.

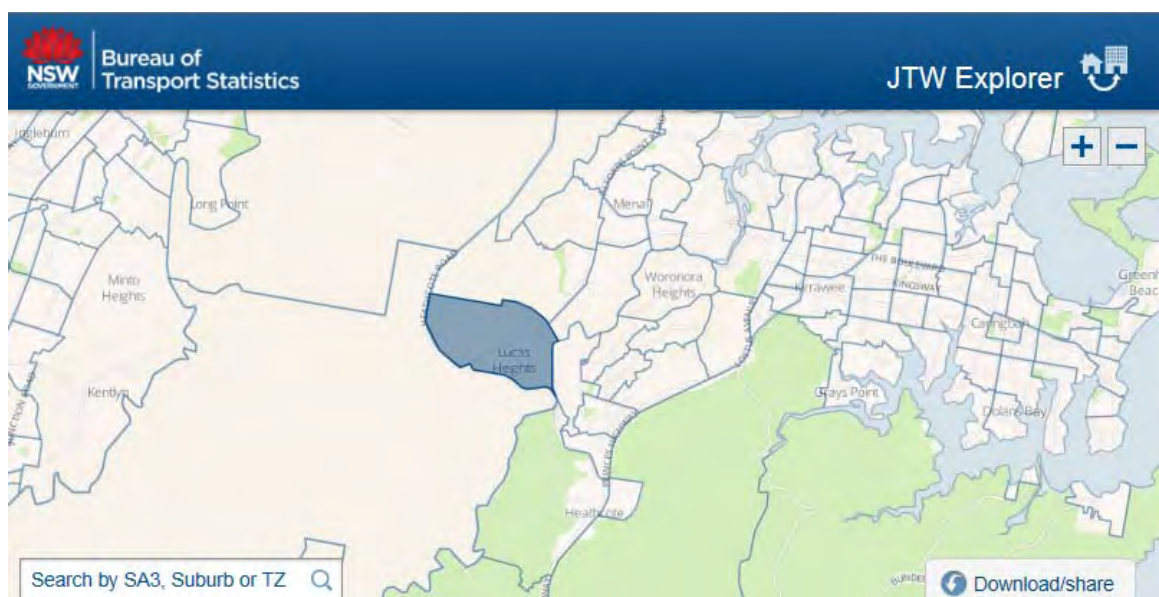


Figure 4-6 Journey to work explorer travel zone location

Source: <http://visual.bts.nsw.gov.au/tz>

The mode share for journey-to-work trips of people working in Lucas Heights is shown in . Out of the recorded 449 people working in the travel zone, 89 percent got to work using private transportation, as the driver. 6 percent travelled as passengers of private vehicles.

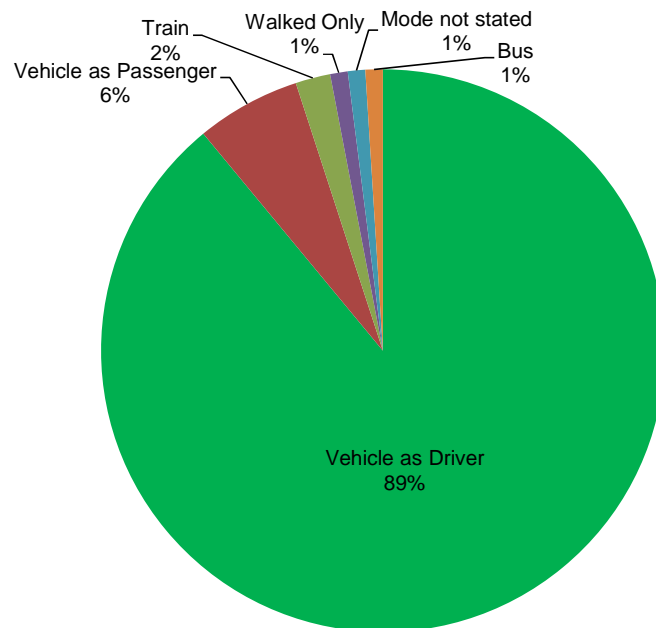


Figure 4-7 How people working in Lucas Heights travel to work

Source: <http://visual.bts.nsw.gov.au/tz>

Data from the Bureau of Transport Statistics also showed the residence of people working in the travel zone area of Lucas Heights, which is summarised in Figure 4-8. Of the 449 people, 50 percent live in the Sutherland area. The next most common location is in Wollongong, where 18 percent of the people live.

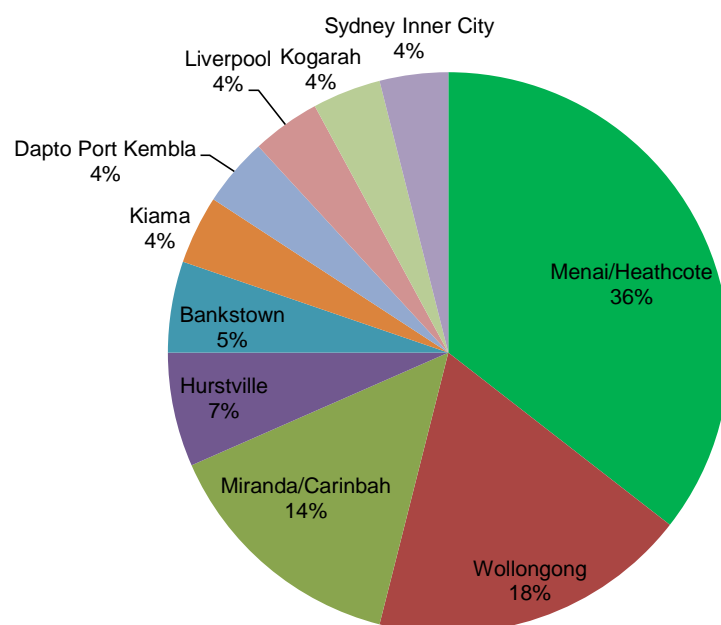


Figure 4-8 Residence of people working in Lucas Heights

Source: <http://visual.bts.nsw.gov.au/tz>



## 4.8 Crash statistics

RMS supplied crash statistics for roads within the study area over a 6-year period between 2008 and 2013. This crash data was used to determine the main factors contributing to crashes within the study area.

The study area has been limited to the extent of 2 kilometres north and south along Heathcote Road, from the New Illawarra Road/Heathcote Road intersection. The boundary of New Illawarra Road to the intersection Recreation Drive is also included in the study area. An extract of the crash incidents around the site can be seen in Figure 4-9, with a detailed crash report found in Appendix B.

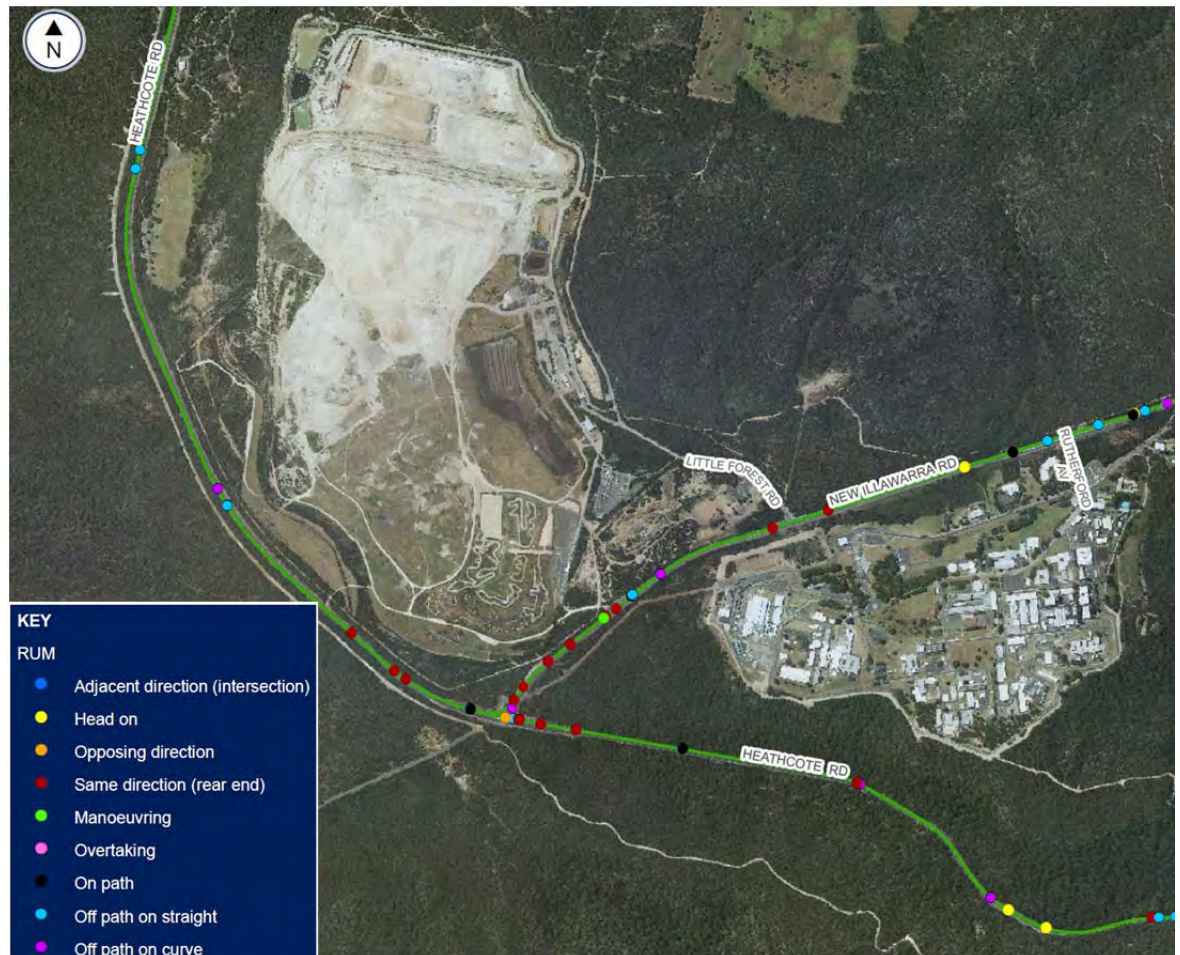


Figure 4-9 Crash incidents around the LHRP site

Analysis of the RMS crash data for road sections within the study area indicate that there are a number of crashes around Heathcote Road/New Illawarra Road intersection, with the majority of crashes being rear end collisions.

### New Illawarra Road

In total, there were 33 crashes recorded along New Illawarra Road within the study area. Of these:

- 17 (52%) incidents resulted in injuries;
- Three (9%) incidents occurred at an intersection;
- Seven (21%) incidents involved right turning vehicles colliding with through traffic; and
- Six (18%) incidents involved right turning traffic colliding with traffic travelling in the opposite direction.

- Two incidents were recorded near the intersection with Little Forrest road, which both involved rear end shunts.

#### **Heathcote Road, west of New Illawarra Road**

In total, there were 12 crashes recorded along Heathcote Road, west of New Illawarra Road, within the study area. Of these:

- In total, six of the incidents resulted in injuries;
- Six (50%) incidents involved vehicles driving off the carriageways;
- Six (50%) incidents involved rear end collisions with other vehicles;
- One incident involved a vehicle driving off the carriageway on a bend.
- The remaining two incidents involved other crash types with no crash trends.

#### **Heathcote Road, east of New Illawarra Road**

In total, there were 46 crashes recorded along Heathcote Road east of New Illawarra Road, within the study area. Of these:

- 11 incidents resulted in injuries;
- One (2%) incident resulted in a fatality, which involved a car and a bus travelling in the opposite direction;
- 14 (30%) incidents involved rear end collisions with other vehicles; and
- Eight (17%) incidents involved vehicles driving off the carriageways.
- The remaining incidents involved other crash types with no crash trends.

#### **4.8.1 Crash data summary**

Below is a summary of the crash data in the study area:

- A total of 91 crashes occurred in the study area;
- 27 (30%) incidents involved heavy vehicles
- 12 (13%) of the incidents involved speeding, which was the main contributing factor of the accidents
- 73 (80%) of the incidents occurred at mid-block sections
- 16 (35%) incidents occurred at the Heathcote Road / New Illawarra Road intersection. It should be noted that this intersection was upgraded to a signalised intersection in March 2010. However, there have been a much lower number of crashes (four crashes) recorded following the upgrade of this intersection, from a seagull type intersection to traffic signal controlled. This suggests that RMS may have upgraded the intersection as a result of its poor crash history.

## 5. The proposal

### 5.1 Proposal overview

The proposal comprises a number of elements, which are to:

- Provide additional landfill airspace by reprofiling the existing landfill (extending its life from 2024 to 2037),
- Relocate and expansion of the existing GO facility, construction and operation of a fully enclosed ARRT facility
- Create of a community parkland, with capping and landscaping to be completed and the site made available for community use in 2039

All waste receipt, landfilling and processing activities at LHRP would cease by 31 December 2037. Landscaping of the final landform would subsequently commence in 2038 with the site being made available for passive recreational use by 2039.

Access to the site would be via the existing accessed from Little Forest Road, off New Illawarra Road. Provision for staff and visitor car parking would be provided on site, accessed from Little Forest Road. Detailed information on the number and location of bays is given in Section 6.8.

The proposed site layout, including access roads is shown at Figure 1-1.

#### 5.1.1 Proposed operating hours

The proposed site operational hours are shown in Table 5-1 alongside the current operational hours. The only proposed change to operating hours is for the landfilling activities which are proposed be extended by one hour each day on weekdays to maximise the use of the current waste receipt hours and provide time to undertake the daily covering of the waste and other necessary activities. Although aeration of the material within the ARRT and GO facilities would occur continuously to ensure that the material remained aerobic, waste receipt activities at the site would be restricted to the operational hours shown in Table 5-1.

Table 5-1 Proposed site operational hours

Activity	Day	Current hours	Proposed hours
Waste receipt	Monday - Friday	6 am – 4 pm	6 am – 5 pm
	Saturday and Sunday	8 am – 4 pm	8 am – 5 pm
Construction & landfilling operations	Monday - Friday	6 am – 4 pm	6 am – 5 pm
	Saturday and Sunday	8 am – 5 pm	8 am – 5 pm
Other activities	Monday - Sunday	Anytime	Anytime
GO facility operations	Monday - Sunday	Anytime	Anytime
ARRT facility operations	Monday - Sunday	N/A	Anytime

The construction of the reprofiled areas is proposed to be undertaken within the proposed operating hours of the landfill.

#### 5.1.2 Plant and equipment

Existing landfill equipment would continue to be used for the proposed reprofiling/landfilling operations. This includes landfill compactors, dozers, excavators, dump trucks, a grader, roller, water cart and road sweeper.

### 5.1.3 Workforce

There are currently 33 landfill staff at the LHRRP. The proposal would require approximately seven additional staff for landfill operations. Additional staff and work crews would be needed to prepare new areas for landfilling, fill areas with waste and then cap and revegetate them progressively.

#### Construction workforce

Construction of the ARRT and GO is expected to occur between 2016 and 2018. This would involve around 25-30 workers, who would arrive in the morning between 6-7 AM and depart the site between 3-4 PM.

## 5.2 Traffic generation

The following process has been used to determine the amount of traffic forecast to be generated by the increased development:

- Generate yearly vehicle trips based on scale of development
- Derive AM and PM peak hour vehicle trips
- Assign generated trips through the local road network

### 5.2.1 Annual trip generation

SITA has provided traffic generation estimates associated with the construction and operation of the proposal during the construction/operational period until 2037. A summary of the forecast additional light and heavy vehicles for each year of operation is provided in Table 5-2. As shown, the year 2027 is expected to be the peak year in terms of traffic generation at the site, with 112,518 additional trips to the site over a period of 1 year.

Table 5-2 Annual traffic generation

Year	Additional vehicles from non-waste inputs <sup>2</sup> (vehicles per year)			Additional vehicles from waste inputs and staff (vehicles per year)			Total additional vehicles per year		
	Light vehicles	Heavy vehicles	TOTAL vehicles	Light vehicles	Heavy vehicles	TOTAL vehicles	Light vehicles	Heavy vehicles	TOTAL vehicles
2014	0	0	0	59,462	5,235	64,698	59,462	5,235	64,698
2015	0	0	0	59,462	7,713	67,175	59,462	7,713	67,175
2016	0	0	0	59,462	19,808	79,270	59,462	19,808	79,270
2017	0	0	0	59,462	27,413	86,876	59,462	27,413	86,876
2018	0	6,600	6,600	59,462	27,413	86,876	59,462	34,013	93,476
2019	0	8,290	8,290	59,462	27,413	86,876	59,462	35,703	95,166
2020	0	10,927	10,927	59,462	27,413	86,876	59,462	38,340	97,802
2021	0	14,702	14,702	59,462	27,413	86,876	59,462	42,116	101,578
2022	0	17,650	17,650	59,462	27,413	86,876	59,462	45,063	104,525
2023	0	10,911	10,911	59,462	27,413	86,876	59,462	38,325	97,787
2024	0	2,832	2,832	59,462	27,413	86,876	59,462	30,245	89,708
2025	0	2,832	2,832	59,462	27,413	86,876	59,462	30,245	89,708
2026	0	7,161	7,161	59,462	27,413	86,876	59,462	34,575	94,037
2027	0	25,642	25,642	59,462	27,413	86,876	59,462	53,055	112,518
2028	0	7,398	7,398	59,462	27,413	86,876	59,462	34,811	94,273

<sup>2</sup> Non-waste input are the other materials required for the operations of the site such as capping materials

Year	Additional vehicles from non-waste inputs <sup>2</sup> (vehicles per year)			Additional vehicles from waste inputs and staff (vehicles per year)			Total additional vehicles per year		
	Light vehicles	Heavy vehicles	TOTAL vehicles	Light vehicles	Heavy vehicles	TOTAL vehicles	Light vehicles	Heavy vehicles	TOTAL vehicles
2029	0	1,102	1,102	59,462	-2,401	57,061	59,462	-1,299	58,163
2030	0	15,046	15,046	59,462	-2,401	57,061	59,462	12,645	72,107
2031	0	909	909	59,462	-2,401	57,061	59,462	-1,492	57,970
2032	0	909	909	59,462	-2,401	57,061	59,462	-1,492	57,970
2033	0	909	909	59,462	-2,401	57,061	59,462	-1,492	57,970
2034	0	899	899	59,462	-2,477	56,985	59,462	-1,579	57,883
2035	0	727	727	59,462	-3,679	55,783	59,462	-2,952	56,511
2036	0	727	727	59,462	-3,679	55,783	59,462	-2,952	56,511
2037	0	14,717	14,717	59,462	-4,957	54,505	59,462	9,760	69,222

As discussed in Section 2.1, the traffic impact assessment is based on the 2017 and 2027, ten year horizon. The 2027 ten year horizon is also represents the peak period in terms of traffic generation for the proposal. As such, this provides a worst case assessment of the proposal. A summary of the annual trip generation for the analysis years 2017 and 2027 is presented in Table 5-3.

Table 5-3 Annual vehicle trip generation from the proposal

Additional vehicles from:	2017			2027		
	Light Vehicles	Heavy vehicles	Total	Light Vehicles	Heavy vehicles	Total
Non-waste inputs	0	0	0	0	25,642	25,642
Waste inputs and staff	59,462	27,413	86,876	59,462	27,413	86,876
<b>Total</b>	<b>59,462</b>	<b>27,413</b>	<b>86,876</b>	<b>59,462</b>	<b>53,055</b>	<b>112,518</b>

#### 5.2.2 AM & PM peak hour vehicle trips

##### *Operational vehicles*

For the purposes of this assessment, the following hours have been assumed based on previously commissioned traffic counts at both intersections:

- Weekday AM peak hour = 7:30 – 8:30 am
- Weekday PM peak hour = 4:00 – 5:00 pm

For each of the assessment years, the total light and heavy vehicle annual trip generation was converted into a weekday AM and PM peak hour volume by applying the following steps:

1. Apply the proportion of yearly volumes that occur between Monday and Friday inclusive to annual vehicle trip generation (80.16% from 2013/14 weighbridge traffic movements – see below)
2. Determine the average volume of traffic occurring each week between Monday and Friday inclusive by dividing step 1 volume by 52 (weeks)
3. Determine the average weekday daily traffic by dividing step 2 volume by five (weekdays)
4. Apply the proportion of additional daily traffic relating to the proposal occurring during each of the AM and PM peak hour periods to step 3 volume (assumed to be evenly distributed across the day)



The proportion used in step 1 was determined from weighbridge traffic movement data supplied by SITA, which contains hourly breakdowns of trucks entering the site every day between 1 July 2013 and 30 June 2014.

SITA has advised that future traffic will consist mainly of transfer trailers, which will result in a different peak hour pattern compared to the council garbage trucks currently served by the facility. As a result, the generated traffic is assumed to be evenly distributed across the day in step 4.

Table 5-4 demonstrates how the AM and PM peak hour volumes were derived for light and heavy vehicles in 2017 and 2027. The traffic volumes shown are one-way traffic movements. For this assessment it has been assumed that all vehicles would enter and depart in the same hour period.

Table 5-4 Derivation of AM & PM peak hour traffic volumes (one-way)

Additional vehicles in:	2017			2027		
	Light Vehicles	Heavy vehicles	Total	Light Vehicles	Heavy vehicles	Total
Yearly volume (Mon-Sun)	59,462	27,413	86,875	59,462	53,055	112,517
Yearly volume (Mon-Fri)	47,663	21,973	69,636	47,663	42,527	90,190
Weekly volume (Mon-Fri)	917	423	1,340	917	818	1,735
Daily volume (weekday)	183	85	268	183	164	347
<b>AM peak hour volume</b>	<b>17</b>	<b>8</b>	<b>25</b>	<b>17</b>	<b>15</b>	<b>32</b>
<b>PM peak hour volume</b>	<b>17</b>	<b>8</b>	<b>25</b>	<b>17</b>	<b>15</b>	<b>32</b>

### Construction workforce

Construction of the ARRT and GO facilities between 2016 and 2018 is expected to involve around 25-30 workers entering and leaving the site per day on average. Workers would arrive in the morning between 6-7 am and depart the site between 3-4 pm.

Based on a worst case, with all workers accessing the site by car, this would result in up to 30 small vehicles entering and leaving the site each day. However, these construction workers are expected to access the site before the morning peak (7.30-8.30 am) and depart the site before the evening peak (4-5 pm), which would not affect the peak hour traffic assessment.

## 5.3 Traffic estimates associated with existing consents

### 5.3.1 Planning consent for capacity expansion (1999)

The consent granted by the Minister for Planning on 12 November 1999 (development consent DA No 11-01-99 consent ref R97/00029) applies to three contiguous areas being: Lucas Heights 1 (Ridges Sporting Complex), Lucas Heights 2 (LHRRP) and the conservation area in between these sites.

This consent also permitted expansion of the LHRRP's capacity by 8.225 million tonnes and extension of the landfill life to 31 December 2024. The same consent also permits ongoing resource recovery operations at Lucas Heights 2 and an adjacent parkland facility for passive recreation by the community. The 1999 EIS<sup>3</sup> for the expansion estimated that an average of 512 trucks per weekday would access the LHRRP between 2005 and 2025.

The Traffic Impact Assessment report for the 1999 EIS provides estimated traffic generation for the current approved waste operations, including during the AM peak:

- 88 truck movements (44 arriving and 44 departing) during the AM peak hour between 7.30-8.30 AM, assuming the peak hour is 50 percent of the 7-9 AM two hour period.
- 30 light vehicle movements (15 arriving and 15 departing) during the AM peak hour
- 118 vehicle movements in total during the AM peak hour

The above traffic generation estimates of 118 vehicle movements includes only waste transferred to the site by bulk waste transfer vehicles and by council waste vehicles.

Based on the assessment undertaken as part of this proposal, the technical analysis indicates that 105 vehicle movements (trucks and light vehicles) in total would occur during the AM peak hour (for the year where maximum level of traffic movements is expected - 2027. This assessment has taken into consideration waste delivery vehicles as well as vehicles associated with operations and capping activities.

Therefore this proposal is expected to generate less traffic movements than that approved in the 1999 consent (105 compared to 118 vehicle movements during the AM peak hour).

### 5.3.2 Planning consent for AWT (2010)

Planning consent was achieved for the Alternative Waste Technology (AWT) facility at the site in 2010. A summary of the expected traffic generation for the consented AWT facility at the site, from the Environmental Assessment report (GHD, August 2009) is provided in Table 5-5 and Table 5-6 for the pre 2025 and post 2025 horizon year respectively. This allows for the 100,000 t/yr AWT facility only.

It is noted that the proposal includes a 200,000 t/yr ARRT facility, which would have higher traffic generation rates than the approved 100,000 tpa capacity AWT facility, with approximately half the throughput of the proposed ARRT facility. Since the proposal also includes additional landfill disposal deliveries to site and additional throughput through the GO facility, so no direct comparisons of traffic figures associated with the AWT and the proposal are made in this report.

Table 5-5 Consented AWT Traffic generation during operation (pre 2025)

Component	Daily total		AM peak		PM peak	
	In	Out	In	Out	In	Out
Employee (light vehicle) traffic	69	69	10	0	2	12
Heavy vehicle traffic	39	39	4	4	4	4
Total	108	108	14	4	6	16

Table 5-6 Consented AWT Traffic generation during operation (post 2025)

Component	Daily total		AM peak		PM peak	
	In	Out	In	Out	In	Out
Employee (light vehicle) traffic	69	69	10	0	2	12
Heavy vehicle traffic:						
- AWT MSW delivery	39	39	4	4	4	4
- AWT off-site residual	7	7	1	1	1	1
Total	115	115	15	5	7	17

## 6. Impact assessment

This section of the report provides an assessment of the traffic and transport impacts associated with the proposed construction and operation of the project. The assessment is based on the ultimate peak scenario during this period and the overall effect on the higher order road network during peak hours. Assumptions on peak hour traffic generation are provided to assess the impact on the external road network peak periods.

### 6.1 Scope

This impact assessment evaluates the performance of the following intersections during the 2017 and 2027 weekday AM and PM peak hour periods:

- Heathcote Road/New Illawarra Road intersection
- Little Forest Road/New Illawarra Road intersection

### 6.2 Baseline traffic volumes

Following discussion and agreement regarding the scope of this assessment, RMS has supplied future growth factors to be applied to the 2014 classified traffic counts (see Section 4.5), allowing the derivation of light and heavy traffic volumes for 2017 and 2027. These are included in Appendix D.

It is noted that the LHRRP is to close at 5.00 PM under the proposal. However, the 2014 and 2015 traffic counts reflect the current 4.00 PM closing time. In order to account for the likely traffic patterns associated with the last hour of operation at the LHRRP each day, for the purposes of this analysis the turning volumes into and out of Little Forest Road between 3.30 and 4.00 PM (doubled to obtain full hour volumes) have been adopted in lieu of the 4.00 PM and 5.00 PM turning volumes. Through traffic volumes along New Illawarra Road considered in this analysis remain between 4.00 and 5.00 PM, as it is assumed that the amended operating hours will not have an impact on mainline traffic patterns.

### 6.3 Trip distribution and assignment of development traffic

The AM and PM peak hour generated trips were distributed and assigned to the local road network using the following assumptions:

- 50% of generated traffic travels to/from north-west via New Illawarra Road and Heathcote Road (north)
- 50% of generated traffic travels to/from north-east via New Illawarra Road (north)

It is also assumed that 100% of the generated traffic will enter and exit the facility during each peak hour. This is a robust assumption as it is highly likely that waste trucks using the facility will dispose of their payload as quickly as possible and will not remain on the site for extended periods of time. The previous Cardno traffic impact assessment (2009) estimates that trucks will typically turnaround from weighbridge to exit in an average time of 15 minutes (25 minutes maximum).

### 6.4 SIDRA analysis

The performance of both intersections was modelled in SIDRA 6 during the AM and PM peak periods under the following scenarios:

- 2017 baseline traffic



Table 6-1 Heathcote Road/New Illawarra Road SIDRA results summary

Scenario/Peak Period	LoS	Ave. delay (s)	Max delay (s)	Deg. satn	Max queue (m)
2017 baseline AM	C	35	67	0.685	191.1
2017 baseline + development AM	C	34	65	0.702	191.0
2017 baseline PM	C	32	66	0.490	136.2
2017 baseline + development PM	C	32	67	0.495	140.5
2027 baseline AM	C	36	54	0.793	208.2
2027 baseline + development AM	C	33	59	0.778	196.3
2027 baseline PM	C	32	66	0.530	148.3
2027 baseline + development PM	C	32	67	0.533	155.4

The SIDRA results summarised in Table 6-1 indicate that the Heathcote Road/New Illawarra Road intersection is forecast to operate with a satisfactory LoS with the additional traffic generation from the proposal during both the AM and PM peak hour in 2017 and 2027.

The SIDRA modelling indicates that the proposal would result in negligible impacts to the operation of the Heathcote Road/New Illawarra Road intersection.

#### 6.4.2 Little Forest Road/New Illawarra Road

Serving as the main access point to the LHRRP, the Little Forest Road/New Illawarra Road intersection is currently a priority controlled T-intersection. Turn bays are provided on New Illawarra Road for traffic to turn left or right into Little Forest Road. Acceleration lanes are also provided in both directions on New Illawarra Road for traffic turning out of Little Forest Road.

With the location of an acceleration lane on New Illawarra Road southbound, a two-stage right turn from Little Forest Road is possible. The first stage models the crossing of the carriageway closest to Little Forest Road, whilst the second stage is represented in SIDRA by a dummy median leg, modelling the entry into the New Illawarra Road southbound carriageway. The results were combined for this right-turn movement only by taking the greater degree of saturation and adding the delay of the two stages together. It is noted that SIDRA is not able to natively model two-stage right turns. Modelling the right turn as a single stage can produce unrealistically large delays in the results.

For this intersection, a “weighted delay” methodology has been adopted in order to account for vehicle bunching from the traffic signals at the Heathcote Road/New Illawarra Road intersection. Details of this methodology and the results of the intermediate weighted delay calculations are provided in Appendix E.

The layout of this intersection as modelled in SIDRA is illustrated in Figure 6-2, with the weighted average delays and LoS derived for both critical movements summarised in Table 6-2 and Table 6-3.



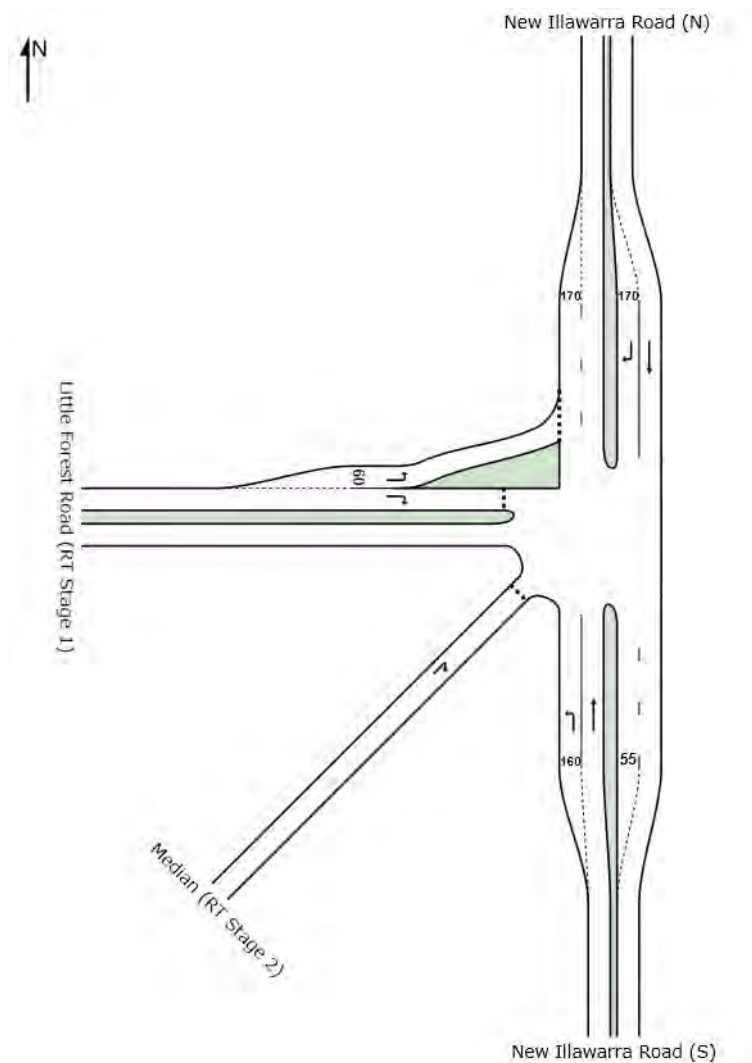


Figure 6-2 Existing Little Forest Road/New Illawarra Road intersection layout

Source: SIDRA 6

Table 6-2 Right turn from New Illawarra Road to Little Forest Road results

Scenario/Peak Period	Delay	LoS
2017 baseline AM	30	C
2017 baseline + development AM	29	C
2017 baseline PM	15	A
2017 baseline + development PM	14	A
2027 baseline AM	44	D
2027 baseline + development AM	50	D
2027 baseline PM	15	A
2027 baseline + development PM	15	A

Table 6-3 Right turn from Little Forest Road to New Illawarra Road results

Scenario/Peak Period	Delay	LoS
2017 baseline AM	22	B
2017 baseline + development AM	28	B
2017 baseline PM	17	B
2017 baseline + development PM	18	B
2027 baseline AM	25	B
2027 baseline + development AM	44	D
2027 baseline PM	18	B
2027 baseline + development PM	19	B

The SIDRA results summarised in Table 6-2 and Table 6-3 indicate that the Little Forest Road/New Illawarra Road intersection is forecast to operate at:

- LoS C during the AM peak hour in 2017 for both the with and without development scenarios.
- LoS B during the AM peak hour in 2017 for both the with and without development scenarios.
- LoS D during the AM peak hour in 2027 for both the with and without development scenarios.
- LoS B during the PM peak hour in 2027 for both the with and without development scenarios.

#### 6.4.3 Summary of intersection analysis

For the Heathcote Road/New Illawarra Road intersection, a LoS of C is maintained for the AM and PM peak periods through 2027, both with and without the increased development. This would suggest that the intersection is able to accommodate both the forecast growth in baseline traffic plus the additional traffic associated with the increased development.

The Little Forest Road/New Illawarra Road intersection is forecast to operate at a LoS C during the 2017 AM peak, and at a LoS D during the 2027 AM peak, both with and without the increased development. The critical movements are the right turn from Little Forest Road to New Illawarra Road southbound, and from New Illawarra Road southbound to Little Forest Road. By the criteria listed in Table 2-2, the SIDRA results indicate that the intersection is likely to be able to accommodate the forecast traffic volumes through 2027 with the development traffic.

Based on the above, both intersections are likely to operate within capacity through 2027.

#### 6.4.4 Increase in midblock traffic volumes

The forecast increase in two-way traffic volumes associated with the proposal along road sections within the study area is shown in Table 6-4 and Table 6-5 for the 2027 AM and PM peak hours respectively. As shown, there would be marginal increases to two-way traffic volumes along New Illawarra Road and Heathcote Road associated with the proposal.

Table 6-4 2027 AM Peak hour forecast increase in traffic

2027 Traffic Volumes	2027 Base (2-way traffic)	2027 Base + Development (2-way traffic)	Increase	% Increase
New Illawarra Road, north of Little Forest Road	2,221	2,253	32	1.4%
New Illawarra Road, south of Little Forest Road	2,172	2,204	32	1.4%
Little Forest Road	73	136	63	46.4%
Heathcote Road, north of New Illawarra Road	1,875	1,906	32	1.7%
Heathcote Road, south of New Illawarra Road	2,143	2,143	0	0.0%

Table 6-5 2027 PM Peak hour forecast increase in traffic

2027 Traffic Volumes	2027 Base (2-way traffic)	2027 Base + Development (2-way traffic)	Increase	% Increase
New Illawarra Road, north of Little Forest Road	1,725	1,756	32	1.8%
New Illawarra Road, south of Little Forest Road	1,720	1,751	32	1.8%
Little Forest Road	51	114	63	55.3%
Heathcote Road, north of New Illawarra Road	1,474	1,506	32	2.1%
Heathcote Road, south of New Illawarra Road	1,747	1,747	0	0.0%

### ***Impacts to ANSTO access intersection***

ANSTO is accessed via a priority controlled seagull intersection at New Illawarra Road, located approximately 800 m to the northeast of the Little Forest Road/ New Illawarra Road intersection. As summarised in Table 6-4 and Table 6-5, the proposal is forecast to result in the following increase in two-way traffic at New Illawarra Road to the north of Little Forest Road:

- 1.4% (32 vehicle movements) during the AM peak hour in 2027
- 1.8% (32 vehicle movements) during the PM peak hour in 2027

Based on the above, the proposal is expected to have negligible impacts to the operation of the ANSTO access/New Illawarra Road intersection. ANSTO has been consulted regarding these findings.

### **6.4.5 Impacts of Construction workforce**

Construction of the ARRT and GO between 2016 and 2018 is expected to involve around 25-30 workers. Based on a worst case, with all workers accessing the site by single occupancy car, this would generate up to 30 trips to the site per day, or 60 two-way movements (arrivals and departures).

Workers are expected to arrive at the site between 6-7 AM and depart the site between 3-4 PM. As such, construction workers would access the site before the morning peak (7.30-8.30 AM) and depart the site before the evening peak (4-5 PM). Based on this, traffic impacts associated with workers accessing the site would be reduced, compared to the AM and PM peak operations, discussed in Section 6.4.3 and 6.4.4. The impacts associated with the construction workers accessing the site would be minimal, with both the Little Forest Road/New Illawarra

Road intersection and the Heathcote Road/New Illawarra Road intersection expected to operate within capacity during the construction period between 2016 and 2018.

## 6.5 Traffic distribution sensitivity testing

It is understood from further discussions with SITA that the LHRRP will receive waste that mostly originates from the west of the facility. To assess the sensitivity of the trip distribution and assignment assumptions listed in section 6.3, an additional scenario was modelled using SIDRA 6 that assumed a 70/30 split of traffic generated from the facility. This scenario assumes that:

- 70% of generated traffic travels to/from north-west via New Illawarra Road and Heathcote Road (north); and
- 30% of generated traffic travels to/from north-east via New Illawarra Road (north).

The results of the sensitivity test are presented in the following sections. Full SIDRA outputs for the sensitivity test are included as Appendix F.

### 6.5.1 Heathcote Road/New Illawarra Road intersection

The modified trip distribution results in negligible change to the Heathcote Road/New Illawarra Road intersection performance. There were negligible variances in the maximum delay, degree of saturation and the maximum queue lengths, as shown in Table 6-6.

Table 6-6 Heathcote Road/New Illawarra Road sensitivity test results

Peak Period/Trip Distribution (base + development traffic)	LoS	Ave. delay (s)	Max delay (s)	Deg. satn	Max queue (m)
2017 AM – 50/50	C	34	65	0.702	191.0
2017 AM – 70/30	C	34	64	0.703	191.3
2017 PM – 50/50	C	32	67	0.495	140.5
2017 PM – 70/30	C	32	67	0.498	143.3
2027 AM – 50/50	C	33	59	0.778	196.3
2027 AM – 70/30	C	33	58	0.789	199.9
2027 PM – 50/50	C	32	67	0.533	155.4
2027 PM – 70/30	C	32	67	0.539	159.7

### 6.5.2 Little Forest Road/New Illawarra Road intersection

The results of the sensitivity testing for both critical movements for the Little Forest Road/New Illawarra Road intersection are summarised in Table 6-7 and Table 6-8. Results of the intermediate weighted delay calculations are provided in Appendix E.

The SIDRA modelling indicates that the intersection will operate satisfactorily under the sensitivity test 70/30 traffic distribution. With the modified 70/30 trip distribution, the critical movements at the Little Forest Road/New Illawarra Road intersection experience minor variation during the 2027 AM peak period. The average delay for the right turn from New Illawarra Road to Little Forest Road is reduced by three seconds, whilst for the right turn from Little Forest Road to New Illawarra Road the average delay increases by four seconds.

Negligible variances in average delay were modelled by SIDRA on both turning movements during the other peak periods analysed.



Table 6-7 Right turn from New Illawarra Road to Little Forest Road  
sensitivity test results

Peak Period/Trip Distribution (base + development traffic)	Delay	LoS
2017 AM – 50/50	29	C
2017 AM – 70/30	29	C
2017 PM – 50/50	14	A
2017 PM – 70/30	14	A
2027 AM – 50/50	50	D
2027 AM – 70/30	47	D
2027 PM – 50/50	15	A
2027 PM – 70/30	15	A

Table 6-8 Right turn from Little Forest Road to New Illawarra Road  
sensitivity test results

Peak Period/Trip Distribution (base + development traffic)	Delay	LoS
2017 AM – 50/50	28	B
2017 AM – 70/30	28	B
2017 PM – 50/50	18	B
2017 PM – 70/30	18	B
2027 AM – 50/50	44	D
2027 AM – 70/30	48	D
2027 PM – 50/50	19	B
2027 PM – 70/30	19	B

## 6.6 Review of SIDRA analysis using traffic microsimulation

At the request of Sutherland Shire Council, a review of the SIDRA intersection modelling was undertaken using the Paramics traffic microsimulation program. This additional analysis was undertaken in order to provide further analysis on the gaps in traffic along New Illawarra Road from the traffic signals at the Heathcote Road/New Illawarra Road intersection.

A 2027 AM worst case (70/30 split) model was developed using the forecast SIDRA traffic volumes and signal timing information from the Heathcote Road/New Illawarra Road intersection SIDRA model. In developing this model, cars and heavy vehicles were modelled as two separate origin/destination matrices to ensure that the delays at the Little Forest Road/New Illawarra Road intersection were based on vehicle performance. Additionally, the model was built in a 3D environment to ensure that truck performance on gradients was accurately represented.

The results of the 2027 AM peak hour Paramics modelling assessment are shown in Table 6-9 for the Heathcote Road/New Illawarra Road intersection and in Table 6-10 for the Little Forest Road/New Illawarra Road intersection. The results of modelling are included in Appendix C.

Table 6-9 Heathcote Road/New Illawarra Road Intersection Paramics Model Results – 2027 AM peak

Intersection	Approach	Turn	Delay (s)	LoS
New Illawarra Rd / Heathcote Rd	New Illawarra Rd (E)	Left	6	A
		Right	21	B
	Heathcote Rd (S)	Through	21	B
		Right	21	B
	Heathcote Rd (N)	Left	15	B
		Through	55	E

Table 6-10 Little Forest Road/New Illawarra Road Intersection Paramics Model Results – 2027 AM peak

Intersection	Approach	Turn	Average Delay (s)	LoS
New Illawarra Rd / Little Forest	Little Forest (N)	Left	5	A
		Right	20	B
	New Illawarra (E)	Through	0	A
		Right	32	C
	New Illawarra (W)	Left	0	A
		Through	0	A

The Paramics modelling indicates that both intersections would operate satisfactorily under the worst case 2027 AM peak traffic conditions. Sufficient gaps in traffic are provided along New Illawarra Road from the Heathcote Road/New Illawarra Road traffic signals which allow both heavy vehicles and light vehicles to turn into and out of Little Forrest Road with minimal delays.

A screenshot of the Paramics micro-simulation mode is shown at Figure 6-3, which shows the platoon dispersion from the Heathcote Road/New Illawarra Road intersection.

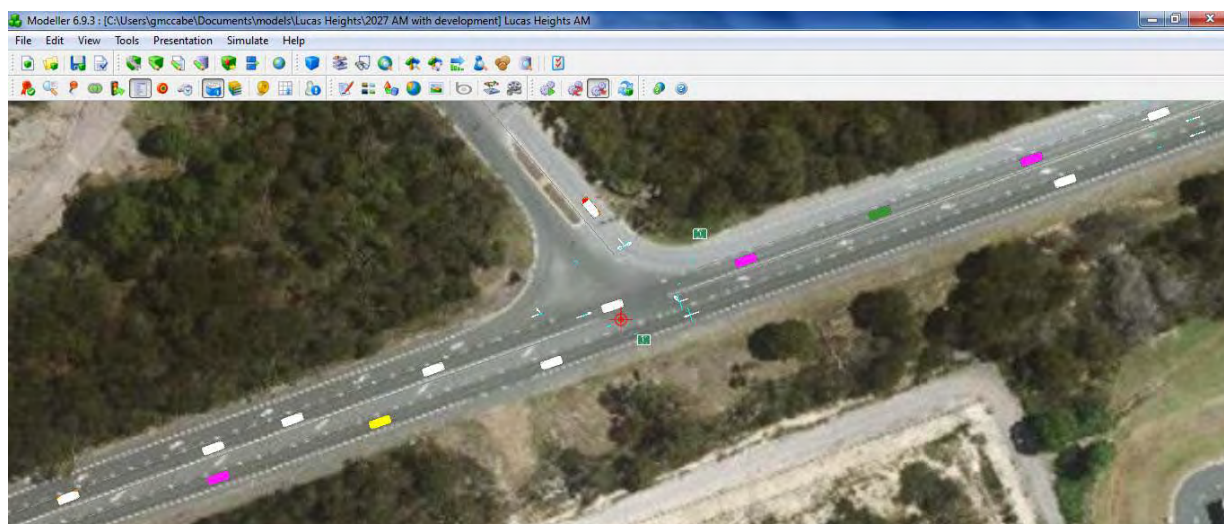


Figure 6-3 Platoon dispersion from the Heathcote Road / New Illawarra Road intersection (Paramics model screenshot)

A screenshot of the Paramics micro-simulation mode is shown at Figure 6-4, which shows the gaps between the platoons (i.e. the left turn from Heathcote Road supplying the only northbound vehicles).

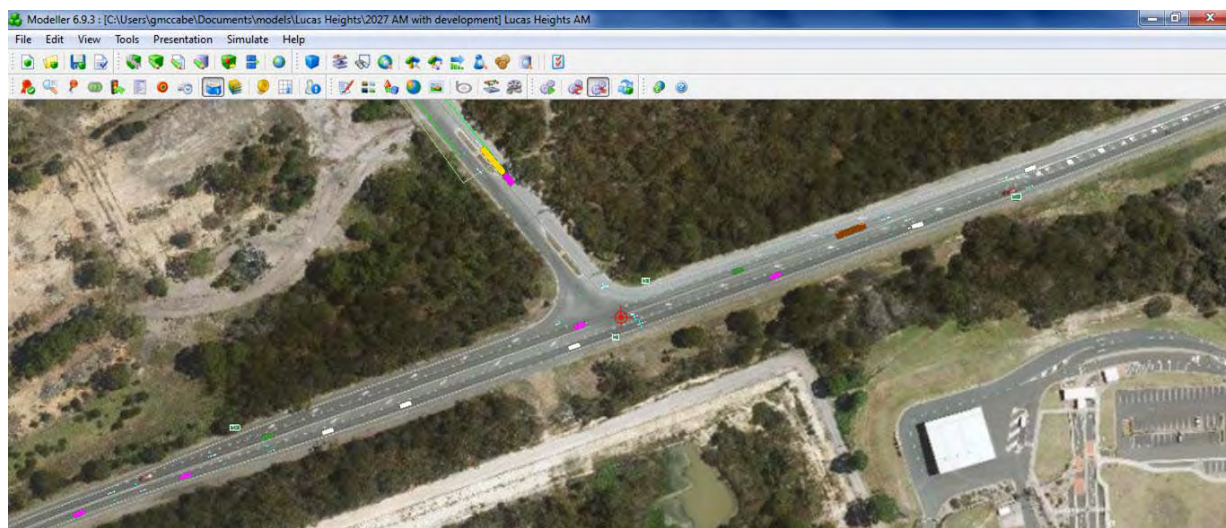


Figure 6-4 Gaps between the platoons (Paramics model screenshot)

#### 6.6.1 Change in mid-block traffic volumes

The forecast increase in two-way traffic volumes associated with the proposal along road sections within the study area is shown in Table 6-11 and Table 6-12 for the 2027 AM and PM peak hours respectively under the 70/30 trip distribution. Compared to the original trip distribution volumes (refer to Table 6-4 and Table 6-5), these increases in volume are similar in proportion to the base traffic.

Table 6-11 2027 AM Peak hour forecast increase in traffic (sensitivity test)

2027 Traffic Volumes	2027 Base (2-way traffic)	2027 Base + Dev (2-way traffic, 70/30)	Increase	% Increase
New Illawarra Road, north of Little Forest Road	2,221	2,240	19	0.8%
New Illawarra Road, south of Little Forest Road	2,172	2,217	44	2.0%
Little Forest Road	73	136	63	46.4%
Heathcote Road, north of New Illawarra Road	1,875	1,919	44	2.3%
Heathcote Road, south of New Illawarra Road	2,143	2,143	0	0.0%

Table 6-12 2027 PM Peak hour forecast increase in traffic (sensitivity test)

2027 Traffic Volumes	2027 Base (2-way traffic)	2027 Base + Development (2-way traffic)	Increase	% Increase
New Illawarra Road, north of Little Forest Road	1,725	1,744	19	1.1%
New Illawarra Road, south of Little Forest Road	1,720	1,764	44	2.5%
Little Forest Road	51	114	63	55.3%
Heathcote Road, north of New Illawarra Road	1,474	1,518	44	2.9%
Heathcote Road, south of New Illawarra Road	1,747	1,747	0	0.0%

On the basis that 136 vehicles per hour would use Little Forest Road in 2027 as a result of the proposal, including 80 vehicles accessing from the north and approximately 2,240 vehicles per hour can be expected to be using New Illawarra Road to the north at this time (refer Table 6-11), it can be concluded that approximately 4% of the vehicles using New Illawarra Road would be accessing the LHRRP in the AM peak hour in 2027.

#### Impacts to ANSTO access intersection

As summarised in Table 6-11 and Table 6-12, under the 70/30 trip distribution the proposal is forecast to result in the following increase in two-way traffic at New Illawarra Road to the north of Little Forest Road:

- 0.8% (19 vehicle movements) during the AM peak hour in 2027
- 1.1% (19 vehicle movements) during the PM peak hour in 2027

Based on the above, under the 70/30 trip distribution the proposal is expected to have negligible impacts to the operation of the ANSTO access/New Illawarra Road intersection. ANSTO has been consulted regarding these findings.

### 6.7 Future residential traffic generation at Barden Ridge

Parts of areas north of the Lucas Heights Resource Recovery Park have been rezoned to allow for six new discrete communities surrounding Barden Ridge. These future residential receptors are illustrated on Figure 1-4. Additional SIDRA and Paramics traffic modelling was undertaken to assess the traffic impacts associated with the proposal, including the additional traffic associated with this future residential development.

The methodology, assessment criteria and assumptions outlined in Section 2.3 were applied.

#### 6.7.1 Rezoned residential area and estimate of the number of lots

In accordance with the lot size map the communities to the west of Barden Ridge are subject to a minimum lot size of 550 m<sup>2</sup>. Based on this size of each community, the number of lots was determined for each location. The number of lots for each location is shown in Table 6-13. As shown, there are estimated to be 286 new low density residential properties proposed to be developed to the north of LHRRP.

Table 6-13 Number of proposed residential lots at Barden Ridge

Location	Area (ha)	Minimum lot size Number of Lots	Number of Lots
North-West	2.54	550	47
North-East	4.79	550	88
South-East	2.05	550	38
South-West	6.20	550	113
Total	15.6		286

#### 6.7.2 Trip generation and traffic distribution

The trip generation rates that were used to determine the number of vehicles generated by the future residential development north of Barden Ridge are provided from the Roads and Maritime document *Technical Direction TDT 2013 / 04a Guide to Traffic Generating Developments Updated Traffic Surveys*. This document provides the following trip rates for low density residential developments:

- 0.99 trips per dwelling in evening peak hour; and
- 0.95 trips per dwelling in the morning peak



Table 6-14 summarises the trip rates and trip generation for arrivals and departures in the AM and PM peaks, assuming 286 residential units. It was assumed that 80% of trips would be departures in the AM peak, with 80% arrivals during the PM peak.

**Table 6-14 Trip generation calculations – proposed residential development**

	AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures
Trip Rate	0.20	0.79	0.76	0.19
Trip Generation (veh)	57	227	217	54

For conservative assessment of the proposed residential development, it has been assumed that 40 percent of the residential traffic would pass the proposal site, with 20 percent travelling to/from Heathcote Road east and 20 percent travelling to/from Heathcote Road west.

#### 6.7.3 SIDRA Traffic Modelling to Develop Signal Phasing Times

SIDRA 6.1 modelling software was used to develop the signal phasing times for input into the Paramics modelling of the Heathcote Road/New Illawarra Road intersection. The traffic demand for this analysis included background traffic growth rates provided by Roads and Maritime, traffic associated with the proposed residential development at Barden Bridge and traffic associated with the Proposal. The 'with development' assessment scenario was modelled based on an assumed a 70/30 split of traffic generated from the facility. This scenario assumes that:

- 70% of generated traffic travels to/from north-west via New Illawarra Road and Heathcote Road (north); and
- 30% of generated traffic travels to/from north-east via New Illawarra Road (north).

A summary of the SIDRA results for the Heathcote Road/New Illawarra Road intersection are provided in Table 6-15. The intersection is expected to continue to operate satisfactory in 2027 with the traffic associated with the Proposal and the proposed residential development at Barden Bridge.

**Table 6-15 Heathcote Road and New Illawarra Road**

Peak Period/Trip Distribution (base + development traffic)	LoS	Ave. delay (s)	Max delay (s)	Deg. satn	Max queue (m)
2027 AM Base	C	31	58	0.81	203
2027 PM Base	C	31	62	0.57	150
2027 AM – With Dev	C	30	29	0.85	210
2027 PM – With Dev	C	31	62	0.57	167

#### 6.7.4 Paramics Modelling Results

At the request of Sutherland Shire Council, Paramics traffic microsimulation modelling was undertaken in order to provide analysis on the gaps in traffic along New Illawarra Road from the traffic signals at the Heathcote Road/New Illawarra Road intersection.

A 2027 AM worst case (70/30 split) model was developed using the forecast SIDRA traffic volumes and signal timing information from the Heathcote Road/New Illawarra Road intersection SIDRA model. In developing this model, cars and heavy vehicles were modelled as two separate origin/destination matrices to ensure that the delays at the intersection of New

Illawarra Road and Little Forest Road were based on vehicle performance. Additionally, the model was built in a 3D environment to ensure that truck performance on gradients was accurately represented.

The results of the 2027 AM peak hour Paramics modelling assessment the Heathcote Road/New Illawarra Road intersection is included in Table 6-16 and the results for the Little Forest Road/New Illawarra Road intersection included in Table 6-17. The traffic demands in the model also include the proposed residential traffic generation, shown at Table 6-14.

**Table 6-16** 2027 Heathcote Road / New Illawarra Road intersection  
Paramics output

Approach	Turn	2027 AM Peak		2027 PM Peak	
		Average Delay (s)	Max Queue Length (m)	Average Delay (s)	Max Queue Length (m)
New Illawarra Rd (E)	Left	6	48	7	35
	Right	14	18	5	51
Heathcote Rd (S)	Through	1	100	0	31
	Right	6	27	1	27
Heathcote Rd (N)	Left	1	81	32	74
	Through	1	61	32	112

**Table 6-17** 2027 Little Forest Road/New Illawarra Road intersection  
Paramics Output

Approach	Turn	2027 AM Peak		2027 PM Peak	
		Average Delay (s)	Max Queue Length (m)	Average Delay (s)	Max Queue Length (m)
Little Forest (N)	Left	7	45	3	26
	Right	28	45	10	26
New Illawarra (E)	Through	0	34	0	22
	Right	22	34	10	22
New Illawarra (W)	Left	0	7	0	11
	Through	0	7	0	11

The Paramics modelling indicates that both intersections would operate satisfactorily under the worst case 2027 AM peak traffic conditions. Sufficient gaps in traffic are provided along New Illawarra Road from the Heathcote Road/New Illawarra Road traffic signals which allow both heavy vehicles and light vehicles to turn into and out of Little Forrest Road with minimal delays.

A screenshot of the Paramics micro-simulation mode is shown at Figure 6-5, which shows the platoon dispersion from the Heathcote Road / New Illawarra Road intersection.



Figure 6-5 Platoon dispersion from the Heathcote Road / New Illawarra Road intersection (Paramics model screenshot)

A screenshot of the Paramics micro-simulation mode is shown at Figure 6-6, which shows the gaps between the platoons (i.e. the left turn from Heathcote Road supplying the only northbound vehicles).



Figure 6-6 Gaps between the platoons (Paramics model screenshot)

## 6.8 Parking and access

### 6.8.1 On-street parking

There is no car parking provision along New Illawarra Road or Little Forest Road near the site access. All parking will be provided internally within the site.

### 6.8.2 On-site parking

In total, there are to be a total of approximately 96 car bays provided on-site to service the expanded facilities under the proposal, divided between three car parks. These are:

- ARRT facility car park (north) – 32 bays servicing the composting hall and biofilter
- ARRT facility car park (south) – 57 bays servicing the waste receival and processing building
- GO facility car park – 7 bays servicing the receival area, GO facility and office

Table 6-18 breaks down the number of bays provided in each car park by type, whilst Figure 6-7 illustrates the conceptual layout of the proposed car parks. The proposal will not change the existing truck parking area, which will be retained.

**Table 6-18** ARRT and GO facility on-site car parking provision

Number of bays	Staff	Visitors	Accessible	Motorcycle	Total
ARRT car park (north)	50	20	1	2	32
ARRT car park (south)			1	3	57
GO facility carpark			1	1	7



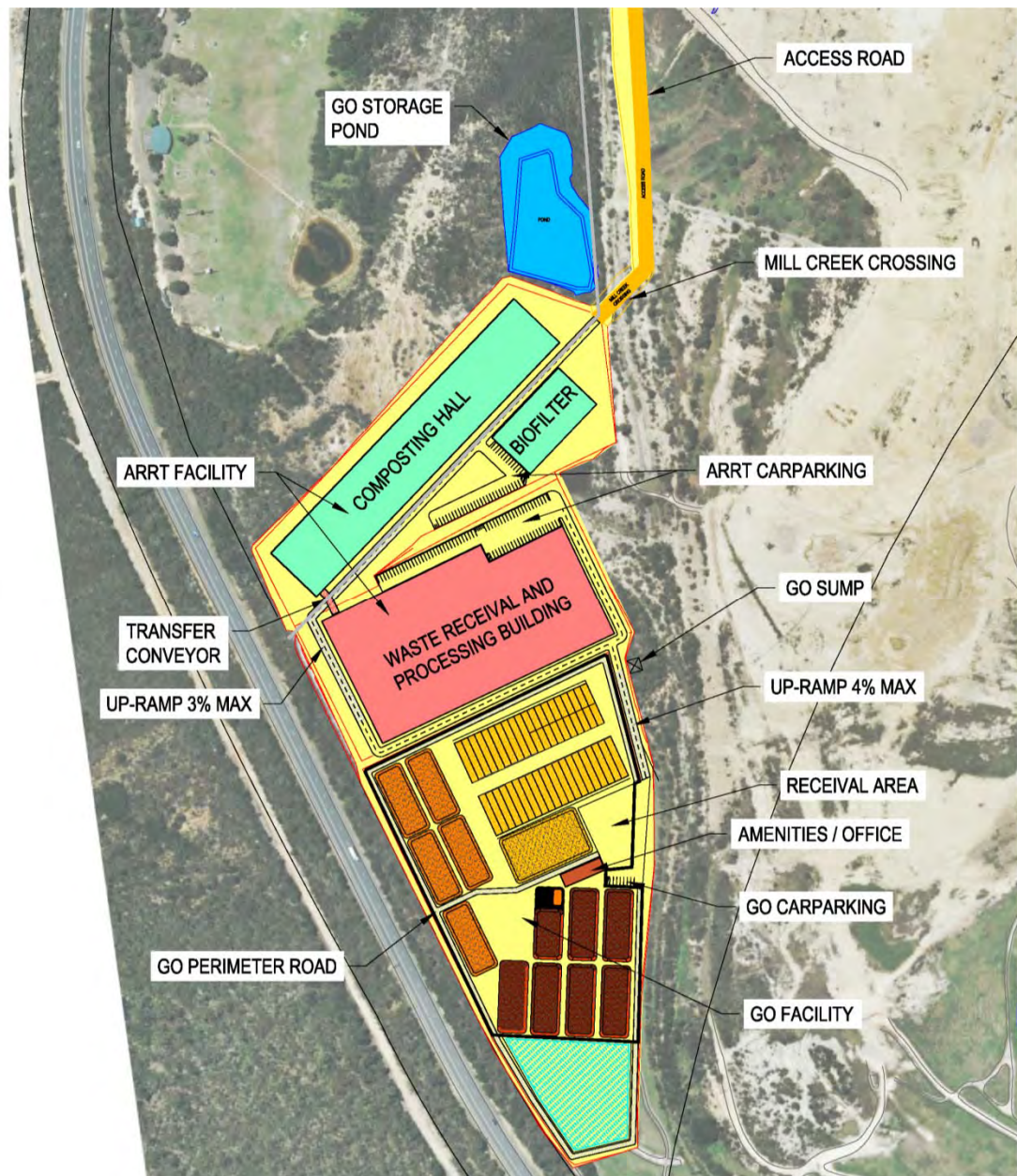


Figure 6-7 Concept plan of proposed car parking arrangements

The SSC's *Development Control Plan (DCP) 2006, Chapter 7: Vehicular Access, Traffic, Parking and Bicycles* contains parking requirements and ratios by land use within the Shire, however no specific guidance or conditions are provided for landfill or waste management facilities. Similarly, the RTA's *Guide to Traffic Generating Developments* (2002) does not provide any parking ratios for landfill or waste management sites in particular.

Therefore, the parking provision in Table 6-18 has been calculated based on projected staff numbers for the ARRT and GO facilities, which were provided by SITA. An additional 20 bays have also been set aside for visitor parking.

Provision for accessible parking is governed by the Building Code of Australia (BCA). Assuming that the proposed facilities can be best classified under the (BCA) as Class 8 buildings under the code (defined as "a laboratory, or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale, or gain"), then one accessible space for every 100 car parking spaces (or part thereof) needs to be provided under clause D3.5. Based on this, one accessible bay is



to be provided in each of the three car parks, designed in accordance with AS2890.6-2009, *Parking facilities Part 6: Off-street parking for people with disabilities*.

Chapter 7, clause 1.b.2 of the SSC's DCP 2006 states that motorcycle parking is to be provided at the rate of one motorcycle parking space per 25 car spaces (or part thereof).

All car and motorcycle bays were designed and dimensioned in accordance with AS2890.1-2004, *Parking facilities Part 1: Off-street parking* assuming a User Class 1 (being suited to employee and all-day parking).

#### 6.8.3 Access arrangements

A traffic management plan would be developed and would address the timing of trucks accessing the site to ensure there is sufficient room within the site to accommodate the vehicles.

### 6.9 Walking

There are no footpaths along New Illawarra Road or Little Forest Road. Little Forest Road is currently used by some ANSTO staff for cycling and pedestrian to access walking tracks on their land.

The proposal is expected to have negligible impacts to pedestrians.

### 6.10 Cycling

There are no dedicated cycleways along New Illawarra Road, Little Forest Road or Heathcote Road, although cyclists can use the shoulder along New Illawarra Road and Heathcote Road. Little Forest Road is also currently used by some ANSTO staff for cycling and pedestrian to access walking tracks on their land.

The proposal is expected to have negligible impacts to cyclists.

### 6.11 Public transport

There are no bus stops along New Illawarra Road or Heathcote Road in the vicinity of the site. The nearest train station is at Engadine train station, which is located approximately 8 kilometres from the LHRRP site.

As such, the proposal would have no impacts to public transport operations.

## 7. Mitigation measures

### 7.1 Overview

A number of mitigating measures have been identified to ensure that transport and traffic impacts associated with the construction and operation of the proposal are minimised. These measures are summarised below and would be incorporated into a traffic management plan.

### 7.2 Mitigation measures

#### 7.2.1 Construction

An important mitigation measure relating to construction traffic impacts is the implementation of a community information and awareness program. This program will be initiated prior to construction commencing and continue throughout the entire construction period to ensure that local residents are fully aware of the construction activities, with particular regard to construction traffic issues. The awareness program will identify communication protocols for community feedback on issues relating to construction vehicle driver behaviour and construction-related matters.

Examples of key measures for the construction stage that would be undertaken as part of the Traffic Management Plan include:

- Consultation with RMS and SSC to ensure that general signposting of construction access roads are appropriate and provide adequate warning of heavy vehicle and construction activity
- Distribute construction activity warning notices to advise local road users of scheduled construction activities
- Provide advance notice of road/lane closures and advice on alternative routes (if required)
- Whenever practical, promote the use internal and haulage access roads rather than public roads by construction vehicles
- Manage the transportation of construction materials to maximise vehicle loads and minimise vehicle movements in consultation with RMS and SSC and the NSW Police Services

#### 7.2.2 Safety review

SITA would engage an independent traffic expert to perform a safety review in both 2020 and 2025 on the safety of the intersection of New Illawarra Road and Little Forest Road. The expert would be jointly selected by SITA and SSC.

The report would include analysis of the relevant peak periods and include the following:

- Vehicle turn counts using video surveillance
- Measured average delay per vehicle for vehicles turning into and out of Little Forest Road based on the video surveillance
- Crash data
- Benefit Cost Ratio Analysis for the provision of a controlled intersection using the RMS Road Safety Project Nomination Benefit Cost Ratio (BCR) model

Should the report indicate either of the following:

- That the measured average delay per vehicle is equal to or greater than 56 seconds for any of the turning movements to and from Little Forest Road from New Illawarra Road, or
- That the Benefit Cost Ratio for the provision of a controlled intersection is equal to or greater than 1, then

SITA would modify the Little Forest Road / New Illawarra Road intersection to address any issues identified, subject to the approval of RMS and SSC. All costs associated with upgrading of the intersection (if required) would be borne by SITA.

### 7.2.3 Operational mitigation measures

A comprehensive list of prevention, mitigation and rectification measures has been identified and they are detailed in the LHRRP Operational Environment Management Plan (OEMP). The identified mitigation and rectification measures would be implemented as required and their exact details would be based on a case by case situation depending on the issue and technical solutions available at the time. Traffic control for inbound and outbound vehicles for the GO facility and the ARRT facility should be considered with traffic associated with the rest of the LHRRP (refer LHRRP OEMP).

Examples of key measures which are included in the OEMPs and initiatives that would be undertaken as part of the Traffic Management Plan and are provided below:

- Review signposted and non-signposted speed restrictions along the road network and where necessary, provide additional signposting of speed limitations
- Consult with schools and school bus services to determine and mitigate if any school bus service use roads within the study area
- Install appropriate traffic control and warning signs for areas identified to have existing potential safety risks
- Consult with the NSW Police Service to mitigate impacts of heavy (multi-dimensional) vehicles on the roads
- Project induction training for truck and vehicle operators
- Manage queuing and prevent long queues at site entrance
- Actively monitor area and have in place traffic control
- Delay trucks when required
- Manage dispatch timing for vehicles from SITA controlled facilities
- SITA owned waste transfer vehicles are to travel on arterial or sub-arterial roads rather than local roads (with the exception of Little Forest Road)
- SITA would discourage customer's transfer trailers and B doubles from travelling on local roads

## 8. Conclusions

The key findings of this traffic impact assessment are summarised in the sections below.

### 8.1 Traffic impact assessment

The year 2027 is expected to be the peak year in terms of traffic generation at the site, with 112,518 additional trips to the site over a period of 1 year.

The forecast increase in vehicles using New Illawarra Road during the AM peak and PM peak hour respectively are 1.4% and 1.8%, or 63 additional vehicles during each period, above what would occur in the absence of the proposal.

The Traffic Impact Assessment report for the 1999 EIS provides estimated traffic generation for the current approved waste operations, including during the AM peak:

- 88 truck movements (44 arriving and 44 departing) during the AM peak hour between 7.30-8.30 AM, assuming the peak hour is 50 percent of the 7-9 AM two hour period.
- 30 light vehicle movements (15 arriving and 15 departing) during the AM peak hour
- 118 vehicle movements in total during the AM peak hour

The above traffic generation estimates of 118 vehicle movements includes only waste transferred to the site by bulk waste transfer vehicles and by council waste vehicles.

Based on the assessment undertaken as part of this proposal, the technical analysis indicates that 105 vehicle movements (trucks and light vehicles) in total would occur during the AM peak hour (for the year where maximum level of traffic movements is expected - 2027. This assessment has taken into consideration waste delivery vehicles as well as vehicles associated with operations and capping activities.

Therefore this proposal is expected to generate less traffic movements than that approved in the 1999 consent (105 compared to 118 vehicle movements during the AM peak hour).

The SIDRA intersection analysis of intersections within the study area indicates the following:

#### 8.1.1 Heathcote Road/New Illawarra Road

- The SIDRA assessment results indicate that the Heathcote Road/New Illawarra Road intersection is forecast to operate satisfactorily with the additional traffic generation from the proposal during both the AM peak hour and PM peak hour in 2017 and 2027.
- A sensitivity test of the trip distribution, assuming 70% of trips to Heathcote Road (north), found that there was little change to the Heathcote Road/New Illawarra Road intersection performance.
- The proposal would have negligible impacts to the operation of the Heathcote Road/New Illawarra Road intersection.

#### 8.1.2 Little Forest Road/New Illawarra Road intersection

- The Little Forest Road/New Illawarra Road intersection is forecast to operate at a LoS of C during the 2017 AM peak, decreasing to a LoS of D during the 2027 AM peak, both with and without the increased development. In the 2017 and 2027 PM peak periods, the intersection is forecast to operate at a LoS of B.
- The critical movements are the right turn from Little Forest Road to New Illawarra Road southbound, and from New Illawarra Road southbound to Little Forest Road. By the

criteria listed in Table 2-2, the SIDRA results indicate that the intersection is likely to be able to accommodate the forecast traffic volumes through 2027 with the development traffic, albeit operating near capacity.

- A sensitivity test of the trip distribution, assuming 70% of trips to Heathcote Road (north), found there was a slight improvement in the average delay turning right from New Illawarra Road to Little Forest Road, along with a corresponding slight increase in the average delay turning right from Little Forest Road to New Illawarra Road.
- At the request of Sutherland Shire Council, a review of the SIDRA intersection modelling was undertaken using the Paramics traffic microsimulation program. Based on a worst case assessment, the Paramics modelling indicates that the Little Forest Road/New Illawarra Road intersection would operate satisfactorily under the 2027 AM peak traffic conditions.

#### 8.1.3 Future residential traffic generated at Barden Ridge

Additional SIDRA and Paramics traffic modelling was undertaken to assess the traffic impacts associated with the proposal when including the potential additional traffic associated with the six new discrete communities which have been approved around Barden Ridge.

The modelling found that, with the additional traffic from the future residential development:

- The proposal would have negligible impacts to the operation of the Heathcote Road/New Illawarra Road intersection
- The Little Forrest Road/New Illawarra Road intersection would operate satisfactorily under the worst case 2027 AM and PM peak traffic conditions

## 8.2 Parking and access

There is no car parking provision along New Illawarra Road or Little Forest Road near the site access. All parking will be provided internally within the site.

## 8.3 Other potential impacts

The proposal is expected to have negligible impacts to pedestrians and cyclists, and no impacts to public transport operations.

## 8.4 Overall findings

The overall traffic increase on the New Illawarra Road and Heathcote Road is minimal and the road network has the capacity to deal with the increase. The proposal would not adversely impact upon the operation of the existing or future road network.



## 9. Limitations

This report: has been prepared by GHD for SITA Australia and may only be used and relied on by SITA Australia for the purpose agreed between GHD and the SITA Australia as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than SITA Australia arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described within this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by SITA Australia and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.



## Appendices



## Appendix A – Traffic Survey Data





# R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.

Mobile.0418239019

Client : GHD  
Job No/Name : 5262 LUCAS HEIGHTS New Illawarra Rd  
Day/Date : Tuesday 29th July 2014

PEDS	WEST	NORTH	EAST	
Time Per	Heathcote Rd	New mawarra Rd	Heathcote Rd	TOT
0630 - 0645				0
0645 - 0700		NOT		0
0700 - 0715		REQUIRED		0
0715 - 0730				0
0730 - 0745				0
0745 - 0800				0
0800 - 0815				0
0815 - 0830				0
0830 - 0845				0
0845 - 0900				0
0900 - 0915				0
0915 - 0930				0
Per End	0	0	0	0

PEDS	WEST	NORTH	EAST	
Peak Per	Heathcote Rd	New mawarra Rd	Heathcote Rd	TOT
0630 - 0730	0	0	0	0
0645 - 0745	0	0	0	0
0700 - 0800	0	0	0	0
0715 - 0815	0	0	0	0
0730 - 0830	0	0	0	0
0745 - 0845	0	0	0	0
0800 - 0900	0	0	0	0
0815 - 0915	0	0	0	0
0830 - 0930	0	0	0	0

PEAK HR	0	0	0	0
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Lights	WEST		NORTH		EAST		
	Heathcote Rd		New mawarra Rd		Heathcote Rd		
Time Per	I	L	R	L	R	I	TOT
0630 - 0645	55	117	117	59	201	128	677
0645 - 0700	32	73	100	62	159	154	580
0700 - 0715	55	77	109	82	169	153	645
0715 - 0730	42	81	84	68	143	134	552
0730 - 0745	59	77	131	101	188	169	725
0745 - 0800	63	95	111	77	196	167	709
0800 - 0815	57	99	88	91	181	121	637
0815 - 0830	41	87	108	91	149	98	574
0830 - 0845	55	87	73	69	162	101	547
0845 - 0900	55	65	65	80	130	86	481
0900 - 0915	55	68	59	87	105	77	451
0915 - 0930	36	62	35	50	76	55	314
Per End	605	988	1080	917	1859	1443	6892

Heavies	WEST		NORTH		EAST		
	Heathcote Rd		New mawarra Rd		Heathcote Rd		
Time Per	I	L	R	L	R	I	TOT
0630 - 0645	3	1	2	3	4	2	15
0645 - 0700	2	3	0	5	4	5	19
0700 - 0715	3	5	3	7	2	4	24
0715 - 0730	3	1	0	5	6	4	19
0730 - 0745	5	0	4	2	4	5	20
0745 - 0800	0	1	2	1	6	3	13
0800 - 0815	0	4	1	4	3	0	12
0815 - 0830	2	3	0	3	3	2	13
0830 - 0845	2	5	1	2	1	1	12
0845 - 0900	3	3	3	5	5	3	22
0900 - 0915	5	4	1	3	5	3	21
0915 - 0930	7	0	3	4	2	1	17
Per End	35	30	20	44	45	33	207

Combined	WEST		NORTH		EAST		
	Heathcote Rd		New mawarra Rd		Heathcote Rd		
Time Per	I	L	R	L	R	I	TOT
0630 - 0645	58	118	119	62	205	130	692
0645 - 0700	34	76	100	67	163	159	599
0700 - 0715	58	82	112	89	171	157	669
0715 - 0730	45	82	84	73	149	138	571
0730 - 0745	64	77	135	103	192	174	745
0745 - 0800	63	96	113	78	202	170	722
0800 - 0815	57	103	89	95	184	121	649
0815 - 0830	43	90	108	94	152	100	587
0830 - 0845	57	92	74	71	163	102	559
0845 - 0900	58	68	68	85	135	89	503
0900 - 0915	60	72	60	90	110	80	472
0915 - 0930	43	62	38	54	78	56	331
Per End	640	1018	1100	961	1904	1476	7099

Lights	WEST		NORTH		EAST		
	Heathcote Rd		New mawarra Rd		Heathcote Rd		
Peak Per	I	L	R	L	R	I	TOT
0630 - 0730	184	348	410	271	672	569	2454
0645 - 0745	188	308	424	313	659	610	2502
0700 - 0800	219	330	435	328	696	623	2631
0715 - 0815	221	352	414	337	708	591	2623
0730 - 0830	220	358	438	360	714	555	2645
0745 - 0845	216	368	380	328	688	487	2467
0800 - 0900	208	338	334	331	622	406	2239
0815 - 0915	206	307	305	327	546	362	2053
0830 - 0930	201	282	232	286	473	319	1793

Heavies	WEST		NORTH		EAST		
	Heathcote Rd		New mawarra Rd		Heathcote Rd		
Peak Per	I	L	R	L	R	I	TOT
0630 - 0730	11	10	5	20	16	15	77
0645 - 0745	13	9	7	19	16	18	82
0700 - 0800	11	7	9	15	18	16	76
0715 - 0815	8	6	7	12	19	12	64
0730 - 0830	7	8	7	10	16	10	58
0745 - 0845	4	13	4	10	13	6	50
0800 - 0900	7	15	5	14	12	6	59
0815 - 0915	12	15	5	13	14	9	68
0830 - 0930	17	12	8	14	13	8	72

Combined	WEST		NORTH		EAST		
	Heathcote Rd		New mawarra Rd		Heathcote Rd		
Peak Per	I	L	R	L	R	I	TOT
0630 - 0730	195	358	415	291	688	584	2531
0645 - 0745	201	317	431	332	675	628	2584
0700 - 0800	230	337	444	343	714	639	2707
0715 - 0815	229	358	421	349	727	603	2687
0730 - 0830	227	366	445	370	730	565	2703
0745 - 0845	220	381	384	338	701	493	2517
0800 - 0900	215	353	339	345	634	412	2298
0815 - 0915	218	322	310	340	560	371	2121
0830 - 0930	218	294	240	300	486	327	1865

PEAK HR	219	330	435	328	696	623	2631
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PEAK HR	11	7	9	15	18	16	76
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PEAK HR	230	337	444	343	714	639	2707
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# R.O.A.R. DATA

**Reliable, Original & Authentic Results**

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : GHD

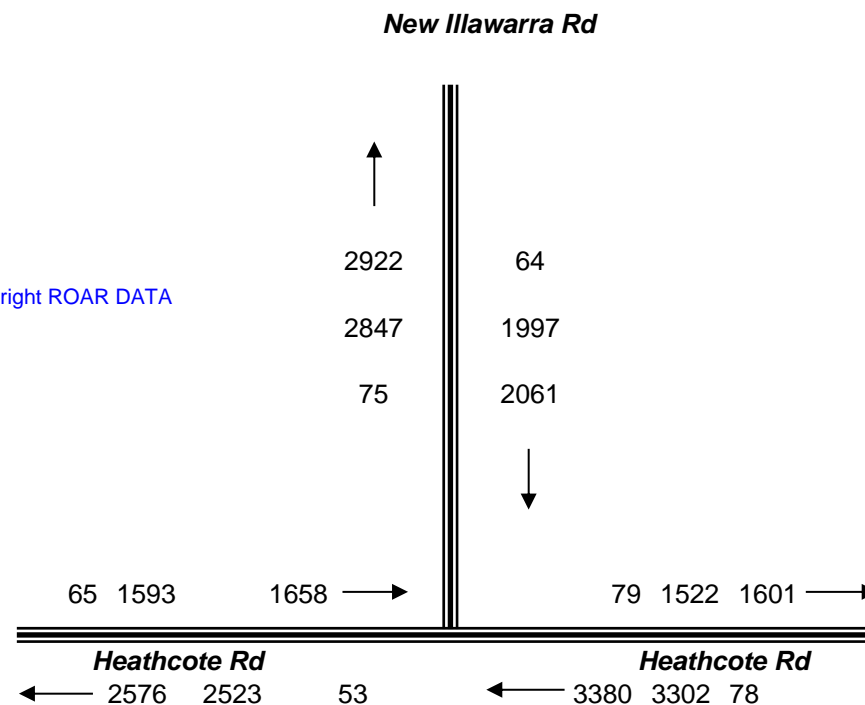
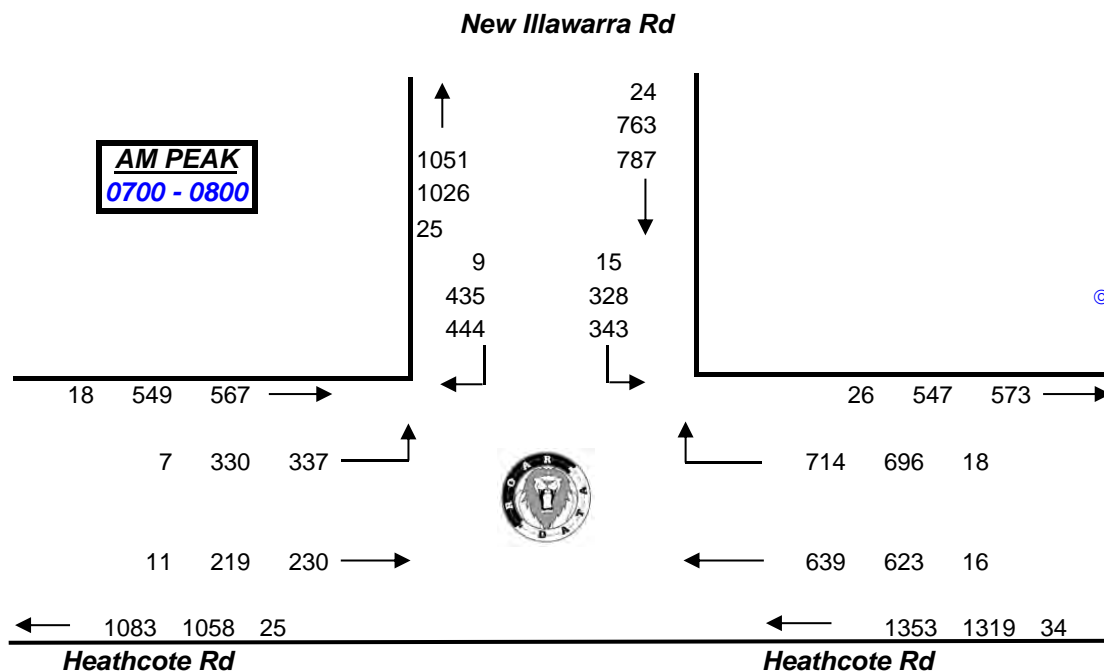
Job No/Name : 5262 LUCAS HEIGHTS New Illawarra Rd

Day/Date : Tuesday 29th July 2014

**TOTAL VOLUMES  
FOR COUNT  
PERIOD**



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# R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.

Mobile.0418239019

Client : GHD  
Job No/Name : 5488 LUCAS HEIGHTS New Illawarra Rd  
Day/Date : Monday 9th February 2015

PEDS	WEST	NORTH	EAST	
Time Per	Heathcote Rd	new mawarra Rd	Heathcote Rd	TOT
1530 - 1545				0
1545 - 1600		NOT		0
1600 - 1615		REQUIRED		0
1615 - 1630				0
1630 - 1645				0
1645 - 1700				0
1700 - 1715				0
1715 - 1730				0
1730 - 1745				0
1745 - 1800				0
1800 - 1815				0
1815 - 1830				0
Per End	0	0	0	0

PEDS	WEST	NORTH	EAST	
Peak Per	Heathcote Rd	new mawarra Rd	Heathcote Rd	TOT
1530 - 1630	0	0	0	0
1545 - 1645	0	0	0	0
1600 - 1700	0	0	0	0
1615 - 1715	0	0	0	0
1630 - 1730	0	0	0	0
1645 - 1745	0	0	0	0
1700 - 1800	0	0	0	0
1715 - 1815	0	0	0	0
1730 - 1830	0	0	0	0

PEAK HR	0	0	0	0
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Lights	WEST		NORTH		EAST		
Time Per	Heathcote Rd		new mawarra Rd		Heathcote Rd		TOT
1530 - 1545	53	44	80	133	56	59	425
1545 - 1600	73	62	92	114	60	49	450
1600 - 1615	79	68	64	108	78	61	458
1615 - 1630	116	77	72	116	64	51	496
1630 - 1645	108	95	70	128	68	72	541
1645 - 1700	126	92	123	280	55	68	744
1700 - 1715	144	109	79	198	84	55	669
1715 - 1730	125	95	95	221	61	57	654
1730 - 1745	161	107	101	245	96	68	778
1745 - 1800	161	95	95	221	80	55	707
1800 - 1815	141	111	111	194	82	50	689
1815 - 1830	134	117	83	159	90	37	620
Per End	1421	1072	1065	2117	874	682	7231

Heavies	WEST		NORTH		EAST		
Time Per	Heathcote Rd		new mawarra Rd		Heathcote Rd		TOT
1530 - 1545	1	0	7	4	1	4	17
1545 - 1600	2	0	5	0	3	3	13
1600 - 1615	0	3	1	2	1	2	9
1615 - 1630	1	1	2	2	2	4	12
1630 - 1645	0	3	0	0	4	1	8
1645 - 1700	0	0	4	2	3	1	10
1700 - 1715	1	0	1	0	0	2	4
1715 - 1730	2	0	3	1	2	3	11
1730 - 1745	2	1	4	0	1	1	9
1745 - 1800	3	0	0	1	0	1	5
1800 - 1815	2	1	1	1	0	0	5
1815 - 1830	1	0	5	1	1	1	9
Per End	15	9	33	14	18	23	112

Combined	WEST		NORTH		EAST		
Time Per	Heathcote Rd		new mawarra Rd		Heathcote Rd		TOT
1530 - 1545	54	44	87	137	57	63	442
1545 - 1600	75	62	97	114	63	52	463
1600 - 1615	79	71	65	110	79	63	467
1615 - 1630	117	78	74	118	66	55	508
1630 - 1645	108	98	70	128	72	73	549
1645 - 1700	126	92	127	282	58	69	754
1700 - 1715	145	109	80	198	84	57	673
1715 - 1730	127	95	98	222	63	60	665
1730 - 1745	163	108	105	245	97	69	787
1745 - 1800	164	95	95	222	80	56	712
1800 - 1815	143	112	112	195	82	50	694
1815 - 1830	135	117	88	160	91	38	629
Per End	1436	1081	1098	2131	892	705	7343

Lights	WEST		NORTH		EAST		
Peak Per	Heathcote Rd		new mawarra Rd		Heathcote Rd		TOT
1530 - 1630	321	251	308	471	258	220	1829
1545 - 1645	376	302	298	466	270	233	1945
1600 - 1700	429	332	329	632	265	252	2239
1615 - 1715	494	373	344	722	271	246	2450
1630 - 1730	503	391	367	827	268	252	2608
1645 - 1745	556	403	398	944	296	248	2845
1700 - 1800	591	406	370	885	321	235	2808
1715 - 1815	588	408	402	881	319	230	2828
1730 - 1830	597	430	390	819	348	210	2794

Heavies	WEST		NORTH		EAST		
Peak Per	Heathcote Rd		new mawarra Rd		Heathcote Rd		TOT
1530 - 1630	4	4	15	8	7	13	51
1545 - 1645	3	7	8	4	10	10	42
1600 - 1700	1	7	7	6	10	8	39
1615 - 1715	2	4	7	4	9	8	34
1630 - 1730	3	3	8	3	9	7	33
1645 - 1745	5	1	12	3	6	7	34
1700 - 1800	8	1	8	2	3	7	29
1715 - 1815	9	2	8	3	3	5	30
1730 - 1830	8	2	10	3	2	3	28

Combined	WEST		NORTH		EAST		
Peak Per	Heathcote Rd		new mawarra Rd		Heathcote Rd		TOT
1530 - 1630	325	255	323	479	265	233	1880
1545 - 1645	379	309	306	470	280	243	1987
1600 - 1700	430	339	336	638	275	260	2278
1615 - 1715	496	377	351	726	280	254	2484
1630 - 1730	506	394	375	830	277	259	2641
1645 - 1745	561	404	410	947	302	255	2879
1700 - 1800	599	407	378	887	324	242	2837
1715 - 1815	597	410	410	884	322	235	2858
1730 - 1830	605	432	400	822	350	213	2822

PEAK HR	556	403	398	944	296	248	2845
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PEAK HR	5	1	12	3	6	7	34
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PEAK HR	561	404	410	947	302	255	2879
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# R.O.A.R. DATA

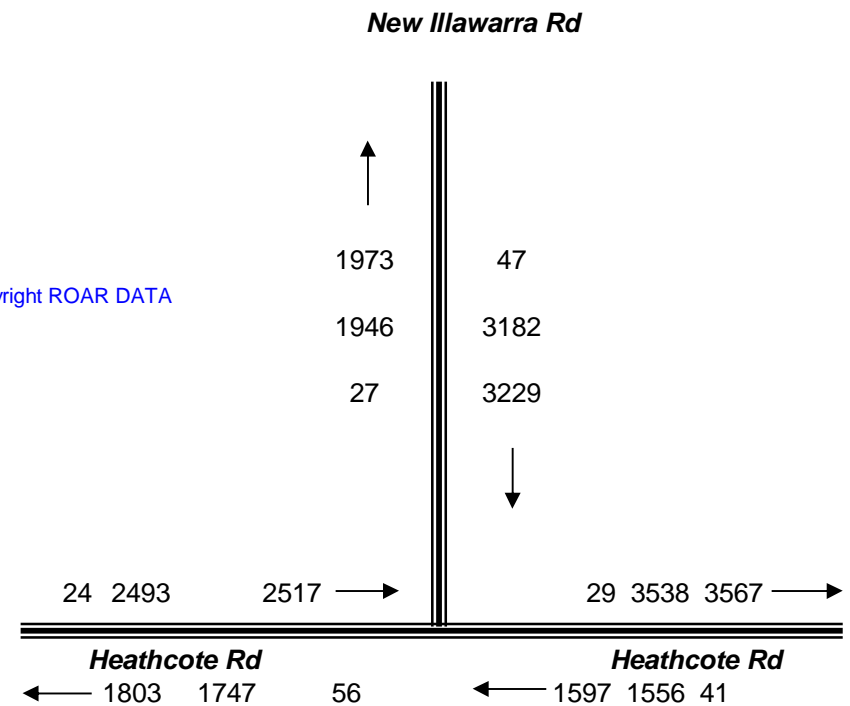
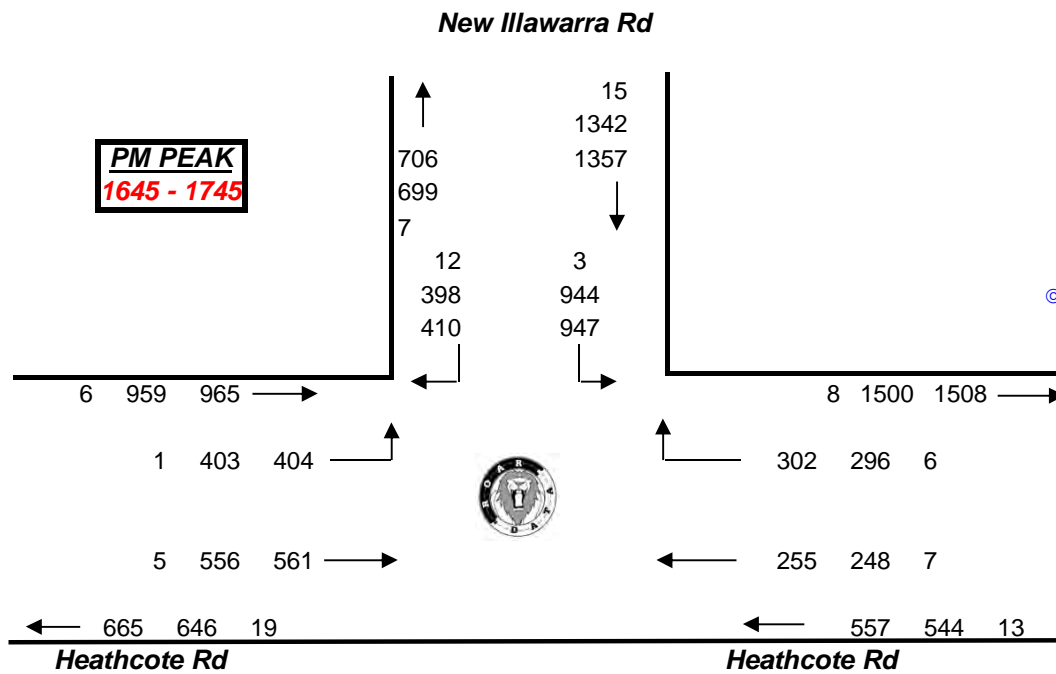
**Reliable, Original & Authentic Results**

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : GHD  
Job No/Name : 5488 LUCAS HEIGHTS New Illawarra Rd  
Day/Date : Monday 9th February 2015



**TOTAL VOLUMES  
FOR COUNT  
PERIOD**





# R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.

Mobile.0418239019

Client : GHD  
Job No/Name : 5262 LUCAS HEIGHTS New Illawarra Rd  
Day/Date : Tuesday 29th July 2014

PEDS	NORTH	WEST	SOUTH	
Time Per	New Illawarra Rd	Little Forest Rd	New Illawarra Rd	TOT
0630 - 0645				0
0645 - 0700		NOT		0
0700 - 0715		REQUIRED		0
0715 - 0730				0
0730 - 0745				0
0745 - 0800				0
0800 - 0815				0
0815 - 0830				0
0830 - 0845				0
0845 - 0900				0
0900 - 0915				0
0915 - 0930				0
Per End	0	0	0	0

PEDS	NORTH	WEST	SOUTH	
Peak Per	New Illawarra Rd	Little Forest Rd	New Illawarra Rd	TOT
0630 - 0730	0	0	0	0
0645 - 0745	0	0	0	0
0700 - 0800	0	0	0	0
0715 - 0815	0	0	0	0
0730 - 0830	0	0	0	0
0745 - 0845	0	0	0	0
0800 - 0900	0	0	0	0
0815 - 0915	0	0	0	0
0830 - 0930	0	0	0	0

PEAK HR	0	0	0	0
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Lights	NORTH		WEST		SOUTH		
Time Per	New Illawarra Rd		Little Forest Rd		New Illawarra Rd		TOT
0630 - 0645	I	R	L	R	L	I	486
0645 - 0700	166	6	2	4	6	302	414
0700 - 0715	159	3	0	2	2	248	467
0715 - 0730	200	0	1	1	0	265	385
0730 - 0745	153	1	1	1	3	226	489
0745 - 0800	230	4	2	1	3	249	469
0800 - 0815	178	0	3	0	0	288	476
0815 - 0830	198	6	2	0	1	269	452
0830 - 0845	200	3	5	3	2	239	396
0845 - 0900	138	2	2	1	4	249	346
0900 - 0915	145	4	1	2	5	189	320
0915 - 0930	142	2	3	3	5	165	217
Per End	1999	34	23	19	33	2809	4917

Heavies	NORTH		WEST		SOUTH		
Time Per	New Illawarra Rd		Little Forest Rd		New Illawarra Rd		TOT
0630 - 0645	I	R	L	R	L	I	11
0645 - 0700	3	1	2	1	1	3	16
0700 - 0715	4	3	3	0	1	5	23
0715 - 0730	11	0	4	0	2	6	14
0730 - 0745	6	2	1	0	0	5	16
0745 - 0800	5	4	1	0	1	5	20
0800 - 0815	3	5	6	0	0	6	19
0815 - 0830	5	4	4	0	1	5	22
0830 - 0845	3	8	4	0	0	7	20
0845 - 0900	4	7	5	0	0	4	25
0900 - 0915	8	3	9	0	0	5	33
0915 - 0930	3	10	4	1	0	15	25
Per End	63	51	50	4	7	69	244

Combined	NORTH		WEST		SOUTH		
Time Per	New Illawarra Rd		Little Forest Rd		New Illawarra Rd		TOT
0630 - 0645	I	R	L	R	L	I	497
0645 - 0700	169	7	4	5	7	305	430
0700 - 0715	163	6	3	2	3	253	490
0715 - 0730	211	0	5	1	2	271	399
0730 - 0745	159	3	2	1	3	231	505
0745 - 0800	235	8	3	1	4	254	489
0800 - 0815	181	5	9	0	0	294	495
0815 - 0830	203	10	6	0	2	274	474
0830 - 0845	203	11	9	3	2	246	416
0845 - 0900	142	9	7	1	4	253	371
0900 - 0915	153	7	10	2	5	194	353
0915 - 0930	145	12	7	4	5	180	242
Per End	2062	85	73	23	40	2878	5161

Lights	NORTH		WEST		SOUTH		
Peak Per	New Illawarra Rd		Little Forest Rd		New Illawarra Rd		TOT
0630 - 0730	I	R	L	R	L	I	1752
0645 - 0745	678	10	4	8	11	1041	1755
0700 - 0800	742	8	4	5	8	988	1810
0715 - 0815	761	5	7	3	6	1028	1819
0730 - 0830	759	11	8	2	7	1032	1886
0745 - 0845	806	13	12	4	6	1045	1793
0800 - 0900	714	11	12	4	7	1045	1670
0815 - 0915	681	15	10	6	12	946	1514
0830 - 0930	625	11	11	9	16	842	1279
Per End	515	11	7	7	16	723	

Heavies	NORTH		WEST		SOUTH		
Peak Per	New Illawarra Rd		Little Forest Rd		New Illawarra Rd		TOT
0630 - 0730	I	R	L	R	L	I	64
0645 - 0745	24	6	10	1	4	19	69
0700 - 0800	26	9	9	0	4	21	73
0715 - 0815	25	11	12	0	3	22	69
0730 - 0830	19	15	12	0	2	21	77
0745 - 0845	16	21	15	0	2	23	81
0800 - 0900	15	24	19	0	1	22	86
0815 - 0915	20	22	22	0	1	21	100
0830 - 0930	18	28	22	1	0	31	103
Per End	23	24	25	3	1	27	

Combined	NORTH		WEST		SOUTH		
Peak Per	New Illawarra Rd		Little Forest Rd		New Illawarra Rd		TOT
0630 - 0730	I	R	L	R	L	I	1816
0645 - 0745	702	16	14	9	15	1060	1824
0700 - 0800	768	17	13	5	12	1009	1883
0715 - 0815	786	16	19	3	9	1050	1888
0730 - 0830	778	26	20	2	9	1053	1963
0745 - 0845	822	34	27	4	8	1068	1874
0800 - 0900	729	35	31	4	8	1067	1756
0815 - 0915	701	37	32	6	13	967	1614
0830 - 0930	643	39	33	10	16	873	1382
Per End	538	35	32	10	17	750	

PEAK HR	806	13	12	4	6	1045	1886
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PEAK HR	16	21	15	0	2	23	77
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PEAK HR	822	34	27	4	8	1068	1963
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# R.O.A.R. DATA

**Reliable, Original & Authentic Results**

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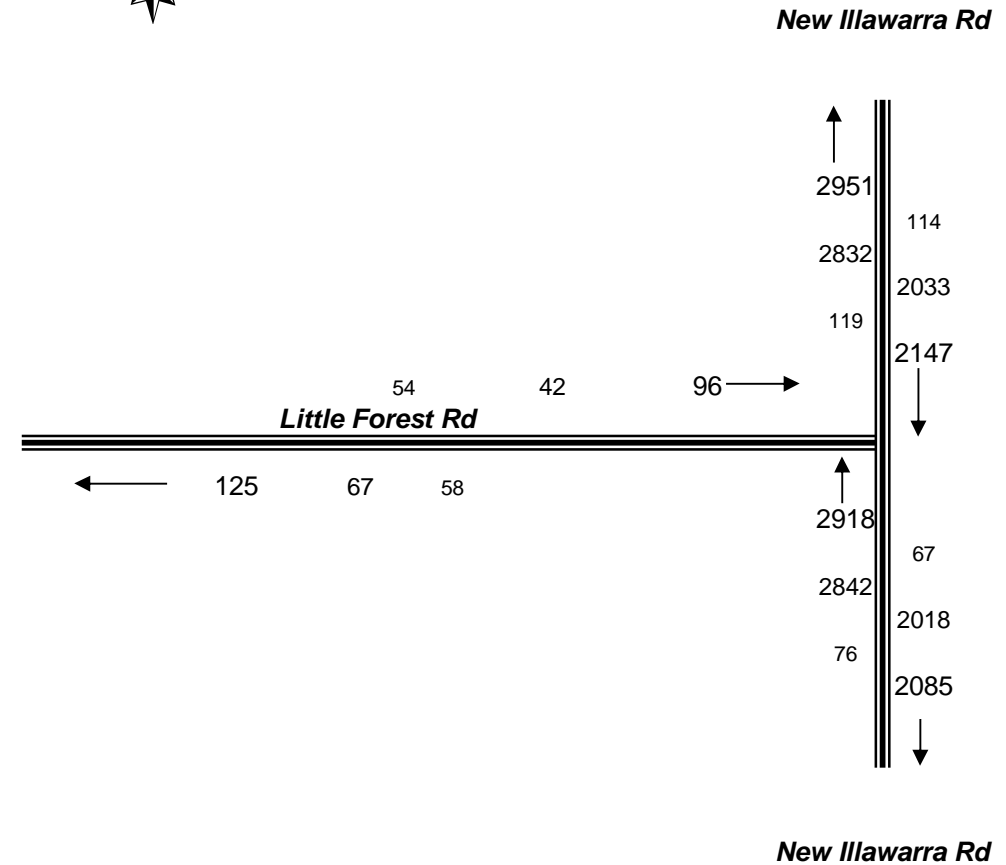
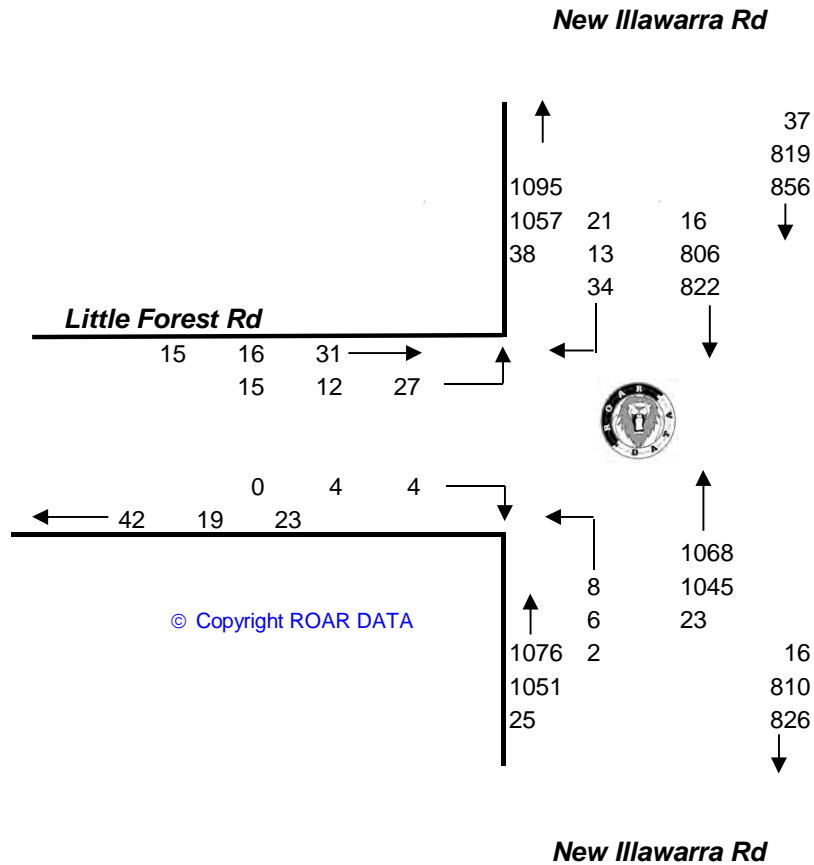
Client : GHD

Job No/Name : 5262 LUCAS HEIGHTS New Illawarra Rd

Day/Date : Tuesday 29th July 2014

**AM PEAK**  
**0730 - 0830**

**TOTAL VOLUMES  
FOR COUNT  
PERIOD**





# R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.

Mobile.0418239019

Client : GHD  
Job No/Name : 5488 LUCAS HEIGHTS New Illawarra Rd  
Day/Date : Monday 9th February 2015

PEDS	NORTH <i>New</i> Illawarra Rd	WEST <i>Little Forest</i> Rd	SOUTH <i>New</i> Illawarra Rd	TOT
Time Per				
1530 - 1545				0
1545 - 1600		NOT		0
1600 - 1615		REQUIRED		0
1615 - 1630				0
1630 - 1645				0
1645 - 1700				0
1700 - 1715				0
1715 - 1730				0
1730 - 1745				0
1745 - 1800				0
1800 - 1815				0
1815 - 1830				0
Per End	0	0	0	0

PEDS	NORTH <i>New</i> Illawarra Rd	WEST <i>Little Forest</i> Rd	SOUTH <i>New</i> Illawarra Rd	TOT
Peak Per				
1530 - 1630	0	0	0	0
1545 - 1645	0	0	0	0
1600 - 1700	0	0	0	0
1615 - 1715	0	0	0	0
1630 - 1730	0	0	0	0
1645 - 1745	0	0	0	0
1700 - 1800	0	0	0	0
1715 - 1815	0	0	0	0
1730 - 1830	0	0	0	0

PEAK HR	0	0	0	0
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Lights	NORTH <i>New</i> Illawarra Rd		WEST <i>Little Forest</i> Rd		SOUTH <i>New</i> Illawarra Rd		TOT
Time Per	T	R	L	R	L	T	
1530 - 1545	198	2	10	9	2	108	329
1545 - 1600	226	3	3	3	5	123	363
1600 - 1615	176	6	3	5	1	130	321
1615 - 1630	214	2	3	2	0	143	364
1630 - 1645	176	1	5	2	1	196	381
1645 - 1700	398	2	4	5	0	144	553
1700 - 1715	248	1	1	1	0	187	438
1715 - 1730	305	0	0	1	0	159	465
1730 - 1745	320	0	1	4	0	201	526
1745 - 1800	350	0	0	4	0	186	540
1800 - 1815	294	0	0	2	0	210	506
1815 - 1830	275	0	0	1	1	227	504
Per End	3180	17	30	39	10	2014	5290

Heavies	NORTH <i>New</i> Illawarra Rd		WEST <i>Little Forest</i> Rd		SOUTH <i>New</i> Illawarra Rd		TOT
Time Per	T	R	L	R	L	T	
1530 - 1545	10	5	1	0	0	1	17
1545 - 1600	4	1	3	3	1	2	14
1600 - 1615	3	0	2	0	1	3	9
1615 - 1630	4	0	0	0	0	2	6
1630 - 1645	2	0	0	1	0	8	11
1645 - 1700	6	0	0	0	0	3	9
1700 - 1715	0	0	0	0	0	0	0
1715 - 1730	4	0	0	0	0	2	6
1730 - 1745	3	0	0	0	0	2	5
1745 - 1800	1	0	0	0	0	0	1
1800 - 1815	2	0	0	0	0	1	3
1815 - 1830	5	0	0	0	0	0	5
Per End	44	6	6	4	2	24	86

Combined	NORTH <i>New</i> Illawarra Rd		WEST <i>Little Forest</i> Rd		SOUTH <i>New</i> Illawarra Rd		TOT
Time Per	T	R	L	R	L	T	
1530 - 1545	208	7	11	9	2	109	346
1545 - 1600	230	4	6	6	6	125	377
1600 - 1615	179	6	5	5	2	133	330
1615 - 1630	218	2	3	2	0	145	370
1630 - 1645	178	1	5	3	1	204	392
1645 - 1700	404	2	4	5	0	147	562
1700 - 1715	248	1	1	1	0	187	438
1715 - 1730	309	0	0	1	0	161	471
1730 - 1745	323	0	1	4	0	203	531
1745 - 1800	351	0	0	4	0	186	541
1800 - 1815	296	0	0	2	0	211	509
1815 - 1830	280	0	0	1	1	227	509
Per End	3224	23	36	43	12	2038	5376

Lights	NORTH <i>New</i> Illawarra Rd		WEST <i>Little Forest</i> Rd		SOUTH <i>New</i> Illawarra Rd		TOT
Peak Per	T	R	L	R	L	T	
1530 - 1630	814	13	19	19	8	504	1377
1545 - 1645	792	12	14	12	7	592	1429
1600 - 1700	964	11	15	14	2	613	1619
1615 - 1715	1036	6	13	10	1	670	1736
1630 - 1730	1127	4	10	9	1	686	1837
1645 - 1745	1271	3	6	11	0	691	1982
1700 - 1800	1223	1	2	10	0	733	1969
1715 - 1815	1269	0	1	11	0	756	2037
1730 - 1830	1239	0	1	11	1	824	2076

Heavies	NORTH <i>New</i> Illawarra Rd		WEST <i>Little Forest</i> Rd		SOUTH <i>New</i> Illawarra Rd		TOT
Peak Per	T	R	L	R	L	T	
1530 - 1630	21	6	6	3	2	8	46
1545 - 1645	13	1	5	4	2	15	40
1600 - 1700	15	0	2	1	1	16	35
1615 - 1715	12	0	0	1	0	13	26
1630 - 1730	12	0	0	1	0	13	26
1645 - 1745	13	0	0	0	0	7	20
1700 - 1800	8	0	0	0	0	4	12
1715 - 1815	10	0	0	0	0	5	15
1730 - 1830	11	0	0	0	0	3	14

Combined	NORTH <i>New</i> Illawarra Rd		WEST <i>Little Forest</i> Rd		SOUTH <i>New</i> Illawarra Rd		TOT
Peak Per	T	R	L	R	L	T	
1530 - 1630	835	19	25	22	10	512	1423
1545 - 1645	805	13	19	16	9	607	1469
1600 - 1700	979	11	17	15	3	629	1654
1615 - 1715	1048	6	13	11	1	683	1762
1630 - 1730	1139	4	10	10	1	699	1863
1645 - 1745	1284	3	6	11	0	698	2002
1700 - 1800	1231	1	2	10	0	737	1981
1715 - 1815	1279	0	1	11	0	761	2052
1730 - 1830	1250	0	1	11	1	827	2090

PEAK HR	1239	0	1	11	1	824	2076
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PEAK HR	11	0	0	0	0	3	14
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PEAK HR	1250	0	1	11	1	827	2090
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# R.O.A.R. DATA

**Reliable, Original & Authentic Results**

Ph.88196847, Fax 88196849, Mob.0418-239019

Client : GHD

Job No/Name : 5488 LUCAS HEIGHTS New Illawarra Rd

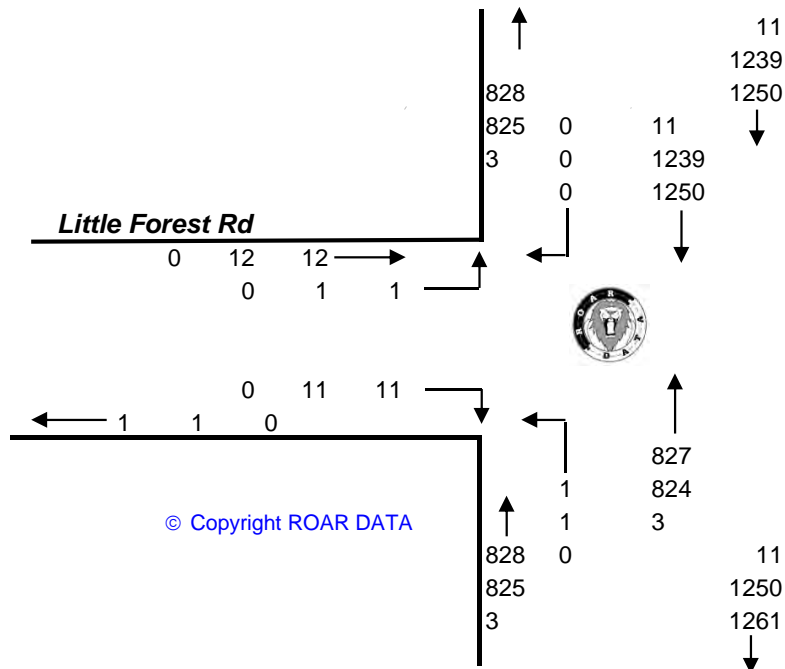
Day/Date : Monday 9th February 2015

**PM PEAK**  
**1730 - 1830**

**TOTAL VOLUMES  
FOR COUNT  
PERIOD**

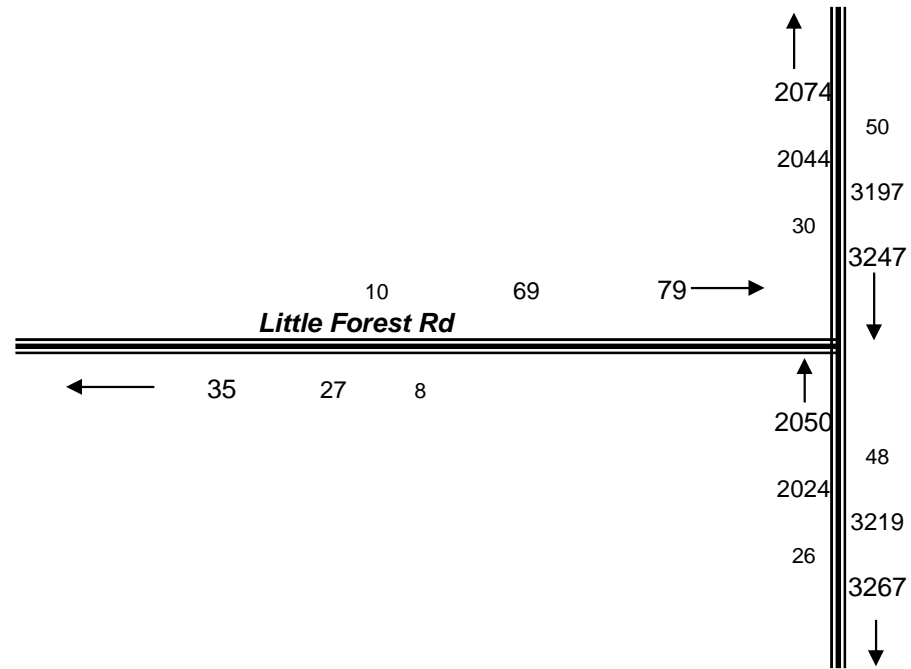


**New Illawarra Rd**



**New Illawarra Rd**

**New Illawarra Rd**



**New Illawarra Rd**

**Quarterly Classification**Client: **GHD**

Site: Heathcote Road 1km North of New Illawarra Road - NB LN1 SB LN2

Site No: 28-033-NB-SB-

Direction: AB Northbound

**Austrroads Classification**

Date	Day	Time	1	2	3	4	5	6	7	8	9	10	11	12	Total
3/02/2013	Total		4,550	96	158	4	3	8	4	3	9	0	0	0	4,835
4/02/2013	Total		6,884	73	593	69	12	26	15	15	81	18	0	0	7,786
5/02/2013	Total		7,226	70	621	65	12	13	23	29	95	24	4	0	8,182
6/02/2013	Total		7,258	86	629	74	22	24	20	22	85	16	0	0	8,236
7/02/2013	Total		7,431	91	614	75	24	23	16	22	91	17	2	0	8,406
8/02/2013	Total		7,951	100	618	69	13	20	15	19	79	9	0	1	8,894
9/02/2013	Total		6,443	156	247	34	10	7	9	6	29	3	1	0	6,945
10/02/2013	Total		6,218	122	165	5	4	7	6	3	14	1	0	0	6,545
Grand Total			53,961	794	3,645	395	100	128	108	119	483	88	7	1	59,829

## Quarterly Classification

Client: GHD

Site: Heathcote Road 1km North of New Illawarra Road, Lucas Heights

Site No: 28-033-SB-LN1

Direction: AB Southbound



			Austroads Classification												Total
Date	Day	Time	1	2	3	4	5	6	7	8	9	10	11	12	
3/02/2013	Total		3,493	91	113	8	2	5	2	2	11	3	0	0	3,730
4/02/2013	Total		5,090	65	400	82	13	20	12	10	63	18	0	0	5,773
5/02/2013	Total		5,085	55	438	48	19	18	16	16	110	22	0	0	5,827
6/02/2013	Total		5,268	71	423	71	15	21	17	13	70	15	0	0	5,984
7/02/2013	Total		5,260	57	464	82	20	21	15	13	67	22	0	0	6,021
8/02/2013	Total		5,877	92	459	64	14	25	13	14	56	10	0	0	6,624
9/02/2013	Total		4,587	116	192	27	5	6	6	6	30	3	0	0	4,978
10/02/2013	Total		4,230	95	106	7	8	8	4	0	10	2	0	0	4,470
Grand Total			38,890	642	2,595	389	96	124	85	74	417	95	0	0	43,407



## Quarterly Classification

Client: GHD

Site: Heathcote Road 1km North of New Illawarra Road - NB LN1 SB LN2

Site No: 28-033-NB-SB-

Direction: BA Southbound



			Austroads Classification												Total
Date	Day	Time	1	2	3	4	5	6	7	8	9	10	11	12	
3/02/2013	Total		858	6	28	1	1	0	2	1	2	0	0	0	899
4/02/2013	Total		1,750	7	111	3	1	5	0	2	6	4	2	0	1,891
5/02/2013	Total		2,038	7	130	5	1	1	3	1	9	2	2	0	2,199
6/02/2013	Total		1,948	11	128	5	3	3	2	2	8	2	1	0	2,113
7/02/2013	Total		2,040	7	108	4	0	2	1	2	7	3	0	0	2,174
8/02/2013	Total		2,233	14	118	7	1	6	2	2	6	2	2	0	2,393
9/02/2013	Total		1,522	18	60	2	2	0	0	0	6	0	0	0	1,610
10/02/2013	Total		1,421	19	45	1	2	0	1	0	0	0	0	0	1,489
Grand Total			13,810	89	728	28	11	17	11	10	44	13	7	0	14,768

## Appendix B – Crash Data

## Summary Crash Report

# Crash Type			Contributing Factors			Crash Movement			CRASHES			CASUALTIES		
Car Crash	79	86.8%	Speeding	12	13.2%	Intersection, adjacent approaches	10	11.0%	Fatal crash	1	1.1%	Killed	2	2.2%
Light Truck Crash	20	22.0%	Fatigue	7	7.7%	Head-on (not overtaking)	7	7.7%	Injury crash	34	37.4%	Injured	88	97.8%
Rigid Truck Crash	1	1.1%				Opposing vehicles; turning	6	6.6%	Non-casualty crash	56	61.5%	^ Unrestrained	1	1.1%
Articulated Truck Crash	0	0.0%				U-turn	0	0.0%	^ Belt fitted but not worn, No restraint fitted to position OR No helmet worn					
'Heavy Truck Crash	(1)	(1.1%)	Weather			Rear-end	28	30.8%	Time Group			Crashes		
Bus Crash	1	1.1%	Fine	68	74.7%	Lane change	2	2.2%	00:01 - 02:59	8	8.8% 12.5%	7	2013	2
"Heavy Vehicle Crash	(2)	(2.2%)	Rain	16	17.6%	Parallel lanes; turning	0	0.0%	03:00 - 04:59	1	1.1% 8.3%	16	2012	12
Emergency Vehicle Crash	1	1.1%	Overcast	7	7.7%	Vehicle leaving driveway	1	1.1%	05:00 - 05:59	1	1.1% 4.2%	15	2011	3
Motorcycle Crash	6	6.6%	Fog or mist	0	0.0%	Overtaking; same direction	0	0.0%	06:00 - 06:59	8	8.8% 4.2%	20	2010	13
Pedal Cycle Crash	0	0.0%	Other	0	0.0%	Hit parked vehicle	0	0.0%	07:00 - 07:59	5	5.5% 4.2%	22	2009	52
Pedestrian Crash	0	0.0%	Road Surface Condition			Hit railway train	0	0.0%	08:00 - 08:59	8	8.8% 4.2%	11	2008	8
' Rigid or Artic. Truck " Heavy Truck or Heavy Bus # These categories are NOT mutually exclusive			Wet	20	22.0%	Hit pedestrian	0	0.0%	09:00 - 09:59	4	4.4% 4.2%			
Location Type			Dry	71	78.0%	Permanent obstruction on road	0	0.0%	10:00 - 10:59	3	3.3% 4.2%	~ School Travel Time		
*Intersection	18	19.8%	Snow or ice	0	0.0%	Hit animal	0	0.0%	11:00 - 11:59	5	5.5% 4.2%	Involvement	19	20.9%
Non intersection	73	80.2%	Natural Lighting			Off road, on straight	3	3.3%	12:00 - 12:59	3	3.3% 4.2%			
* Up to 10 metres from an intersection ~ 07:30-09:30 or 14:30-17:00 on school days			Dawn	1	1.1%	Off road on straight, hit object	12	13.2%	13:00 - 13:59	5	5.5% 4.2%	McLean Periods		
Collision Type			Daylight	67	73.6%	Out of control on straight	0	0.0%	14:00 - 14:59	6	6.6% 4.2%	A	21	23.1% 17.9%
Single Vehicle	36	39.6%	Dusk	5	5.5%	Off road, on curve	3	3.3%	15:00 - 15:59	7	7.7% 4.2%	B	2	2.2% 7.1%
Multi Vehicle	55	60.4%	Darkness	18	19.8%	Off road on curve, hit object	9	9.9%	16:00 - 16:59	6	6.6% 4.2%	C	16	17.6% 17.9%
Road Classification			Speed Limit			Out of control on curve	0	0.0%	17:00 - 17:59	8	8.8% 4.2%	D	3	3.3% 3.5%
Freeway/Motorway	0	0.0%	40 km/h or less	2	2.2%	Other crash type	10	11.0%	18:00 - 18:59	3	3.3% 4.2%	E	7	7.7% 3.6%
State Highway	0	0.0%	50 km/h zone	0	0.0%	~ 40km/h or less			19:00 - 19:59	4	4.4% 4.2%	F	13	14.3% 10.7%
Other Classified Road	58	63.7%	60 km/h zone	8	8.8%	80 km/h zone	24	26.4%	20:00 - 21:59	3	3.3% 8.3%	G	9	9.9% 7.1%
Unclassified Road	33	36.3%	70 km/h zone	50	54.9%	90 km/h zone	0	0.0%	22:00 - 24:00	3	3.3% 8.3%	H	8	8.8% 7.1%
						100 km/h zone	7	7.7%	Street Lighting Off/Nil			I	5	5.5% 12.5%
						110 km/h zone	0	0.0%	17	of	18 in Dark	J	7	7.7% 10.7%
Day of the Week			# Holiday Periods			New Year	1	1.1%	% of Dark					
Monday	15	16.5%	Thursday	11	12.1%	Aust. Day	2	2.2%				Queen's BD		
Tuesday	16	17.6%	Friday	12	13.2%	Easter	0	0.0%				Labour Day		
Wednesday	13	14.3%	Saturday	9	9.9%	Anzac Day	1	1.1%				Christmas		
			Sunday	15	16.5%							January SH		
			WEEKDAY	67	73.6%							Easter SH		
			WEEKEND	24	26.4%							June/July SH		
												Sept./Oct. SH		
												December SH		

Crashid dataset 5962 - Crashes on Heathcote Rd from New Illawarra Rd to 2km north and south, and crashes on New Illawarra Rd from Heathcote Rd to Recreation Dr, 1 July 2008 to 30 June 2013.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.



# Heathcote Road and New Illawarra Road

2 km north/south of New Illawarra Rd and Heathcote Rd to Recreation Dr

Crashes reported 1 July 2008 to 30 June 2013





# Detailed Crash Report

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Sydney Region																				
Sutherland LGA																				
Heathcote																				
Heathcote Rd																				
739391	24/01/2011	Mon	01:40	500 m	E NEW ILLAWARRA RD	2WY	STR	Fine	Dry	80	1	CAR	F23 E	HEATHCOTE RD	80	Proceeding in lane	N	0	0	
E42663910						RUM:	66	Object on road					Other non fixed object							
672656	20/06/2009	Sat	23:40	1 km	E NEW ILLAWARRA RD	2WY	CRV	Raining	Wet	80	2	CAR	M C W	in HEATHCOTE RD		Unk Incorrect side	N	0	0	
E169018993						RUM:	20	Head on					CAR M29 E	in HEATHCOTE RD	80	Proceeding in lane				
741895	13/02/2011	Sun	01:50	1 km	E NEW ILLAWARRA RD	2WY	CRV	Overcast	Wet	80	1	CAR	M22 W	in HEATHCOTE RD	80	Proceeding in lane	N	0	0	S
E43619212						RUM:	87	Off lft/lft bnd=>obj					Fence (prior to 2014)							
748421	07/04/2011	Thu	21:00	1 km	E NEW ILLAWARRA RD	2WY	CRV	Fine	Dry	70	1	M/C	M38 E	in HEATHCOTE RD	70	Proceeding in lane	I	0	1	
E140858598						RUM:	66	Object on road					Other non fixed object							
737048	26/12/2010	Sun	09:40	1.5 km	E NEW ILLAWARRA RD	2WY	CRV	Overcast	Wet	70	1	TRK	M33 W	in HEATHCOTE RD	65	Proceeding in lane	N	0	0	S
E44371755						RUM:	83	Off rt/rt bnd=>obj					Fence (prior to 2014)							
671309	20/05/2009	Wed	19:20	1 km	N NEW ILLAWARRA RD	2WY	STR	Raining	Wet	80	1	CAR	M19 N	in HEATHCOTE RD		Unk Proceeding in lane	I	0	1	
E37165952						RUM:	71	Off rd left=>obj					Tree/bush							
667014	29/04/2009	Wed	00:20	2 km	N NEW ILLAWARRA RD	2WY	STR	Fine	Dry	100	1	CAR	M23 S	in HEATHCOTE RD	100	Proceeding in lane	I	0	1	
E39017385						RUM:	70	Off rd to left												
646106	11/11/2008	Tue	10:43	1 km	W NEW ILLAWARRA RD	2WY	CRV	Fine	Dry	80	1	TRK	M48 E	in HEATHCOTE RD	70	Proceeding in lane	I	0	1	S
E208958392						RUM:	87	Off lft/lft bnd=>obj					Embankment							
Holsworthy																				
Heathcote Rd																				
632666	22/07/2008	Tue	06:40		at NEW ILLAWARRA RD	2WY	STR	Fine	Dry	70	2	CAR	M45 W	in HEATHCOTE RD	10	Turning right	N	0	0	
E35494708						RUM:	21	Right through					M/C M44 E	in HEATHCOTE RD	50	Proceeding in lane				
644559	17/10/2008	Fri	06:45		at NEW ILLAWARRA RD	2WY	STR	Fine	Dry	80	3	TRK	M22 S	in HEATHCOTE RD	30	Turning right	N	0	0	
E35213011						RUM:	14	2 right turning					CAR M45 W	in NEW ILLAWARRA RD	10	Turning right				
													CAR F19 E	in HEATHCOTE RD	70	Proceeding in lane				
687153	24/10/2009	Sat	04:00	20 m	E NEW ILLAWARRA RD	2WY	STR	Fine	Dry	70	1	M/C	M29 N	in HEATHCOTE RD	70	Proceeding in lane	I	0	1	
E38985646						RUM:	72	Off road to right												
794186	28/04/2012	Sat	15:30	63 m	E NEW ILLAWARRA RD	OTH	CRV	Fine	Dry	70	2	CAR	M40 E	in HEATHCOTE RD	5	Proceeding in lane	N	0	0	
E47942066						RUM:	30	Rear end					4WD M48 E	in HEATHCOTE RD	0	Stationary				



# Detailed Crash Report

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
793467	29/04/2012	Sun	14:50	63 m	E NEW ILLAWARRA RD	OTH	CRV	Fine	Dry	60	2	CAR	F25 E in HEATHCOTE RD		20 Proceeding in lane		N	0	0	
E47496214						RUM:	30	Rear end				UTE	M49 E in HEATHCOTE RD		0 Stationary					
769180	20/09/2011	Tue	17:20	200 m	E NEW ILLAWARRA RD	2WY	STR	Fine	Dry	70	2	CAR	M36 E in HEATHCOTE RD		25 Proceeding in lane		N	0	0	
E45621606						RUM:	30	Rear end				4WD	M41 E in HEATHCOTE RD		20 Proceeding in lane					
673958	11/09/2009	Fri	07:45	1.615 km	E NEW ILLAWARRA RD	2WY	CRV	Fine	Dry	80	2	CAR	M57 E in HEATHCOTE RD		90 Incorrect side		F	2	40	S
E38339322						RUM:	20	Head on				BUS	F67 W in HEATHCOTE RD		60 Proceeding in lane					
652066	12/12/2008	Fri	14:00	1 km	N NEW ILLAWARRA RD	2WY	CRV	Raining	Wet	80	1	4WD	M21 E in HEATHCOTE RD		80 Proceeding in lane		N	0	0	S
E36041203						RUM:	82	Off right/right bend												
704998	15/03/2010	Mon	17:15	2 km	N NEW ILLAWARRA RD	2WY	STR	Fine	Dry	100	1	CAR	F11 N in HEATHCOTE RD		80 Proceeding in lane		I	0	1	
E40402312						RUM:	73	Off rd right => obj												
685632	04/10/2009	Sun	16:00	3.95 km	W PRINCES HWY	2WY	CRV	Overcast	Wet	70	1	CAR	F32 E in HEATHCOTE RD		60 Proceeding in lane		N	0	0	
E40413082						RUM:	86	Off left/left bend												
Lucas Heights																				
Heathcote Rd																				
654591	30/01/2009	Fri	15:30		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	70	2	CAR	F22 S in NEW ILLAWARRA RD		20 Turning right		N	0	0	
E36022315						RUM:	13	Right near				CAR	F26 E in HEATHCOTE RD		70 Proceeding in lane					
654612	30/01/2009	Fri	18:15		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	60	2	CAR	F23 W in HEATHCOTE RD		10 Turning right		N	0	0	
E36936378						RUM:	14	2 right turn				CAR	M22 S in NEW ILLAWARRA RD		10 Turning right					
673973	18/05/2009	Mon	15:00		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	70	2	TRK	M27 S in NEW ILLAWARRA RD		5 Turning right		N	0	0	
E37452545						RUM:	13	Right near				UTE	M51 E in HEATHCOTE RD		70 Proceeding in lane					
674119	25/06/2009	Thu	23:13		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	70	2	WAG	F37 W in HEATHCOTE RD		25 Turning right		N	0	0	
E38137029						RUM:	13	Right near				CAR	U U S in NEW ILLAWARRA RD		20 Proceeding in lane					
673619	26/06/2009	Fri	10:50		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	70	2	CAR	M26 W in HEATHCOTE RD		50 Turning right		N	0	0	
E37420909						RUM:	21	Right through				CAR	M40 E in HEATHCOTE RD		70 Proceeding in lane					
672928	28/06/2009	Sun	11:50		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	80	2	CAR	M26 S in NEW ILLAWARRA RD		20 Turning right		N	0	0	
E37773256						RUM:	13	Right near				UTE	M30 E in HEATHCOTE RD		80 Proceeding in lane					
681535	31/08/2009	Mon	13:59		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	40	1	LOR	M34 W in HEATHCOTE RD		40 Turning right		I	0	1	S
E73796202						RUM:	80	Off left/right bend												
690172	23/11/2009	Mon	08:10		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	60	2	WAG	F23 W in HEATHCOTE RD		Unk Turning right		I	0	2	
E39031633						RUM:	21	Right through				CAR	F25 E in HEATHCOTE RD		Unk Proceeding in lane					
729413	26/10/2010	Tue	08:00		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	70	2	TRK	M37 S in NEW ILLAWARRA RD		60 Turning right		N	0	0	F
E42481705						RUM:	13	Right near				CAR	M21 E in HEATHCOTE RD		60 Proceeding in lane					

# Detailed Crash Report

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
733082	27/11/2010	Sat	09:43		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	60	1	CAR	M24	W in HEATHCOTE RD		40 Turning right	N	0	0	
E42131960						RUM:	81	Off left/rt bnd=>obj						Signal pole						
751282	19/04/2011	Tue	17:40		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	60	2	4WD	M50	E in HEATHCOTE RD		40 Proceeding in lane	N	0	0	
E44344345						RUM:	30	Rear end						TRK	M2	E in HEATHCOTE RD				
795327	06/05/2012	Sun	19:10		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	70	2	CAR	M49	W in HEATHCOTE RD		Unk Turning right	I	0	4	
E47826676						RUM:	21	Right through						CAR	M63	E in HEATHCOTE RD				
814252	16/10/2012	Tue	13:00		at NEW ILLAWARRA RD	TJN	STR	Fine	Dry	70	2	CAR	M24	W in HEATHCOTE RD		Unk Turning right	N	0	0	
E49143123						RUM:	21	Right through						CAR	M70	E in HEATHCOTE RD				
704129	30/03/2010	Tue	08:10	25 m	E NEW ILLAWARRA RD	OTH	CRV	Raining	Wet	70	1	CAR	M53	E in HEATHCOTE RD		50 Proceeding in lane	N	0	0	S
E40655431						RUM:	86	Off left/left bend												
815248	30/10/2012	Tue	18:00	60 m	E NEW ILLAWARRA RD	OTH	STR	Fine	Dry	70	2	WAG	M39	E in HEATHCOTE RD		20 Proceeding in lane	N	0	0	
E49311232						RUM:	30	Rear end						TRK	M55	E in HEATHCOTE RD				
828398	21/02/2013	Thu	16:20	63 m	E NEW ILLAWARRA RD	OTH	STR	Fine	Dry	80	2	CAR	M22	E in HEATHCOTE RD		10 Proceeding in lane	N	0	0	
E50264637						RUM:	30	Rear end						4WD	M U	E in HEATHCOTE RD				
713931	13/06/2010	Sun	09:30	65 m	E NEW ILLAWARRA RD	OTH	STR	Fine	Dry	70	2	M/C	M33	E in HEATHCOTE RD		Unk Proceeding in lane	I	0	1	
E41475173						RUM:	30	Rear end						CAR	F38	E in HEATHCOTE RD				
819122	30/11/2012	Fri	17:50	65 m	E NEW ILLAWARRA RD	OTH	STR	Fine	Dry	80	2	CAR	F26	E in HEATHCOTE RD		30 Proceeding in lane	N	0	0	
E49854212						RUM:	30	Rear end						TRK	M58	E in HEATHCOTE RD				
818804	02/12/2012	Sun	11:55	65 m	E NEW ILLAWARRA RD	OTH	CRV	Fine	Dry	80	2	CAR	M39	E in HEATHCOTE RD		20 Proceeding in lane	N	0	0	
E52308383						RUM:	30	Rear end						CAR	M56	E in HEATHCOTE RD				
698208	26/01/2010	Tue	11:50	100 m	E NEW ILLAWARRA RD	2WY	STR	Fine	Dry	60	3	CAR	M18	E in HEATHCOTE RD		Unk Proceeding in lane	N	0	0	
E39745413						RUM:	30	Rear end						4WD	M28	E in HEATHCOTE RD				
														4WD	M51	E in HEATHCOTE RD				
822129	01/01/2013	Tue	13:35	100 m	E NEW ILLAWARRA RD	2WY	STR	Fine	Dry	70	4	CAR	M59	E in HEATHCOTE RD		20 Proceeding in lane	N	0	0	
E49417920						RUM:	30	Rear end						CAR	M29	E in HEATHCOTE RD				
														CAR	F27	E in HEATHCOTE RD				
														CAR	F22	E in HEATHCOTE RD				
713965	14/06/2010	Mon	13:42	200 m	E NEW ILLAWARRA RD	2WY	STR	Fine	Dry	70	1	CAR	M49	W in HEATHCOTE RD		Unk Proceeding in lane	I	0	2	
E43762586						RUM:	73	Off rd right => obj						Tree/bush						
829354	08/03/2013	Fri	17:30	200 m	E NEW ILLAWARRA RD	2WY	STR	Fine	Dry	70	2	CAR	M32	E in HEATHCOTE RD		Unk Proceeding in lane	N	0	0	
E50801554						RUM:	30	Rear end						4WD	M50	E in HEATHCOTE RD				
761028	20/07/2011	Wed	06:30	500 m	E NEW ILLAWARRA RD	2WY	STR	Raining	Wet	70	1	4WD	M29	W in HEATHCOTE RD		60 Proceeding in lane	I	0	1	
E45188312						RUM:	71	Off rd left => obj						Embankment						

# Detailed Crash Report

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
635294	23/08/2008	Sat	01:30	1 km	E NEW ILLAWARRA RD	2WY	CRV	Raining	Wet	70	1	TRK	M53 E in HEATHCOTE RD		70 Proceeding in lane		N	0	0	
E34592814						RUM:	87	Off lft/lft bnd=>obj				Embankment								
650738	17/12/2008	Wed	17:35	1 km	E NEW ILLAWARRA RD	2WY	CRV	Fine	Dry	70	1	TRK	M35 W in HEATHCOTE RD		60 Proceeding in lane		N	0	0	
E36163149						RUM:	85	Off rt/lft bnd=>obj				Fence (prior to 2014)								
658698	08/03/2009	Sun	02:15	1 km	E NEW ILLAWARRA RD	2WY	CRV	Overcast	Dry	70	1	CAR	M30 W in HEATHCOTE RD		70 Proceeding in lane		N	0	0	F
E37183467						RUM:	87	Off lft/lft bnd=>obj				Embankment								
747862	03/02/2011	Thu	00:20	1 km	E NEW ILLAWARRA RD	2WY	CRV	Overcast	Wet	70	1	TRK	M35 W in HEATHCOTE RD		60 Proceeding in lane		N	0	0	S
E44536239						RUM:	87	Off lft/lft bnd=>obj				Embankment								
834777	18/04/2013	Thu	05:50	1 km	E NEW ILLAWARRA RD	DIV	CRV	Fine	Dry	70	4	TRK	M38 W in HEATHCOTE RD		60 Proceeding in lane		N	0	0	
E440123291						RUM:	30	Rear end				UTE	M37 W in HEATHCOTE RD		0 Stationary					
												CAR	M22 W in HEATHCOTE RD		60 Proceeding in lane					
												TRK	M44 W in HEATHCOTE RD		60 Proceeding in lane					
711317	26/05/2010	Wed	14:50	1.68 km	E NEW ILLAWARRA RD	2WY	CRV	Raining	Wet	70	2	TRK	M42 W in HEATHCOTE RD		70 Incorrect side		I	0	1	S
E40946813						RUM:	20	Head on				TRK	M45 E in HEATHCOTE RD		Unk Proceeding in lane					
662546	31/03/2009	Tue	19:55	2 km	E NEW ILLAWARRA RD	2WY	STR	Raining	Wet	100	1	CAR	M41 E in HEATHCOTE RD		85 Proceeding in lane		I	0	1	
E36934013						RUM:	71	Off rd left => obj				Fence (prior to 2014)								
730483	11/07/2010	Sun	07:55	2 km	E NEW ILLAWARRA RD	2WY	STR	Fine	Dry	80	2	CAR	F37 W in HEATHCOTE RD		90 Proceeding in lane		I	0	3	S
E80126301						RUM:	32	Right rear				TRK	M49 W in HEATHCOTE RD		Unk Turning right					
806954	31/07/2012	Tue	09:10	2 km	E NEW ILLAWARRA RD	2WY	STR	Fine	Dry	80	1	CAR	F29 W in HEATHCOTE RD		70 Proceeding in lane		N	0	0	F
E48559547						RUM:	71	Off rd left => obj				Other fixed object								
639999	01/09/2008	Mon	08:15	50 m	W NEW ILLAWARRA RD	2WY	STR	Fine	Dry	70	1	CAR	M28 W in HEATHCOTE RD		70 Proceeding in lane		I	0	1	
E122294796						RUM:	73	Off rd right => obj				Tree/bush								
750064	26/04/2011	Tue	10:33	100 m	W NEW ILLAWARRA RD	2WY	STR	Fine	Dry	100	1	CAR	M54 W in HEATHCOTE RD		100 Proceeding in lane		N	0	0	
E43820509						RUM:	66	Object on road				Other non fixed object								
641213	15/10/2008	Wed	08:55	300 m	W NEW ILLAWARRA RD	2WY	STR	Fine	Dry	100	1	WAG	F27 W in HEATHCOTE RD		90 Proceeding in lane		N	0	0	
E68247901						RUM:	71	Off rd left => obj				Tree/bush								
739383	23/01/2011	Sun	11:40	300 m	W NEW ILLAWARRA RD	2WY	CRV	Fine	Dry	100	2	CAR	F23 E in HEATHCOTE RD		75 Proceeding in lane		N	0	0	
E45475184						RUM:	33	Lane sideswipe				WAG	M47 E in HEATHCOTE RD		100 Proceeding in lane					
810541	09/09/2012	Sun	14:30	340 m	W NEW ILLAWARRA RD	2WY	CRV	Fine	Dry	100	2	CAR	F70 W in HEATHCOTE RD		95 Proceeding in lane		I	0	1	
E48722352						RUM:	30	Rear end				CAR	F73 W in HEATHCOTE RD		80 Proceeding in lane					
676214	25/07/2009	Sat	12:10	500 m	W NEW ILLAWARRA RD	2WY	STR	Fine	Dry	80	2	UTE	M19 W in HEATHCOTE RD		70 Proceeding in lane		N	0	0	
E224274792						RUM:	30	Rear end				OMV	U U W in HEATHCOTE RD		0 Stationary					

# Detailed Crash Report

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
679979 E38414004	21/08/2009	Fri	06:25		at OLD ILLAWARRA RD	TJN	STR	Fine	Dry	70	2	CAR	M30	S in OLD ILLAWARRA RD	10	Turning right	N	0	0	
						RUM:	13	Right near				CAR	M41	E in HEATHCOTE RD	70	Proceeding in lane				
<b>New Illawarra Hwy</b>																				
661521 E121792898	09/03/2009	Mon	06:55	1.5 km	E HEATHCOTE RD	2WY	STR	Raining	Wet	80	2	CAR	M15	E in NEW ILLAWARRA HWY	Unk	Incorrect side	I	0	1	F
						RUM:	20	Head on				4WD	M48	N in NEW ILLAWARRA HWY	60	Proceeding in lane				
<b>New Illawarra Rd</b>																				
801492 E48338707	14/06/2012	Thu	20:05	200 m	E ANSTO ENT	2WY	STR	Fine	Dry	70	1	UTE	M30	N in NEW ILLAWARRA RD	70	Proceeding in lane	N	0	0	
						RUM:	66	Object on road						Other non fixed object						
801657 E48144175	27/06/2012	Wed	02:00	300 m	E ANSTO ENT	2WY	CRV	Raining	Wet	70	1	TRK	M20	W in NEW ILLAWARRA RD	105	Proceeding in lane	N	0	0	S
						RUM:	81	Off left/rt bnd=>obj						Tree/bush						
693787 E39536946	20/12/2009	Sun	15:40	500 m	E ANSTO ENT	2WY	STR	Overcast	Dry	70	1	CAR	F46	E in NEW ILLAWARRA RD	68	Proceeding in lane	I	0	1	
						RUM:	71	Off rd left => obj						Embankment						
848697 E51503222	10/06/2013	Mon	08:10	150 m	W ANSTO ENT	2WY	STR	Fine	Dry	80	1	CAR	M43	W in NEW ILLAWARRA RD	70	Proceeding in lane	I	0	1	
						RUM:	66	Object on road						Other non fixed object						
806981 E160596297	02/08/2012	Thu	15:25	55 m	N HEATHCOTE RD	DIV	STR	Fine	Dry	70	2	TRK	M46	N in NEW ILLAWARRA RD	40	Merging	I	0	1	
						RUM:	34	Lane change right				CAR	M33	N in NEW ILLAWARRA RD	15	Proceeding in lane				
703715 E40695507	26/03/2010	Fri	22:30	100 m	N HEATHCOTE RD	2WY	STR	Fine	Dry	80	2	CAR	F20	N in NEW ILLAWARRA RD	50	Incorrect side	N	0	0	F
						RUM:	20	Head on				CAR	F27	S in NEW ILLAWARRA RD	50	Proceeding in lane				
830405 E50681259	10/02/2013	Sun	15:15	100 m	N HEATHCOTE RD	2WY	STR	Fine	Dry	80	2	M/C	M19	N in NEW ILLAWARRA RD	50	Proceeding in lane	I	0	1	
						RUM:	30	Rear end				CAR	M56	N in NEW ILLAWARRA RD	50	Proceeding in lane				
669567 E37718462	27/05/2009	Wed	07:40	200 m	N HEATHCOTE RD	2WY	STR	Fine	Dry	70	2	CAR	M24	S in NEW ILLAWARRA RD	65	Proceeding in lane	I	0	1	
						RUM:	30	Rear end				4WD	F45	S in NEW ILLAWARRA RD	0	Stationary				
750751 E43408344	27/02/2011	Sun	15:45	200 m	N HEATHCOTE RD	2WY	STR	Fine	Dry	80	2	CAR	F32	S in NEW ILLAWARRA RD	60	Pull out opposite	I	0	1	
						RUM:	50	Head on (overtake)				CAR	M51	N in NEW ILLAWARRA RD	80	Proceeding in lane				
815282 E49655046	01/11/2012	Thu	07:05	200 m	N HEATHCOTE RD	2WY	STR	Fine	Dry	80	3	CAR	F25	S in NEW ILLAWARRA RD	80	Proceeding in lane	I	0	3	
						RUM:	30	Rear end				CAR	F34	S in NEW ILLAWARRA RD	0	Stationary				
												CAR	F46	S in NEW ILLAWARRA RD	0	Stationary				
699232 E39454260	12/02/2010	Fri	16:10	400 m	N HEATHCOTE RD	2WY	STR	Raining	Wet	70	2	UTE	M45	S in NEW ILLAWARRA RD	40	Proceeding in lane	I	0	1	
						RUM:	30	Rear end				CAR	M76	S in NEW ILLAWARRA RD	10	Proceeding in lane				
735707 E43222079	16/12/2010	Thu	17:20	400 m	N HEATHCOTE RD	2WY	STR	Fine	Dry	70	2	OMV	M42	E in NEW ILLAWARRA RD	5	Forward from drive	I	0	1	
						RUM:	47	Emerging from drive				CAR	F22	N in NEW ILLAWARRA RD	50	Proceeding in lane				

# Detailed Crash Report

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
SF																				
739680 E44218653	26/01/2011	Wed	13:10	400 m	N HEATHCOTE RD	2WY RUM:	STR 30	Fine Rear end	Dry	80	4	CAR F17	S in NEW ILLAWARRA RD	50	Proceeding in lane		N	0	0	
												CAR F19	S in NEW ILLAWARRA RD	0	Stationary					
												CAR M27	S in NEW ILLAWARRA RD	0	Stationary					
												WAG M36	S in NEW ILLAWARRA RD	0	Stationary					
802619 E48202222	07/07/2012	Sat	16:50	440 m	N HEATHCOTE RD	DIV RUM:	STR 30	Fine Rear end	Dry	70	2	CAR M60	S in NEW ILLAWARRA RD	20	Proceeding in lane		I	0	1	
												CAR M19	S in NEW ILLAWARRA RD	0	Stationary					
747661 E44208379	21/03/2011	Mon	11:00	500 m	N HEATHCOTE RD	2WY RUM:	STR 73	Raining Off rd right => obj	Wet	70	1	CAR M1	N in NEW ILLAWARRA RD	60	Proceeding in lane		N	0	0	
												Tree/bush								
729523 E42577407	11/10/2010	Mon	07:00	1.1 km	N HEATHCOTE RD	2WY RUM:	STR 30	Raining Rear end	Wet	70	3	CAR F17	N in NEW ILLAWARRA RD	70	Proceeding in lane		N	0	0	
												CAR M18	N in NEW ILLAWARRA RD	0	Stationary					
												OMV M U	N in NEW ILLAWARRA RD	0	Stationary					
735988 E43291865	25/10/2010	Mon	16:40	2 km	N HEATHCOTE RD	2WY RUM:	STR 20	Fine Head on	Dry	60	2	CAR M47	E in NEW ILLAWARRA RD	60	Incorrect side		I	0	2	F
												CAR F53	W in NEW ILLAWARRA RD	60	Proceeding in lane					
734203 E82762502	08/12/2010	Wed	18:30	200 m	N OLD ILLAWARRA RD	2WY RUM:	STR 30	Fine Rear end	Dry	70	4	UTE M40	N in NEW ILLAWARRA RD	60	Proceeding in lane		N	0	0	
												CAR F26	N in NEW ILLAWARRA RD	0	Stationary					
												4WD F27	N in NEW ILLAWARRA RD	0	Stationary					
												OMV M U	N in NEW ILLAWARRA RD	0	Stationary					
735472 E44783885	08/12/2010	Wed	19:08	1 km	S OLD ILLAWARRA RD	2WY RUM:	STR 30	Fine Rear end	Dry	70	2	CAR F52	N in NEW ILLAWARRA RD	Unk	Proceeding in lane		I	0	1	
												CAR F37	N in NEW ILLAWARRA RD	0	Stationary					
736374 E42757052	22/12/2010	Wed	06:55	1 km	S OLD ILLAWARRA RD	2WY RUM:	STR 30	Fine Rear end	Dry	70	4	CAR F24	N in NEW ILLAWARRA RD	65	Proceeding in lane		N	0	0	
												CAR F49	N in NEW ILLAWARRA RD	0	Stationary					
												4WD F29	N in NEW ILLAWARRA RD	0	Stationary					
												TRK M36	N in NEW ILLAWARRA RD	0	Stationary					
637655 E34761713	26/08/2008	Tue	12:30		at RUTHERFORD AVE	TJN RUM:	STR 13	Fine Right near	Dry	70	2	TRK M41	N in RUTHERFORD AVE	5	Turning right		I	0	3	
												CAR M54	W in NEW ILLAWARRA RD	65	Proceeding in lane					
676266 E39980980	27/07/2009	Mon	06:15		at RUTHERFORD AVE	TJN RUM:	STR 14	Fine 2 right turning	Dry	70	2	UTE M28	E in NEW ILLAWARRA RD	20	Turning right		N	0	0	
												CAR M59	N in RUTHERFORD AVE	20	Turning right					
798303 E698268590	01/06/2012	Fri	12:44	100 m	E RUTHERFORD AVE	DIV RUM:	STR 71	Fine Off rd left => obj	Dry	60	1	CAR M26	E in NEW ILLAWARRA RD	60	Proceeding in lane		I	0	2	
												Tree/bush								
645738 E147250894	13/11/2008	Thu	01:55	950 m	N RUTHERFORD AVE	2WY RUM:	STR 66	Fine Object on road	Dry	70	1	M/C M37	N in NEW ILLAWARRA RD	70	Proceeding in lane		I	0	1	
												Other non fixed object								
774290 E46611977	14/11/2011	Mon	14:35	100 m	S RUTHERFORD AVE	2WY RUM:	STR 72	Fine Off road to right	Dry	70	1	CAR M18	S in NEW ILLAWARRA RD	60	Proceeding in lane		N	0	0	F



# Detailed Crash Report

Crash No.	Date	Day of Week	Time	Distance	ID Feature	Loc Type	Alignment	Weather	Surface Condition	Speed Limit	No. of Tus	Tu Type/Obj	Age/Sex	Street Travelling	Speed Travelling	Manoeuvre	Degree of Crash	Killed	Injured	Factors
Menai																				
New Illawarra Rd																				
770342	01/10/2011	Sat	20:41	500 m	N HEATHCOTE RD	2WY	STR	Fine	Dry	70	1	UTE	M61	S in NEW ILLAWARRA RD	65	Proceeding in lane	N	0	0	
E45872534						RUM:	66	Object on road					Other non fixed object							
845779	23/05/2013	Thu	08:00	600 m	N HEATHCOTE RD	2WY	CRV	Raining	Wet	80	1	WAG	F37	S in NEW ILLAWARRA RD	65	Proceeding in lane	N	0	0	S
E51548934						RUM:	85	Off rt/lt bnd=>obj					Embankment							
733194	30/11/2010	Tue	08:30	1 km	N HEATHCOTE RD	2WY	STR	Raining	Wet	70	2	CAR	F19	S in NEW ILLAWARRA RD	20	Proceeding in lane	N	0	0	
E82609402						RUM:	30	Rear end				TRK	M60	N in NEW ILLAWARRA RD	0	Stationary				
718717	20/07/2010	Tue	06:30	380 m	S OLD ILLAWARRA RD	DIV	STR	Fine	Dry	40	2	CAR	M33	N in NEW ILLAWARRA RD	40	Proceeding in lane	N	0	0	
E43530289						RUM:	30	Rear end				CAR	M38	N in NEW ILLAWARRA RD	0	Stationary				
651068	29/12/2008	Mon	17:50	300 m	N RUTHERFORD AVE	2WY	CRV	Overcast	Dry	70	2	TRK	M31	N in NEW ILLAWARRA RD	Unk	Incorrect side	I	0	2	
E119996598						RUM:	20	Head on				TRK	M17	S in NEW ILLAWARRA RD	Unk	Proceeding in lane				
762455	30/07/2011	Sat	14:20		at THE RIDGE SPOR ENT	DIV	STR	Fine	Dry	80	2	4WD	F17	S in NEW ILLAWARRA RD	10	Turning right	N	0	0	
E45189305						RUM:	21	Right through				CAR	M U	N in NEW ILLAWARRA RD	70	Proceeding in lane				
New Illswarra Rd																				
799294	13/06/2012	Wed	16:45	50 m	W RUTHERFORD AVE	DIV	STR	Raining	Wet	70	1	CAR	M42	S in NEW ILLSWARRA RD	70	Proceeding in lane	N	0	0	
E48769774						RUM:	71	Crash left => emb					Embankment							

**Report Totals:** Total Crashes: 91 Fatal Crashes: 1 Injury Crashes: 34 Killed: 2 Injured: 88

Crashid dataset 5962 - Crashes on Heathcote Rd from New Illawarra Rd to 2km north and south and crashes on New Illawarra Rd from Heathcote Rd to Recreation Dr, 1 July 2008 to 30 June 2013.

# Appendix C – SIDRA Results

## Heathcote Road/New Illawarra Road

- 2014 AM Base
- 2015 PM Base
- 2017 AM Base
- 2017 AM Base + Development
- 2017 PM Base
- 2017 PM Base + Development
- 2027 AM Base
- 2027 AM Base + Development
- 2027 PM Base
- 2027 PM Base + Development

## Little Forest Road/New Illawarra Road (run 1)

- 2014 AM Base
- 2015 PM Base
- 2017 AM Base
- 2017 AM Base + Development
- 2017 PM Base
- 2017 PM Base + Development
- 2027 AM Base
- 2027 AM Base + Development
- 2027 PM Base
- 2027 PM Base + Development

## Little Forest Road/New Illawarra Road (run 2)

- 2014 AM Base
- 2015 PM Base
- 2017 AM Base
- 2017 AM Base + Development
- 2017 PM Base
- 2017 PM Base + Development
- 2027 AM Base
- 2027 AM Base + Development
- 2027 PM Base
- 2027 PM Base + Development

# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2017 AM

AM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 133 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Deg. Satn HV %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)										
5	T1	612	1.7	0.309	LOS B	11.0	78.2	0.61	0.52	51.5
6	R2	791	2.1	0.703	LOS C	25.8	183.9	0.87	0.84	38.4
Approach		1402	2.0	0.703	LOS C	25.8	183.9	0.76	0.70	43.2
North: New Illawarra Road (N)										
7	L2	395	2.7	0.283	LOS A	3.9	27.7	0.23	0.67	60.7
9	R2	492	2.6	0.703	LOS D	26.7	191.3	0.91	0.86	38.1
Approach		886	2.6	0.703	LOS B	26.7	191.3	0.60	0.78	45.7
West: Heathcote Road (W)										
10	L2	429	3.4	0.447	LOS A	10.8	77.8	0.48	0.74	54.8
11	T1	255	2.9	0.697	LOS E	9.2	66.2	1.00	0.82	31.5
Approach		684	3.2	0.697	LOS C	10.8	77.8	0.68	0.77	43.0
All Vehicles		2973	2.4	0.703	LOS C	26.7	191.3	0.69	0.74	43.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2017 PM

PM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total	Deg. Satn HV	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	sec		veh	m		per veh	km/h
East: Heathcote Road (E)										
5	T1	278	3.0	0.153	22.4	LOS B	5.5	39.5	0.59	49.0
6	R2	295	3.6	0.515	64.2	LOS E	11.6	83.7	0.93	31.1
Approach		573	3.3	0.515	44.0	LOS D	11.6	83.7	0.77	37.8
North: New Illawarra Road (N)										
7	L2	682	0.9	0.516	11.0	LOS A	14.5	102.6	0.38	59.0
9	R2	377	3.4	0.479	39.4	LOS C	19.4	139.9	0.77	40.0
Approach		1059	1.8	0.516	21.1	LOS B	19.4	139.9	0.52	50.5
West: Heathcote Road (W)										
10	L2	378	3.3	0.289	8.5	LOS A	4.6	33.5	0.24	59.8
11	T1	458	0.2	0.512	50.8	LOS D	15.8	110.7	0.90	35.5
Approach		836	1.6	0.512	31.7	LOS C	15.8	110.7	0.60	43.5
All Vehicles		2467	2.1	0.516	30.0	LOS C	19.4	139.9	0.60	44.6

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2017 AM**

AM Base + Development Traffic  
 Giveway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles veh	Distance m			
		veh/h	%								
South: New Illawarra Road (S)											
1	L2	26	28.0	0.017	7.5	LOS A	0.0	0.0	0.00	0.63	57.0
2	T1	1160	2.2	0.603	0.0	LOS A	0.0	0.0	0.00	0.00	79.6
Approach		1186	2.8	0.603	0.3	NA	0.0	0.0	0.00	0.01	78.9
North: New Illawarra Road (N)											
8	T1	897	2.0	0.466	0.0	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	43	56.1	0.480	63.4	LOS E	1.6	16.5	0.96	1.04	28.0
Approach		940	4.5	0.480	3.0	NA	1.6	16.5	0.04	0.05	73.5
West: Little Forest Road (RT Stage 1)											
10	L2	36	50.0	0.034	3.4	LOS A	0.0	0.0	0.00	0.38	41.1
12	R2	22	23.8	0.244	43.9	LOS D	0.7	5.8	0.93	0.99	18.2
Approach		58	40.0	0.244	18.9	LOS B	0.7	5.8	0.36	0.62	31.3
SouthWest: Median (RT Stage 2)											
32b	R3	22	23.8	0.023	6.3	LOS A	0.1	0.5	0.50	0.71	42.5
Approach		22	23.8	0.023	6.3	LOS A	0.1	0.5	0.50	0.71	42.5
All Vehicles		2206	4.7	0.603	1.9	NA	1.6	16.5	0.03	0.05	73.5

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2017 PM**

PM Base + Development Traffic  
 Giveway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles	Distance			
		veh/h	%				veh	m			
South: New Illawarra Road (S)											
1	L2	26	24.0	0.017	7.4	LOS A	0.0	0.0	0.00	0.63	58.0
2	T1	665	2.5	0.347	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		692	3.3	0.347	0.3	NA	0.0	0.0	0.00	0.02	78.7
North: New Illawarra Road (N)											
8	T1	1043	1.5	0.540	0.0	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	19	44.4	0.046	14.8	LOS B	0.2	1.5	0.66	0.85	44.5
Approach		1062	2.3	0.540	0.4	NA	0.2	1.5	0.01	0.02	78.6
West: Little Forest Road (RT Stage 1)											
10	L2	25	25.0	0.021	3.3	LOS A	0.0	0.0	0.00	0.40	44.6
12	R2	34	25.0	0.093	11.3	LOS A	0.3	2.5	0.66	0.82	26.0
Approach		59	25.0	0.093	7.9	LOS A	0.3	2.5	0.38	0.64	34.3
SouthWest: Median (RT Stage 2)											
32b	R3	34	25.0	0.042	7.2	LOS A	0.1	1.0	0.59	0.81	41.9
Approach		34	25.0	0.042	7.2	LOS A	0.1	1.0	0.59	0.81	41.9
All Vehicles		1846	3.8	0.540	0.6	NA	0.3	2.5	0.03	0.05	75.1

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2027 AM

AM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 103 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Deg. Satn HV %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)										
5	T1	669	1.7	0.346	LOS B	9.8	69.8	0.63	0.55	53.8
6	R2	877	2.2	0.839	LOS C	26.9	192.1	0.94	0.89	38.6
Approach		1546	2.0	0.839	LOS C	26.9	192.1	0.81	0.74	44.0
North: New Illawarra Road (N)										
7	L2	459	2.5	0.342	LOS A	4.8	34.1	0.30	0.69	60.2
9	R2	565	3.4	0.845	LOS D	29.1	209.7	0.99	0.93	37.4
Approach		1024	3.0	0.845	LOS C	29.1	209.7	0.68	0.82	45.1
West: Heathcote Road (W)										
10	L2	535	4.1	0.585	LOS B	14.0	101.2	0.65	0.79	53.0
11	T1	309	3.1	0.835	LOS D	9.4	67.7	1.00	0.89	34.5
Approach		844	3.7	0.835	LOS C	14.0	101.2	0.78	0.83	44.3
All Vehicles		3415	2.7	0.845	LOS C	29.1	209.7	0.76	0.79	44.4

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2027 PM

PM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total	Deg. Satn HV	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
East: Heathcote Road (E)											
5	T1	302	3.1	0.162	21.4	LOS B	5.9	42.2	0.58	0.48	49.7
6	R2	365	3.2	0.559	61.5	LOS E	14.2	102.3	0.93	0.81	31.9
Approach		667	3.2	0.559	43.4	LOS D	14.2	102.3	0.77	0.66	38.0
North: New Illawarra Road (N)											
7	L2	746	1.0	0.569	11.9	LOS A	18.5	130.9	0.44	0.74	58.1
9	R2	421	4.5	0.557	42.1	LOS C	23.0	167.3	0.81	0.84	38.7
Approach		1167	2.3	0.569	22.8	LOS B	23.0	167.3	0.57	0.78	49.2
West: Heathcote Road (W)											
10	L2	449	4.2	0.358	9.3	LOS A	6.9	50.2	0.29	0.67	58.8
11	T1	482	0.2	0.568	53.2	LOS D	17.1	119.8	0.92	0.78	34.7
Approach		932	2.1	0.568	32.0	LOS C	17.1	119.8	0.62	0.73	43.3
All Vehicles		2766	2.4	0.569	30.9	LOS C	23.0	167.3	0.64	0.73	44.1

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2027 AM**

AM Base + Development Traffic  
Giveway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles	Distance			
		veh/h	%				veh	m			
South: New Illawarra Road (S)											
1	L2	32	40.0	0.022	7.7	LOS A	0.0	0.0	0.00	0.63	54.0
2	T1	1300	2.1	0.676	0.0	LOS A	0.0	0.0	0.00	0.00	79.4
Approach		1332	3.0	0.676	0.4	NA	0.0	0.0	0.00	0.01	78.5
North: New Illawarra Road (N)											
8	T1	1093	1.7	0.567	0.0	LOS A	0.0	0.0	0.00	0.00	79.6
9	R2	45	58.1	0.954	226.9	LOS F	4.4	46.3	1.00	1.25	12.4
Approach		1138	4.0	0.954	9.1	NA	4.4	46.3	0.04	0.05	65.5
West: Little Forest Road (RT Stage 1)											
10	L2	38	52.8	0.036	3.4	LOS A	0.0	0.0	0.00	0.38	40.8
12	R2	27	38.5	0.711	158.3	LOS F	2.1	19.8	0.99	1.12	8.9
Approach		65	46.8	0.711	68.4	LOS E	2.1	19.8	0.41	0.69	20.3
SouthWest: Median (RT Stage 2)											
32b	R3	27	38.5	0.042	8.2	LOS A	0.1	1.1	0.64	0.83	39.6
Approach		27	38.5	0.042	8.2	LOS A	0.1	1.1	0.64	0.83	39.6
All Vehicles		2562	4.9	0.954	5.9	NA	4.4	46.3	0.04	0.06	67.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2027 PM**

PM Base + Development Traffic  
 Giveway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles veh	Distance m			
		veh/h	%								
South: New Illawarra Road (S)											
1	L2	32	36.7	0.021	7.6	LOS A	0.0	0.0	0.00	0.63	54.8
2	T1	773	2.2	0.402	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		804	3.5	0.402	0.4	NA	0.0	0.0	0.00	0.02	78.4
North: New Illawarra Road (N)											
8	T1	1127	1.5	0.584	0.0	LOS A	0.0	0.0	0.00	0.00	79.6
9	R2	21	50.0	0.068	18.3	LOS B	0.2	2.3	0.75	0.91	42.7
Approach		1148	2.4	0.584	0.5	NA	0.2	2.3	0.01	0.02	78.4
West: Little Forest Road (RT Stage 1)											
10	L2	27	30.8	0.024	3.3	LOS A	0.0	0.0	0.00	0.39	43.8
12	R2	39	35.1	0.152	15.8	LOS B	0.5	4.2	0.76	0.87	24.5
Approach		66	33.3	0.152	10.7	LOS A	0.5	4.2	0.45	0.68	32.6
SouthWest: Median (RT Stage 2)											
32b	R3	39	35.1	0.061	8.3	LOS A	0.2	1.5	0.66	0.84	39.9
Approach		39	35.1	0.061	8.3	LOS A	0.2	1.5	0.66	0.84	39.9
All Vehicles		2058	4.5	0.584	0.8	NA	0.5	4.2	0.03	0.06	74.5

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



## Site: Little Forest Road and New Illawarra Road 2027 AM

AM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 117 seconds (User-Given Cycle Time)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles	Distance			
		veh/h	%				veh	m			
South: New Illawarra Road (S)											
1	L2	32	40.0	0.025	8.5	LOS A	0.2	1.5	0.14	0.62	48.9
2	T1	1300	2.1	0.919	23.2	LOS B	68.9	490.7	0.87	0.89	53.0
Approach		1332	3.0	0.919	22.9	LOS B	68.9	490.7	0.85	0.88	52.9
North: New Illawarra Road (N)											
8	T1	1093	1.7	0.670	3.4	LOS A	21.6	153.7	0.39	0.37	74.5
9	R2	45	58.1	0.672	74.2	LOS F	2.9	29.9	1.00	0.81	25.8
Approach		1138	4.0	0.672	6.2	LOS A	21.6	153.7	0.41	0.38	69.3
West: Little Forest Road											
10	L2	38	52.8	0.133	30.0	LOS C	1.6	15.9	0.73	0.69	31.5
12	R2	27	38.5	0.366	66.6	LOS E	1.6	15.3	1.00	0.72	17.0
Approach		65	46.8	0.366	45.4	LOS D	1.6	15.9	0.85	0.70	25.4
All Vehicles		2535	4.6	0.919	16.0	LOS B	68.9	490.7	0.65	0.65	57.7

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2027 PM**

AM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 149 seconds (User-Given Cycle Time)

## Movement Performance - Vehicles

Mov ID	ODMo	Demand Flows		Deg. Satn	Average	Level of	95% Back of Queue		Prop.	Effective	Average					
	v	Total	HV				Delay	Service				Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%				v/c	sec								per veh
South: New Illawarra Road (S)																
1	L2	32	36.7	0.023	8.3	LOS A	0.1	1.2	0.10	0.62	49.0					
2	T1	773	2.2	0.503	5.3	LOS A	18.4	131.0	0.37	0.34	71.7					
Approach		804	3.5	0.503	5.4	LOS A	18.4	131.0	0.36	0.35	70.4					
North: New Illawarra Road (N)																
8	T1	1127	1.5	0.664	2.7	LOS A	23.1	163.8	0.32	0.30	75.5					
9	R2	21	50.0	0.382	89.7	LOS F	1.6	16.3	1.00	0.71	23.3					
Approach		1148	2.4	0.664	4.3	LOS A	23.1	163.8	0.33	0.31	72.5					
West: Little Forest Road																
10	L2	27	30.8	0.051	6.0	LOS A	0.4	3.2	0.24	0.49	42.4					
12	R2	39	35.1	0.651	87.4	LOS F	3.1	28.0	1.00	0.81	14.4					
Approach		66	33.3	0.651	53.8	LOS D	3.1	28.0	0.68	0.68	23.0					
All Vehicles		2019	3.9	0.664	6.4	LOS A	23.1	163.8	0.35	0.34	68.1					

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2017 AM

AM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 134 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Deg. Satn HV %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)										
5	T1	612	1.7	0.307	LOS B	11.0	78.1	0.60	0.52	51.6
6	R2	791	2.1	0.694	LOS C	25.8	183.8	0.86	0.84	38.5
Approach		1402	2.0	0.694	LOS C	25.8	183.8	0.75	0.70	43.3
North: New Illawarra Road (N)										
7	L2	395	2.7	0.283	LOS A	3.9	27.7	0.22	0.67	60.7
9	R2	487	2.4	0.701	LOS D	26.7	191.0	0.91	0.86	37.9
Approach		882	2.5	0.701	LOS C	26.7	191.0	0.60	0.78	45.6
West: Heathcote Road (W)										
10	L2	424	3.0	0.441	LOS A	10.6	76.2	0.48	0.73	55.0
11	T1	255	2.9	0.702	LOS E	9.3	66.8	1.00	0.82	31.3
Approach		679	2.9	0.702	LOS C	10.6	76.2	0.67	0.77	42.9
All Vehicles		2963	2.3	0.702	LOS C	26.7	191.0	0.69	0.74	43.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2017 PM

PM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Deg. Satn HV %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)										
5	T1	278	3.0	0.153	LOS B	5.5	39.5	0.59	0.49	49.0
6	R2	295	3.6	0.515	LOS E	11.6	83.7	0.93	0.80	31.1
Approach		573	3.3	0.515	LOS D	11.6	83.7	0.77	0.65	37.8
North: New Illawarra Road (N)										
7	L2	682	0.9	0.516	LOS A	14.5	102.6	0.38	0.73	59.0
9	R2	372	3.1	0.472	LOS C	19.1	137.1	0.76	0.82	40.1
Approach		1054	1.7	0.516	LOS B	19.1	137.1	0.52	0.76	50.6
West: Heathcote Road (W)										
10	L2	374	3.1	0.285	LOS A	4.6	32.9	0.24	0.66	59.9
11	T1	458	0.2	0.512	LOS D	15.8	110.7	0.90	0.76	35.5
Approach		832	1.5	0.512	LOS C	15.8	110.7	0.60	0.71	43.5
All Vehicles		2458	2.0	0.516	LOS C	19.1	137.1	0.60	0.72	44.6

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2017 AM**

AM Base + Development Traffic

Giveaway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles	Distance			
		veh/h	%				veh	m			
South: New Illawarra Road (S)											
1	L2	20	30.0	0.013	7.5	LOS A	0.0	0.0	0.00	0.63	56.5
2	T1	1102	2.2	0.573	0.0	LOS A	0.0	0.0	0.00	0.00	79.6
Approach		1122	2.7	0.573	0.2	NA	0.0	0.0	0.00	0.01	79.0
North: New Illawarra Road (N)											
8	T1	852	2.0	0.443	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
9	R2	46	54.3	0.400	47.9	LOS D	1.3	13.8	0.94	1.02	31.7
Approach		898	4.7	0.443	2.5	NA	1.3	13.8	0.05	0.05	74.0
West: Little Forest Road (RT Stage 1)											
10	L2	39	48.7	0.036	3.4	LOS A	0.0	0.0	0.00	0.39	41.3
12	R2	16	25.0	0.148	34.2	LOS C	0.4	3.4	0.91	0.95	20.0
Approach		55	41.8	0.148	12.4	LOS A	0.4	3.4	0.26	0.55	34.6
SouthWest: Median (RT Stage 2)											
32b	R3	16	25.0	0.016	6.2	LOS A	0.0	0.4	0.47	0.68	42.4
Approach		16	25.0	0.016	6.2	LOS A	0.0	0.4	0.47	0.68	42.4
All Vehicles		2091	4.7	0.573	1.5	NA	1.3	13.8	0.03	0.05	74.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2017 PM**

PM Base + Development Traffic

Giveaway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles	Distance			
		veh/h	%				veh	m			
South: New Illawarra Road (S)											
1	L2	20	25.0	0.013	7.4	LOS A	0.0	0.0	0.00	0.63	57.8
2	T1	632	2.5	0.329	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		652	3.2	0.329	0.3	NA	0.0	0.0	0.00	0.02	78.9
North: New Illawarra Road (N)											
8	T1	991	1.5	0.513	0.0	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	23	43.5	0.051	14.0	LOS A	0.2	1.7	0.63	0.83	44.9
Approach		1014	2.5	0.513	0.4	NA	0.2	1.7	0.01	0.02	78.3
West: Little Forest Road (RT Stage 1)											
10	L2	29	27.6	0.025	3.3	LOS A	0.0	0.0	0.00	0.39	44.2
12	R2	27	25.9	0.071	10.7	LOS A	0.2	1.9	0.64	0.81	26.2
Approach		56	26.8	0.071	6.8	LOS A	0.2	1.9	0.31	0.59	35.9
SouthWest: Median (RT Stage 2)											
32b	R3	27	25.9	0.032	6.9	LOS A	0.1	0.7	0.56	0.77	41.9
Approach		27	25.9	0.032	6.9	LOS A	0.1	0.7	0.56	0.77	41.9
All Vehicles		1749	3.9	0.513	0.6	NA	0.2	1.9	0.03	0.05	75.3

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2027 AM

AM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 110 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Deg. Satn HV	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec	veh	m		per veh	km/h
East: Heathcote Road (E)										
5	T1	669	1.7	0.344	16.5	LOS B	10.4	73.8	0.63	53.2
6	R2	889	2.1	0.839	43.4	LOS D	28.8	205.5	0.94	38.0
Approach		1559	2.0	0.839	31.8	LOS C	28.8	205.5	0.80	43.3
North: New Illawarra Road (N)										
7	L2	459	2.5	0.340	9.2	LOS A	4.8	34.3	0.29	60.3
9	R2	559	2.8	0.837	46.3	LOS D	29.8	213.5	0.97	37.2
Approach		1018	2.7	0.837	29.6	LOS C	29.8	213.5	0.66	45.0
West: Heathcote Road (W)										
10	L2	528	3.6	0.575	17.0	LOS B	14.8	106.9	0.64	52.5
11	T1	309	3.1	0.818	56.1	LOS D	9.9	71.0	1.00	33.8
Approach		838	3.4	0.818	31.4	LOS C	14.8	106.9	0.78	43.6
All Vehicles		3415	2.5	0.839	31.1	LOS C	29.8	213.5	0.76	43.9

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2027 PM

PM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total	Deg. Satn HV	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	
		veh/h	%	v/c	sec	veh	m		per veh	km/h	
East: Heathcote Road (E)											
5	T1	302	3.1	0.162	21.4	LOS B	5.9	42.2	0.58	0.48	49.7
6	R2	365	3.2	0.559	61.5	LOS E	14.2	102.3	0.93	0.81	31.9
Approach		667	3.2	0.559	43.4	LOS D	14.2	102.3	0.77	0.66	38.0
North: New Illawarra Road (N)											
7	L2	746	1.0	0.569	11.9	LOS A	18.5	130.9	0.44	0.74	58.1
9	R2	415	3.8	0.546	41.9	LOS C	22.5	162.8	0.81	0.83	38.8
Approach		1161	2.0	0.569	22.6	LOS B	22.5	162.8	0.57	0.78	49.4
West: Heathcote Road (W)											
10	L2	443	3.6	0.351	9.3	LOS A	6.8	48.8	0.29	0.67	59.0
11	T1	482	0.2	0.568	53.2	LOS D	17.1	119.8	0.92	0.78	34.7
Approach		925	1.8	0.568	32.1	LOS C	17.1	119.8	0.62	0.73	43.3
All Vehicles		2754	2.2	0.569	30.9	LOS C	22.5	162.8	0.63	0.73	44.1

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2027 AM**

AM Base + Development Traffic  
 Giveway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles veh	Distance m			
		veh/h	%								
South: New Illawarra Road (S)											
1	L2	23	39.1	0.016	7.7	LOS A	0.0	0.0	0.00	0.63	54.2
2	T1	1235	2.1	0.642	0.0	LOS A	0.0	0.0	0.00	0.00	79.5
Approach		1258	2.8	0.642	0.3	NA	0.0	0.0	0.00	0.01	78.8
North: New Illawarra Road (N)											
8	T1	1038	1.7	0.538	0.0	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	49	57.1	0.751	123.4	LOS F	2.8	28.9	0.98	1.12	19.2
Approach		1087	4.2	0.751	5.7	NA	2.8	28.9	0.04	0.05	69.7
West: Little Forest Road (RT Stage 1)											
10	L2	42	52.4	0.040	3.4	LOS A	0.0	0.0	0.00	0.38	40.8
12	R2	19	36.8	0.359	79.9	LOS F	1.0	9.1	0.96	1.02	13.7
Approach		61	47.5	0.359	27.2	LOS B	1.0	9.1	0.30	0.58	29.4
SouthWest: Median (RT Stage 2)											
32b	R3	19	36.8	0.027	7.6	LOS A	0.1	0.7	0.61	0.80	40.0
Approach		19	36.8	0.027	7.6	LOS A	0.1	0.7	0.61	0.80	40.0
All Vehicles		2425	4.8	0.751	3.3	NA	2.8	28.9	0.03	0.05	71.5

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2027 PM**

PM Base + Development Traffic  
 Giveway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles veh	Distance m			
		veh/h	%								
South: New Illawarra Road (S)											
1	L2	23	34.8	0.015	7.6	LOS A	0.0	0.0	0.00	0.63	55.3
2	T1	734	2.2	0.382	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		757	3.2	0.382	0.3	NA	0.0	0.0	0.00	0.02	78.8
North: New Illawarra Road (N)											
8	T1	1071	1.5	0.555	0.0	LOS A	0.0	0.0	0.00	0.00	79.6
9	R2	26	50.0	0.076	17.1	LOS B	0.3	2.6	0.72	0.90	43.3
Approach		1097	2.6	0.555	0.5	NA	0.3	2.6	0.02	0.02	78.1
West: Little Forest Road (RT Stage 1)											
10	L2	32	34.4	0.028	3.3	LOS A	0.0	0.0	0.00	0.39	43.3
12	R2	30	33.3	0.106	14.2	LOS A	0.3	2.9	0.73	0.86	25.0
Approach		62	33.9	0.106	8.6	LOS A	0.3	2.9	0.35	0.62	34.7
SouthWest: Median (RT Stage 2)											
32b	R3	30	33.3	0.042	7.7	LOS A	0.1	1.0	0.62	0.82	40.4
Approach		30	33.3	0.042	7.7	LOS A	0.1	1.0	0.62	0.82	40.4
All Vehicles		1946	4.3	0.555	0.7	NA	0.3	2.9	0.03	0.05	74.9

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



## Site: Little Forest Road and New Illawarra Road 2027 AM

AM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 117 seconds (User-Given Cycle Time)

### Movement Performance - Vehicles

Mov ID	ODMo	Demand Flows		Deg. Satn	Average	Level of	95% Back of Queue		Prop.	Effective	Average
	v	Total	HV		Delay	Service	Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: New Illawarra Road (S)											
1	L2	23	39.1	0.018	8.5	LOS A	0.1	1.0	0.13	0.62	48.9
2	T1	1235	2.1	0.868	12.2	LOS A	50.5	360.1	0.78	0.75	63.1
Approach		1258	2.8	0.868	12.1	LOS A	50.5	360.1	0.77	0.74	62.8
North: New Illawarra Road (N)											
8	T1	1038	1.7	0.636	3.2	LOS A	19.3	137.1	0.36	0.34	74.8
9	R2	49	57.1	0.724	75.1	LOS F	3.1	32.5	1.00	0.83	25.7
Approach		1087	4.2	0.724	6.4	LOS A	19.3	137.1	0.39	0.36	68.9
West: Little Forest Road											
10	L2	42	52.4	0.141	24.1	LOS B	1.5	15.7	0.67	0.67	33.2
12	R2	19	36.8	0.252	65.9	LOS E	1.1	10.4	0.99	0.70	17.1
Approach		61	47.5	0.252	37.1	LOS C	1.5	15.7	0.77	0.68	28.0
All Vehicles		2406	4.6	0.868	10.2	LOS A	50.5	360.1	0.60	0.57	63.6

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2027 PM**

AM Base + Development Traffic

Signals - Fixed Time Isolated Cycle Time = 147 seconds (User-Given Cycle Time)

## Movement Performance - Vehicles

Mov ID	ODMo	Demand Flows		Deg. Satn	Average	Level of	95% Back of Queue		Prop.	Effective	Average					
	v	Total	HV				Delay	Service				Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%				v/c	sec								per veh
South: New Illawarra Road (S)																
1	L2	23	34.8	0.017	8.3	LOS A	0.1	0.9	0.10	0.62	49.0					
2	T1	734	2.2	0.480	5.2	LOS A	16.9	120.4	0.36	0.33	71.8					
Approach		757	3.2	0.480	5.3	LOS A	16.9	120.4	0.35	0.34	70.8					
North: New Illawarra Road (N)																
8	T1	1071	1.5	0.632	2.6	LOS A	20.5	145.4	0.30	0.28	75.7					
9	R2	26	50.0	0.465	89.1	LOS F	2.0	20.0	1.00	0.72	23.4					
Approach		1097	2.6	0.632	4.6	LOS A	20.5	145.4	0.32	0.29	71.9					
West: Little Forest Road																
10	L2	32	34.4	0.058	5.7	LOS A	0.4	3.6	0.23	0.48	42.1					
12	R2	30	33.3	0.490	84.5	LOS F	2.3	20.6	1.00	0.73	14.7					
Approach		62	33.9	0.490	43.8	LOS D	2.3	20.6	0.60	0.60	25.9					
All Vehicles		1916	3.9	0.632	6.2	LOS A	20.5	145.4	0.34	0.32	68.4					

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2014 AM

AM Base

Signals - Fixed Time Isolated Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Deg. Satn HV %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)										
5	T1	595	1.8	0.298	LOS B	11.5	81.4	0.60	0.52	50.7
6	R2	768	2.2	0.665	LOS D	26.5	189.2	0.85	0.84	37.7
Approach		1363	2.0	0.665	LOS C	26.5	189.2	0.74	0.70	42.5
North: New Illawarra Road (N)										
7	L2	389	2.7	0.276	LOS A	3.8	27.2	0.21	0.67	60.8
9	R2	468	1.6	0.664	LOS D	27.0	191.7	0.89	0.86	37.4
Approach		858	2.1	0.664	LOS C	27.0	191.7	0.58	0.77	45.4
West: Heathcote Road (W)										
10	L2	385	2.2	0.393	LOS A	9.5	67.7	0.44	0.72	55.6
11	T1	239	3.1	0.666	LOS E	9.3	66.9	1.00	0.80	30.1
Approach		624	2.5	0.666	LOS C	9.5	67.7	0.65	0.75	42.0
All Vehicles		2845	2.1	0.666	LOS C	27.0	191.7	0.67	0.73	43.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2015 PM

PM Base

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Deg. Satn HV %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)										
5	T1	274	3.1	0.151	LOS B	5.4	38.9	0.59	0.49	49.0
6	R2	289	3.6	0.506	LOS E	11.4	82.1	0.93	0.80	31.1
Approach		563	3.4	0.506	LOS D	11.4	82.1	0.76	0.65	37.8
North: New Illawarra Road (N)										
7	L2	672	0.9	0.507	LOS A	14.1	99.1	0.38	0.72	59.1
9	R2	354	2.1	0.446	LOS C	17.9	127.5	0.75	0.81	40.4
Approach		1025	1.3	0.507	LOS B	17.9	127.5	0.51	0.75	51.0
West: Heathcote Road (W)										
10	L2	357	2.1	0.270	LOS A	4.3	30.6	0.23	0.66	60.2
11	T1	453	0.2	0.506	LOS D	15.6	109.2	0.90	0.76	35.5
Approach		809	1.0	0.506	LOS C	15.6	109.2	0.60	0.71	43.4
All Vehicles		2398	1.7	0.507	LOS C	17.9	127.5	0.60	0.72	44.7

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2014 AM**

AM Base

Giveaway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles	Distance			
		veh/h	%				veh	m			
South: New Illawarra Road (S)											
1	L2	8	25.0	0.005	7.4	LOS A	0.0	0.0	0.00	0.63	57.8
2	T1	1124	2.2	0.585	0.0	LOS A	0.0	0.0	0.00	0.00	79.6
Approach		1133	2.3	0.585	0.2	NA	0.0	0.0	0.00	0.00	79.4
North: New Illawarra Road (N)											
8	T1	865	1.9	0.449	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
9	R2	36	61.8	0.376	55.1	LOS D	1.2	12.9	0.94	1.02	29.9
Approach		901	4.3	0.449	2.3	NA	1.2	12.9	0.04	0.04	74.8
West: Little Forest Road (RT Stage 1)											
10	L2	28	55.6	0.027	3.4	LOS A	0.0	0.0	0.00	0.38	40.4
12	R2	4	0.0	0.027	23.7	LOS B	0.1	0.5	0.87	0.93	22.4
Approach		33	48.4	0.027	6.0	LOS A	0.1	0.5	0.11	0.45	38.1
SouthWest: Median (RT Stage 2)											
32b	R3	4	0.0	0.003	5.5	LOS A	0.0	0.1	0.43	0.61	46.8
Approach		4	0.0	0.003	5.5	LOS A	0.0	0.1	0.43	0.61	46.8
All Vehicles		2071	3.9	0.585	1.1	NA	1.2	12.9	0.02	0.03	76.0

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2015 PM**

PM Base

Giveaway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles veh	Distance m			
		veh/h	%								
South: New Illawarra Road (S)											
1	L2	8	12.5	0.005	7.2	LOS A	0.0	0.0	0.00	0.63	61.4
2	T1	662	2.5	0.345	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		671	2.7	0.345	0.1	NA	0.0	0.0	0.00	0.01	79.5
North: New Illawarra Road (N)											
8	T1	1031	1.5	0.534	0.0	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	12	54.5	0.030	15.3	LOS B	0.1	1.0	0.66	0.83	44.2
Approach		1042	2.1	0.534	0.3	NA	0.1	1.0	0.01	0.01	79.0
West: Little Forest Road (RT Stage 1)											
10	L2	18	23.5	0.015	3.3	LOS A	0.0	0.0	0.00	0.40	44.9
12	R2	16	20.0	0.041	10.4	LOS A	0.1	1.0	0.63	0.80	26.3
Approach		34	21.9	0.041	6.6	LOS A	0.1	1.0	0.30	0.58	36.5
SouthWest: Median (RT Stage 2)											
32b	R3	16	20.0	0.019	6.8	LOS A	0.0	0.4	0.56	0.76	42.8
Approach		16	20.0	0.019	6.8	LOS A	0.0	0.4	0.56	0.76	42.8
All Vehicles		1762	2.9	0.534	0.3	NA	0.1	1.0	0.02	0.03	77.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2017 AM

AM Base

Signals - Fixed Time Isolated Cycle Time = 140 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Deg. Satn HV %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)										
5	T1	612	1.7	0.304	LOS B	11.3	80.5	0.59	0.52	51.4
6	R2	791	2.1	0.685	LOS D	26.7	190.0	0.86	0.84	38.1
Approach		1402	2.0	0.685	LOS C	26.7	190.0	0.74	0.70	42.9
North: New Illawarra Road (N)										
7	L2	395	2.7	0.282	LOS A	3.9	27.8	0.21	0.67	60.8
9	R2	475	1.6	0.683	LOS D	26.9	191.1	0.90	0.86	37.5
Approach		869	2.1	0.683	LOS C	26.9	191.1	0.59	0.77	45.4
West: Heathcote Road (W)										
10	L2	412	2.3	0.425	LOS A	10.5	74.6	0.46	0.73	55.1
11	T1	255	2.9	0.684	LOS E	9.6	69.0	1.00	0.81	30.7
Approach		666	2.5	0.684	LOS C	10.5	74.6	0.67	0.76	42.3
All Vehicles		2938	2.1	0.685	LOS C	26.9	191.1	0.68	0.74	43.5

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2017 PM

PM Base

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows Total	Deg. Satn HV	Average Delay sec	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c		veh	m		per veh	km/h
East: Heathcote Road (E)										
5	T1	278	3.0	0.153	22.4	LOS B	5.5	39.5	0.59	49.0
6	R2	295	3.6	0.515	64.2	LOS E	11.6	83.7	0.93	31.1
Approach		573	3.3	0.515	44.0	LOS D	11.6	83.7	0.77	37.8
North: New Illawarra Road (N)										
7	L2	682	0.9	0.516	11.0	LOS A	14.5	102.6	0.38	59.0
9	R2	359	2.1	0.453	38.8	LOS C	18.2	129.8	0.76	40.4
Approach		1041	1.3	0.516	20.6	LOS B	18.2	129.8	0.51	50.9
West: Heathcote Road (W)										
10	L2	361	2.0	0.274	8.4	LOS A	4.4	31.1	0.23	60.2
11	T1	458	0.2	0.512	50.8	LOS D	15.8	110.7	0.90	35.5
Approach		819	1.0	0.512	32.1	LOS C	15.8	110.7	0.61	43.4
All Vehicles		2433	1.7	0.516	30.0	LOS C	18.2	129.8	0.60	44.7

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



Site: Little Forest Road and New Illawarra Road 2017 AM

AM Base

Giveaway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles	Distance			
		veh/h	%				veh	m			
South: New Illawarra Road (S)											
1	L2	8	25.0	0.005	7.4	LOS A	0.0	0.0	0.00	0.63	57.8
2	T1	1160	2.2	0.603	0.0	LOS A	0.0	0.0	0.00	0.00	79.6
Approach		1168	2.3	0.603	0.2	NA	0.0	0.0	0.00	0.00	79.3
North: New Illawarra Road (N)											
8	T1	897	2.0	0.466	0.0	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	36	61.8	0.434	65.4	LOS E	1.4	14.9	0.96	1.03	27.6
Approach		933	4.3	0.466	2.6	NA	1.4	14.9	0.04	0.04	74.3
West: Little Forest Road (RT Stage 1)											
10	L2	28	55.6	0.027	3.4	LOS A	0.0	0.0	0.00	0.38	40.4
12	R2	4	0.0	0.031	26.2	LOS B	0.1	0.6	0.88	0.94	21.8
Approach		33	48.4	0.031	6.4	LOS A	0.1	0.6	0.11	0.45	38.0
SouthWest: Median (RT Stage 2)											
32b	R3	4	0.0	0.004	5.6	LOS A	0.0	0.1	0.45	0.62	46.8
Approach		4	0.0	0.004	5.6	LOS A	0.0	0.1	0.45	0.62	46.8
All Vehicles		2138	3.9	0.603	1.2	NA	1.4	14.9	0.02	0.03	75.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



Site: Little Forest Road and New Illawarra Road 2017 PM

PM Base

Giveaway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%				v/c	sec			
South: New Illawarra Road (S)											
1	L2	8	12.5	0.005	7.2	LOS A	0.0	0.0	0.00	0.63	61.4
2	T1	665	2.5	0.347	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		674	2.7	0.347	0.1	NA	0.0	0.0	0.00	0.01	79.5
North: New Illawarra Road (N)											
8	T1	1043	1.5	0.540	0.0	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	12	54.5	0.030	15.4	LOS B	0.1	1.1	0.66	0.83	44.2
Approach		1055	2.1	0.540	0.3	NA	0.1	1.1	0.01	0.01	79.0
West: Little Forest Road (RT Stage 1)											
10	L2	18	23.5	0.015	3.3	LOS A	0.0	0.0	0.00	0.40	44.9
12	R2	16	20.0	0.041	10.5	LOS A	0.1	1.0	0.64	0.80	26.3
Approach		34	21.9	0.041	6.6	LOS A	0.1	1.0	0.30	0.59	36.5
SouthWest: Median (RT Stage 2)											
32b	R3	16	20.0	0.019	6.9	LOS A	0.1	0.4	0.57	0.76	42.8
Approach		16	20.0	0.019	6.9	LOS A	0.1	0.4	0.57	0.76	42.8
All Vehicles		1778	2.8	0.540	0.3	NA	0.1	1.1	0.02	0.03	77.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2027 AM

AM Base

Signals - Fixed Time Isolated Cycle Time = 116 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total veh/h	Deg. Satn HV %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)										
5	T1	669	1.7	0.339	LOS B	10.8	76.4	0.62	0.54	53.0
6	R2	877	2.2	0.810	LOS D	28.3	201.7	0.92	0.87	38.3
Approach		1546	2.0	0.810	LOS C	28.3	201.7	0.79	0.73	43.5
North: New Illawarra Road (N)										
7	L2	459	2.5	0.338	LOS A	5.1	36.4	0.28	0.69	60.2
9	R2	542	1.4	0.801	LOS D	28.6	202.6	0.96	0.90	38.0
Approach		1001	1.9	0.801	LOS B	28.6	202.6	0.65	0.80	45.8
West: Heathcote Road (W)										
10	L2	511	2.1	0.547	LOS B	14.2	101.0	0.61	0.78	53.3
11	T1	309	3.1	0.796	LOS E	10.2	73.5	1.00	0.86	33.2
Approach		820	2.4	0.796	LOS C	14.2	101.0	0.76	0.81	43.4
All Vehicles		3367	2.1	0.810	LOS C	28.6	202.6	0.74	0.77	44.1

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2027 PM

PM Base

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

### Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows Total	Deg. Satn HV	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance Queue	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec	veh	m		per veh	km/h
East: Heathcote Road (E)										
5	T1	302	3.1	0.160	21.9	LOS B	5.9	42.6	0.58	49.3
6	R2	365	3.2	0.562	62.4	LOS E	14.3	102.8	0.93	31.6
Approach		667	3.2	0.562	44.1	LOS D	14.3	102.8	0.77	37.8
North: New Illawarra Road (N)										
7	L2	746	1.0	0.568	11.9	LOS A	18.6	131.1	0.44	58.1
9	R2	399	2.1	0.511	40.5	LOS C	21.1	150.3	0.79	39.6
Approach		1145	1.4	0.568	21.9	LOS B	21.1	150.3	0.56	50.0
West: Heathcote Road (W)										
10	L2	425	1.7	0.332	9.2	LOS A	6.3	45.0	0.28	59.6
11	T1	482	0.2	0.568	53.2	LOS D	17.1	119.8	0.92	34.7
Approach		907	0.9	0.568	32.5	LOS C	17.1	119.8	0.62	43.2
All Vehicles		2720	1.7	0.568	30.9	LOS C	21.1	150.3	0.63	44.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# MOVEMENT SUMMARY



**Site: Little Forest Road and New Illawarra Road 2027 AM**

AM Base

Giveway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles veh	Distance m			
		veh/h	%								
South: New Illawarra Road (S)											
1	L2	8	25.0	0.005	7.4	LOS A	0.0	0.0	0.00	0.63	57.8
2	T1	1300	2.1	0.676	0.0	LOS A	0.0	0.0	0.00	0.00	79.4
Approach		1308	2.3	0.676	0.2	NA	0.0	0.0	0.00	0.00	79.2
North: New Illawarra Road (N)											
8	T1	1093	1.7	0.567	0.0	LOS A	0.0	0.0	0.00	0.00	79.6
9	R2	36	61.8	0.820	187.9	LOS F	2.9	31.3	0.99	1.13	14.3
Approach		1128	3.6	0.820	6.1	NA	2.9	31.3	0.03	0.04	69.6
West: Little Forest Road (RT Stage 1)											
10	L2	28	55.6	0.027	3.4	LOS A	0.0	0.0	0.00	0.38	40.4
12	R2	4	0.0	0.050	40.8	LOS C	0.1	0.9	0.93	0.96	18.8
Approach		33	48.4	0.050	8.3	LOS A	0.1	0.9	0.12	0.46	37.2
SouthWest: Median (RT Stage 2)											
32b	R3	4	0.0	0.004	6.3	LOS A	0.0	0.1	0.55	0.69	46.4
Approach		4	0.0	0.004	6.3	LOS A	0.0	0.1	0.55	0.69	46.4
All Vehicles		2474	3.5	0.820	2.9	NA	2.9	31.3	0.02	0.03	73.4

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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# MOVEMENT SUMMARY



Site: Little Forest Road and New Illawarra Road 2027 PM

PM Base

Giveaway / Yield (Two-Way)

## Movement Performance - Vehicles

Mov ID	ODMo v	Demand Flows		Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
		Total	HV				Vehicles veh	Distance m			
		veh/h	%								
South: New Illawarra Road (S)											
1	L2	8	12.5	0.005	7.2	LOS A	0.0	0.0	0.00	0.63	61.4
2	T1	773	2.2	0.402	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		781	2.3	0.402	0.1	NA	0.0	0.0	0.00	0.01	79.5
North: New Illawarra Road (N)											
8	T1	1127	1.5	0.584	0.0	LOS A	0.0	0.0	0.00	0.00	79.6
9	R2	12	54.5	0.038	18.2	LOS B	0.1	1.3	0.74	0.90	42.7
Approach		1139	2.0	0.584	0.3	NA	0.1	1.3	0.01	0.01	78.9
West: Little Forest Road (RT Stage 1)											
10	L2	18	23.5	0.015	3.3	LOS A	0.0	0.0	0.00	0.40	44.9
12	R2	16	20.0	0.052	13.0	LOS A	0.2	1.3	0.71	0.85	25.4
Approach		34	21.9	0.052	7.8	LOS A	0.2	1.3	0.33	0.61	36.0
SouthWest: Median (RT Stage 2)											
32b	R3	16	20.0	0.021	7.4	LOS A	0.1	0.5	0.62	0.81	42.5
Approach		16	20.0	0.021	7.4	LOS A	0.1	0.5	0.62	0.81	42.5
All Vehicles		1969	2.6	0.584	0.3	NA	0.2	1.3	0.02	0.02	77.4

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

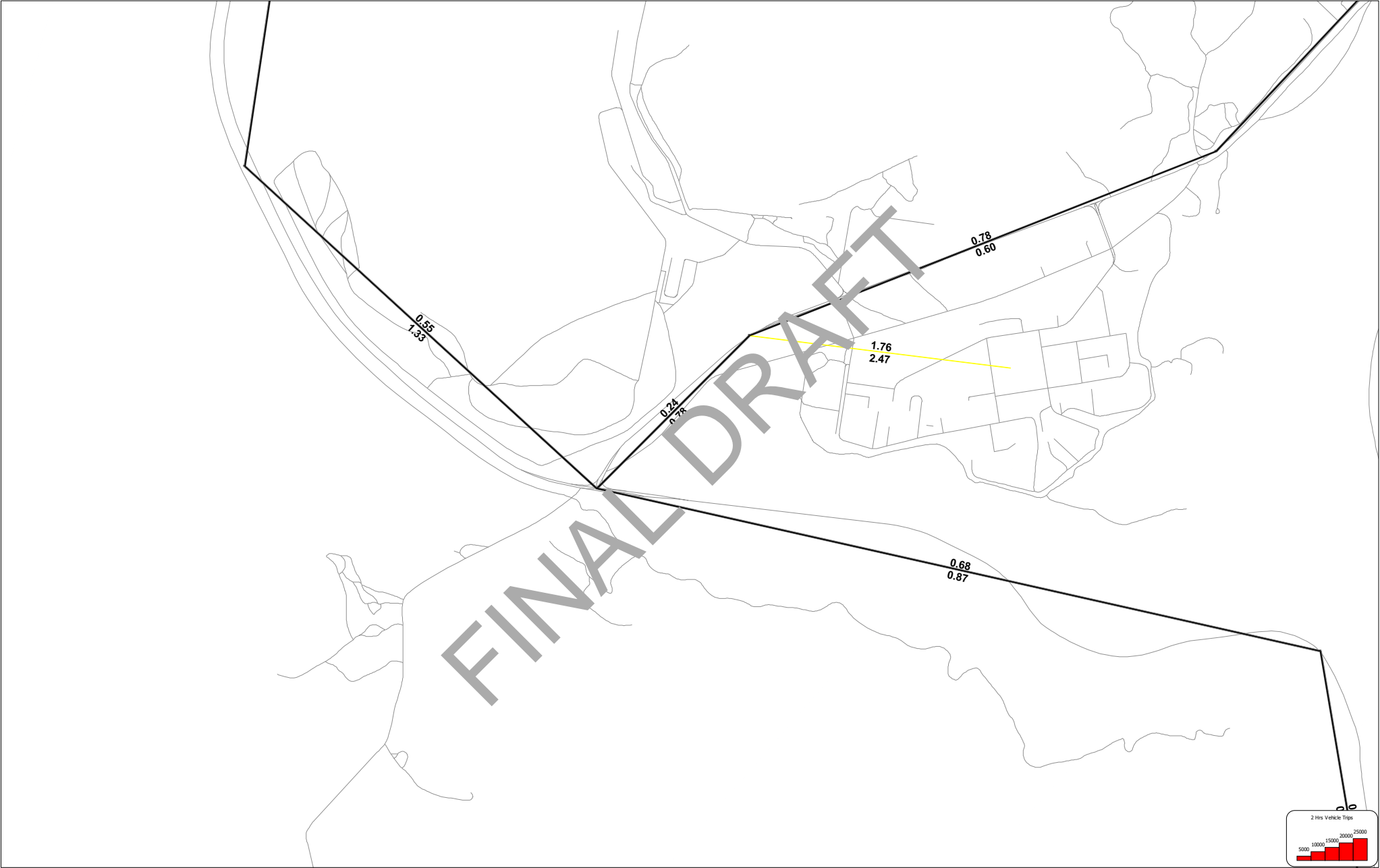
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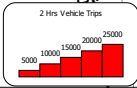
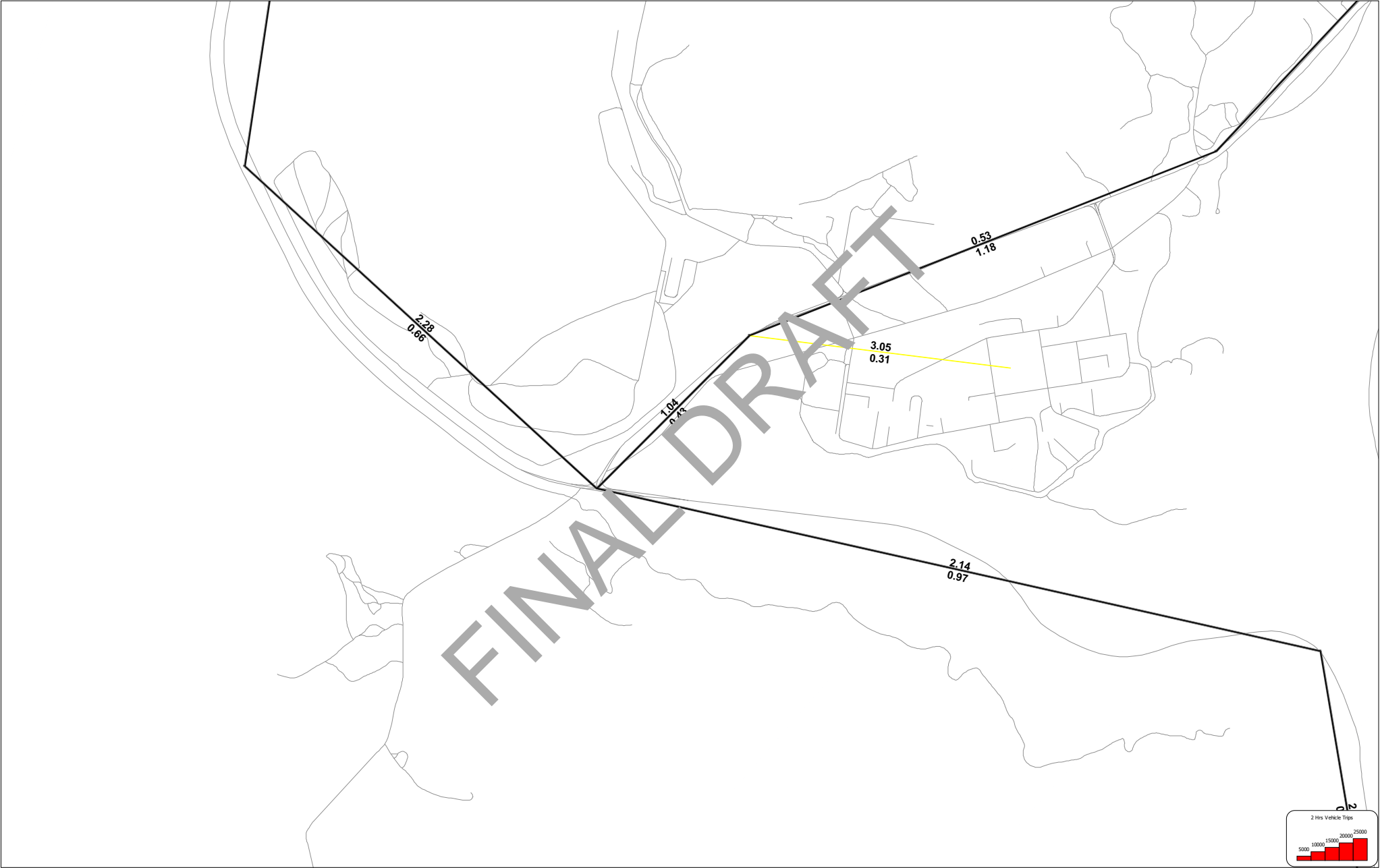
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## Appendix D – Background Traffic Growth Factors from RMS









## Appendix E – Weighted Delay Methodology and Results

## Rationale

Typically SIDRA assumes an even distribution of vehicles travelling through an intersection. With high volumes of through traffic, under an even distribution there may be limited opportunities for a vehicle on Little Forest Road to accept a gap. However, an even distribution does not take into account large gaps that may form in traffic due to upstream effects. Specifically, there is the potential for vehicles turning right onto New Illawarra Road from Heathcote Road to bunch up as this turning movement is controlled by traffic signals.

As there are relatively large volumes of traffic making this turning movement, the impact of vehicle bunching on the performance of the Little Forest Road/New Illawarra Road intersection should be taken into consideration. Therefore, a “weighted delay” methodology has been adopted, which aims to quantitatively account for gaps in northbound traffic that may form as a result of the traffic signals operating at the Heathcote Road/New Illawarra Road intersection, as well as the resultant effect on delays experienced with the critical movements.

## Methodology

To derive the weighted delay, two SIDRA runs were conducted for each scenario:

- Run 1 represents a “best-case” and excludes right-turning traffic leaving Heathcote Road from the analysis. The delay derived from this run is intended to model the likely gap acceptance without the bunched vehicles from this right turn.
- Run 2 represents a “worst-case” and includes all traffic, assuming no extra bunching to provide the least opportunity for right-turning vehicles entering or exiting Little Forest Road to accept gaps in traffic.

The weighted average delay ( $D_w$ ) is then calculated for each scenario using the following:

$$D_w = \frac{T_1 \times D_1 + T_2 \times D_2}{3600}$$

Where:

- $T_1$  is the amount of seconds during peak hour in which the right-turn phase from Heathcote Road (i.e. phase B) is not running (determined from SIDRA modelling of the Heathcote Road/New Illawarra Road intersection).  $T_1$  is calculated using the following:

$$T_1 = (\text{cycle time} - \text{phase B green \& yellow time}) \times \frac{3600}{\text{cycle time}}$$

- $T_2$  is the amount of green and yellow time (in seconds) during peak hour in which the right-turn phase from Heathcote Road (i.e. phase B) operates (determined from SIDRA modelling of the Heathcote Road/New Illawarra Road intersection).  $T_2$  is calculated using the following:

$$T_2 = (\text{phase B green \& yellow time}) \times \frac{3600}{\text{cycle time}}$$

- $D_1$  is the delay calculated from SIDRA Run 1
- $D_2$  is the delay calculated from SIDRA Run 2

## Results

Results of the intermediate weighted delay calculations are presented in the tables below.

### 50-50 distribution

#### Calculations for T1, T2

Year	Scenario	G/Y AM	Cycle AM	T1 AM	T2 AM	G/Y PM	Cycle PM	T1 PM	T2 PM
2014/15	Base	60	145	2110	1490	35	150	2760	840
2017	Base	58	140	2109	1491	35	150	2760	840
2017	Base+Dev	55	134	2122	1478	34	149	2779	821
2027	Base	50	126	2171	1429	35	150	2760	840
2027	Base+Dev	49	121	2142	1458	34	148	2773	827

#### Right from New Illawarra Road

Year	Scenario	D1 AM	D2 AM	Dw AM	D1 PM	D2 PM	Dw PM
2014/15	Base	13.7	46.1	27.1	13.6	17.6	14.5
2017	Base	13.8	52.3	29.8	13.5	17.6	14.5
2017	Base+Dev	13.8	50.9	29.0	13.5	17.2	14.3
2027	Base	14.3	89.1	44.0	13.4	18.0	14.5
2027	Base+Dev	14.4	102.6	50.1	13.6	18.1	14.6

#### Right turn from Little Forest Road

Year	Scenario	D1 AM	D2 AM	Dw AM	D1 PM	D2 PM	Dw PM
2014/15	Base	14.8	29.6	20.9	16.3	19.9	17.1
2017	Base	15.0	31.6	21.9	16.3	20.1	17.2
2017	Base+Dev	16.4	43.9	27.7	16.9	21.1	17.9
2027	Base	15.6	40.2	25.4	16.6	20.7	17.6
2027	Base+Dev	18.2	81.4	43.8	17.8	22.9	19.0

### 70-30 distribution - sensitivity testing

#### Calculations for T1, T2

Year	Scenario	G/Y AM	Cycle AM	T1 AM	T2 AM	G/Y PM	Cycle PM	T1 PM	T2 PM
2017	Base+Dev	54	133	2138	1462	34	150	2784	816
2027	Base+Dev	48	120	2160	1440	34	149	2779	821

#### Right from New Illawarra Road

Year	Scenario	D1 AM	D2 AM	Dw AM	D1 PM	D2 PM	Dw PM
2017	Base+Dev	13.9	50.8	28.9	13.5	17.3	14.4
2027	Base+Dev	14.5	94.8	46.6	13.6	18.1	14.6

#### Right turn from Little Forest Road

Year	Scenario	D1 AM	D2 AM	Dw AM	D1 PM	D2 PM	Dw PM
2017	Base+Dev	16.3	44.4	27.7	16.8	21.0	17.8
2027	Base+Dev	18.2	81.4	43.5	17.9	23.2	19.1





# Appendix F – Sensitivity Testing SIDRA Results

## Heathcote Road/New Illawarra Road

- 2017 AM Base + Development
- 2017 PM Base + Development
- 2027 AM Base + Development
- 2027 PM Base + Development

## Little Forest Road/New Illawarra Road (run 1)

- 2017 AM Base + Development
- 2017 PM Base + Development
- 2027 AM Base + Development
- 2027 PM Base + Development

## Little Forest Road/New Illawarra Road (run 2)

- 2017 AM Base + Development
- 2017 PM Base + Development
- 2027 AM Base + Development
- 2027 PM Base + Development

# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2017 AM

AM Base + Development Traffic

Signals - Fixed Time Cycle Time = 133 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)											
5	T1	612	1.7	0.309	18.8	LOS B	11.0	78.2	0.61	0.52	42.6
6	R2	791	2.1	0.703	46.3	LOS D	25.8	183.9	0.87	0.89	30.4
Approach		1402	2.0	0.703	34.3	LOS C	25.8	183.9	0.76	0.73	34.6
North: New Illawarra Road (N)											
7	L2	395	2.7	0.257	11.7	LOS A	3.6	26.0	0.22	0.60	55.8
9	R2	492	2.6	0.703	47.4	LOS D	26.7	191.3	0.91	0.87	29.9
Approach		886	2.6	0.703	31.5	LOS C	26.7	191.3	0.60	0.75	37.7
West: Heathcote Road (W)											
10	L2	429	3.4	0.389	17.3	LOS B	10.0	71.9	0.45	0.77	47.7
11	T1	255	2.9	0.697	64.0	LOS E	9.2	66.2	1.00	0.82	22.9
Approach		684	3.2	0.697	34.7	LOS C	10.0	71.9	0.66	0.78	34.3
All Vehicles		2973	2.4	0.703	33.6	LOS C	26.7	191.3	0.69	0.75	35.4

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# PHASING SUMMARY

 **Site: Heathcote Road and New Illawarra Road 2017 AM**

AM Base + Development Traffic

Signals - Fixed Time Cycle Time = 133 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

**Phase times determined by the program**

**Sequence: Two-Phase**

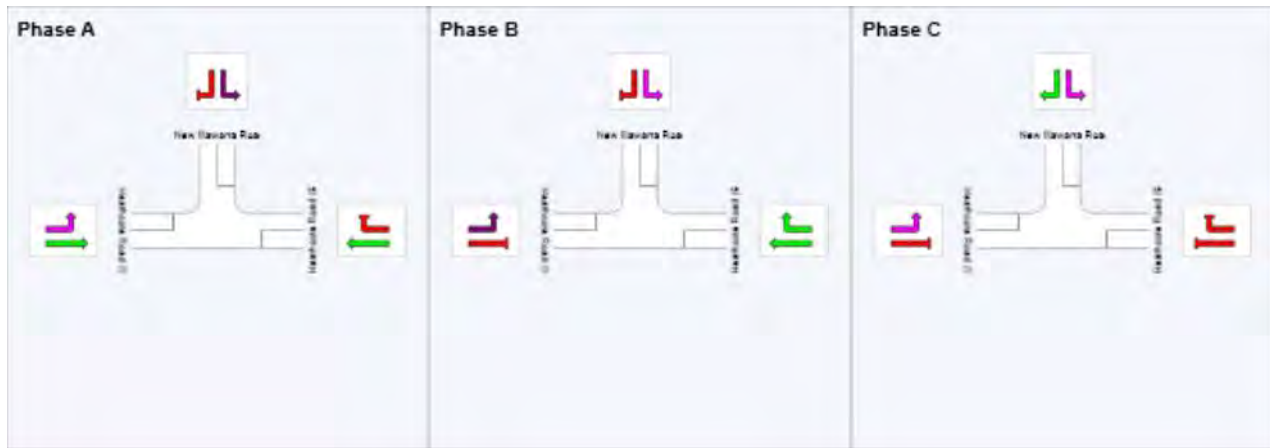
**Movement Class: All Movement Classes**

**Input Sequence: A, B, C**

**Output Sequence: A, B, C**

## Phase Timing Results

Phase	A	B	C
Green Time (sec)	14	50	51
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	20	56	57
Phase Split	15 %	42 %	43 %



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# MOVEMENT SUMMARY



**Site: Heathcote Road and New Illawarra Road 2017 PM**

PM Base + Development Traffic

Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)											
5	T1	278	3.0	0.149	21.3	LOS B	5.4	38.5	0.57	0.47	40.9
6	R2	295	3.6	0.498	67.1	LOS E	11.5	82.9	0.93	0.85	24.1
Approach		573	3.3	0.498	44.9	LOS D	11.5	82.9	0.75	0.67	30.0
North: New Illawarra Road (N)											
7	L2	682	0.9	0.488	13.6	LOS A	12.8	90.5	0.35	0.72	53.3
9	R2	377	3.4	0.495	44.2	LOS D	19.9	143.3	0.78	0.84	31.2
Approach		1059	1.8	0.495	24.5	LOS B	19.9	143.3	0.50	0.76	42.6
West: Heathcote Road (W)											
10	L2	378	3.3	0.259	12.1	LOS A	4.4	31.6	0.23	0.72	53.0
11	T1	458	0.2	0.498	49.9	LOS D	15.6	109.6	0.89	0.75	26.8
Approach		836	1.6	0.498	32.8	LOS C	15.6	109.6	0.59	0.73	34.8
All Vehicles		2467	2.1	0.498	32.0	LOS C	19.9	143.3	0.59	0.73	36.2

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

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# PHASING SUMMARY

 **Site: Heathcote Road and New Illawarra Road 2017 PM**

PM Base + Development Traffic

Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

Phase times determined by the program

Sequence: Two-Phase

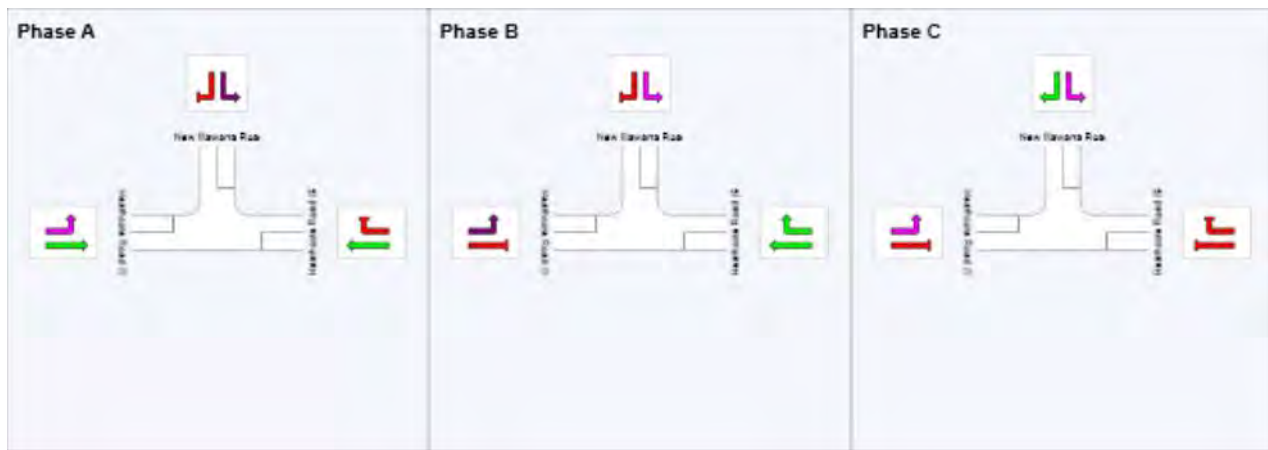
Movement Class: All Movement Classes





Input Sequence: A, B, C

Output Sequence: A, B, C

## Phase Timing Results

Phase	A	B	C
Green Time (sec)	39	30	63
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	45	36	69
Phase Split	30 %	24 %	46 %



	Normal Movement		Permitted/Opposed
	Slip/Bypass-Lane Movement		Opposed Slip/Bypass-Lane
	Stopped Movement		Turn On Red
	Other Movement Class Running		Other Movement Class Stopped
	Mixed Running & Stopped Movement Classes		Phase Transition Applied
	Undetected Movement		

Processed: Tuesday, 24 February 2015 11:16:02

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# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2027 AM

AM Base + Development Traffic

Signals - Fixed Time Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)											
5	T1	669	1.7	0.334	16.8	LOS B	10.9	77.7	0.61	0.53	44.2
6	R2	865	2.2	0.789	46.1	LOS D	27.8	198.5	0.91	0.90	30.5
Approach		1535	2.0	0.789	33.4	LOS C	27.8	198.5	0.78	0.74	35.1
North: New Illawarra Road (N)											
7	L2	412	2.8	0.276	12.0	LOS A	4.1	29.4	0.25	0.61	55.3
9	R2	518	3.7	0.785	48.4	LOS D	27.7	199.9	0.95	0.89	29.5
Approach		929	3.3	0.785	32.3	LOS C	27.7	199.9	0.64	0.77	37.2
West: Heathcote Road (W)											
10	L2	523	4.2	0.492	19.1	LOS B	13.5	98.2	0.56	0.79	46.0
11	T1	309	3.1	0.765	58.3	LOS E	10.4	74.5	1.00	0.85	24.3
Approach		833	3.8	0.765	33.7	LOS C	13.5	98.2	0.72	0.81	34.8
All Vehicles		3297	2.8	0.789	33.1	LOS C	27.8	199.9	0.73	0.76	35.6

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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



# PHASING SUMMARY

 **Site: Heathcote Road and New Illawarra Road 2027 AM**

AM Base + Development Traffic

Signals - Fixed Time Cycle Time = 120 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

Phase times determined by the program

Sequence: Two-Phase

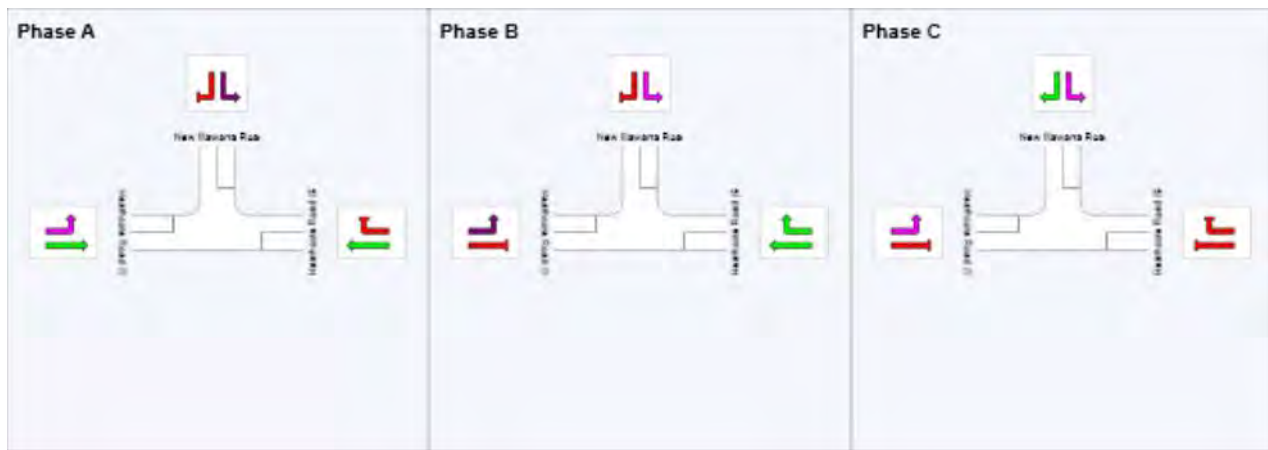
Movement Class: All Movement Classes

Input Sequence: A, B, C

Output Sequence: A, B, C

## Phase Timing Results

Phase	A	B	C
Green Time (sec)	14	44	44
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	20	50	50
Phase Split	17 %	42 %	42 %



Processed: Tuesday, 24 February 2015 11:17:26

SIDRA INTERSECTION 6.0.14.4193

Project: N:\AU\Sydney\Projects\21\23482\Technical\Traffic and Transport\SIDRA\Base+Dev Lucas Heights 70-30 HC.sip6

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**SIDRA  
INTERSECTION 6**

# MOVEMENT SUMMARY



## Site: Heathcote Road and New Illawarra Road 2027 PM

PM Base + Development Traffic

Signals - Fixed Time Cycle Time = 149 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Heathcote Road (E)											
5	T1	302	3.1	0.163	21.6	LOS B	5.9	42.2	0.58	0.48	40.7
6	R2	320	3.6	0.537	67.0	LOS E	12.5	90.2	0.93	0.85	24.2
Approach		622	3.4	0.537	45.0	LOS D	12.5	90.2	0.76	0.67	29.9
North: New Illawarra Road (N)											
7	L2	735	1.0	0.529	14.1	LOS A	15.3	107.9	0.38	0.73	52.7
9	R2	409	4.6	0.539	44.5	LOS D	21.9	159.7	0.80	0.84	31.1
Approach		1144	2.3	0.539	25.0	LOS B	21.9	159.7	0.53	0.77	42.2
West: Heathcote Road (W)											
10	L2	404	4.7	0.282	12.3	LOS A	5.1	36.8	0.24	0.71	52.7
11	T1	482	0.2	0.535	50.7	LOS D	16.6	116.4	0.90	0.76	26.5
Approach		886	2.3	0.535	33.2	LOS C	16.6	116.4	0.60	0.74	34.6
All Vehicles		2653	2.5	0.539	32.4	LOS C	21.9	159.7	0.61	0.74	36.0

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

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

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

# PHASING SUMMARY

 **Site: Heathcote Road and New Illawarra Road 2027 PM**

PM Base + Development Traffic

Signals - Fixed Time Cycle Time = 149 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

**Phase times determined by the program**

**Sequence: Two-Phase**

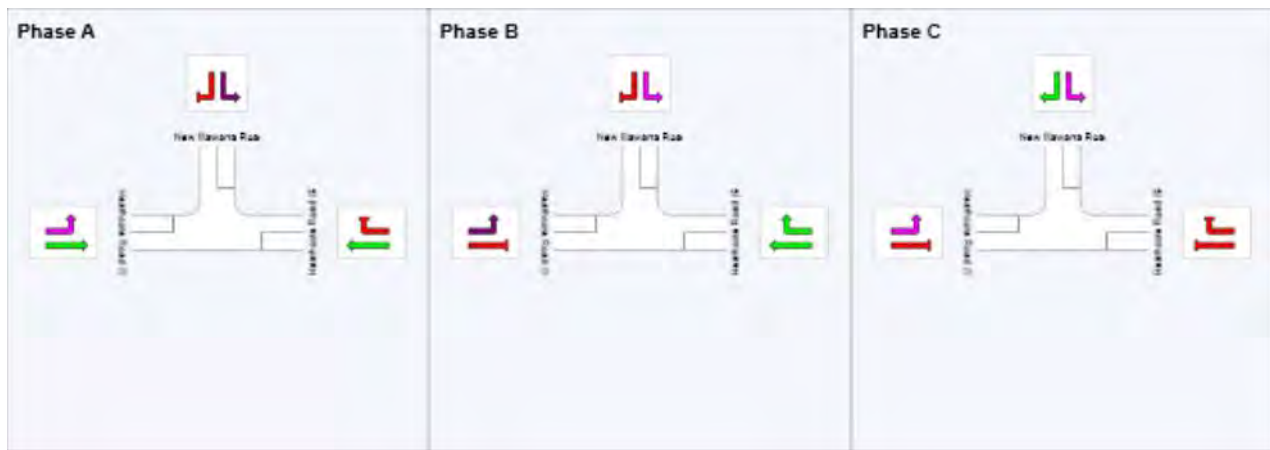
**Movement Class: All Movement Classes**

**Input Sequence: A, B, C**

**Output Sequence: A, B, C**

## Phase Timing Results

Phase	A	B	C
Green Time (sec)	38	30	63
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	44	36	69
Phase Split	30 %	24 %	46 %



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**SIDRA  
INTERSECTION 6**

# MOVEMENT SUMMARY

 **Site: Little Forest Road and New Illawarra Road 2017 AM**

AM Base + Development Traffic  
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total	HV	v/c	sec		Vehicles	Distance	per veh	km/h	
		veh/h	%				veh	m			
South: New Illawarra Road (S)											
1	L2	25	28.0	0.016	10.9	LOS A	0.0	0.0	0.00	0.53	58.9
2	T1	350	2.0	0.182	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		375	3.7	0.182	0.8	NA	0.0	0.0	0.00	0.04	78.1
North: New Illawarra Road (N)											
8	T1	852	2.0	0.443	0.1	LOS A	0.0	0.0	0.00	0.00	79.8
9	R2	41	56.1	0.061	13.9	LOS A	0.2	2.4	0.49	0.69	53.0
Approach		893	4.5	0.443	0.7	NA	0.2	2.4	0.02	0.03	78.3
West: Little Forest Road (RT Stage 1)											
10	L2	34	50.0	0.032	5.9	LOS A	0.0	0.0	0.00	0.40	40.0
12	R2	21	23.8	0.035	7.6	LOS A	0.1	0.9	0.45	0.63	34.7
Approach		55	40.0	0.035	6.6	LOS A	0.1	0.9	0.17	0.49	38.1
SouthWest: Median (RT Stage 2)											
32b	R3	21	23.8	0.021	8.7	LOS A	0.1	0.5	0.47	0.69	38.4
Approach		21	23.8	0.021	8.7	LOS A	0.1	0.5	0.47	0.69	38.4
All Vehicles		1344	6.0	0.443	1.1	NA	0.2	2.4	0.03	0.06	74.1

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

Processed: Tuesday, 24 February 2015 12:38:06

SIDRA INTERSECTION 6.0.14.4193

Project: N:\AU\Sydney\Projects\21\23482\Technical\Traffic and Transport\SIDRA\Run 1\Run 1 Base+Dev Lucas

Heights 70-30 HC.sip6

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**SIDRA**  
**INTERSECTION 6**

# MOVEMENT SUMMARY

 **Site: Little Forest Road and New Illawarra Road 2017 PM**

PM Base + Development Traffic  
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Illawarra Road (S)											
1	L2	25	24.0	0.016	10.9	LOS A	0.0	0.0	0.00	0.55	58.9
2	T1	352	1.7	0.183	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		377	3.2	0.183	0.7	NA	0.0	0.0	0.00	0.04	78.1
North: New Illawarra Road (N)											
8	T1	991	1.5	0.513	0.1	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	18	44.4	0.025	13.5	LOS A	0.1	0.9	0.47	0.66	53.6
Approach		1009	2.3	0.513	0.4	NA	0.1	0.9	0.01	0.01	79.1
West: Little Forest Road (RT Stage 1)											
10	L2	24	25.0	0.020	5.9	LOS A	0.0	0.0	0.00	0.47	40.0
12	R2	32	25.0	0.051	7.4	LOS A	0.2	1.4	0.44	0.63	34.8
Approach		56	25.0	0.051	6.8	LOS A	0.2	1.4	0.25	0.56	37.1
SouthWest: Median (RT Stage 2)											
32b	R3	32	25.0	0.038	9.4	LOS A	0.1	0.9	0.56	0.78	37.9
Approach		32	25.0	0.038	9.4	LOS A	0.1	0.9	0.56	0.78	37.9
All Vehicles		1474	3.9	0.513	0.9	NA	0.2	1.4	0.03	0.06	74.3

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

Processed: Tuesday, 24 February 2015 12:49:15

SIDRA INTERSECTION 6.0.14.4193

Project: N:\AU\Sydney\Projects\21\23482\Technical\Traffic and Transport\SIDRA\Run 1\Run 1 Base+Dev Lucas

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**SIDRA  
INTERSECTION 6**

# MOVEMENT SUMMARY

## Site: Little Forest Road and New Illawarra Road 2027 AM

AM Base + Development Traffic  
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Illawarra Road (S)											
1	L2	30	40.0	0.021	10.9	LOS A	0.0	0.0	0.00	0.48	58.9
2	T1	390	2.1	0.203	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		420	4.8	0.203	0.8	NA	0.0	0.0	0.00	0.03	78.0
North: New Illawarra Road (N)											
8	T1	948	1.9	0.492	0.1	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	43	58.1	0.070	14.5	LOS B	0.3	2.8	0.52	0.72	52.1
Approach		991	4.3	0.492	0.7	NA	0.3	2.8	0.02	0.03	78.3
West: Little Forest Road (RT Stage 1)											
10	L2	36	52.8	0.034	5.9	LOS A	0.0	0.0	0.00	0.40	40.0
12	R2	26	38.5	0.051	8.7	LOS A	0.2	1.5	0.49	0.67	34.1
Approach		62	46.8	0.051	7.1	LOS A	0.2	1.5	0.21	0.51	37.6
SouthWest: Median (RT Stage 2)											
32b	R3	26	38.5	0.032	9.6	LOS A	0.1	0.8	0.56	0.75	37.8
Approach		26	38.5	0.032	9.6	LOS A	0.1	0.8	0.56	0.75	37.8
All Vehicles		1499	6.8	0.492	1.2	NA	0.3	2.8	0.03	0.06	73.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

Processed: Tuesday, 24 February 2015 12:51:23

SIDRA INTERSECTION 6.0.14.4193

Project: N:\AU\Sydney\Projects\21\23482\Technical\Traffic and Transport\SIDRA\Run 1\Run 1 Base+Dev Lucas

Heights 70-30 HC.sip6

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**SIDRA**  
**INTERSECTION 6**



# MOVEMENT SUMMARY

 **Site: Little Forest Road and New Illawarra Road 2027 PM**

PM Base + Development Traffic  
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Illawarra Road (S)											
1	L2	30	36.7	0.020	10.9	LOS A	0.0	0.0	0.00	0.49	58.9
2	T1	343	1.5	0.178	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		373	4.3	0.178	0.9	NA	0.0	0.0	0.00	0.04	77.7
North: New Illawarra Road (N)											
8	T1	1049	1.5	0.543	0.1	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	20	50.0	0.029	13.6	LOS A	0.1	1.1	0.47	0.66	53.4
Approach		1069	2.4	0.543	0.4	NA	0.1	1.1	0.01	0.01	79.1
West: Little Forest Road (RT Stage 1)											
10	L2	26	30.8	0.023	5.9	LOS A	0.0	0.0	0.00	0.45	40.0
12	R2	37	35.1	0.063	7.7	LOS A	0.2	1.9	0.45	0.63	34.7
Approach		63	33.3	0.063	7.0	LOS A	0.2	1.9	0.26	0.56	37.0
SouthWest: Median (RT Stage 2)											
32b	R3	37	35.1	0.052	10.2	LOS A	0.1	1.3	0.61	0.81	37.5
Approach		37	35.1	0.052	10.2	LOS A	0.1	1.3	0.61	0.81	37.5
All Vehicles		1542	4.9	0.543	1.0	NA	0.2	1.9	0.03	0.06	73.8

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

Processed: Tuesday, 24 February 2015 12:53:17

SIDRA INTERSECTION 6.0.14.4193

Project: N:\AU\Sydney\Projects\21\23482\Technical\Traffic and Transport\SIDRA\Run 1\Run 1 Base+Dev Lucas

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**SIDRA  
INTERSECTION 6**

# MOVEMENT SUMMARY

 **Site: Little Forest Road and New Illawarra Road 2017 AM**

AM Base + Development Traffic  
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Prop. Queued	Effective Stop Rate	Average Speed	
		Total	HV	v/c	sec		Vehicles	Distance	per veh	km/h	
		veh/h	%				veh	m			
South: New Illawarra Road (S)											
1	L2	25	28.0	0.016	10.9	LOS A	0.0	0.0	0.00	0.53	58.9
2	T1	1102	2.2	0.573	0.2	LOS A	0.0	0.0	0.00	0.00	79.6
Approach		1127	2.8	0.573	0.4	NA	0.0	0.0	0.00	0.01	79.0
North: New Illawarra Road (N)											
8	T1	852	2.0	0.443	0.1	LOS A	0.0	0.0	0.00	0.00	79.8
9	R2	41	56.1	0.367	50.8	LOS D	1.2	12.5	0.93	1.01	26.7
Approach		893	4.5	0.443	2.4	NA	1.2	12.5	0.04	0.05	74.3
West: Little Forest Road (RT Stage 1)											
10	L2	34	50.0	0.032	5.9	LOS A	0.0	0.0	0.00	0.40	40.0
12	R2	21	23.8	0.188	35.7	LOS C	0.5	4.5	0.91	0.97	23.3
Approach		55	40.0	0.188	17.3	LOS B	0.5	4.5	0.35	0.62	32.3
SouthWest: Median (RT Stage 2)											
32b	R3	21	23.8	0.021	8.7	LOS A	0.1	0.5	0.47	0.69	38.4
Approach		21	23.8	0.021	8.7	LOS A	0.1	0.5	0.47	0.69	38.4
All Vehicles		2096	4.7	0.573	1.8	NA	1.2	12.5	0.03	0.05	73.7

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

Processed: Tuesday, 24 February 2015 13:06:34

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Project: N:\AU\Sydney\Projects\21\23482\Technical\Traffic and Transport\SIDRA\Base+Dev Lucas Heights 70-30

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**SIDRA  
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# MOVEMENT SUMMARY

 **Site: Little Forest Road and New Illawarra Road 2017 PM**

PM Base + Development Traffic  
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Illawarra Road (S)											
1	L2	25	24.0	0.016	10.9	LOS A	0.0	0.0	0.00	0.55	58.9
2	T1	632	2.5	0.329	0.1	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		657	3.3	0.329	0.5	NA	0.0	0.0	0.00	0.02	78.8
North: New Illawarra Road (N)											
8	T1	991	1.5	0.513	0.1	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	18	44.4	0.041	17.3	LOS B	0.1	1.4	0.63	0.82	48.6
Approach		1009	2.3	0.513	0.4	NA	0.1	1.4	0.01	0.01	79.0
West: Little Forest Road (RT Stage 1)											
10	L2	24	25.0	0.020	5.9	LOS A	0.0	0.0	0.00	0.47	40.0
12	R2	32	25.0	0.083	11.6	LOS A	0.3	2.2	0.63	0.81	32.5
Approach		56	25.0	0.083	9.2	LOS A	0.3	2.2	0.36	0.67	35.7
SouthWest: Median (RT Stage 2)											
32b	R3	32	25.0	0.038	9.4	LOS A	0.1	0.9	0.56	0.78	37.9
Approach		32	25.0	0.038	9.4	LOS A	0.1	0.9	0.56	0.78	37.9
All Vehicles		1754	3.8	0.513	0.9	NA	0.3	2.2	0.03	0.05	74.9

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

Processed: Tuesday, 24 February 2015 13:09:07

SIDRA INTERSECTION 6.0.14.4193

Project: N:\AU\Sydney\Projects\21\23482\Technical\Traffic and Transport\SIDRA\Base+Dev Lucas Heights 70-30

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**SIDRA  
INTERSECTION 6**

# MOVEMENT SUMMARY

 **Site: Little Forest Road and New Illawarra Road 2027 AM**

AM Base + Development Traffic  
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Illawarra Road (S)											
1	L2	30	40.0	0.021	10.9	LOS A	0.0	0.0	0.00	0.48	58.9
2	T1	1212	2.1	0.630	0.2	LOS A	0.0	0.0	0.00	0.00	79.5
Approach		1242	3.1	0.630	0.5	NA	0.0	0.0	0.00	0.01	78.9
North: New Illawarra Road (N)											
8	T1	948	1.9	0.492	0.1	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	43	58.1	0.612	94.8	LOS F	2.1	21.7	0.97	1.07	16.8
Approach		991	4.3	0.612	4.2	NA	2.1	21.7	0.04	0.05	70.5
West: Little Forest Road (RT Stage 1)											
10	L2	36	52.8	0.034	5.9	LOS A	0.0	0.0	0.00	0.40	40.0
12	R2	26	38.5	0.453	81.7	LOS F	1.3	12.1	0.97	1.05	15.2
Approach		62	46.8	0.453	37.7	LOS C	1.3	12.1	0.41	0.67	24.9
SouthWest: Median (RT Stage 2)											
32b	R3	26	38.5	0.032	9.6	LOS A	0.1	0.8	0.56	0.75	37.8
Approach		26	38.5	0.032	9.6	LOS A	0.1	0.8	0.56	0.75	37.8
All Vehicles		2321	5.2	0.630	3.2	NA	2.1	21.7	0.04	0.05	70.7

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

Processed: Tuesday, 24 February 2015 13:11:09

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# MOVEMENT SUMMARY

 **Site: Little Forest Road and New Illawarra Road 2027 PM**

PM Base + Development Traffic  
 Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: New Illawarra Road (S)											
1	L2	30	36.7	0.020	10.9	LOS A	0.0	0.0	0.00	0.49	58.9
2	T1	647	2.5	0.337	0.1	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		677	4.0	0.337	0.5	NA	0.0	0.0	0.00	0.02	78.6
North: New Illawarra Road (N)											
8	T1	1049	1.5	0.543	0.1	LOS A	0.0	0.0	0.00	0.00	79.7
9	R2	20	50.0	0.049	18.1	LOS B	0.2	1.7	0.66	0.85	47.6
Approach		1069	2.4	0.543	0.5	NA	0.2	1.7	0.01	0.02	78.9
West: Little Forest Road (RT Stage 1)											
10	L2	26	30.8	0.023	5.9	LOS A	0.0	0.0	0.00	0.45	40.0
12	R2	37	35.1	0.109	13.0	LOS A	0.3	3.1	0.67	0.83	31.8
Approach		63	33.3	0.109	10.1	LOS A	0.3	3.1	0.39	0.67	35.1
SouthWest: Median (RT Stage 2)											
32b	R3	37	35.1	0.052	10.2	LOS A	0.1	1.3	0.61	0.81	37.5
Approach		37	35.1	0.052	10.2	LOS A	0.1	1.3	0.61	0.81	37.5
All Vehicles		1846	4.7	0.543	1.0	NA	0.3	3.1	0.03	0.06	74.4

Level of Service (LOS) Method: Delay (RTA NSW).

Vehicle movement LOS values are based on average delay per movement

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

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

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

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

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

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GHD

133 Castlereagh St Sydney NSW 2000

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T: +61 2 9239 7100 F: +61 2 9239 7199 E: sydmail@ghd.com.au

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		Name	Signature	Name	Signature	Date
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