Educations

NSW Department of Education

North Kellyville New Primary School Development

Final Traffic Impact Assessment

August 2017

Table of contents

Table index

Figure index

Appendices

This report: has been prepared by GHD for the Department of Education and may only be used and relied on by the Department of Education for the purpose agreed between GHD and the Department of Education

GHD otherwise disclaims responsibility to any person other than the Department of Education 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 in this report, GHD disclaims liability arising from any of the assumptions being incorrect.

1. Introduction

1.1 Overview

GHD has been engaged by the NSW Department of Education to undertake a Traffic Impact Assessment (TIA) in support of a Development Application for the construction of the Kellyville North New Primary School.

Information included in the Environmental Impact Assessment for North Kellyville indicates that the school will consist of:

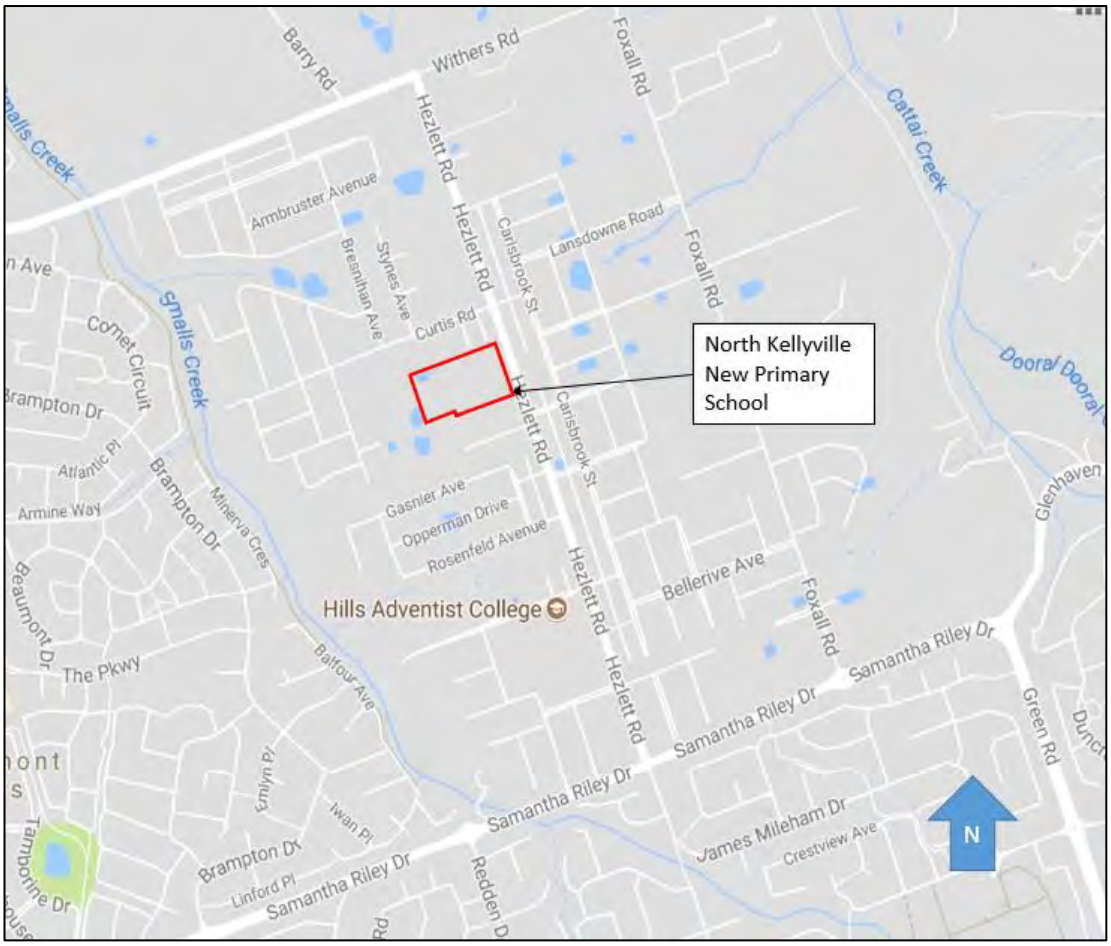
- A new two storey building which will house an "innovative learning precinct" comprising of workrooms, learning zones and ancillary areas such as resource rooms, performance rooms, storage rooms and staff rooms.
- Sports facilities including a soccer field and netball/basketball courts.
- Playgrounds and a covered outdoor learning area (COLA) within a central courtyard.

The proposed school is expected to have a population of 1,000 students and 40 teachers.

1.2 Site Location

The proposed Kellyville North New Primary School is located at 120 Hezlett Road, approximately 150 m south-west of the intersection of Hezlett Road / Curtis Road / Camrose Street, as displayed below in Figure 1-1.

Figure 1-1 – Subject Site Location



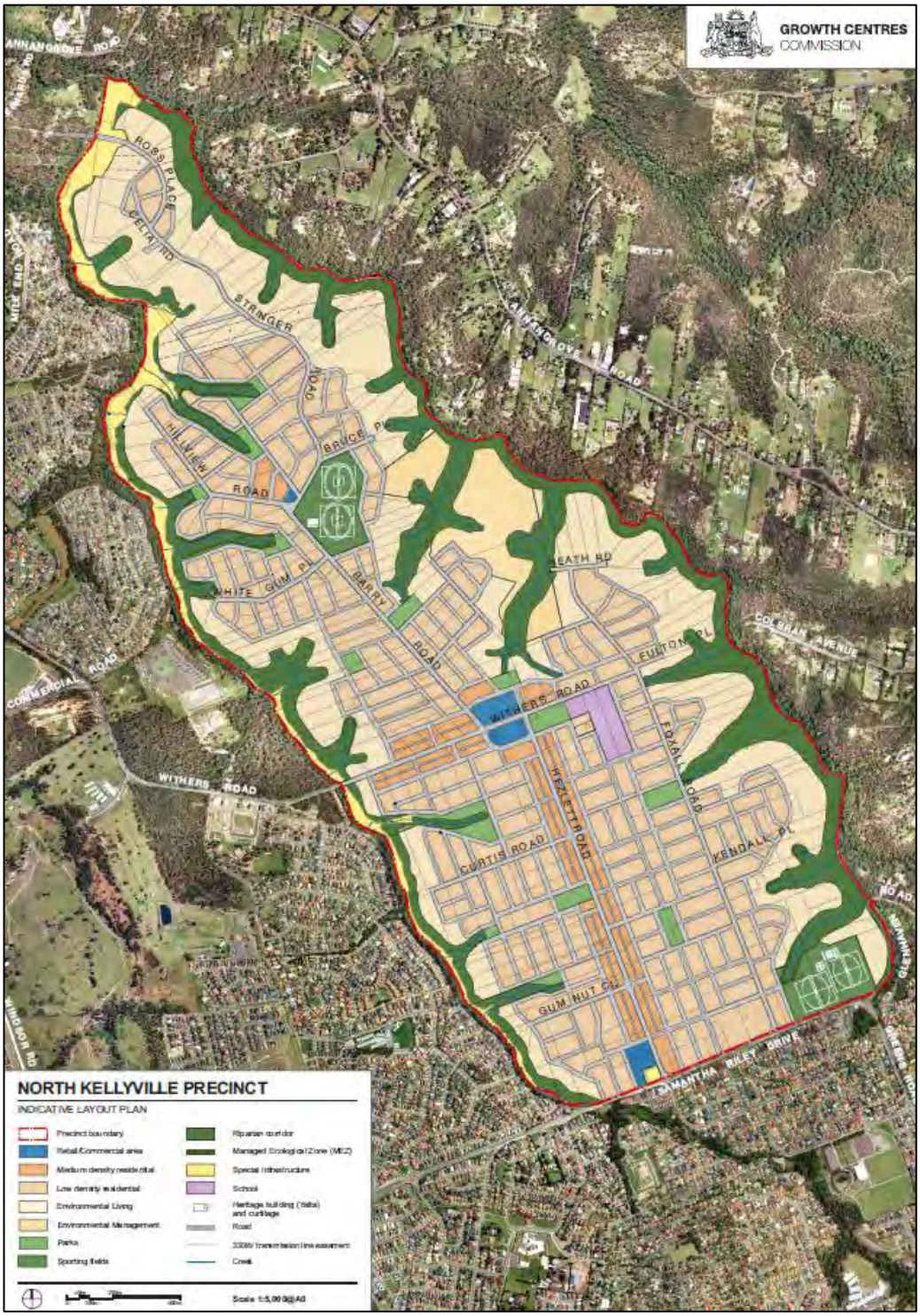
The subject site was previously referred to as 56 – 58 Hezlett Road but has been changed to 120 Hezlett Road due to amendments to the planning controls which included the rezoning of the adjoining land to low density residential.

Hills Adventist College (which provided classes from kindergarten to year 12) is located on Hezlett Road south of the Kellyville North New Primary School subject site.

1.2.1 North Kellyville Precinct Plan

The proposed Kellyville North New Primary School is located in the North West Growth Corridor of Sydney and part of the North Kellyville Precinct Plan. Jackson Teece was engaged by the Department of Planning NSW (DoP) to undertake the planning for North Kellyville with an indicative layout of the precinct displayed in Figure 1-2.

Figure 1-2 – North Kellyville Precinct Plan



The plan shows the indicative layout for residential housing highlighted in brown, commercial and town centres highlighted in blue and the school location highlighted in purple. The New Primary School was originally intended to be located south of Withers Road but has been relocated to Hezlett Road (as displayed in Figure 1-1).

As specified in the North Kellyville Growth Centre Precinct Development Control Plan DCP), the precinct is targeted to provide 4,500 new dwellings.

The proposed school is intended to accommodate the expected increases in the nearby population associated with the expected increases in population.

1.3 Study Assumptions and Limitations

The study has been limited by the following:

- Intersection modelling using SIDRA 7 was undertaken for the intersection of Hezlett Road and Curtis Road.
- A traffic count survey was undertaken on Hezlett Road / Curtis Road for Tuesday 18th July 2017 in the critical AM peak between 8:00 am – 9:00 am, and on Wednesday 19th July 2017 in the critical PM peak between 3:00 pm – 4:00 pm
- As the subject site is a proposed new development, traffic generation estimates for the proposal are based on mode of travel surveys conducted at Beaumont Hills Public School during school zone times, located approximately 1 km south-west of the subject site.

The following assumptions were made as part of this study:

- Background traffic growth rate of one and a half percent per year.
- Traffic generation assumptions for the proposal is based on survey information from manual travel mode surveys and questionnaire surveys conducted at Beaumont Hills Public School.
- Assumptions with respect to traffic distribution have been based on indicative traffic movement estimates given the underdeveloped site location

1.4 Study Scope

This Traffic Impact Assessment (TIA) discusses the following:

- Existing Conditions – a review of existing road and transport conditions, adjacent developments, traffic volumes and crash data.
- Trip Generation – an assessment of the trip generation characteristics of the proposed school expansion.
- Development Impacts – an assessment of the performance of the existing intersections (delays, and level of service) following the development of the proposed school expansion.
- Construction – A high-level assessment recommendation of construction traffic management activities.

1.5 Secretary's Environmental Assessment Requirements

The DoP issued Secretary's Environmental Assessment Requirements (SEARs) for Kellyville North New Primary School were issued on 11th April 2017. The comments relating to traffic and transport are listed in Table 1-1.

Table 1-1 – SEARs Comments

Comment	Response
Accurate details of the current daily and peak hour vehicle, public transport, pedestrian and cycle movement and existing traffic and transport facilities provided on the road network located adjacent to the proposed development.	The peak hour trip generation for Kellyville North New Primary School has been assessed in accordance with the current operation of the nearby Beaumont Public School and the expected student population.

Comment	Response
An assessment of the operation of existing and future transport networks including the bus network and their ability to accommodate the forecast number of trips to and from the development.	The Kellyville Station will be located at the corner of Old Windsor Road and Samantha Riley Drive, east of the current Riley T-way Station and car park. Under this project, a new transport interchange will be built in Kellyville Station which will include bus, taxi, cycle and “kiss and ride” facilities. It is assumed that bus routes that operate as “feeder services” to the Kellyville Station will be implemented, however details of future bus services are not currently available. Details about potential school bus services at North Kellyville Public Services are not currently available. The Hills Adventist College is served by three morning services and four afternoon services and there are potential efficiencies in extending these services to Kellyville North New Primary School. Data from surveys at Beaumont Hills Public School indicates that 5 percent – 14 percent of students take the bus to/from school. This data indicates that 50 – 140 students at Kellyville North New Primary School will use the bus.
Details of estimated total daily and peak hour trips generated by the proposal, including vehicle, public transport, pedestrian and bicycle trips.	The trip generation for North Kellyville New Primary School has been undertaken on a first principles basis accounting for: • The proposed student populations. • The modes of transport currently used by the students at the nearby Beaumont Public School. The proposed school fully occupied it is expected to generate: • 756 inbound and 756 outbound vehicle trips in the AM peak period (8:00 am – 9:30 am); and • 620 inbound and 620 outbound vehicle trips in the PM peak period (2:30 pm – 4:00 pm). During the weekday AM and PM peak hours, the development is expected to generate:

Comment	Response
	• 711 inbound and 711 outbound vehicle trips in the AM peak hour (8:00 am – 9:00 am) • 472 inbound and 472 outbound vehicle trips in PM peak hour (3:00 pm – 4:00 pm). However, the school is expected to open with approximately 300 students, which are expected to generate: • 213 inbound and 213 outbound vehicle trips in the AM peak hour (8:00 am – 9:00 am). • 142 inbound and 142 outbound vehicle trips in PM peak hour (3:00 pm – 4:00 pm).
The adequacy of public transport, pedestrian and bicycle networks and infrastructure to meet the likely future demand of the proposed development	Currently, the public transport services in proximity to the school consist of the 603 / 615X buses. The provision of Sydney Metro Northwest and Kellyville Station will improve public transport access to the North Kellyville Growth Centre. The North Kellyville Growth Centre DCP indicates improved bus services in proximity to the school (see Figure 2-15). Currently, there are limited active transport facilities in proximity to the school subject site. The road hierarchy data in the DCP indicates that pedestrian and bicycle paths will be constructed in proximity to the school. Based on discussions with Council these will be constructed prior to the opening of the school. The locations of the proposed public transport services are displayed in Figure 2-15 and the active transport network in Figure 2-17.
	As discussed and agreed with Council intersection analysis has been undertaken at the intersection of Hezlett Road / Curtis Road / Camrose Street. The intersection is currently priority controlled but will be converted into a roundabout by 2018.

Comment	Response
	For the purpose of the assessment, it has been assumed that the roundabout will operate with dual circulation lanes (see Figure 4-2) Based on an annual growth rate of 1.5 percent, the SIDRA analysis indicates that the proposed roundabout is expected to operate with spare capacity in the future horizon year 2030 and at an acceptable LoS A during both the AM and PM peak periods following the development of the proposed school. Scenario testing using a five percent annual growth rate indicates that the intersection is expected to continue to operate with a good LoS.
Details of any upgrading or road improvement works required to accommodate the proposed development;	A number of road upgrades are proposed in proximity to the school, including: - Hezlett Road will be widened in accordance with DCP specifications - The intersection of Samantha Riley will be signalised - A new four-way signalised junction at the intersection of Barry Road and Withers Road will provide the main access/egress from Hezlett Road. - A roundabout will be constructed at the intersection of Hezlett Road / Curtis Road. Based on discussions with Council analysis of the operation of the key intersections on Hezlett Road (with the exception of Hezlett Road / Curtis Road) has been undertaken as part of a separate study and thus have been excluded from this assessment.
The preparation of a Green Travel Plan that outlines proposals to encourage sustainable travel choices and details programs for implementation;	Green Travel Plans (GTP) are particularly important in a schools context as schools are often located in residential areas where surrounding residents are negatively impacted by the significant peaks of traffic at school pick-up and drop-off times. Furthermore, there has been a trend towards increasing the size of schools, which puts pressure on the space at schools. On-site car parking is often a luxury which schools

Comment	Response
	cannot afford to apportion limited land resources. A preliminary GTP for North Kellyville New Primary School is included in Appendix F.
The impact of trips generated by the development on nearby intersections, with consideration of the cumulative impacts from other approved developments in the vicinity, and the need/associated funding for upgrading or road improvement works, if required (note: traffic modelling is to be undertaken with scope to be agreed by TfNSW and RMS in advance);	As discussed and agreed with Council SIDRA analysis has been undertaken for the intersection of Hezlett Road and Curtis Road. Analysis has been undertaken for the 2020 and 2030 horizon years. An annual growth rate of one and a half percent (as agreed with council) has been applied to the existing traffic volumes to identify the background horizon year traffic volumes. Additionally, scenario testing using an annual growth rate of five percent has been undertaken. SIDRA analysis indicates that the intersection of interest is expected to operate with a good LoS up to the 2030 horizon year for both scenarios.
The proposed active transport access arrangements and connections to public transport services	There is limited active transport facilities in proximity to the school subject site. It is assumed that suitable active transport facilities will be constructed in proximity to the school in accordance with DCP specifications. A small number of bus services currently operate on Hezlett Road and it is assumed that additional services will be provided as the precinct is developed. The locations of the proposed public transport services are displayed in Figure 2-15 and the active transport network in Figure 2-17.
Details of any proposed school bus routes along bus capable roads (i.e. travel lanes of 3.5 m minimum) and infrastructure (bus stops, bus layovers etc.);	It is assumed that school buses will serve the proposed Kellyville North New Primary School. The DCP indicates that the Hezlett Road will be designated as a “Town Centre Road” which can accommodate public transport services.

Comment	Response
	The proposed Hezlett Road Layout from the DCP (Figure 2-11) indicates that it will be constructed with minimum widths of 3.5m.
The proposed access arrangements, including car and bus pick up/drop off facilities, and measures to mitigate any associated traffic impacts and impacts on public transport, pedestrian and bicycle networks, including pedestrian crossings and refuges and speed control devices and zones.	The proposed access arrangements for Kellyville North New Primary School, are as follows: - The main pedestrian access will be provided from Hezlett Road, with a secondary pedestrian access provided to the west of the school (south of the basketball court) - Access to the car park is provided from Hezlett Road. - The pick up and drop off facilities will be provided on Hezlett Road - A service vehicle entry will be provided at the north of the site via Thorogood Boulevard. - Emergency vehicle access will be provided via Thorogood Boulevard. It is proposed that a pedestrian crossing facility be provided at the front of the school on Hezlett Road to facilitate the safety of students. It is assumed that a 40 km/h school zone will be provided on Hezlett Road. At the year of opening (2019) it is proposed to provide 25 bicycle racks at the school in accordance with the EFSG specifications.
Measures to maintain road and personal safety in line with CPTED principles.	A detailed master plan of Kellyville North New Primary School is not currently available, however it is assumed it will be designed/constructed in accordance with CPTED Principles.
The proposed car and bicycle parking provision, including end of trip facilities, which must be taken into consideration of the availability of public transport and the requirements of Council's relevant parking codes and Australian Standards;	A detailed master plan of Kellyville North New Primary School is not currently available. In accordance with the North Kellyville DCP specifications, 300 students require parking for 60 bikes. Assuming that an Australian Standard Bicycle Rack can accommodate two bikes simultaneously, a total of 30 bike racks are required.

Comment	Response
	The DoE *Educational Facilities Standards and Guidelines (EFSG)* specifies the following parking specifications for schools: *Generally allow 1 bicycle storage position for every 20 students.* Based upon a population of 1,000 students this equates to the provision of 50 racks (which could accommodate 100 bikes). It is understood that the DOE have reduced the *EFSG* requirement by 50% to allow provision for the initial provision of 25 bicycle racks (for 50 bikes). At the year of opening (2019) it is proposed to provide 25 bicycle racks at the school in accordance with the *EFSG* specifications. Additional racks can be provided at the school to comply with the DCP (if required) as demand increases in accordance with the growing student population. All bicycle parking will be constructed to comply with AS2890.3:2015 Part 3: Bicycle parking.
Proposed bicycle parking facilities in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance.	See above comment.
Details of the proposed number of car parking spaces and compliance with appropriate parking codes and justify the level of car parking provided on-site.	It is currently proposed to provide 12 time restricted parking spaces on site that will operate as teacher drop off facilities and accommodate the parking needs of special education students. In addition to the onsite parking bays, the DoE has allocated space adjacent to the west of the school as “community parking” which is expected to accommodate up to 45 vehicles. There is also proposed to be community parking on the west side of the football pitch (located to the south of the school) which is expected to accommodate up to 30 vehicles. It is understood that these community parking spaces will be available to the general public including the teaching staff of the North Kellyville New Primary School. The Sydney Metro Northwest will improve public transport access to the school.

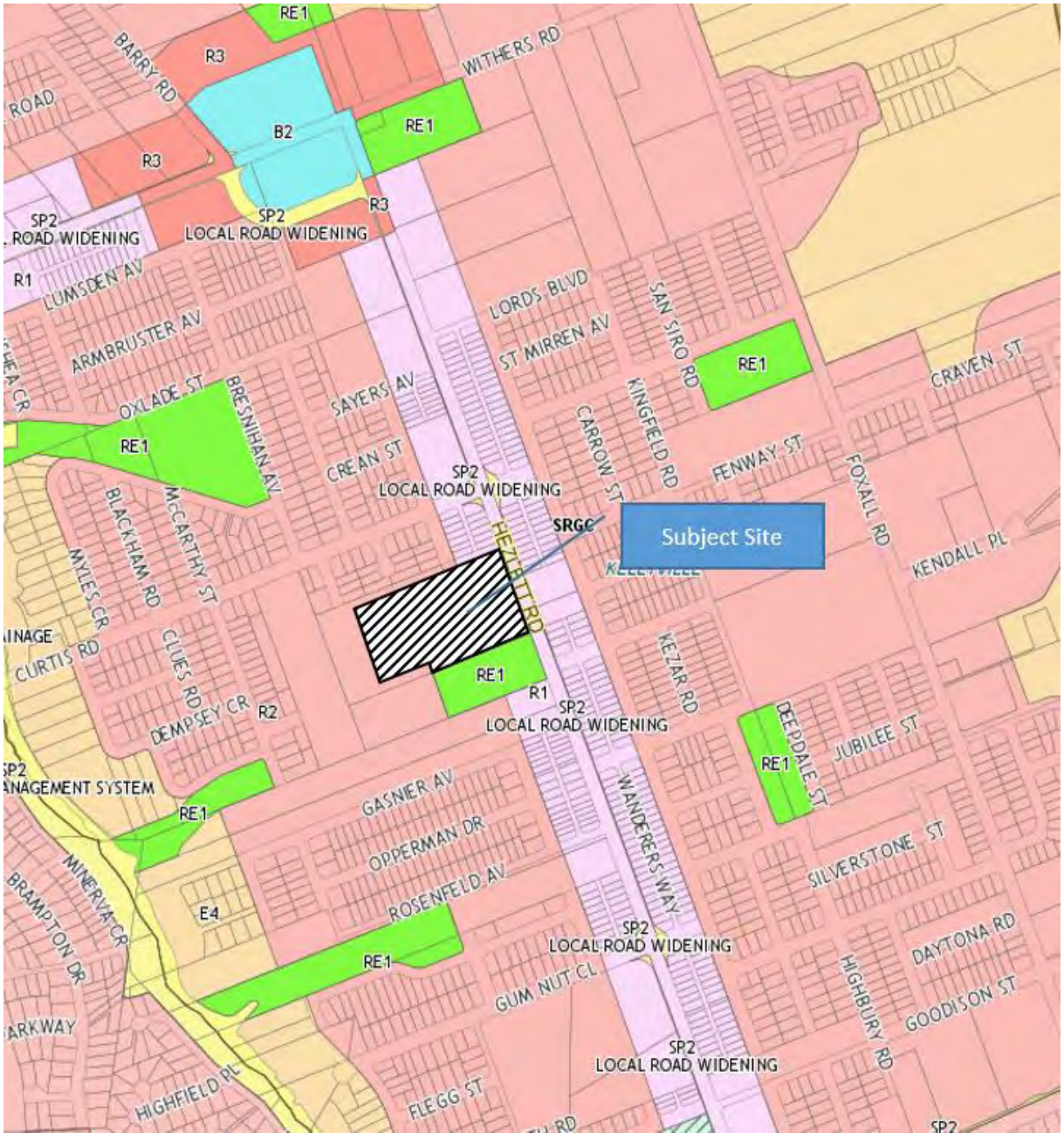
Comment	Response
	Further, it is assumed that some teachers will live within walking / cycling distance from the school. Thus the proposed parking provision is considered to be acceptable. It is assumed the car parks will be designed and constructed in accordance with Australian Standards.
Details of emergency vehicle access arrangements.	Vehicle access to the site will be provided from Hezlett Road and Thorogood Boulevard. Details of the proposed emergency vehicle access arrangements are not currently available.
An assessment of road and pedestrian safety adjacent to the proposed development and the details of required road safety measures,	There were five crashes recorded on Hezlett Road within proximity to the proposed school in the last five years. A 40 km/h school zone and a pedestrian crossing adjacent to the school entrance are proposed to be provided on Hezlett Road to facilitate the safety of students and other road users.
Service vehicle access, delivery and loading arrangements and estimated service vehicle movements (including vehicle type and the likely arrival and departure times);	Service vehicle access is proposed from Thorogood Boulevard. Details of the type and frequency of vehicles expected to access/egress the school are not currently available. However, it is assumed it will occur outside of peak school activity. Upon completion of the school master plan a swept path analysis will be undertaken to ensure the design service vehicle can enter the school, manoeuvre internally and exit in a forward direction.

2. Existing Conditions

2.1 Land Uses

The existing land uses in the vicinity of to the school site predominantly consists of low-density residences. A significant portion of the surrounding area is currently undeveloped but is intended to be developed in accordance with the North Kellyville Growth Precincts SCP and The Hills Shire Council Local Environmental Plan (LEP) 2012 which is displayed in Figure 2-1.

Figure 2-1 – Land Zoning in Proximity to the Kellyville North New Primary School



Source: The Hills Shire Council Local Environmental Plan (2012)

The LEP zones the majority of the land in proximity to Kellyville North New Primary School as R2 – Low Density Residential, which is consistent with the provision of an additional 4,500 dwellings.

The land located directly to the south of Kellyville North New Primary School is zoned as RE1 – Public Recreation Zone. This area is proposed to be occupied by a football pitch.

The development of the North Kellyville Precinct includes the conversion of Hezlett Road and Withers Road (west of its intersection with Hezlett Road) into a sub-arterial roads. Therefore these roads are zoned as SP2 – Special Purpose Infrastructure Zone.

As specified in the DCP, it is proposed that the North Kellyville Local Centre be developed along Withers Roads, between Barry Road and Hezlett Road, which is approximately 750 m north of the school subject site. The centre is zoned as B2 – Local Centre and is proposed to be a hub with a focus on retail and community.

The North Kellyville Square Shopping Centre (which includes a Woolworths and variety of specialist retail and commercial services) recently opened in the North Kellyville Local Centre.

Additionally, the Hezlett Neighbourhood Centre (located at the intersection with Samantha Riley Drive) is proposed to provide a maximum of 3,000 m2 GFA of retail, commercial and mixed use development.

The North Village, which is proposed to provide 209 apartments with ground floor retail is currently under construction in the Hezlett Neighbourhood Centre.

Figure 2-2 – Hezlett Neighbourhood Centre Construction Works

2.2 .Existing Road Network Characteristics

2.2.1 Road Hierarchy

Roads within NSW are categorised in the following two ways:

- By Classification (ownership)
- By the function that they perform.

Road Classification

Roads are classified (as defined by the Roads Act 1993) based on their importance to the movement of people and goods within NSW (as a primary means of communication).

The classification of a road allows Roads and Maritime Services (Roads and Maritime) to exercise authority of all or part of the road. Classified roads include Main Roads, State Highways, Tourist Roads, Secondary Roads, Tollways, Freeways and Transitways.

For management purposes, Roads and Maritime has three administrative classes of roads. These are:

- **State Roads –** Major arterial links through NSW and within major urban areas. They are the principle traffic carrying roads and fully controlled by Roads and Maritime with maintenance fully funded by Roads and Maritime. State Roads include all Tollways, Freeways and Transitways; and all or part of a Main Road, Tourist Road or State Highway.
- **Regional Roads** – Roads of secondary importance between State Roads and Local Roads which, with State Roads provide the main connections to and between smaller towns and perform a sub arterial function in major urban areas. Regional roads are the responsibility of councils for maintenance funding, though Roads and Maritime funds some maintenance based on traffic and infrastructure. Traffic management on Regional Roads is controlled under the delegations to local government from Roads and Maritime. Regional Roads may or all part of all or part of a Main Road, Secondary Road, Tourist Road or State Highway; or other roads as determined by Roads and Maritime.
- **Local Roads** – The remainder of the council controlled roads. Local Roads are the responsibility of councils for maintenance funding. Roads and Maritime may fund some maintenance and improvements based on specific programs (e.g. urban bus routes, road safety programs). Traffic management on Local Roads is controlled under the delegations to local government from Roads and Maritime.

Functional Hierarchy

Functional road classification involves the relative balance of the mobility and access functions. Roads and Maritime 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** – generally controlled by Roads and Maritime, typically no limit in flow and designed to carry vehicles long distance between regional centres.
- **Sub-Arterial Roads** – can be managed by either Roads and Maritime or local council. 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 roads 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.

A summary of the key roads in proximity to the subject site is provided below.

2.2.2 Samantha Riley Drive

Samantha Riley Drive Street is a 3.7 km (approximately) sub-arterial road located in that connects Kellyville (in the east) and Stanhope Gardens (in the west).

Samantha Riley Drive is a key route that provides access to numerous commercial, industrial and residential areas whilst also providing a link between the state roads of Windsor Road and Old Windsor Road.

In proximity to the subject site Samantha Riley Drive has the following characteristics:

- A two lane - two way road, with the provision of turning lanes and roundabouts at key intersections.
- Currently, no dedicated pedestrian facilities are provided along Samantha Riley Drive.
- A sealed undivided carriageway with a width of approximately 9 metres.
- A sign posted speed limit of 60 km/h.

Figure 2-3 – Samantha Riley Drive at Hezlett Road (facing east)

Source: GHD

Figure 2-4 - Samantha Riley Drive at Hezlett Road (facing west)

Source: GHD

As part of the Hills Shire Council's initiative to meet the forecasted growth demands within the North Kellyville Precinct due to the construction of the Sydney Metro Link Stage 1 (formerly known as North West Rail Link), works are underway to upgrade and widen Samantha Riley Drive to a four-lane carriageway. Therefore, temporary roundabouts have been installed on Samantha Riley Drive at its intersections with Redden Drive, Hezlett Road and Foxall Road.

Samantha Riley Drive intersects Hezlett Road at an unsignalised roundabout, with no provision of pedestrian crossing facilities.

2.2.3 Hezlett Road

Hezlett Road is a 1.7 km (approximately) collector road located in the upper north west of Sydney. The road links Kellyville (in the south) with Rouse Hill (in the north). Hezlett Road will provide an access route to Kellyville North New Primary School whilst also serving as a

connection to a small number of low density residential dwellings and the nearby retail and commercial developments.

In proximity to the subject site, Hezlett Road has the following characteristics:

- A two lane - two way collector road, with the provision of turning lanes at key intersections.
- Currently, no dedicated pedestrian facilities are provided along Hezlett Road.
- A sealed undivided carriageway with a width of approximately 9 metres.
- A sign posted speed limit of 60 km/h, with 40 km/h zone on school days (8:00 am - 9:30 am and 2:30 pm – 4:00 pm) in proximity to the Hills Adventist College.

Figure 2-5 – Hezlett Road at Samantha Riley Drive (facing north)

Source: GHD

Figure 2-6 – Hezlett Road at Samantha Riley Drive (facing south)

Source: GHD

2.2.4 Curtis Road

Curtis Road is a local road with an east-west alignment adjacent to the north of the proposed. Curtis Road provides access to a small number of residential dwellings and also acts a potential secondary access to Kellyville North New Primary School via its extension to Hipwell Avenue (subject to Council approval).

Curtis Road has the following characteristics:

- A single travel lane and parking lane in either direction.
- An 11 m wide carriageway.

- Newly constructed pedestrian footpaths on both sides of the road to facilitate pedestrian mobility.
- The default speed limit for local urban roads of 50 km/h applies.

Figure 2-7 – Curtis Road at Hezlett Street (facing west)

Source: GHD

Figure 2-8 – Curtis Road at Hezlett Street (facing east)

Source: GHD

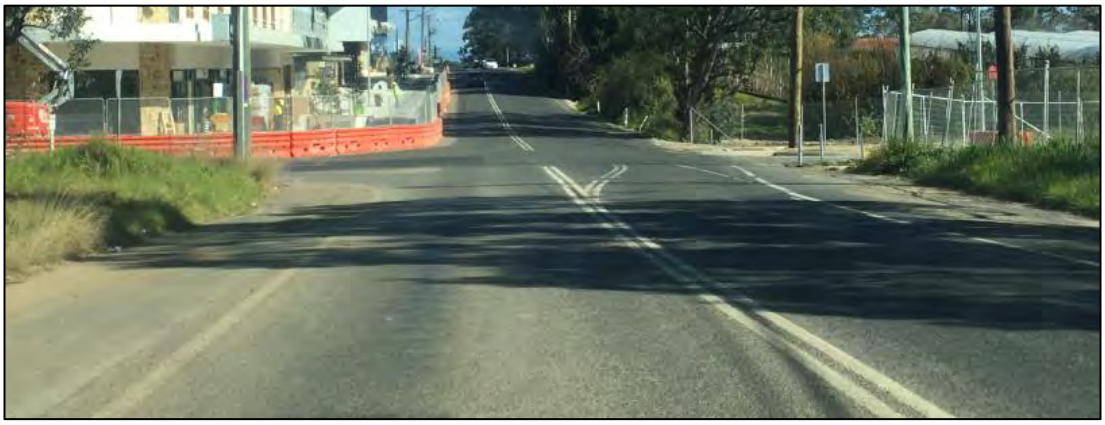
2.2.5 Withers Road

Withers Road is a collector road with an east-west alignment approximately 650 m to the north of the school subject site. Withers Road provides access to residential land uses and the North Kellyville Local Centre.

In proximity to the subject site Withers Road has the following characteristics:

- A single travel lane in either direction.
- An 8 m wide carriageway.
- No dedicated pedestrian facilities are currently provided along Withers Road.
- A sign posted speed limit of 60 km/h.

Figure 2-9 – Withers Road at Hezlett Road (facing west)



Source: GHD

Figure 2-10 – Withers Road at Hezlett Road (facing east)

Source: GHD

2.3 Proposed Road Upgrades

The DCP designates Hezlett Road and parts of Withers Road as “Town Centre Streets”, which are intended to provide:

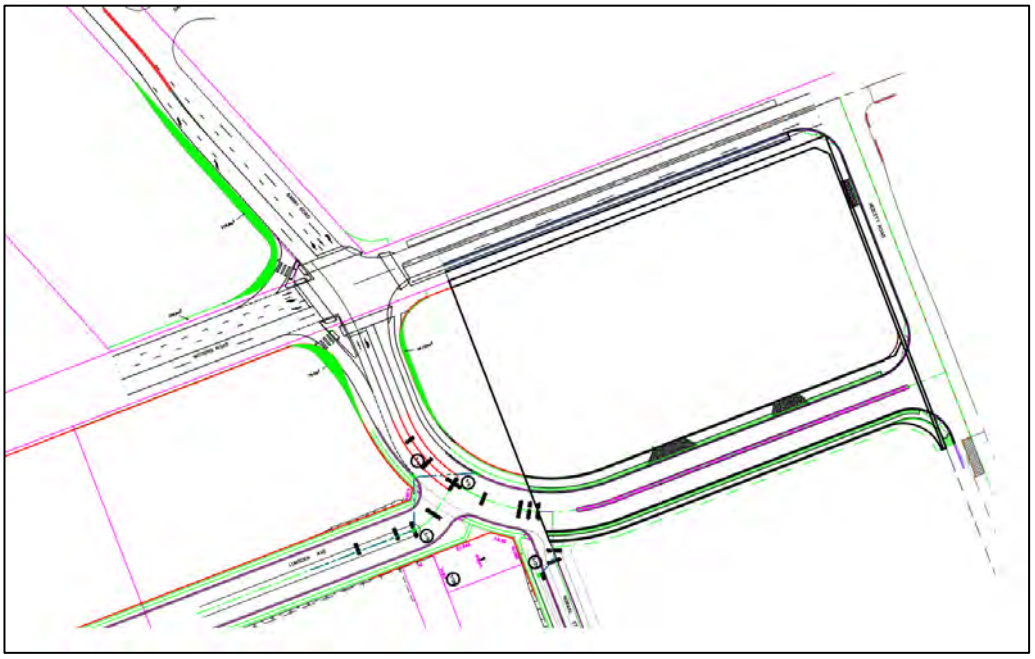
- Wide shaded footpaths.
- Traffic calmed street and crossing points.
- The provision for public transport routes.
- On-street parking on both sides of the street.

Figure 2-11 – Proposed Layout of Hezlett Street

Based upon discussions with Council it is understood that the following road works will be completed in the next 2 years (prior to the opening of the school):

- Hezlett Road will be widened in accordance with DCP specifications.
- The intersection of Samantha Riley will be signalised (the Traffic Control Signal drawing for this intersection was prepared by Roads and Maritime in November 2015).
- A new four-way signalised junction at the intersection of Barry Road and Withers Road will provide the main access/egress from Hezlett Road.

Figure 2-12 – Proposed Barry Road / Withers Road Traffic Signals

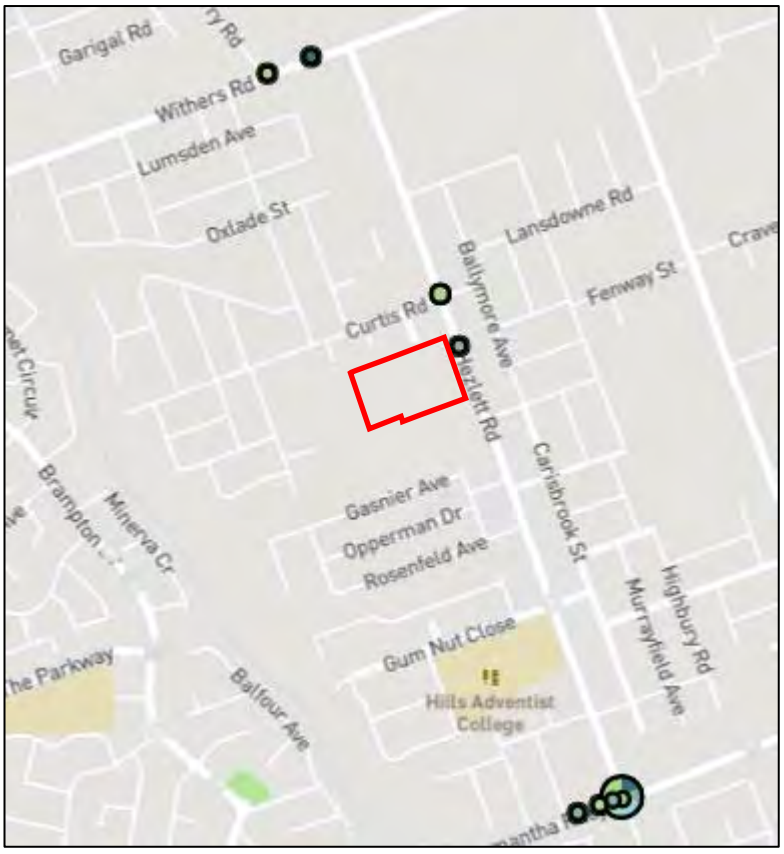


Based on discussions with Council analysis of the operation of the key intersections on Hezlett Road (including Samantha Riley Drive and Withers Road) has been undertaken as part of a separate study and are not considered further in this document.

2.4 Crash Data Review

Crash data was obtained from the Centre for Road Safety (for a four-year period between 2012 and 2015, with data for 2016 yet to be finalised) for roads in the vicinity of the Kellyville North New Primary School. The location of the recorded crashes are shown in Figure 2-13.

Figure 2-13 – Crash Locations near Kellyville North New Primary School



Source: http://roadsafety.transport.nsw.gov.au/statistics/interactivecrashstats/lga_stats.html?tablga=1

A review of the crash data is provided below.

There were five crashes recorded on Hezlett Road within proximity to the proposed school:

- Two of the crashes involved cross traffic collisions with vehicles travelling in perpendicular directions colliding at an intersection - no injuries were reported.
- One of the crashes involved a two vehicle collision where a vehicle travelling on a minor road collided with a vehicle turning right on the major road– no injuries were reported.
- One of the crashes was a result of a vehicle colliding with another vehicle in the same direction – no injuries were reported.
- One of the crashes involved a rear end collision between two vehicles whereby a vehicle turning right from the major road was struck by another vehicle travelling in the same direction – one person suffered a moderate injury.

There were two crashes recorded in proximity to the intersection of Withers Road and Hezlett Road.

- One crash was a result of a vehicle travelling straight and deviating off the carriageway to the left and hitting an object, one person was seriously injured.
- One of the crashes involved a rear end collision between two vehicles whereby a vehicle turning right from the major road was struck by another vehicle travelling in the same direction – no injuries were reported.

There were 21 crashes recorded in proximity to the intersection of Samantha Riley Drive and Hezlett Road.

- 10 of the crashes resulted in no injuries with:
  - Three crashes involved vehicles turning right at the intersection and being struck by a vehicle travelling in the opposite direction
  - Three crashes involved rear end collisions
  - One crash involved a cross traffic collision, where a vehicle travelling on the minor road collided with a vehicle turning right on the major road.
  - One crash involved a head on collision between two vehicles
  - One crash was between a vehicle turning right and being struck on the right by another vehicle.
  - One crash was a result of a vehicle being struck by another vehicle travelling in the adjacent direction.
- Four crashes resulted in four minor injuries:
  - Two crashes involved vehicles turning right at the intersection and being struck by a vehicle travelling in the opposite direction – two people were injured.
  - One crash was a rear end collision between - one person was injured.
  - One crash was a result of a vehicle travelling straight on the major road and deviating off the road – one person was injured.
- Four crashes resulted in six moderate injuries:
  - One crash was a cross traffic collision, where a vehicle travelling on the minor road collided with a vehicle turning right on the major road – three people were injured
  - One crash involved vehicles turning right at the intersection and being struck by a vehicle travelling in the opposite direction – one person was injured.
  - Two crashes involved rear end collisions – two people were injured.
- Three crashes resulted in four serious injuries:
  - One crash involved vehicles turning right at the intersection and being struck by a vehicle travelling in the opposite direction – two people were injured.
  - One crash was a cross traffic collision, where a vehicle travelling on the minor road collided with a vehicle on the major road – one person was injured.
  - One crash was a result of a collision due to a parked vehicle runaway into an object – one person was injured.

A summary of the crash data review, reveals the following information:

- None of the crashes recorded involved pedestrians or bicycle riders.
- None of the crashes resulted in a fatality.
- Four of the crashes resulted in five serious injuries.
- Five of the crashes resulted in seven moderate injuries.
- Four of the crashes resulted in four minor injuries.

2.5 Public Transport

2.5.1 Train Services

Currently, the North-Western region of Sydney, in which Kellyville North New Primary School is proposed to be located, is not serviced by train services.

However, as part of State Government's initiative to expand public transport services to Western Sydney, an $8.3 billion North West Rail Link is under construction and will open in the first half

of 2019 as Stage 1 of the Sydney Metro Northwest Project. The metro includes 23 kilometres of line and 8 new stations. It is proposed to operate as a “turn up and go” service with a peak frequency of 12 services per hour per direction. The travel time between Kellyville Station and Wynyard Station is expected to be 53 minutes.

The operation of the Sydney Metro Northwest is expected to change how people living and working in Western Sydney travel.

The Kellyville Station will be located at the corner of Old Windsor Road and Samantha Riley Drive, east of the current Riley T-way Station and car park. Under this project, a new transport interchange will be built in Kellyville Station which will include bus, taxi, cycle and “kiss and ride” facilities.

It is assumed that bus routes that operate as “feeder services” to the Kellyville Station will be implemented, however details of future bus services are not currently available.

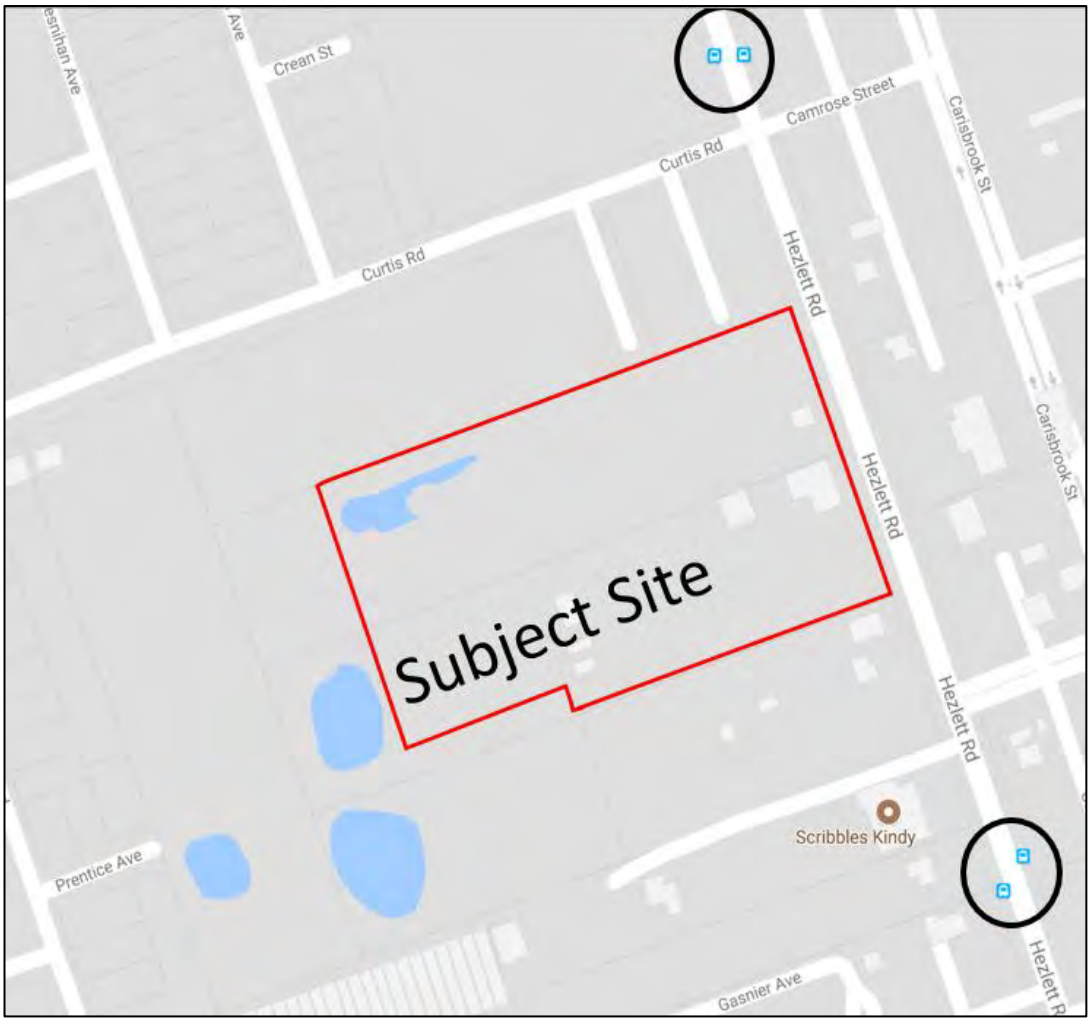
Kellyville Station will be located approximately 3.8 km south-west of Kellyville North New Primary School. Transport planning principles suggest individuals are typically willing to walk up to 800 m to access rail services. Kellyville North New Primary School is therefore outside of an acceptable walking distance from Kellyville Station.

It is expected that bus services will be the predominant mode of public transport utilised by students travelling to and from the school.

2.5.2 Bus Services

The nearest public bus stops in proximity to the subject site are located on both sides of Hezlett Road within 200 m of the school, as shown in Figure 2-14.

Figure 2-14 – Bus stop in proximity to Kellyville North New Primary School



A summary of the bus routes operating from these bus stops and their approximate frequency is provided in Table 2-1.

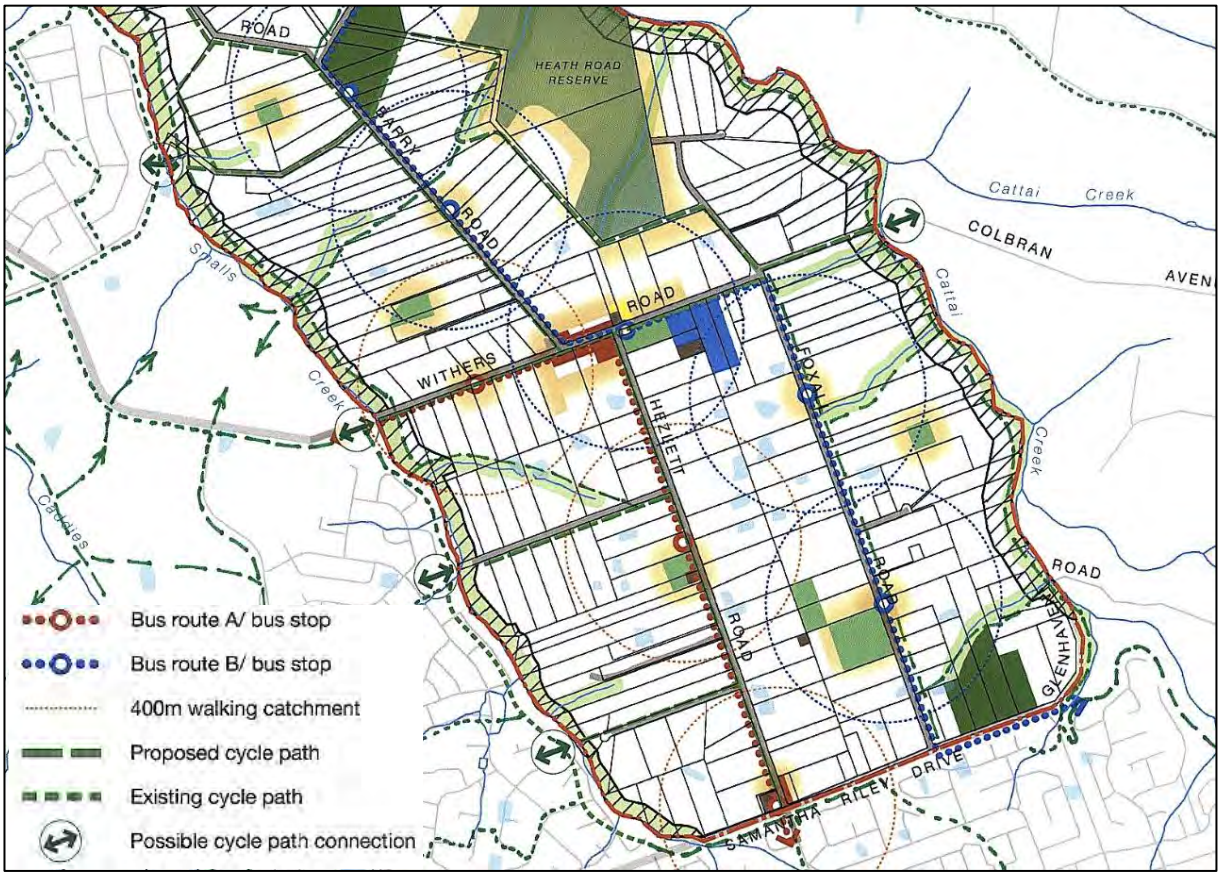
Table 2-1 – Bus Routes and Frequencies

Bus Route	Origin – Destination	Frequency (minutes)	
		Peak	Off-peak
603	Rouse Hill Town Centre to Parramatta Interchange	30	60
615X	North Kellyville to City	15	30

The DCP specifies that:

- Bus stops should generally be provided in accordance with Figure 2-15, with the final locations of bus stops to be determined by the local traffic committee.
- Typically bus stops should be provided on-street and not within indented bays.
- Bus shelters should be provided at key stops.

Figure 2-15 – Proposed Transport Services



Details about potential school bus services at North Kellyville Public Services are not currently available. However, the Hills Adventist College is served by three morning services and four afternoon services and there are potential efficiencies in extending these services to Kellyville North New Primary School.

It has been noted that bus trips from longer distances would be primarily used by teachers and staff at the school, as the majority of students are likely to be drawn from an undefined catchment (within the Kellyville North Precinct) in walking distance of the school.

2.6 Active Transport

2.6.1 Existing Pedestrian Facilities

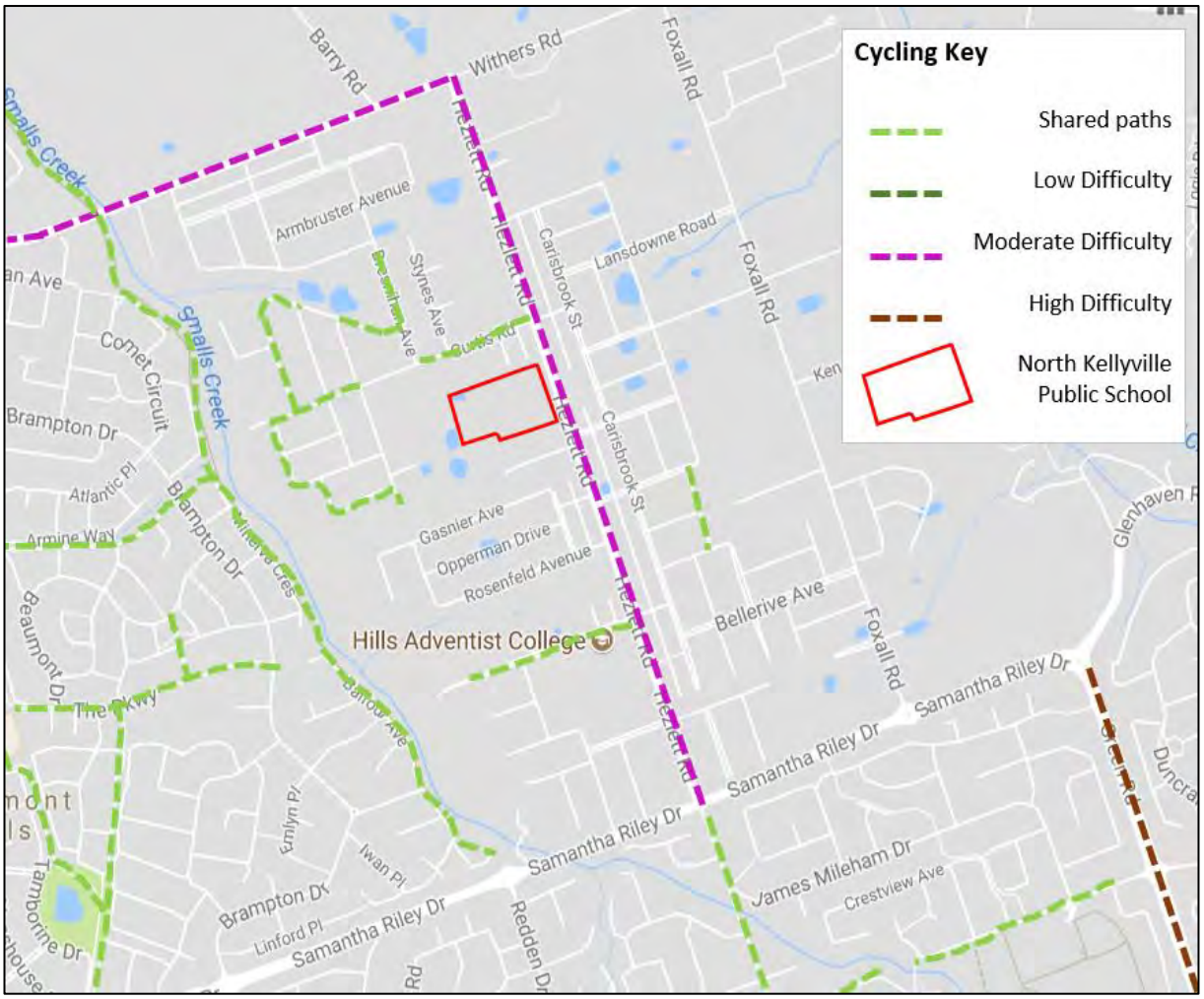
Site visits indicate that key streets in proximity to the school such as Hezlett Road, Samantha Riley Drive and Withers Road currently do not provide formalised pedestrian paths.

Currently there are no zebra crossing or signalised pedestrian crossings in the vicinity of the proposed school.

2.6.2 Existing Bicycle Facilities

The bicycle network in the vicinity of Kellyville North New Primary School has been identified using the Roads and Maritime Cycleway Finder (www.rms.nsw.gov.au/roads/bicycles/cyclewayfinder/index.html), and is displayed in Figure 2-16.

Figure 2-16 – Cycling Routes in proximity to Kellyville North New Primary School



Source: RMS Cycle Finder modified by GHD

Figure 2-16 indicates that cycling facilities in proximity to Kellyville North New Primary School are limited, with Hezlett Road and Withers Road designated as “moderate difficulty” on-road bicycle routes.

No on-road markings are currently provided on Hezlett Road and Withers Road to indicate their inclusion in a cycle network.

In proximity to the school, shared paths around Kellyville North New Primary School are also present on nearby local roads such as Curtis Road and Bramhall Avenue but their use by children seeking to cycle to and from school may be limited due to the areas that they serve.

2.6.3 Future pedestrian and cycling facilities

A safe and walkable active transport network will be required on the road network in proximity to the subject site to facilitate the safety of students, their parents / guardians and other pedestrians.

The DCP specifications for the provision of active transport facilities within the North Kellyville Precinct are as follows:

1. *Pedestrian paths, cycle routes and facilities in public spaces are to be safe, well lit, clearly defined, functional and accessible to all*

2. *Pedestrian paths, cycle paths and pedestrian refuge islands are to be designed to be fully accessible by all in terms of access points and gradients, generally in accordance with Australian Standard 1428:1-4.*

3. *Pedestrian and cycle pathways are to be constructed as part of the infrastructure works for each residential stage with detailed designs to be submitted with the construction certificate application. Concept approval will be required at DA stage*

4. *Pedestrian and cycle routes shall be in accordance Figure 22* (this is shown in).

Figure 2-17 – Proposed Pedestrian and Bicycle Network

In accordance with the road hierarchy specified in the DCP the following active transport facilities should be provided:

- Sub-arterial (Samantha Riley Drive) – Shared path for pedestrian and cycle use.
- Town Centre Streets (Hezlett Road and Withers Road) – Wide shared footpaths, traffic calmed streets.
- Local Streets and Minor Streets– Designed to slow residential traffic in order to provide priority to pedestrian and cyclists.

The active transport facilities identified in road hierarchy should be finalised prior to the construction of the school.

Other improvements to pedestrian facilities that may improve the walkability of the surrounding footpaths include:

- Providing desirable footpath widths (2.4 m or higher for high pedestrian volumes), particularly at pedestrian crossing and school bus stops.
- Local walking schemes such as Safe Routes to School.

- Incorporate shared path facilities on Hezlett Road for both pedestrians and cyclists.

A 40 km/h zone on school days (8:00 am - 9:30 am and 2:30 pm – 4:00 pm) is provided on Hezlett Road in proximity to the Hills Adventist College, it is assumed that this will be extended to include the proposed Kellyville North New Primary School.

Cycling trips that can be made to and from the proposed metro station at Kellyville may enhance the access to this interchange for public transport journeys. However, the proposed bicycle network as shown in does not emphasise or show this potential link to the Kellyville Station.

School Pedestrian Crossing (Hezlett Road)

It is proposed that a pedestrian crossing facility be provided on Hezlett Road at the frontage to the school entrance, potential options for this include:

- A standard pedestrian crossing.
- A children's crossing – which operate before and after school hours.
- A mid-block signalised pedestrian crossing

A list of the pros and cons associated with each of these options is provided in Table 2-2.

Table 2-2 – Pedestrian Crossing Options

Crossing Type	Pro	Con
Children's Crossing	• Operates only during school peak periods. • The provision of a traffic controller can assess the variability in traffic and pedestrian activity thereby reacting to increased traffic or pedestrian demand. • Provides a high level of safety with crossings taking place in a very controlled environment.	• Requires twice daily installation and removal of the "School Crossing" flags. • Likely require the provision of traffic controller. So, high operational cost. • Can only be installed in locations with maximum of one travel lane in the same direction, thereby requiring the installation of line marking /kerb build out to direct traffic into one lane through the crossing • Requires increased awareness from drivers and pedestrians to ensure visual connectivity is maintained.
Pedestrian (Zebra Crossing)	• Operates full time giving priority to pedestrians. • Can incorporate a raise in the threshold for traffic calming. • Crossing area well defined.	• Potential increase in traffic delays due to constant pedestrian crossing activity likely. Therefore, only suitable on roads with low no. of vehicles. • Can only be installed in locations with a maximum of one travel lane in the same direction, thereby requiring the installation of line marking /kerb build out to direct traffic into one lane through the crossing. • Requires increased awareness from drivers and pedestrians to ensure visual connectivity is maintained.
Mid-block Signalised Crossing	• Operates full time and activated only as required • Highly visible infrastructure with clear directions to both drivers and pedestrians for increased safety • Creates groups of pedestrian to cross at one time in lieu of potential constant pedestrian crossing activity. • Can be installed in locations with more than two travel lane in the same direction.	• Less priority given to pedestrian as they will be required to wait for appropriate green time. • Mitigation options for the above could be either integrating a vehicle detecting system to identify end of queue extents, or during low traffic volumes the push button could activate the pedestrian phase immediately reducing the wait time for pedestrians. • Higher capital cost

	• Allows opportunity of audio and tactile queues	

The *Roads and Maritime Supplement to Australian Standard* warrant for the provision of a standard pedestrian crossing that is used by children (and the site is not suitable for a children's crossing) and in two counts in an hour before and after school exceed the following, a standard pedestrian crossing may be installed:

- Pedestrian volumes (P) is greater than 30; and
- Vehicle volumes (V) is greater than 200.

The *Roads and Maritime Traffic signal design Section 2 – Warrants* provides data for the provision of signalised mid-block pedestrian crossings where the crossing is used predominantly by children and for each of two one-hour periods on an average day:

1. The pedestrian flow exceeds 50 persons/hour; and
2. The vehicular flow exceeds 600 vehicles/hour in each direction.

The results of traffic assessment (assuming an annual growth rate of 1.5 percent) indicates that

- In the 2020 horizon year (AM and PM peak) traffic flows (V) on Hezlett Road will be in the order 410 – 580 vehicles per hour per direction.
- In the 2030 horizon year (AM and PM peak) traffic flows (V) on Hezlett Road will be in the order of 500 – 1,090 vehicle direction.

The volumes of students and parent / guardians that will cross Hezlett Road to access / egress the school. However as the main entrance to the school will be on Hezlett Road, much of the student population will be drawn from the local residential area and it is expected that parents / guardians will accompany many of the children to / from school, it has been assumed that pedestrian flows (P) will exceed 50 from the 2019 opening year.

Therefore it is recommended that:

- The proposed pedestrian crossing on Hezlett Road be designated as a children's crossing for the opening year of 2019.
- The traffic volumes on Hezlett Road be monitored annually and a signalised mid-block pedestrian crossing be installed when the warrant is met.

This assumes that Hezlett Road will operate with a single travel lane in either direction, if two travel lanes are provided then a signalised mid-block crossing will be required.

2.7 Surveys

2.7.1 Manual travel mode surveys (Travel Mode Surveys)

As Kellyville North New Primary School is not currently operational, in order to obtain data to quantify the mode choice of students and teachers accessing and egressing Beaumont Hills Public School.

Beaumont Hills Public School is located approximately 1.2 km from the Kellyville North New Primary School site and thus is expected to be indicative of future travel patterns.

Manual surveys were undertaken on The Parkway, Hadlow Close, Lees Place and Forest Crescent on Thursday 8th June 2017, between 8:00 am – 9:30 am and 2:30 pm – 4:00 pm. The travel mode surveys recorded the following:

- The number of students being dropped off and picked up by their parents or guardians by private vehicle, and the occupancy of these vehicles.

- The number of students accessing and egressing the school via bus.
- The number of students walking to and from the school.
- The number of vehicles accessing and egressing the school car park.

The survey locations are shown in Figure 2-18.

Figure 2-18 – Manual Travel Mode Survey Locations

Source: Google Maps (2017), modified by GHD

A summary of the results of these manual travel mode surveys are is shown in Table 2-3.

Table 2-3 – Mode of Travel Survey

Mode of Transport	AM Peak Entries (No. Students / %)		PM Peak Exits (No. Students / %)	
Pedestrian	98	20%	240	49%
Vehicle Pick-up/Drop-off	378	75%	183	37%
Bus	24	5%	68	14%
Total	**500**	**100 %**	**491**	**100 %**

The results shown in Table 2-3 indicate that:

- In the AM peak, 75 percent of trips to the school used the drop-off facilities on The Parkway and Forest Crescent, with the majority of the remaining trips (20 percent) were identified as walking trips.
- In the PM peak, 37 percent of trips to the school used the pick-up facilities on The Parkway and Forest Crescent, and the majority of the remaining trips (49 percent) were identified as walking trips.
- Approximately four percent of trips to the school were by bus, with 13 percent of trips from the school being by bus

The outputs of the manual school travel mode surveys indicate that a much lower proportion of students are picked up from the school in the afternoon peak than are dropped off in the morning peak.

The survey observed that parents / guardians generally waited for longer periods to pick up their children during the PM peak than during the AM peak. This indicates that a higher portion of parents are required to park their vehicles further away from the school and walk to collect their child / children in the afternoon peak, compared to the morning peak. As vehicle dwell times are generally shorter during the AM peak when parents / guardians drop off their children (by car), more vehicles were observed to utilise the available drop off facilities.

The outputs of the manual travel mode surveys are included in Appendix D.

Analysis

The manual school travel mode surveys did not identify whether students travelled to school by walking only, or if they were accessed by car and walked from a nearby street located outside of the survey area.

Based upon data identified in other traffic assessments undertaken for the DoE approximately of the identified "pedestrians" approximately 50 percent of children walked to school and 50 percent "parked then walked.

These portions have been applied to "pedestrian"1 volumes in Table 2-3 to identify "walk only" trips from "park and walk" trips. The resulting school travel mode proportions are shown in Table 2-4.

Table 2-4 – Updated Mode of Travel Data

Mode of Transport	AM Peak Entries (No. Students / %)		PM Peak Exits (No. Students / %)	
Walk Only	49	10%	120	24%
Park and Walk	49	10%	120	24%
Vehicle Pick-up/Drop-off	378	75%	183	37%
Bus	24	5%	68	14%
Total	**500**	**100 %**	**491**	**100 %**

The data in Table 2-4 indicates:

- Ten percent – 24 percent of students walk to/from school (walk only).
- 62 percent – 85 percent of students are driven to/from school.
- Five percent – 14 percent of students utilise public transport.

2.7.2 Intersection Surveys (Traffic Surveys)

As the operation of the main intersections on Hezlett Road in proximity to the school have been included in analysis previously undertaken by Council they have not been included for analysis in this traffic assessment.

As discussed and agreed with Council the intersection of Hezlett Road / Curtis Road / Camrose Street, a photograph of which is displayed below in Figure 2-19.

[1] As an example of this in the AM peak the volume of walk only students was identified as 41/55 x 217

Figure 2-19 – Intersection of Hezlett Road /Curtis Road / Camrose Street

In order to identify the existing traffic conditions at this intersection, a survey was undertaken on Tuesday 18th July 2017 in the critical AM peak between 8:00 am – 9:00 am, and on Wednesday 19th July 2017 in the critical PM peak between 3:00 pm – 4:00 pm.

The peak hour volumes identified in the traffic surveys are displayed in Appendix A.

2.8 Current Network Operation

2.8.1 Intersection Analysis

The operation of the existing intersection at Hezlett Road / Curtis Road / Camrose Street has been assessed using SIDRA 7.

SIDRA calculates the amount of delay to vehicles using an intersection and, amongst other performance measures, gives a Level of Service (LoS) rating which indicates the relative performance of traffic movements within the intersection.

Table 2-5 presents the criteria generally applied to intersection performance. The Level of Service (LoS) is determined from the calculated delay to traffic movements, which is a representation of driver frustration, fuel consumption and increased travel time. There are six LoS measures ranging from A (very low delay and very good operating conditions) to F (over saturation where arrival rates exceed intersection capacity) Typically a LoS D or better is considered to be acceptable, however a LoS E may be acceptable if it also operates with a low degree of saturation (which is a measure of demand to capacity). Degree of saturation values of 0.85 or greater are typically consistent with congested conditions.

Table 2-5 – Intersection Level of Service Criteria

LoS	Average Delay/ Vehicle (sec)	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.

The layout of the intersections of interest (as modelled in SIDRA) are displayed below in Figure 2-20.

Figure 2-20 – Intersection Geometry

The results of the SIDRA analysis based on the existing traffic volumes and road geometry is displayed in Table 2-6.

Table 2-6 – Intersection Performance - 2017

Intersection	2017 AM Peak			2017 PM Peak		
	Delay (s)	LoS	95% Queue (m)	Delay (s)	LoS	95% Queue (m)
Hezlett Road / Curtis Road / Camrose Street	8.0	A	1.5	7.1	A	1.8

The outputs indicate that in both the AM and PM peaks, the intersection of Hezlett Road / Curtis Road / Camrose Street operates with a good level of service.

2.8.2 Mid-Block Analysis

Table 2-7 (from the *Roads and Maritime Guide to Traffic Generating Developments*) indicates the mid-block capacities for urban roads.

Table 2-7 – Urban Road Mid-Block Capacities

Level of Service	One Lane veh/h	Two Lanes veh/h
A	200	900
B	380	1,400
C	600	1,800
D	**900**	**2,200**
E	1,400	2,800

In accordance with the above criteria (corresponding to a LoS D), Hezlett Road has a mid-block capacity of 900 vehicles per hour per direction.

The traffic survey outputs and data indicate that the roads in this vicinity of the school currently operate within the acceptable limits of their mid-block capacities.

3. The Proposed Development

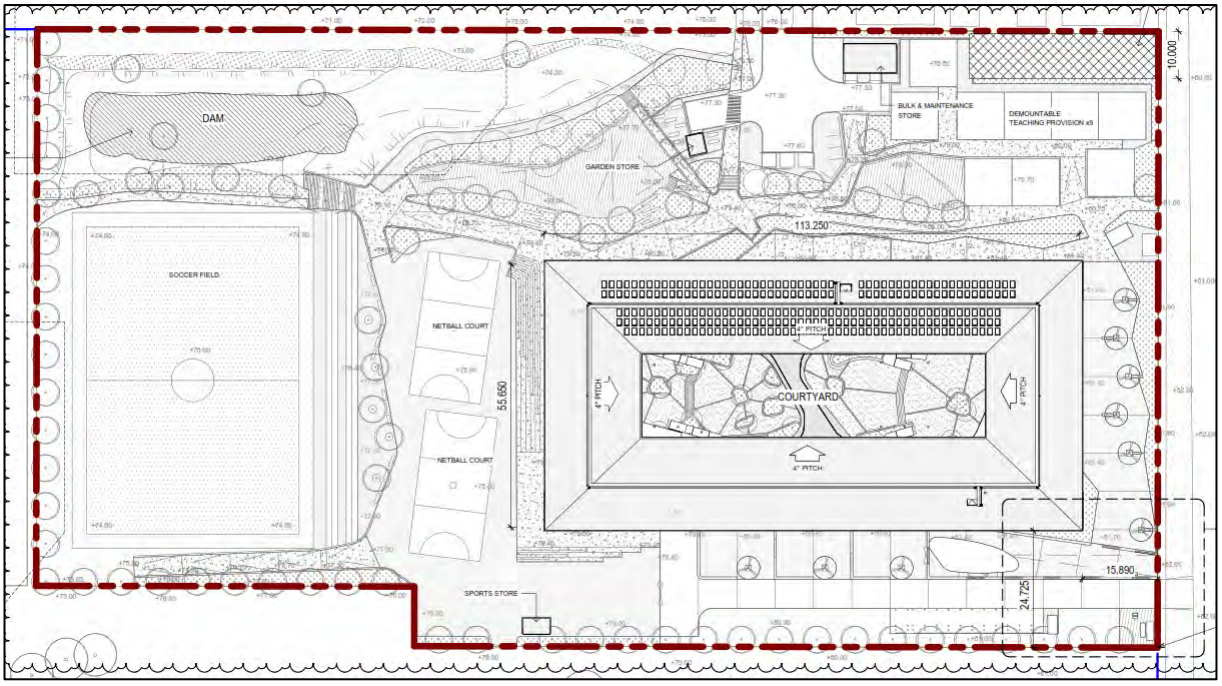
3.1 The Development

Information included in the Environmental Impact Assessment for North Kellyville indicates that Kellyville North New Primary School will consist of:

- A new two storey building which will house an “innovative learning precinct” comprising of workrooms, learning zones and ancillary areas such as resource rooms, performance rooms, storage rooms and staff rooms.
- Sports facilities including a soccer field and netball/basketball courts
- Playgrounds and a covered outdoor learning area (COLA) within a central courtyard.

The capacity of the school is expected to be approximately 1,000 students and 40 teachers. The school is expected to be completed by term 1 2019. It is envisaged that the school will initially have a student population of 300 students and this will increase to 1,000 as the North Kellyville Precinct is developed.

Figure 3-1 – Site Plan



3.2 Proposed Site Access Arrangements

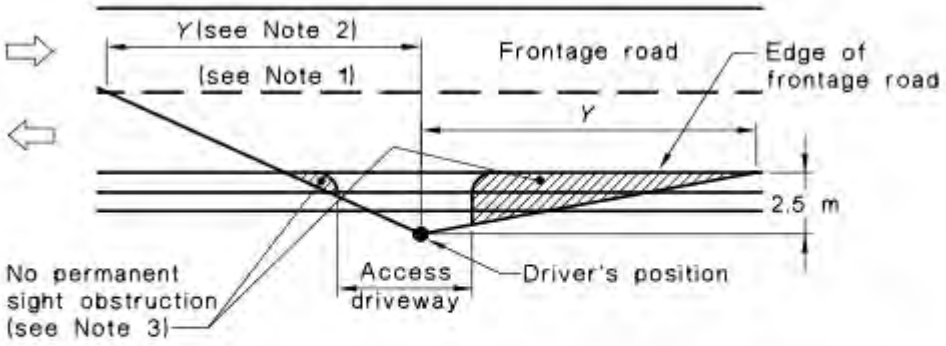
A summary of the proposed access arrangement for Kellyville North New Primary School is as follow:

- The main pedestrian access will be provided from Hezlett Road, with a secondary pedestrian access provided to the west of the school (south of the basketball court)
- Access to the teacher drop off facilities and the parking for special needs students is provided from Hezlett Road.
- The pick-up and drop-off facilities will be provided on Hezlett Road
- A service vehicle entry will be provided at the north of the site.

Hezlett Road currently functions as a collector road with a speed limit of 60 km/h. Sight distance requirements for a driveway access are provided in Australian Standards AS 2890.2 as shown in Figure 3-2.

Based on the speed limit along Hezlett Road, it is recommended to leave the shaded area shown in Figure 3-2 free of permanent obstacles for a desirable length 'Y' of 83 m or a minimum of 65 m from the access driveway.

Figure 3-2 – Sight Distance Requirement at Access Driveway



Frontage road speed (Note 4) km/h	Distance (Y) along frontage road m		
	Access driveways other than domestic (Note 5)		Domestic property access (Note 6)
	Desirable 5 s gap	Minimum SSD	
40	55	35	30
50	69	45	40
60	83	65	55
70	97	85	70
80	111	105	95
90	125	130	Use values from 2nd and 3rd columns
100	139	160	
110	153	190	

It is appropriate to assess the traffic safety of the proposed entry / exit locations to and from the school, by determining whether there is adequate longitudinal sight distance sufficient to avoid potential conflicts. The specific sight distance criteria used in the report has been derived from the *Australian Standards Publications AS2890.1.*

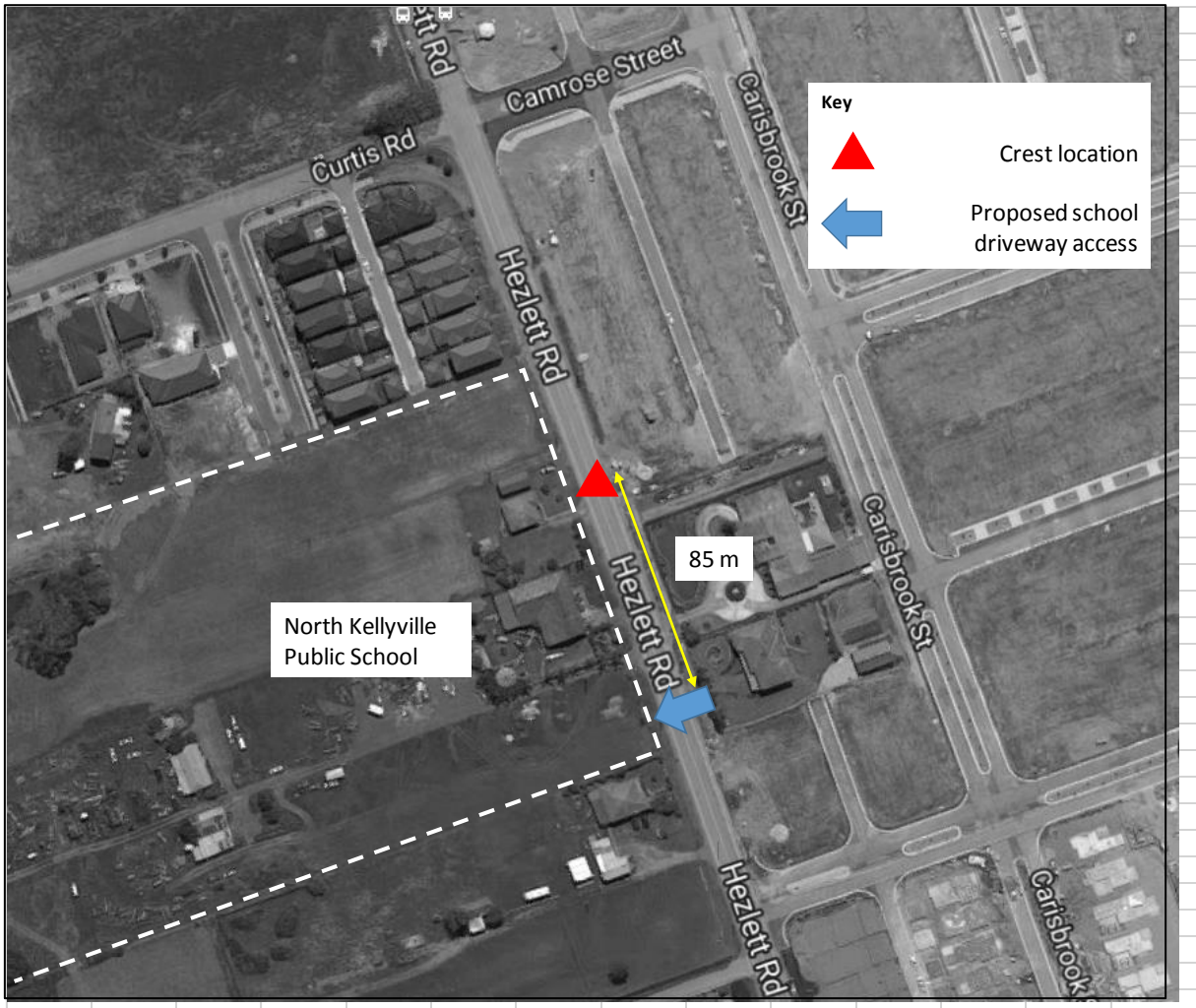
The Safe Intersection Sight Distance for the proposed site access on Hezlett Road has been based on the sign posted vehicle speed of 60 km/hr for the approaches to the proposed school driveway access.

A comparison of the required and available sight distance for vehicles approaching and departing the proposed access road is set out in Table 3-1. The measured sight distance to the observed crest on Hezlett Road is shown in Figure 3-3.

Table 3-1 – Sight distance requirements (car)

Conflicting Approach	Minimum Requirement		Desirable Requirement	
	Required	Measured	Required	Measured
North approach	65 m (based on 60 km/h speed)	85 m	83 m	85 m
South approach	65 m (based on 60 km/h speed)	300 m +	83 m	300 m +

Figure 3-3 – Measure Sight Distance to Observed Crest



The results in Table 3-1 and Figure 3-3 sufficient sight distance is provided from the proposed access driveway on Hezlett Road to the north and south.

3.3 Parking

3.3.1 On street parking

There is currently no formal parking restrictions on Hezlett Road. Unrestricted parking is typically provided on the residential streets in proximity to the school subject site.

The DCP indicates that Hezlett Road will be widened to provide a single travel lane and parking lane in either direction (see Figure 2-11).

3.3.2 Car Parking Supply

Parking Supply

The North Kellyville Growth Centre Precincts DCP states that parking should be provided at the following rates:

- 1 space per full time employee or classroom.
- 1 space per 10 students over the age of 17.
- 3% of total car parking required for disabled persons.

Based on the DCP specifications the proposed school requires 40 parking bays.

It is proposed to provide 12 time restricted parking bays (including 2 disabled parking bays) on site designated for a teacher drop off location and for special education students.

Accordingly, the majority of teachers will be required to park elsewhere or use alternative modes of transport (active and/or public transport) to access their places of employment. As discussed in Section 2.5 the proposed Sydney Metro NorthWest and the provision of a new station in Kellyville will provide a viable alternative to private vehicle for teachers to access / egress the school.

The DoE provides a set of guidelines with respect to the provision of parking at schools in the Educational Facilities Standards and Guidelines (PS610.17 Service Zone), which states:

In order to ensure that the available site are for teaching, learning and play is maximised, to enable community use and to encourage sustainable means of transport to and from school, on school parking should be kept to a minimum.

As such, the proposed parking provision of 12 time restricted onsite parking spaces is consistent with the DOE Guidelines.

In addition to the onsite parking bays, the DoE has allocated space adjacent to the west of the school as “community parking” which is expected to accommodate up to 45 vehicles.

There is also proposed to be community parking adjacent to the west of the football pitch adjacent to the west of the football pitch (located to the south of the school) which is expected to accommodate up to 30 vehicles.

It is understood that these community parking spaces will be available to the general public including the teaching staff of the North Kellyville New Primary School.

Detailed drawings of the school’s car park are not currently available. The layout of car park will comply with Australian Standard AS:2890.1 Part 1: Off street car parking and AS2890.6: Off-street parking for people with disabilities.

Bicycle Parking

As part of the school development, it is proposed to provide bicycle parking facilities.

The North Kellyville Growth Centre Precincts DCP states that parking should be provided at the following rates:

- 1 space per full 5 students above Grade 4.

This is consistent with young children being unlikely to have the skills to safely cycle to school.

The proposed New Primary School will provide classes from kindergarten through to sixth grade. Thus it has been assumed that students in grades 5 and 6 will represent approximately 30 percent of the student population (approximately 300 students).

In accordance with the DCP specifications, 300 students require parking for 60 bikes. Assuming that an Australian Standard Bicycle Rack can accommodate two bikes simultaneously, a total of 30 bike racks are required.

The DoE *Educational Facilities Standards and Guidelines (EFSG)* specifies the following parking specifications for schools:

Generally allow 1 bicycle storage position for every 20 students.

Based upon a population of 1,000 students this equates to the provision of 50 racks (which could accommodate 100 bikes). It is understood that the DOE have reduced the *EFSG* requirement by 50% to allow provision for the initial provision of 25 bicycle racks (for 50 bikes).

At the year of opening (2019) it is proposed to provide 25 bicycle racks at the school in accordance with the *EFSG* specifications. Additional racks can be provided at the school to comply with the DCP (if required) as demand increases in accordance with the growing student population.

All bicycle parking will be constructed to comply with AS2890.3:2015 Part 3: Bicycle parking.

3.3.3 Pick-up and Drop-off

As displayed in , the focus for the pick-up / drop-off facility for Kellyville North New Primary School is proposed on the west side of Hezlett Road adjacent to the school. However, the focus of this pick/up and drop off is to move to the west of the site when Hipwell Avenue, Prentice Avenue and Wickham Place have been extended.

The widening of Hezlett Road will enable the kerbside lane to be used as a dedicated pick-up drop off lane i.e. No Parking 8:00 am-9:30 am and 2:30 pm – 4:00 pm School Days.

The current drawings of the Kellyville North New Primary School indicate that a length of approximately 180 m will be provided on Hezlett Road.

Analysis of Proposed Pick-up and Drop-off Facility

The proposed pick-up and drop-off facility at Hezlett Road is proposed to be approximately 180 metres2 in length and accommodate 30 parked cars. Based on a conservative waiting period of two minutes per vehicle (this period is likely to be less than 30 seconds, particularly during the morning drop-off period), this would have the capacity to accommodate around 900 vehicles in an hour. This is consistent with the expected 756 trips by car to the school during the morning peak and 650 vehicle trips during the evening peak. Although this dwell time does not account for peak drop-off / pick-up periods at the start and end of school periods, it is estimated that the length proposed pick-up and drop-off facility is sufficient to cater for the demand. There are also other locations within the surrounding streets, where parents and guardians could potentially

[2] The frontage of the school is approximatley 210 metres in length. The width of the Mossop Road easement and the required "No Stopping" space either side of the proposed pedestrian crossing on Hezlett Street have been deducted from this distance.

undertake pick-up and drop-off short term parking if required, including the proposed community parking bays located to the west of the school.

However, the functional capacity of the proposed pick-up and drop-off will be dependent on a management plan for this facility, which would be developed by the school. This may include:

- Designated pick-up times, with parents / guardians not to arrive before this period;
- Students to be grouped into designated pick-up zones; and
- Parents / guardians to identify the student names on the front of cars (to assist teachers with identifying the approaching cars).

As the new school supports the proposed development within the Kellyville North Precinct, it is anticipated that there would be more local trips to the school made by walking and cycling, than compared with the Beaumont Hills Public School. In addition, the Kellyville North precinct would provide good walking and bicycle access to the school, as shown in the proposed pedestrian and bicycle network plan provided in . This is likely to lower the demand for the pick-up and drop-off facility. Further to this, the proposed implementation of Travel Demand Measures, such as implementing a Green Travel Plan, will also reduce the demand for the pick-up and drop-off facility. The measures in the Green Travel Plan will seek to encourage teachers and students to travel by public transport, active transport or car share.

Notwithstanding the above, as the school is yet to be constructed, it is recommended that the school and Council monitor the operation of the proposed pick-up and drop-off facility once the school is constructed and in operation. If required, Council would then be able to review the parking restrictions along Hezlett Road and identify if additional, or less, parking provision / vehicle queueing space is required for the proposed pick-up and drop-off facility.

3.4 Travel Demand Management

Travel demand management (TDM) is a term for strategies that encourage a shift from single occupant private vehicles trips and provide solutions for improving transport efficiencies while reducing negative impacts associated with the use of private motor vehicles.

A key element of TDMs is the development of a School Green Travel Plan (GTP), which is a package of initiatives aimed at reducing car travel, particularly single occupant trips (this is also referred to as a School Travel Management Plan). In the case of GTPs for schools, their intent is to encourage greater use of public transport, walking and cycling by staff, students and visitors to a school, with the aim of reducing traffic and parking impacts within communities.

Some of the key tasks associated the preparation of a GTP for Kellyville North New Primary School, include:

- Establish a Workplace Travel Plan Working Group to coordinate specific actions and track the progress of key initiatives.
- Set SMART targets (specific, measurable, achievable, relevant, and timed) i.e. 50 percent of the new students will walk / cycle to school by 2020
- Audit recommended walking and bicycle riding routes.
- Prepare a survey to identify barriers to active transport utilisation.
- Provide information to students, teachers and parents / guardians of public transport options and services.
- Develop an action plan that details strategies to address barriers to active transport utilisation at the proposed school.

- Become involved in activities / program such as the National Walk Safely to School Day, TravelSmart and Ride2School.
- Run classroom and curriculum activities to promote active and safe transport.
- Prepare a funding strategy to implement the WTP.
- Undertake regular communication with parents about WTP initiatives using the school's newsletter and app.
- Establish a monitoring and review mechanism i.e. six monthly travel surveys.

A Preliminary Green Travel Plan is provided in 0.

4. Traffic Assessment

4.1 Background Traffic Growth

In accordance with typical Roads and Maritime requirements, the impact of the additional traffic expected to be generated by the proposed school has been assessed for 2020 (a year after the school opening) and a 10-year design horizon of 2030.

As discussed and agreed with Council, an annual growth rate of 1.5 percent has been applied to the current traffic volumes to identify the horizon year baseline traffic volumes and account for the expected growth in the North Kellyville Precinct.

4.2 Traffic Generation

Total Trips

The trip generation for Kellyville North New Primary School has been undertaken on a first principles basis accounting for:

- The current and proposed student populations.
- The modes of transport currently used by the student population at Beaumont Hills Public School.
- The results of the Manual Travel Mode Surveys (Table 2-4) indicate:
- In AM peak period, 378 of the 500 student trips to the nearby Beaumont Hills Public School were undertaken by private vehicle.
- In the PM peak period, 303 of the 491 student trips to the nearby Beaumont Hills Public School were undertaken by private vehicle.

Utilising the above data, the vehicle trip generation rate at Kellyville North New Primary School is:

- 0.76 trips per student in AM peak periods (vehicle pick-up/drop off).
- 0.62 trips per student in PM peak periods.

Based on the above rates, by 2030 the proposed 1,000 students are expected to generate:

- 756 inbound and 756 outbound vehicle trips in the AM peak period (8:00 am – 9:30 am).
- 620 inbound and 620 outbound vehicle trips in the PM peak period (2:30 pm – 4:00 pm).

While by 2020 (assuming a student population of 300 students) the school is expected to generate:

- 228 inbound and 228 outbound vehicle trips in the AM peak period (8:00 am – 9:30 am).
- 186 inbound and 186 outbound vehicle trips in the PM peak period (2:30 pm – 4:00 pm).

Peak Hour Trips

Further analysis has been undertaken to identify the expected additional trips at the school during the AM and PM peak hours of activity at the school, which were identified as:

- 8:00 am – 9:00 am

- 3:00 pm – 4:00 pm.

The Manual Travel Mode Surveys indicate:

- 94 percent of pedestrian activity occurred in the school AM peak hour and 99 percent of pedestrian activity occurred in the school PM peak hour (no students were recorded entering the school prior to 8:00 am and exiting the school after 4:00 pm).
- 94 percent of vehicle drop off activity occurs in the school AM peak hour and 62 percent of pick up vehicle activity occurs in the school PM peak hour.

Thus the development of Kellyville North New Primary School is expected to generate the following peak hour trips in 2030 (1,000 students):

- 711 inbound and 711 outbound vehicle trips in the AM peak hour (8:00 am – 9:00 am).
- 472 inbound and 472 outbound vehicle trips in PM peak hour (3:00 pm – 4:00 pm).

While in 2020 (300 students) the school is expected to generate the following peak hour trips:

- 213 inbound and 213 outbound vehicle trips in the AM peak hour (8:00 am – 9:00 am).
- 142 inbound and 142 outbound vehicle trips in PM peak hour (3:00 pm – 4:00 pm).

As stated earlier, the development of Kellyville North New Primary School is proposed to have a population of approximately 1,000 students and 40 teachers. In taking into account trip generation analysis, teachers' vehicle activity must also be considered as the school constitutes a new development rather than an extension to an already existing school, and can have an effect in future scenarios.

The surveys indicate that the majority of teachers' vehicle activity does not coincide with student activity. However, instances where teachers' vehicle activity between the AM and PM peak hour periods have coincided with student vehicle activity, have been included in the trip generation assessment.

Trip distribution

Calculating a trip distribution is challenging given the uncertainties inherent in forecasting traffic volumes in an area which is developing significantly and where the priority arrangement of the existing intersection will change considerably. The forecast distribution is necessarily based on some broad-brush assumptions, using professional experience. They should be considered as indicative only.

The following assumptions have been used in both the AM and PM peak hours to produce a distribution of trips at the Curtis Road / Hezlett Road roundabout:

- A low linear growth rate of one and a half percent per year, as previously agreed with Council, has been utilised to generate the future traffic volumes. In addition, a high linear growth rate of five percent per year has also been tested as a potential growth rate for future scenarios (see 4.4 Scenario Testing).
- A catchment of radius 500 metres has been applied around the school, as shown in Figure 4-1:
  - It is assumed that 50 percent of students travelling to and from school within this catchment will walk and all students outside this catchment will travel to and from school via private vehicle
- All trips heading towards the school will do so from the south of Hezlett Road, as this is the most convenient direction for drop-off and collection:

  - Vehicles unable to access the drop-off area from the south of Hezlett Road are assumed to utilise side roads to drop-off students to the school, and therefore will not go through the Curtis Road / Hezlett Road roundabout
  - All vehicles egressing the drop-off area adjacent to the school on Hezlett Road, will go through the Curtis Road / Hezlett Road roundabout, with eastbound traffic heading north and turning right at a location past the roundabout as Camrose Street is assumed to be closed off
- It is assumed that 75 percent of the vehicles from the north will turn right at Curtis Road, and therefore pass through the intersection.
- The trips generated to and from the school by teachers have been ignored as it is assumed that teachers' vehicle activity does not coincide with the vehicle activity caused by students
- The following trip distribution splits have been used to generate traffic volumes in the AM and PM periods:
  - The distribution of origins (home) for drop-offs, from the north is 45 percent, from the south is 30 percent, from the east is 15 percent and from the west is 10 percent.
  - The assumed distribution of trips back to home is 25 percent, onward travel via Samantha Riley Drive is 50 percent and onward travel via Withers Road is 25 percent."
- The trip generation patterns are reversed for the PM period.

Figure 4-1 – Catchment Area for Trip Generation

4.3 Intersection Performance

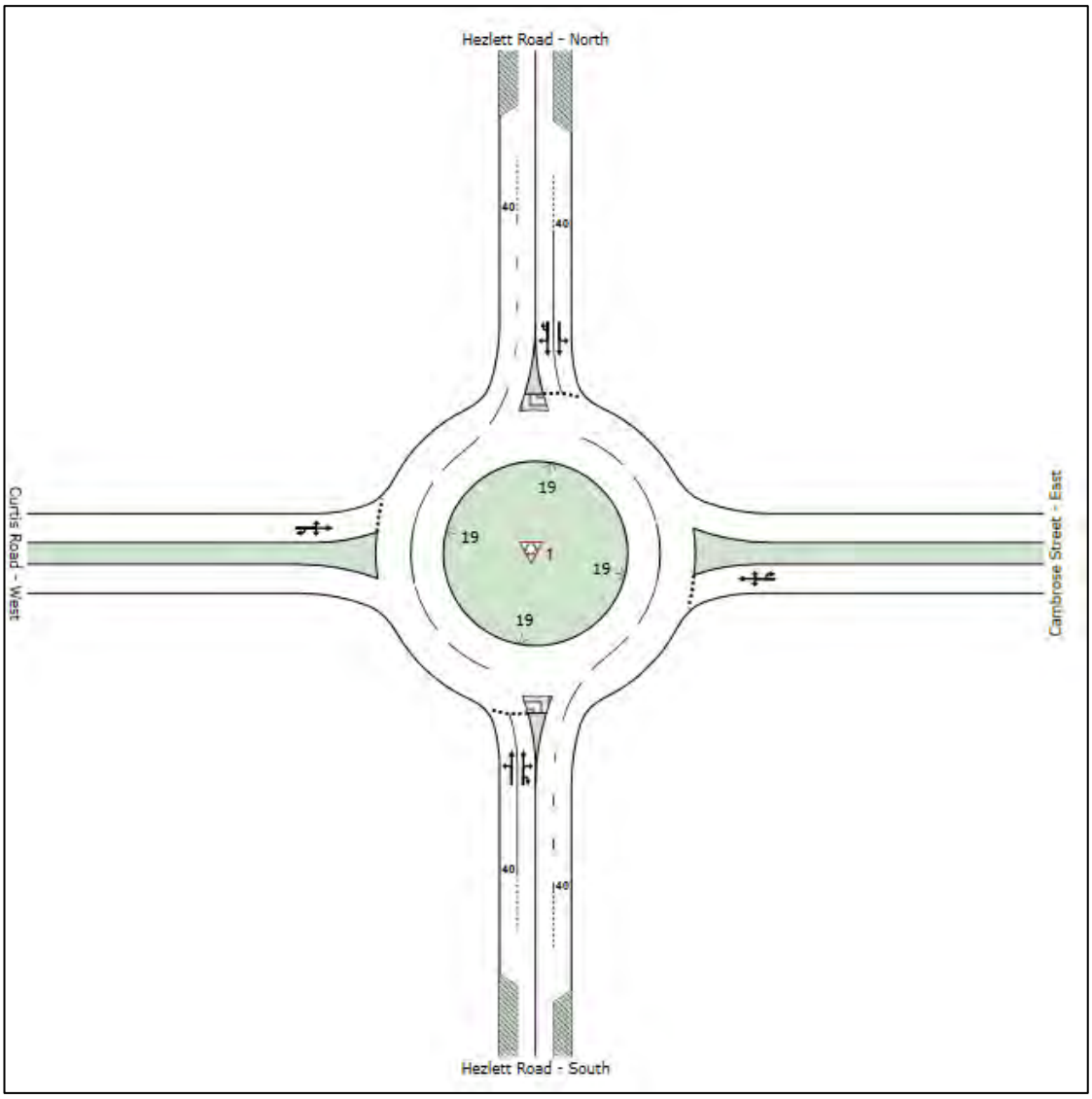
Intersection analysis, using the SIDRA 7 modelling software has been undertaken for the following two scenarios for the weekday AM and PM peak hours:

- A "no-build" scenario, accounting for the background traffic growth (based on a 1.5 percent linear growth rate per annum).
- A "build" scenario, which accounts for background traffic volumes and also the trips associated with the proposed expansion of Kellyville North New Primary School.

As stated previously it is expected that the intersection of Hezlett Road / Curtis Road / Camrose Street will be upgraded to a roundabout and that Hezlett Road will be widened to provide two traffic lanes in either direction prior to the opening of the proposed school.

For the purposes of analysis it has been assumed that parking will be provided on Hezlett Road (as per DCP specifications) and the roundabout will operate with dual circulation lanes. The assumed layout of the proposed roundabout is shown in Figure 4-2.

Figure 4-2 – Hezlett Road / Curtis Road / Camrose Street Intersection – Modelled Intersection Layout



Source: SIDRA 7

The results of the SIDRA analysis are displayed in Table 4-1.

Table 4-1 – SIDRA Modelling Results

Scenario	AM Peak			PM Peak		
	Delay (s)	LoS	95% Queue (m)	Delay (s)	LoS	95% Queue (m)
2020 No Build	2	A	13	2	A	13
2020 Build	4	A	20	3	A	16
2030 No Build	2	A	15	2	A	15
2030 Build	10	A	91	4	A	33

The SIDRA results in Table 4-1 indicates that the proposed roundabout is expected to operate with spare capacity and at an acceptable LoS A during both the AM and PM peak periods following the development of the proposed school.

The SIDRA modelling indicates that the proposed school is expected to have minimal impacts to the operation of the proposed Hezlett Road / Curtis Road / Camrose Street roundabout.

4.4 Scenario Testing

As mentioned earlier, the proposed Kellyville North New Primary School is located in the North West Growth Corridor of Sydney and part of the North Kellyville Precinct Plan.

In order to assess a “high growth” scenario, a linear growth rate of five per cent, in addition to the agreed one and a half percent, has been utilised to generate traffic volumes for future scenarios in 2020 and 2030.

The SIDRA results for the high growth rate is presented in Table 4-2.

Table 4-2 – SIDRA Modelling Results – 5% linear growth rate

Scenario	AM Peak			PM Peak		
	Delay (s)	LoS	95% Queue (m)	Delay (s)	LoS	95% Queue (m)
2020 No Build	2	A	15	2	A	14
2020 Build	4	A	22	3	A	18
2030 No Build	2	A	25	3	A	25
2030 Build	16	B	168	4	A	50

The SIDRA results in Table 4-2 indicates that the proposed roundabout is expected to operate with spare capacity and at an acceptable LoS A during the AM and PM peak periods following the development of the proposed school, with a five percent annual growth rate.

5. Summary and Conclusion

5.1 Background

GHD has been engaged by the NSW Department of Education to undertake a Traffic Impact Assessment (TIA) in support of a Development Application for the construction of the Kellyville North New Primary School, with access from Hezlett Road.

The existing land uses in the vicinity of to the school site predominantly consists of low-density residences. A significant portion of the surrounding area is currently undeveloped but is intended to be developed in accordance with the North Kellyville Growth Precincts SCP and the Hills Shire Council Local Environmental Plan (LEP) 2012.

5.2 The Proposed Development

Information included in the Environmental Impact Assessment for North Kellyville indicates that Kellyville North New Primary School will consist of:

- A new two storey building which will house an “innovative learning precinct” comprising of workrooms, learning zones and ancillary areas such as resource rooms, performance rooms, storage rooms and staff rooms.
- Sports facilities including a soccer field and netball / basketball courts
- Playgrounds and a COLA within a central courtyard.

Parking onsite is to be provided on the southeast side of the school building with 12 car parking spaces to be provided.

A summary of the proposed access arrangement for Kellyville North New Primary School is as follows:

- The main pedestrian access will be provided from Hezlett Road, with a secondary pedestrian access provided to the west of the school (south of the basketball court).
- Access to the car park is proposed to be provided from Hezlett Road.
- The pick-up and drop-off facilities will be provided on Hezlett Road.
- A service vehicle entry will be provided at the north of the site.

Access arrangements have been reviewed for safety and sufficient sight distance is proposed provided from the proposed access driveway on Hezlett Road to the north and south.

Travel Demand Management strategies will be used to limit the impact of car-based travel, which may potentially include a Green Travel Plan which, through a range of measures encourages active and public transport use and car sharing

5.3 Road network

The DCP designates Hezlett Road as a “Town Centre Street”, and as such, the following are expected to be provided:

- Wide shaded footpaths;
- Traffic calmed street and crossing points;
- The provision for public transport routes; and

- On-street parking on both sides of the street.

In order to discourage parking on the nearby residential streets, Council could implement time restricted parking and a residential parking scheme along streets in the vicinity of the site.

5.4 Public Transport

A new train station is proposed at Kellyville when the North West Rail link opens as part of Sydney Metro. The proposed train station would be located 3.7 km from the proposed Kellyville North New Primary School, which is not within the typically acceptable 800 m walking distance to train stations. However, feeder bus services are expected to provide access to the train station.

The nearest public bus stops in the vicinity of the proposed school site are located on both sides of Hezlett Road, within 200 m of the school and served by the 603 and 615X bus routes.

Details about potential school bus services at North Kellyville Public Services are not currently available. However, the Hills Adventist College is served by three morning services and four afternoon services and there are potential efficiencies in extending these services to Kellyville North New Primary School.

5.5 Active Transport

Site visits indicate that no footpaths are currently provided along the key streets in the vicinity of the proposed school, including at Hezlett Road, Samantha Riley Drive and Withers Road. In addition, there are currently no pedestrian crossing provided in across any of the streets in the vicinity of the proposed school.

There are no on-road bicycle symbol markings currently provided on Hezlett Road and Withers Road to indicate their inclusion in the bicycle network.

In the vicinity of the school, shared paths are also provided along nearby local roads, including Curtis Road and Bramhall Avenue. However, the use of these shared paths by children acing the proposed school by bicycle may be limited due to the areas that they serve.

Improvements to the walking and bicycle network will need to be implemented in the vicinity of the proposed school to encourage access to the school by active transport modes.

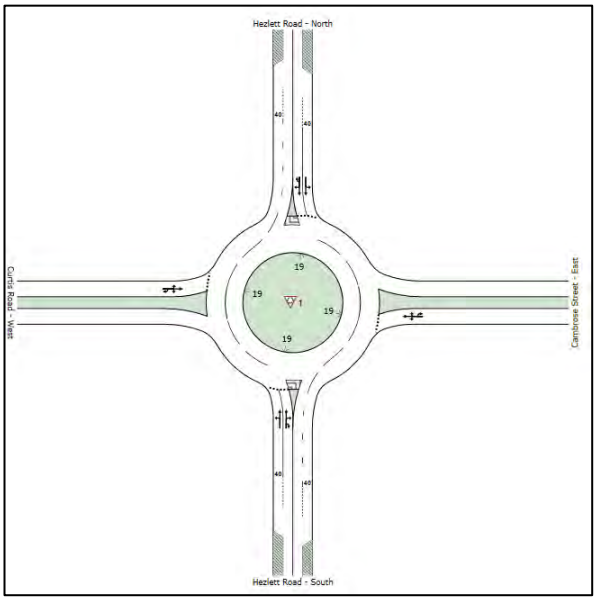
5.6 Network Operation

An assessment of the potential traffic impact on the network has been carried out for the Hezlett Road / Curtis Road intersection. The operation of the existing intersection at Hezlett Road / Curtis Road / Camrose Street has been assessed using SIDRA 7 and suggests that the intersection performs satisfactorily under current conditions.

Future year traffic conditions have been assessed at the Hezlett Road / Curtis Road intersection, which is to be converted to a roundabout before the school opens. Forecast assessments for peak hours in 2020 and 2030 have been undertaken both with and without the school traffic.

The intersecton geography used in the assessment is displayed in Figure 5-1.

Figure 5-1 – Proposed Intersection Layout



Utilising a 1.5 percent annual growth rate, the SIDRA results indicate that the proposed roundabout is expected to operate with spare capacity in the future horizon years of 2020 and 2030 and at an acceptable LoS A during both the AM and PM peak periods following the development of the proposed school.

The SIDRA modelling indicates that the proposed school is expected to have minimal impacts to the operation of the proposed Hezlett Road / Curtis Road / Camrose Street roundabout.

Scenario testing using a five percent annual growth rate indicates that the intersection of interest is expected to operate with a good LoS in the 2020 and 2030 horizon years for both the “no build” and “build” scenarios.

5.7 Conclusion

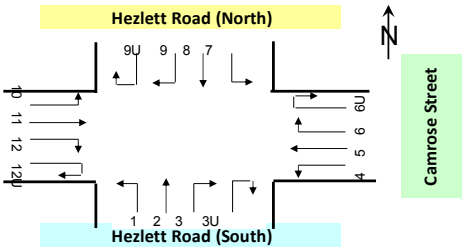
The overall conclusion from the investigations is that the traffic and parking arrangements for the proposed school are satisfactory and there are no traffic and parking impediments to the development.

Appendices

Appendix A – Traffic Survey Outputs

2017 AM Peak

Job No.	2126108
Client	: GHD
Suburb	: North Kellyville Public School
Location	: 1. Curtis Road/ Hezlett Road
Day/Date	: Tues 18th July 2017
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data



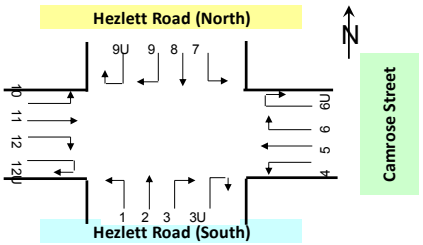
Classifications	**Class 1**	**Class 2**
	Lights	Heavies

Approach	**Hezlett Road (South)**												
Direction	**Direction 1 (Left Turn)**			**Direction 2 (Through)**			**Direction 3 (Right Turn)**			**Direction 3U (U Turn)**			**Pedestrians**
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	
8:00 am - 8:15 am	9	2	**11**	65	6	**71**	2	0	**2**	0	0	**0**	**0**
Approach	**Hezlett Road (North)**												
Direction	**Direction 7 (Left Turn)**			**Direction 8 (Through)**			**Direction 9 (Right Turn)**			**Direction 9U (U Turn)**			**Pedestrians**
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	
8:15 am - 8:30 am	9	1	**10**	87	8	**95**	1	1	**2**	0	0	**0**	**6**

Approach	**Camrose Street**												
Direction	**Direction 4 (Left Turn)**			**Direction 5 (Through)**			**Direction 6 (Right Turn)**			**Direction 6U (U Turn)**			**Pedestrians**
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	
8:45 am - 9:00 am	2	0	**2**	0	0	**0**	2	0	**2**	0	0	**0**	**0**
Approach	**Curtis Road**												
Direction	**Direction 10 (Left Turn)**			**Direction 11 (Through)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**			**Pedestrians**
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	
8:30 am - 8:45 am	3	2	**5**	1	0	**1**	9	0	**9**	0	0	**0**	**4**

2017 PM Peak

Job No.	2126108
Client	: GHD
Suburb	: North Kellyville Public School
Location	: 1. Curtis Road/ Hezlett Road
Day/Date	: Wed 19th July 2017
Weather	: Fine
Description	: Classified Intersection Count
	: 15 mins Data



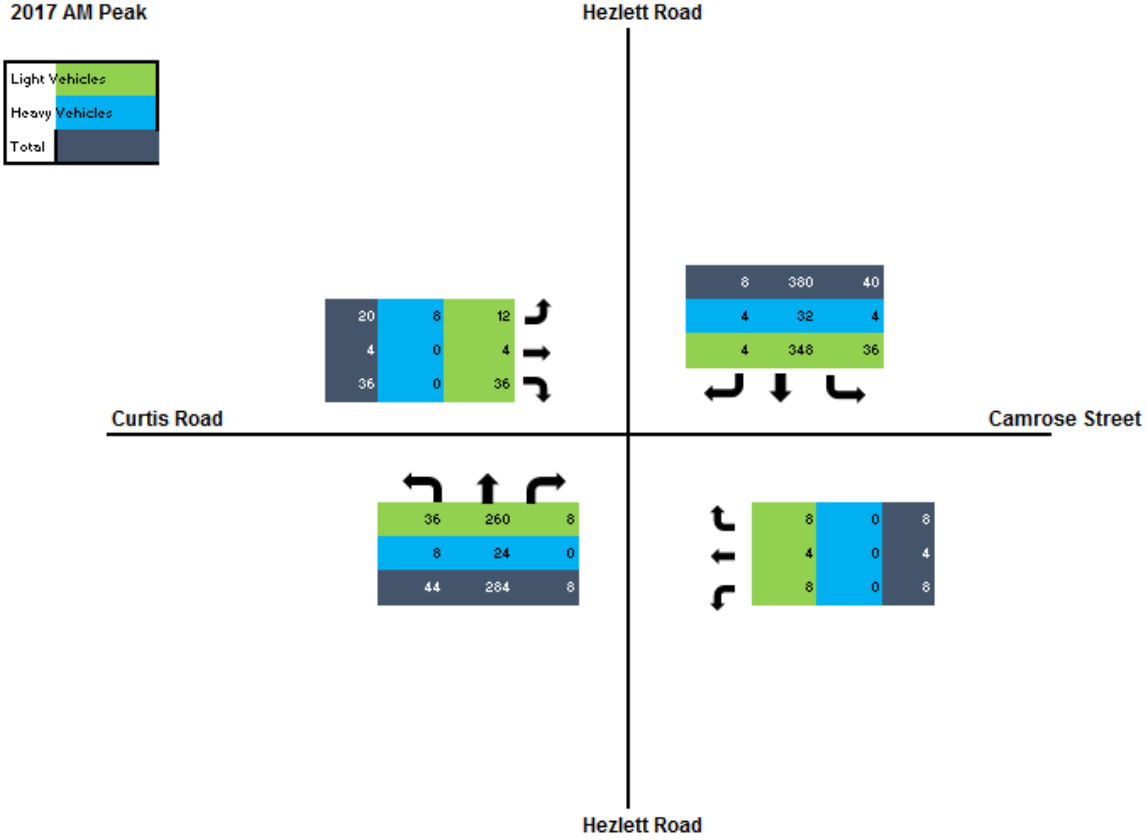
	Class 1	Class 2
Classifications	Lights	Heavies

Approach	Hezlett Road (South)												
Direction	Direction 1 (Left Turn)			Direction 2 (Through)			Direction 3 (Right Turn)			Direction 3U (U Turn)			Pedestrians
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	
3:00 pm - 3:15 pm	9	0	**9**	95	7	**102**	1	0	**1**	0	0	**0**	**0**
Approach	**Hezlett Road (North)**												
Direction	**Direction 7 (Left Turn)**			**Direction 8 (Through)**			**Direction 9 (Right Turn)**			**Direction 9U (U Turn)**			**Pedestrians**
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	
3:15 pm - 3:30 pm	3	0	**3**	86	4	**90**	2	0	**2**	0		**0**	**2**

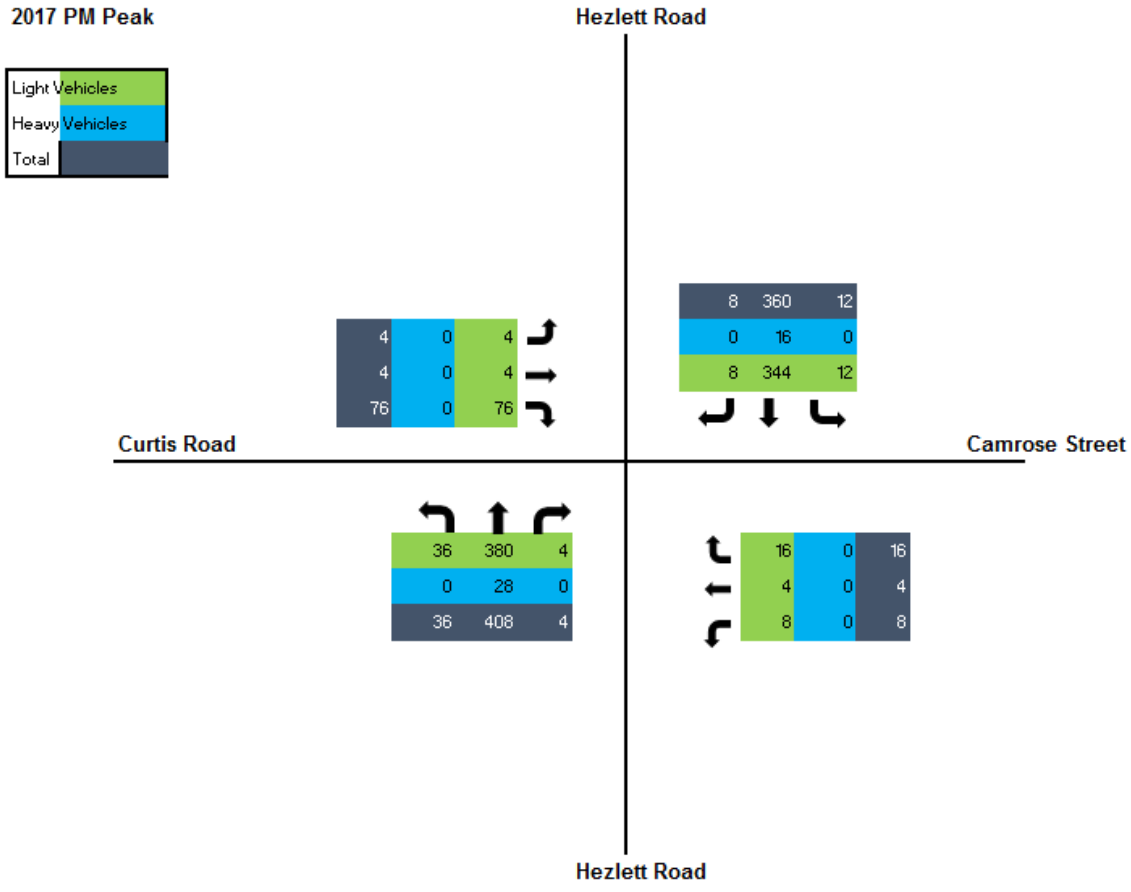
Approach	Camrose Street												
Direction	Direction 4 (Left Turn)			Direction 5 (Through)			Direction 6 (Right Turn)			Direction 6U (U Turn)			Pedestrians
Time Period	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	Lights	Heavies	Total	
3:45 pm - 4:00 pm	2	0	**2**	1	0	**1**	4	0	**4**	0	0	**0**	**0**
Approach	**Curtis Road**												
Direction	**Direction 10 (Left Turn)**			**Direction 11 (Through)**			**Direction 12 (Right Turn)**			**Direction 12U (U Turn)**			**Pedestrians**
Time Period	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	**Lights**	**Heavies**	**Total**	
3:30 pm - 3:45 pm	0	0	**0**	1	0	**1**	19	0	**19**	0	0	**0**	**2**

Appendix B – Existing and Forecast Traffic Volumes

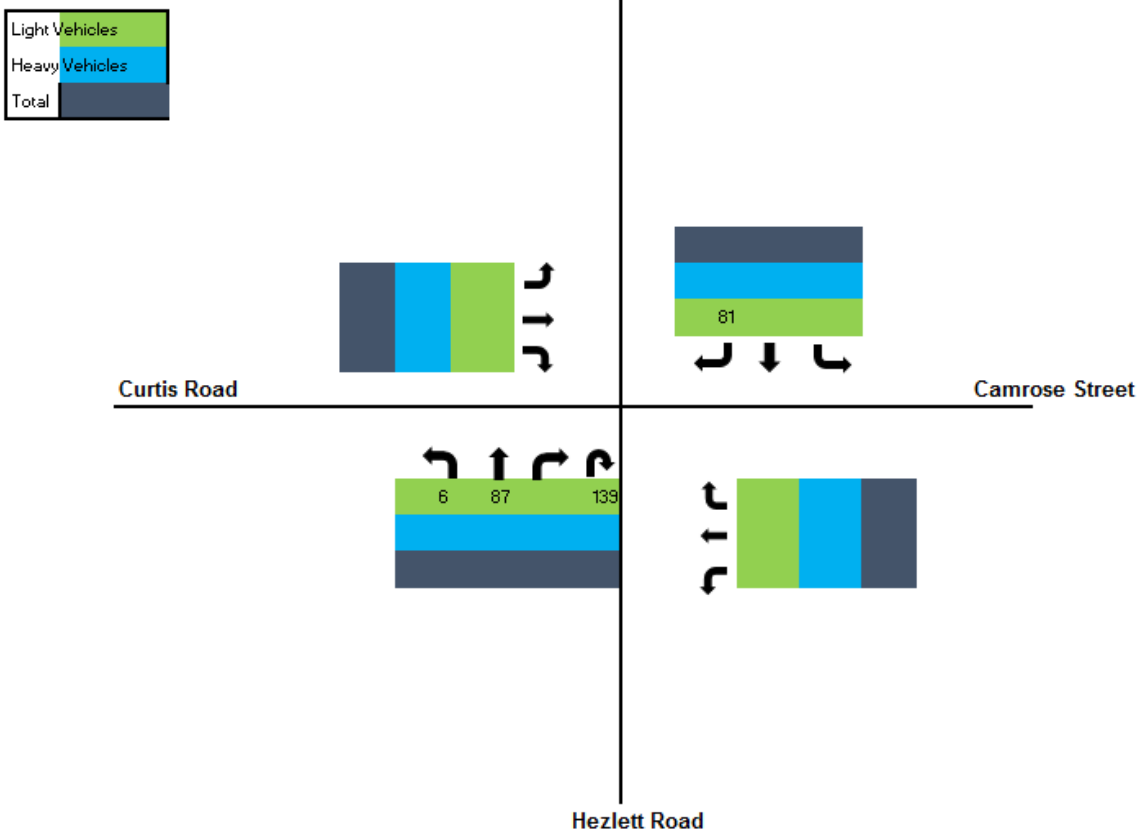
2017 AM Peak



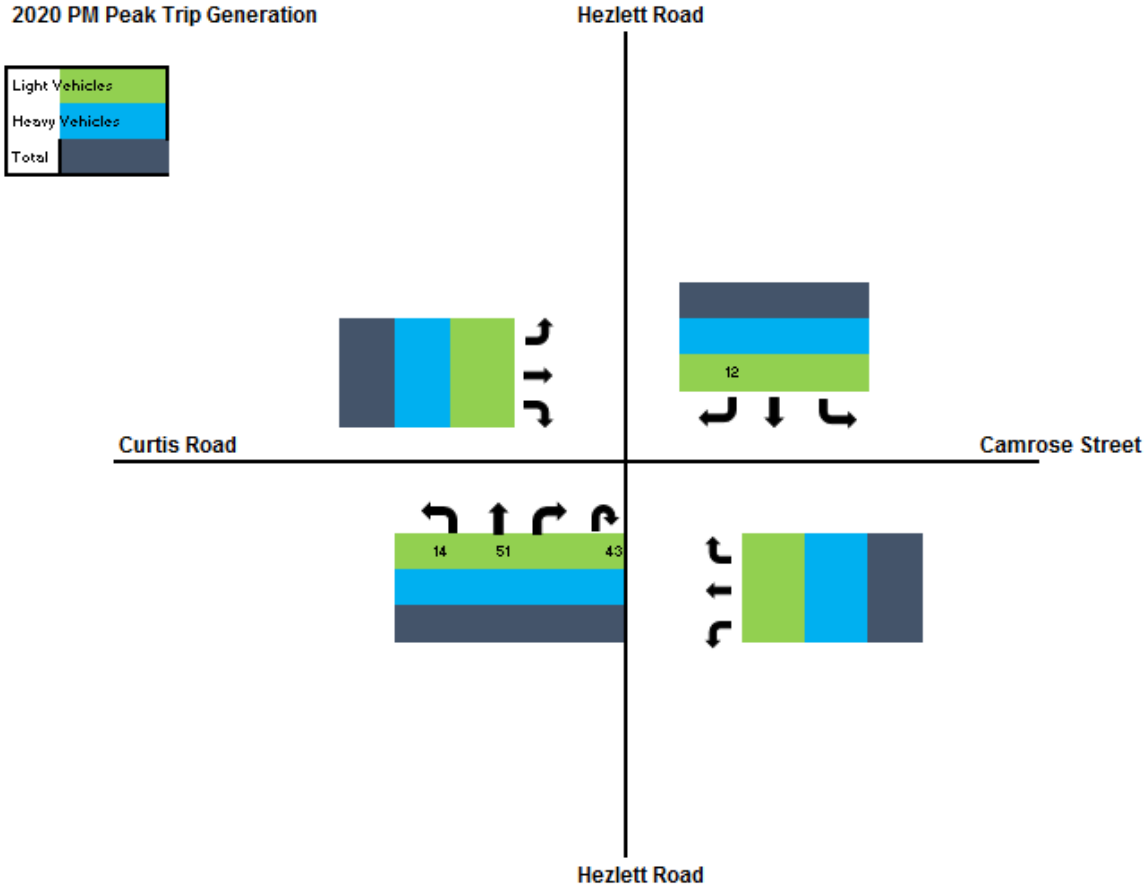
2017 PM Peak



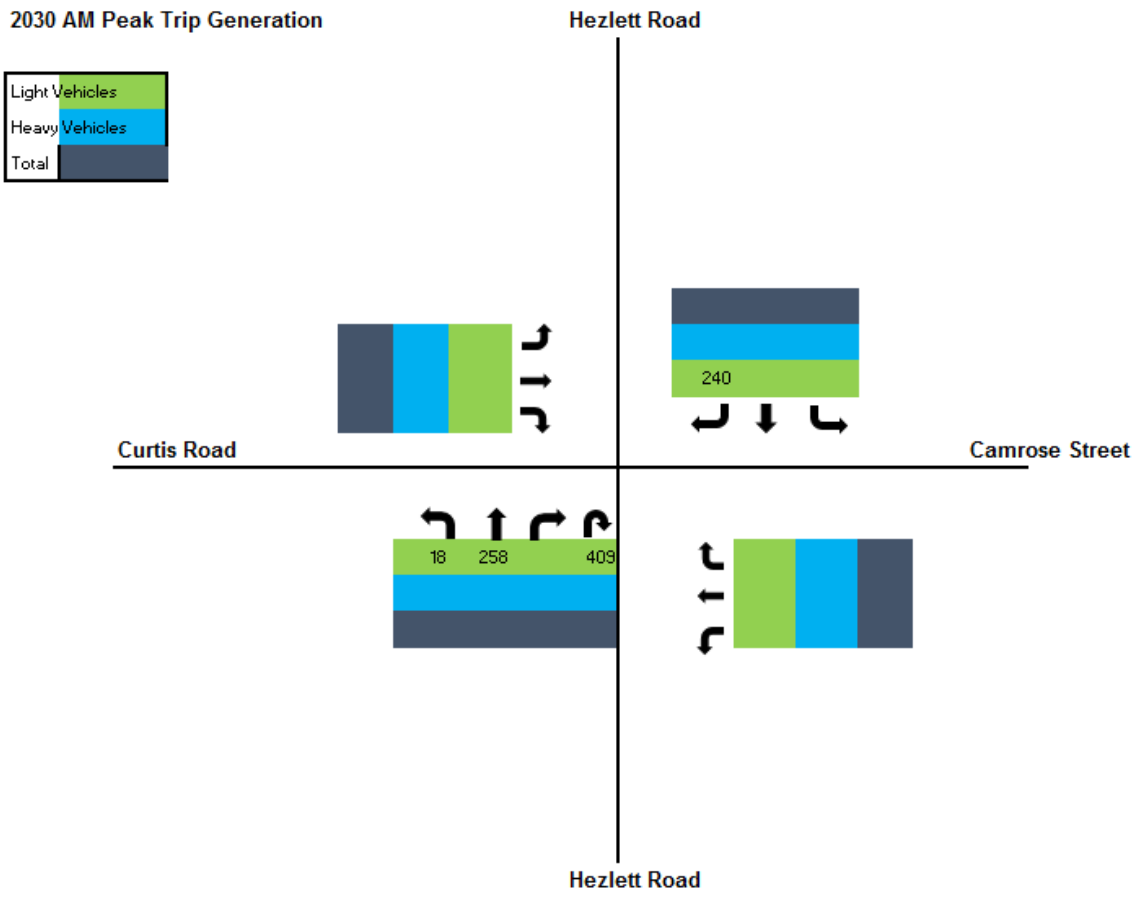
2020 AM Peak Trip Generation



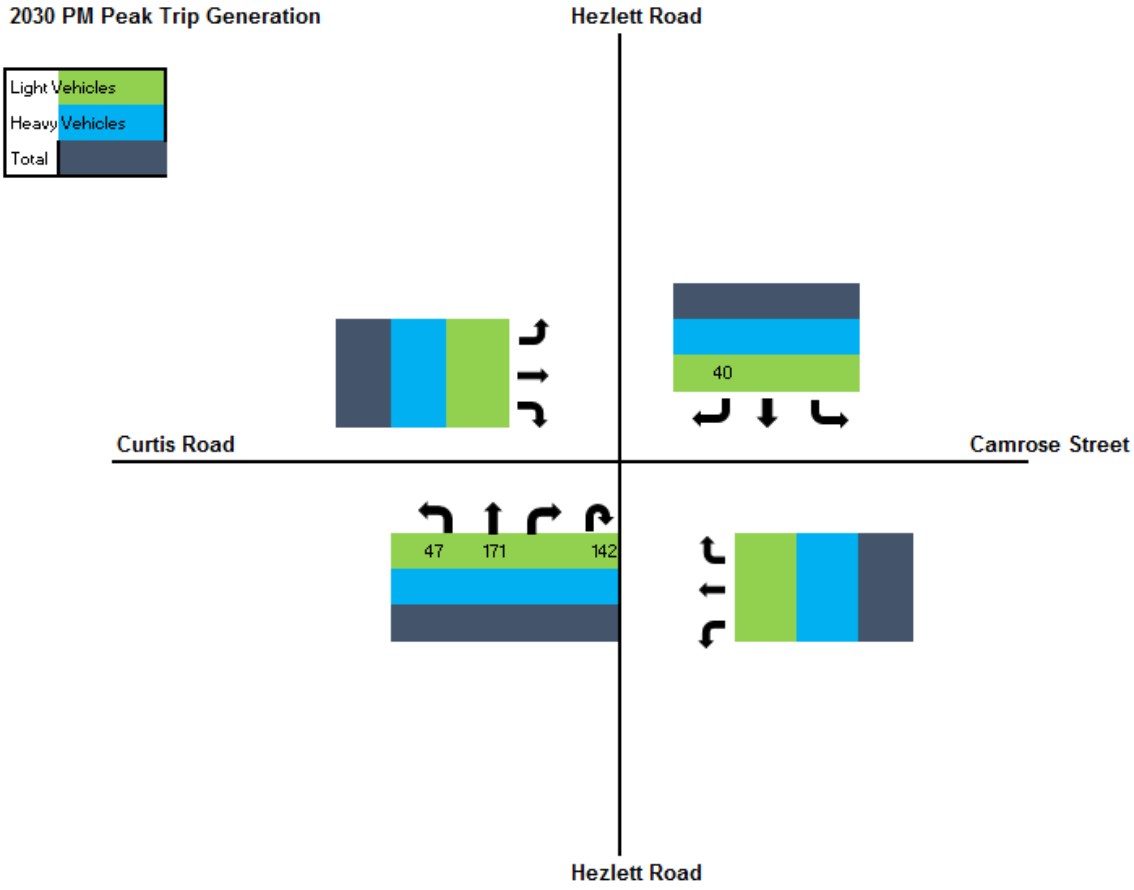
2020 PM Peak Trip Generation



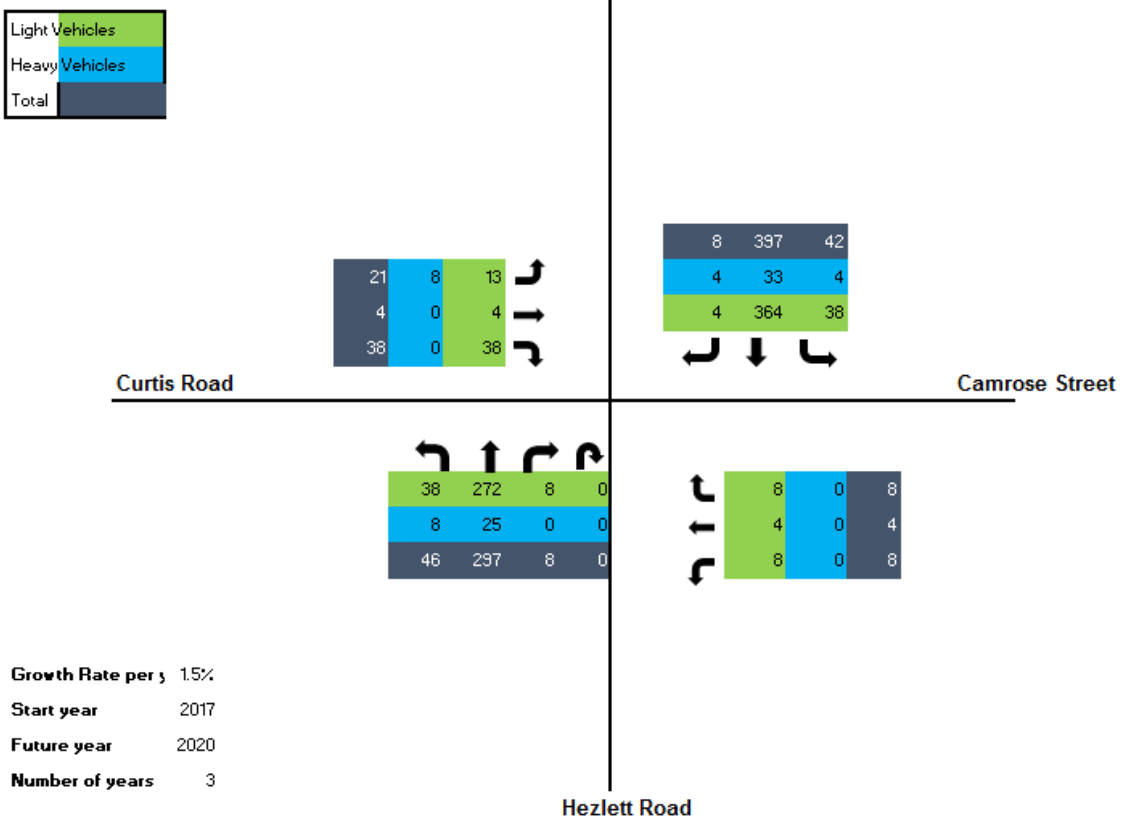
2030 AM Peak Trip Generation



2030 PM Peak Trip Generation

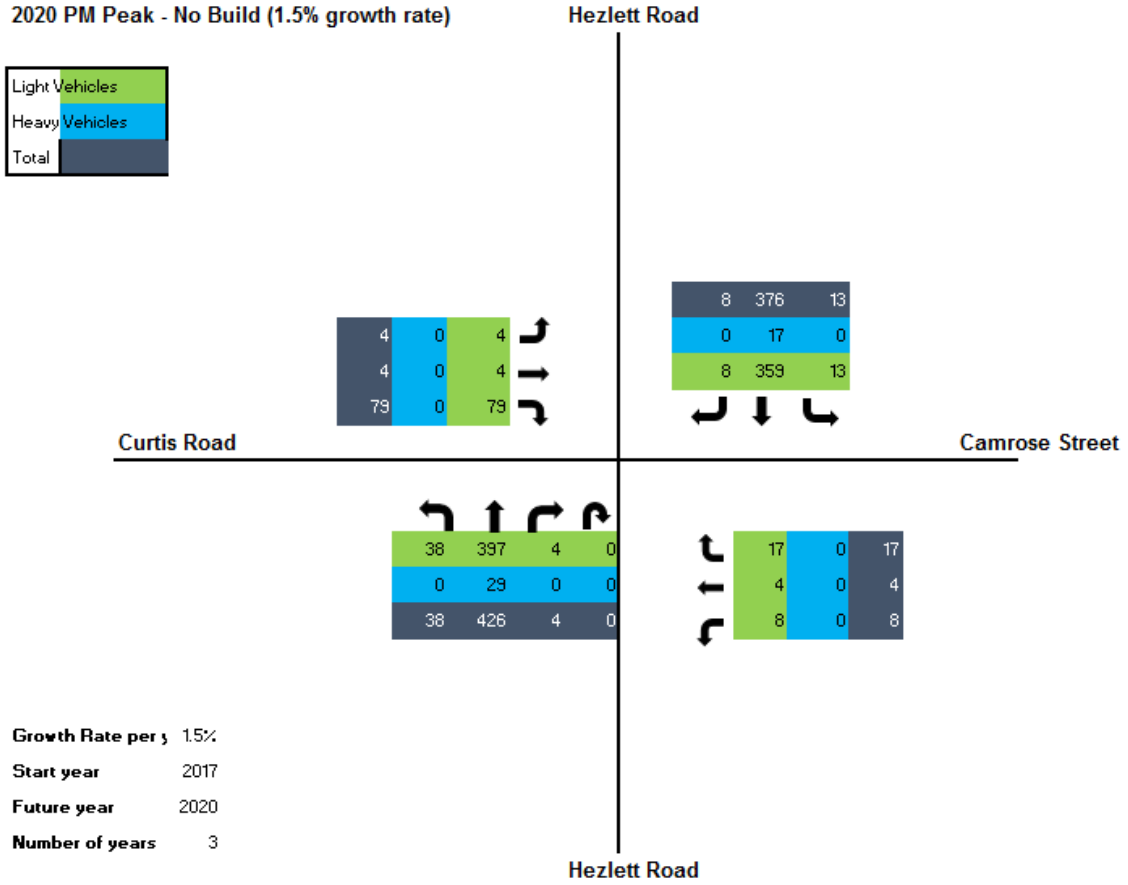


2020 AM Peak - No Build (1.5% growth rate)



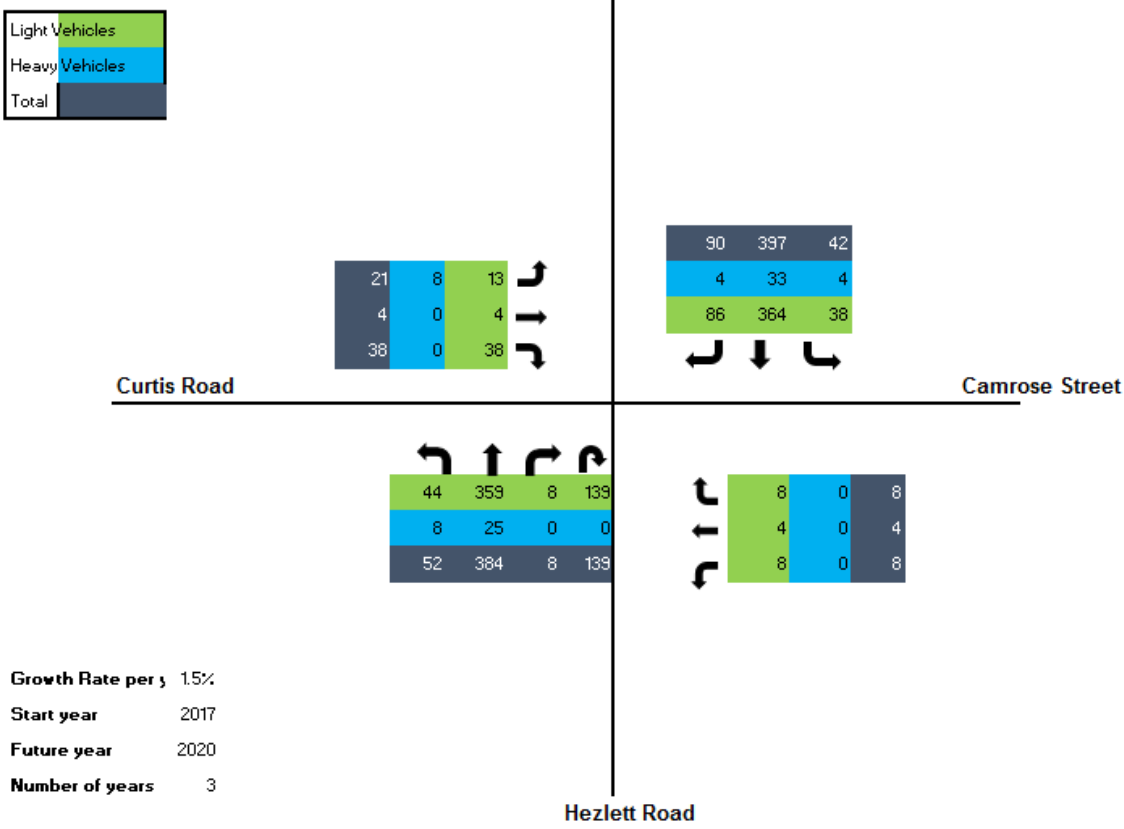
Growth Rate per y	1.5%
Start year	2017
Future year	2020
Number of years	3

2020 PM Peak - No Build (1.5% growth rate)



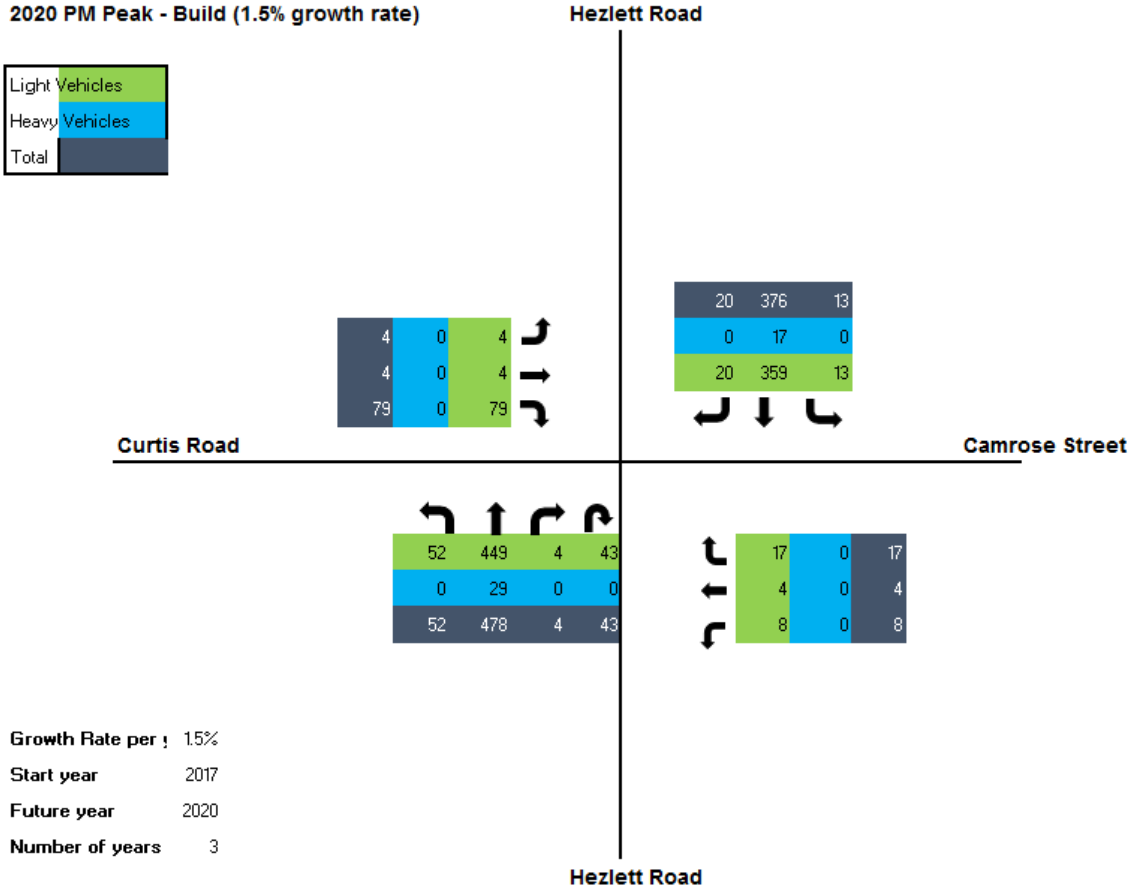
Growth Rate per y	1.5%
Start year	2017
Future year	2020
Number of years	3

2020 AM Peak - Build (1.5% growth rate)



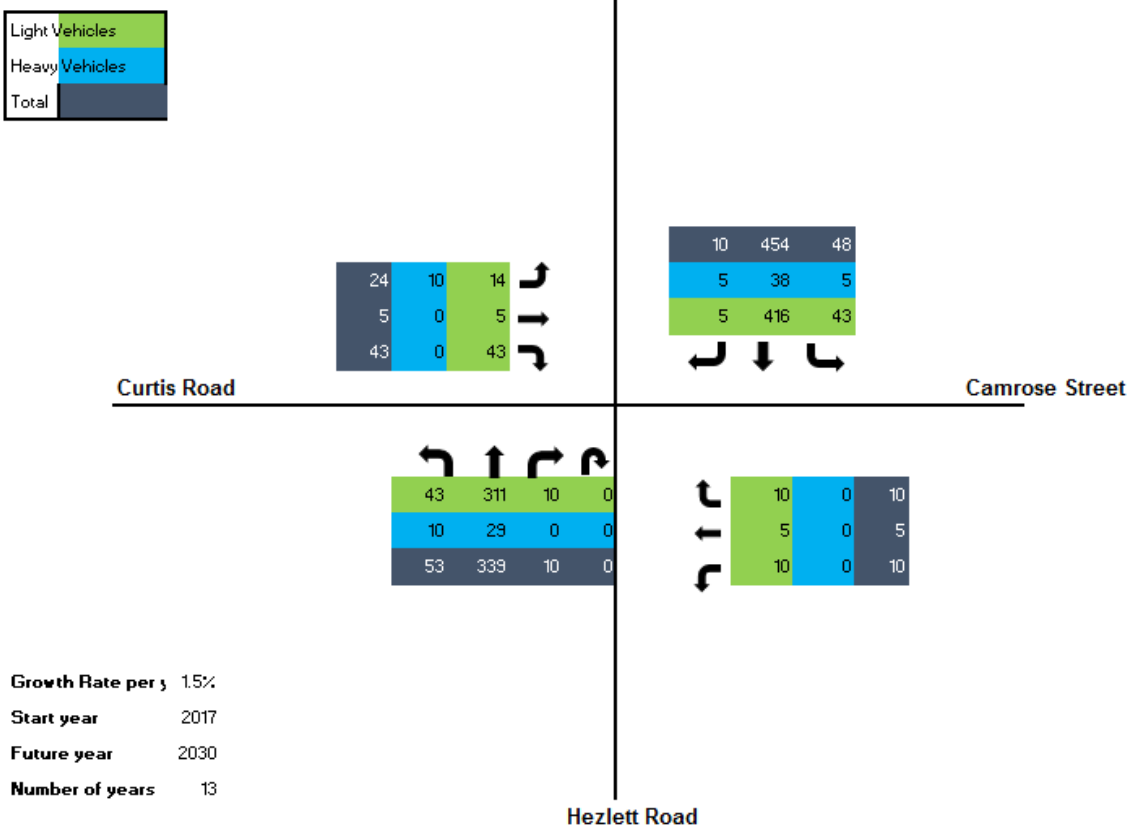
Growth Rate per y	1.5%
Start year	2017
Future year	2020
Number of years	3

2020 PM Peak - Build (1.5% growth rate)



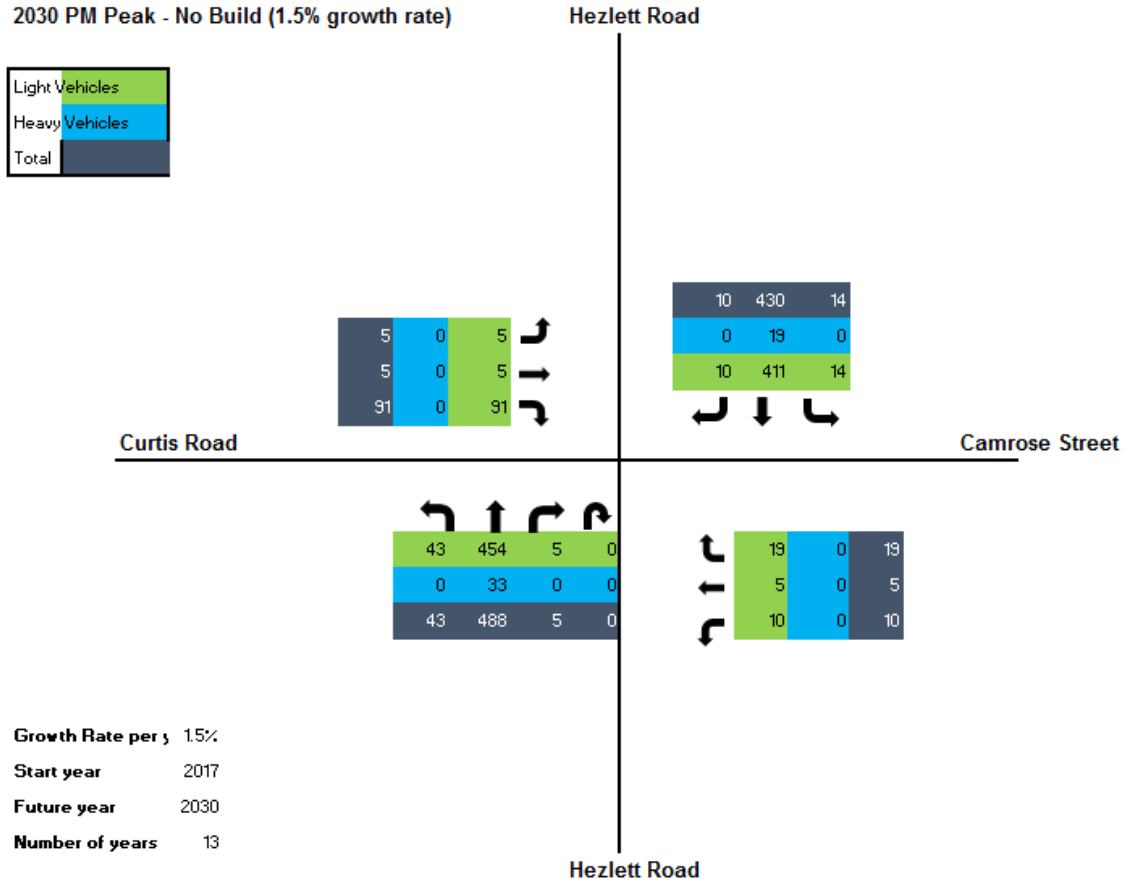
Growth Rate per y	1.5%
Start year	2017
Future year	2020
Number of years	3

2030 AM Peak - No Build (1.5% growth rate)



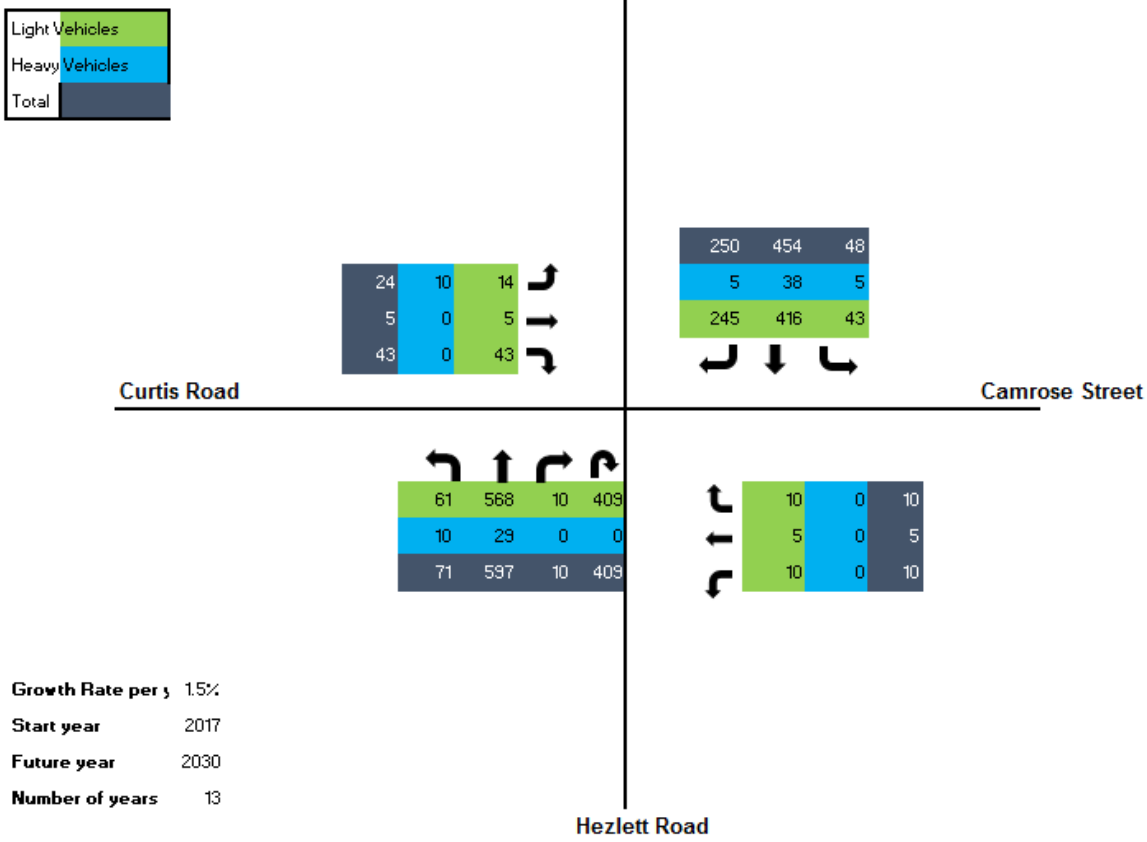
Growth Rate per y	1.5%
Start year	2017
Future year	2030
Number of years	13

2030 PM Peak - No Build (1.5% growth rate)



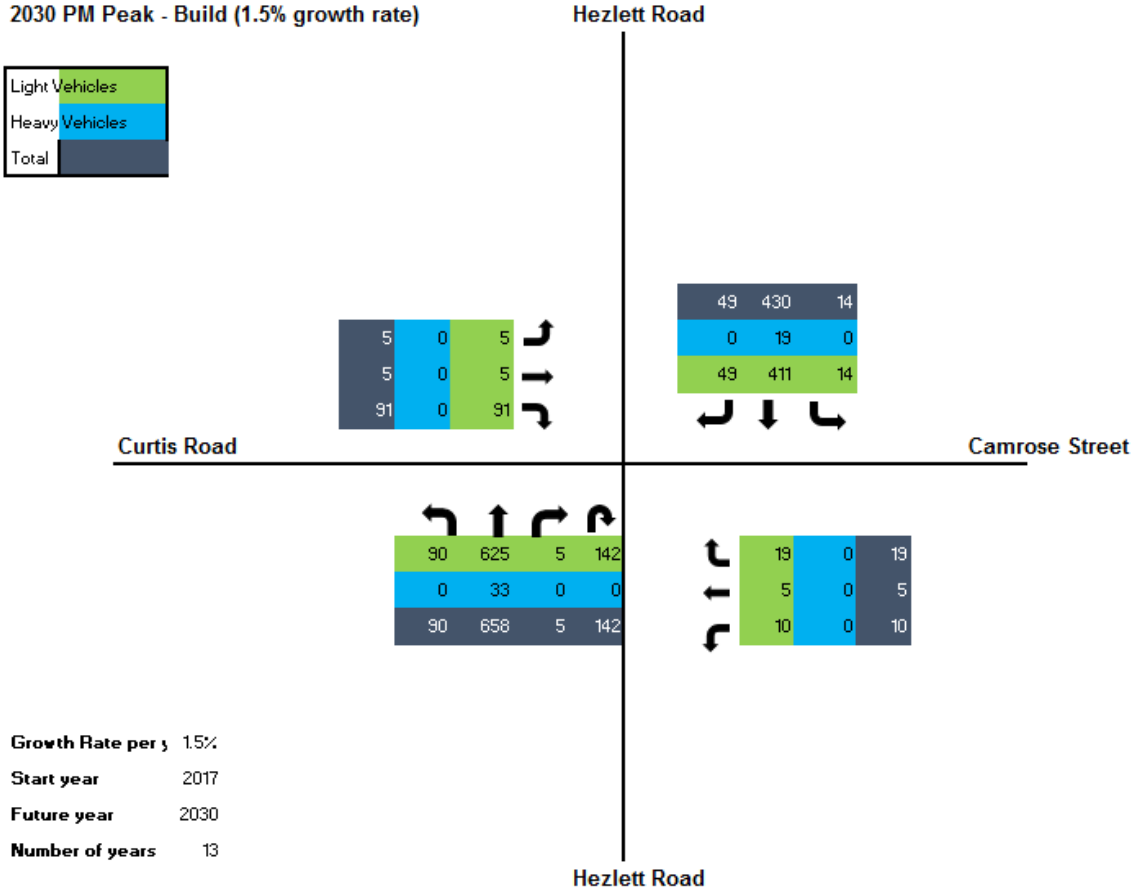
Growth Rate per y	1.5%
Start year	2017
Future year	2030
Number of years	13

2030 AM Peak - Build (1.5% growth rate)



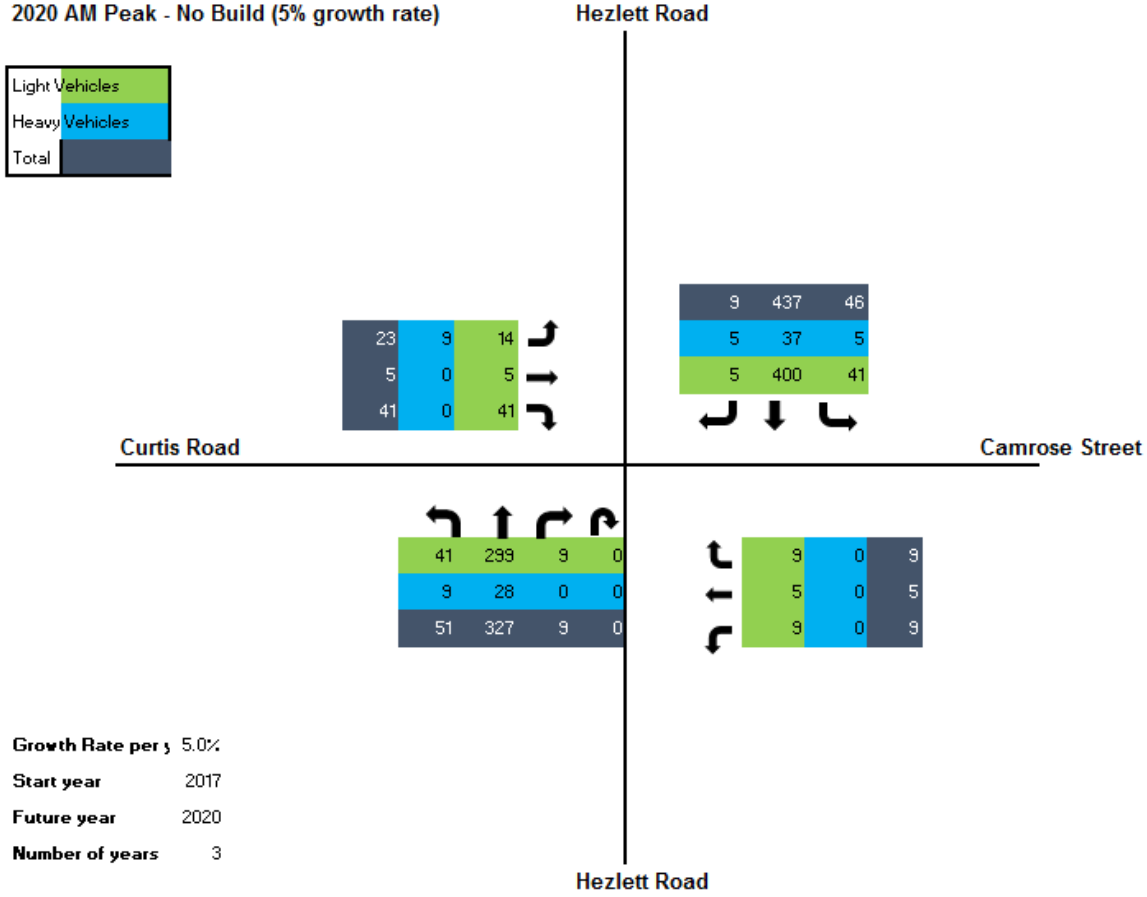
Growth Rate per y	1.5%
Start year	2017
Future year	2030
Number of years	13

2030 PM Peak - Build (1.5% growth rate)



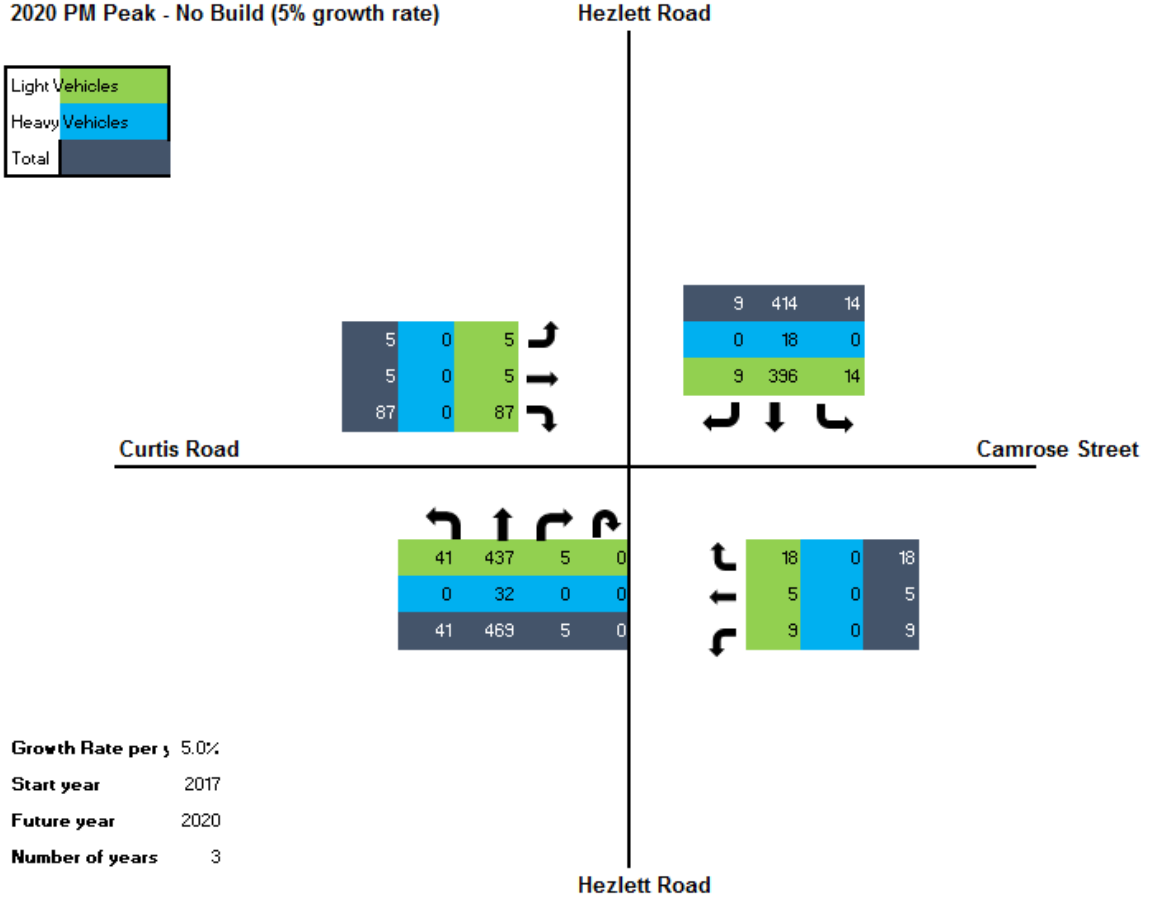
Growth Rate per y	1.5%
Start year	2017
Future year	2030
Number of years	13

2020 AM Peak - No Build (5% growth rate)



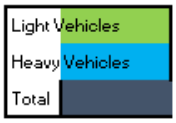
Growth Rate per y	5.0%
Start year	2017
Future year	2020
Number of years	3

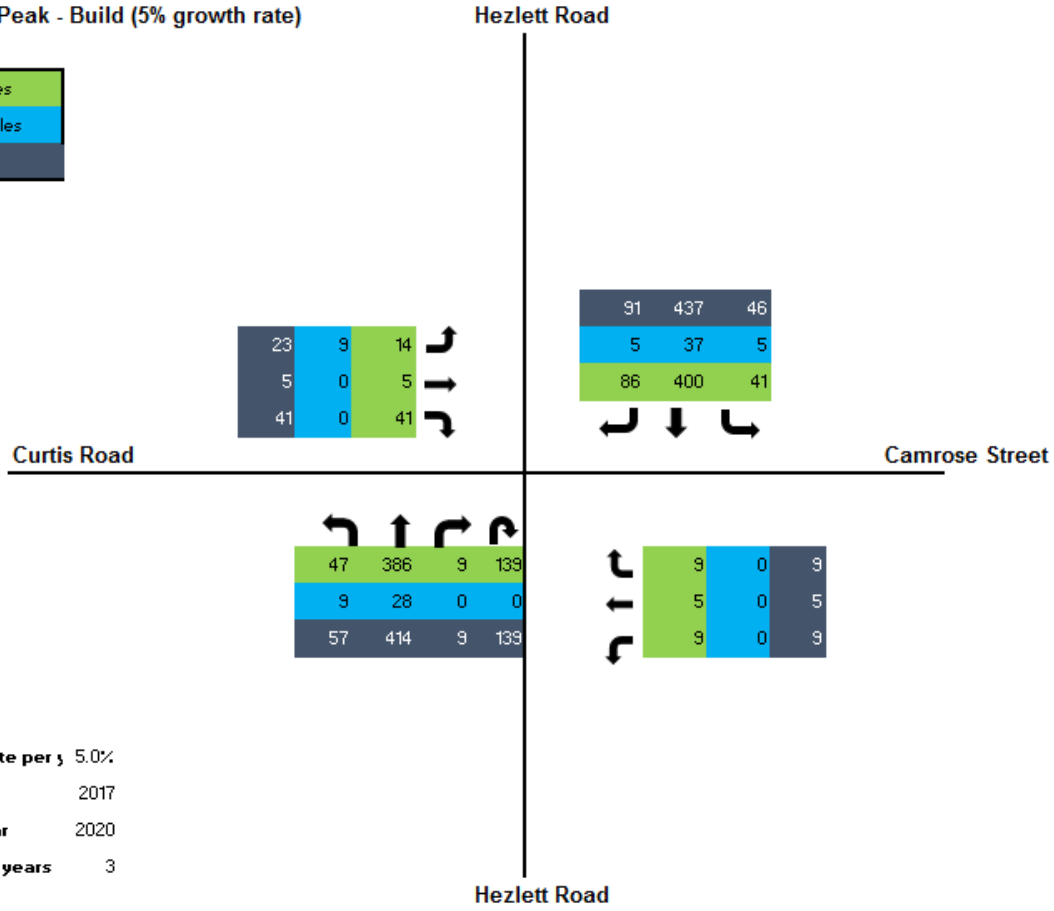
2020 PM Peak - No Build (5% growth rate)



Growth Rate per y	5.0%
Start year	2017
Future year	2020
Number of years	3

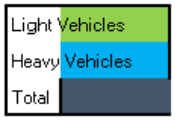
2020 AM Peak - Build (5% growth rate)

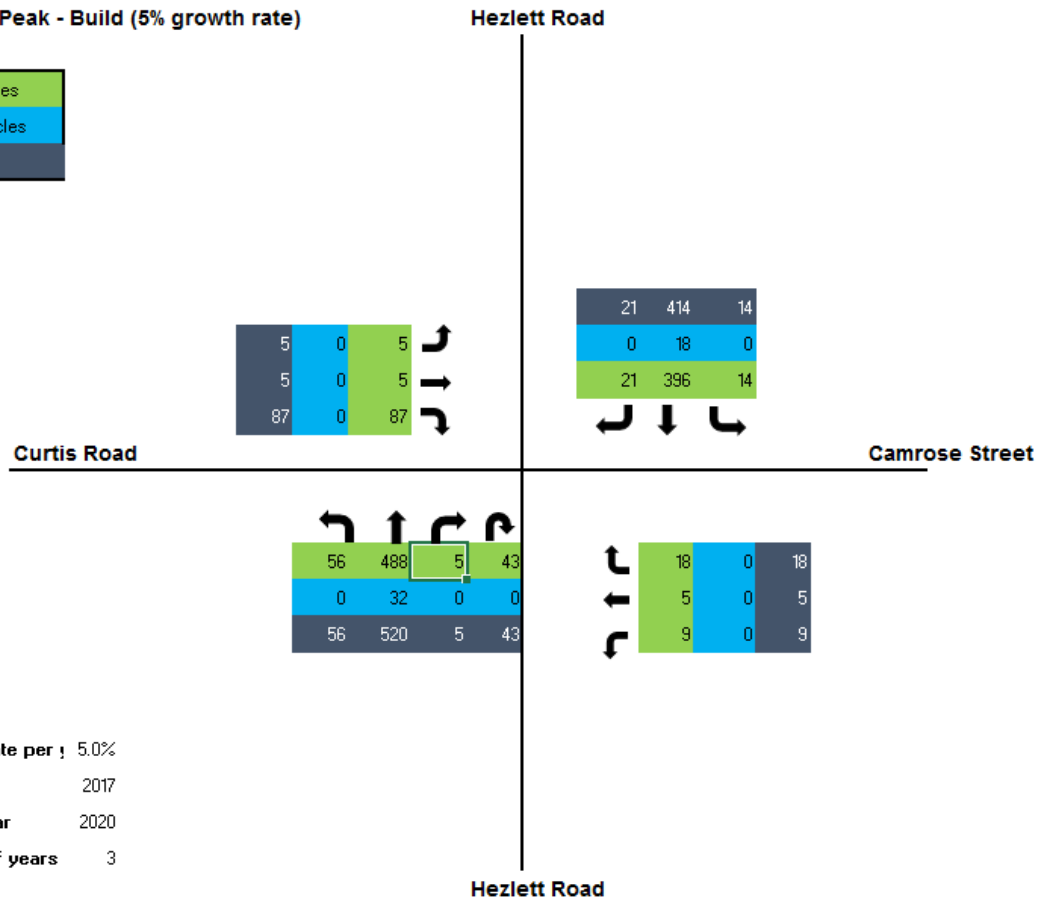




Growth Rate per y	5.0%
Start year	2017
Future year	2020
Number of years	3

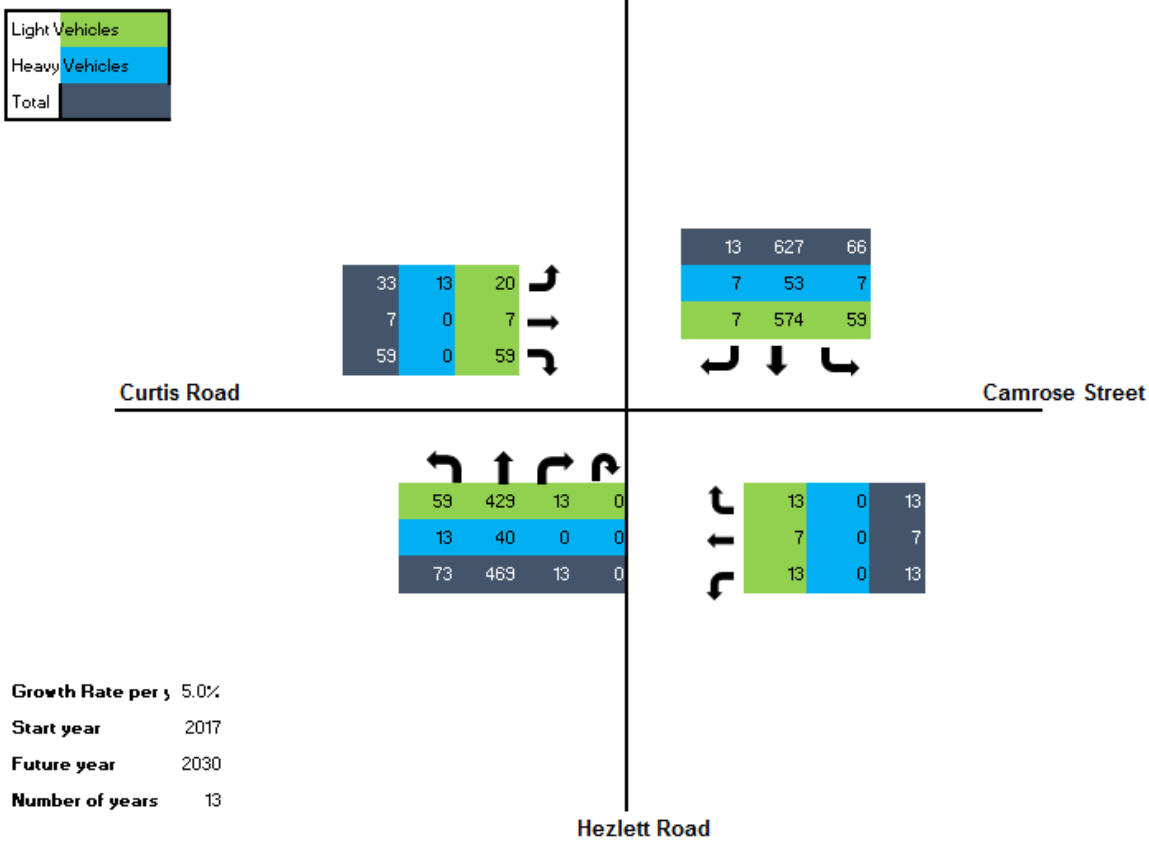
2020 PM Peak - Build (5% growth rate)





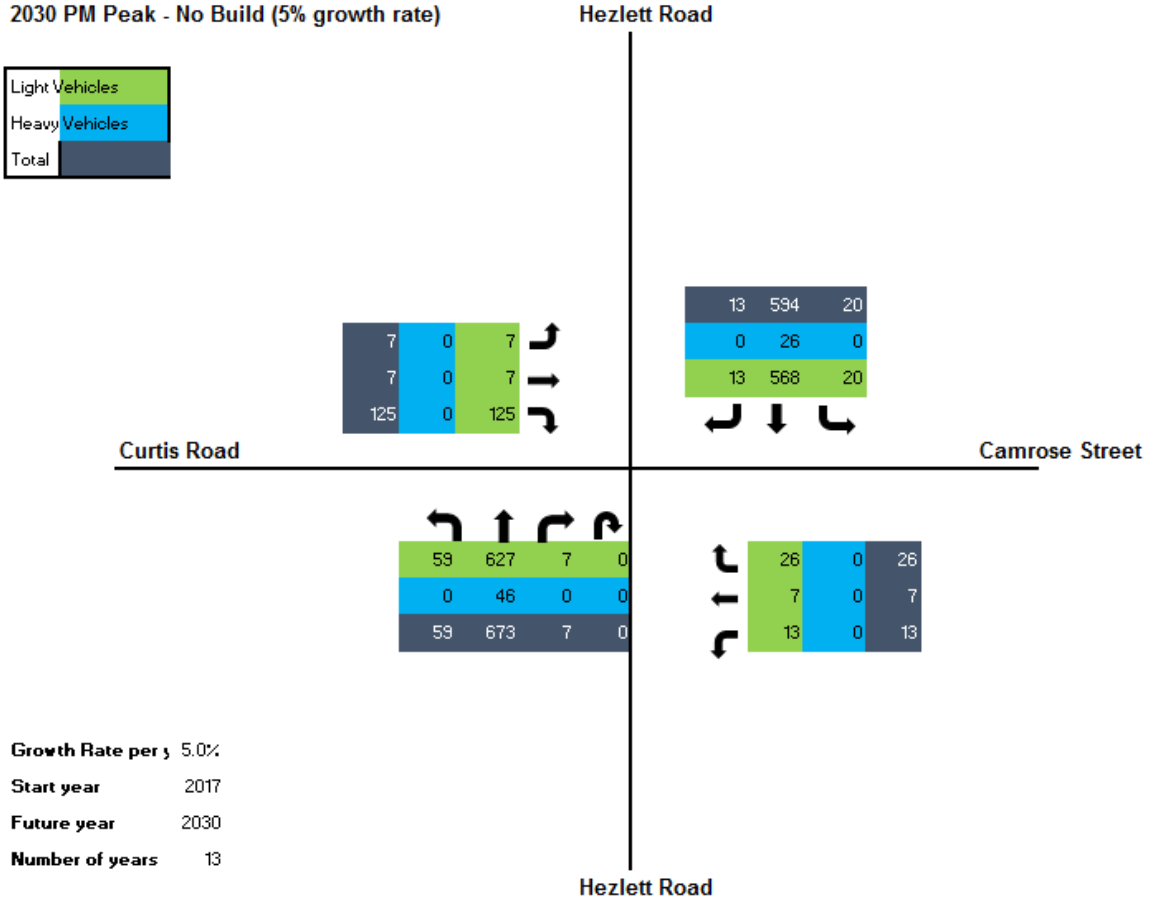
Growth Rate per y	5.0%
Start year	2017
Future year	2020
Number of years	3

2030 AM Peak - No Build (5% growth rate)



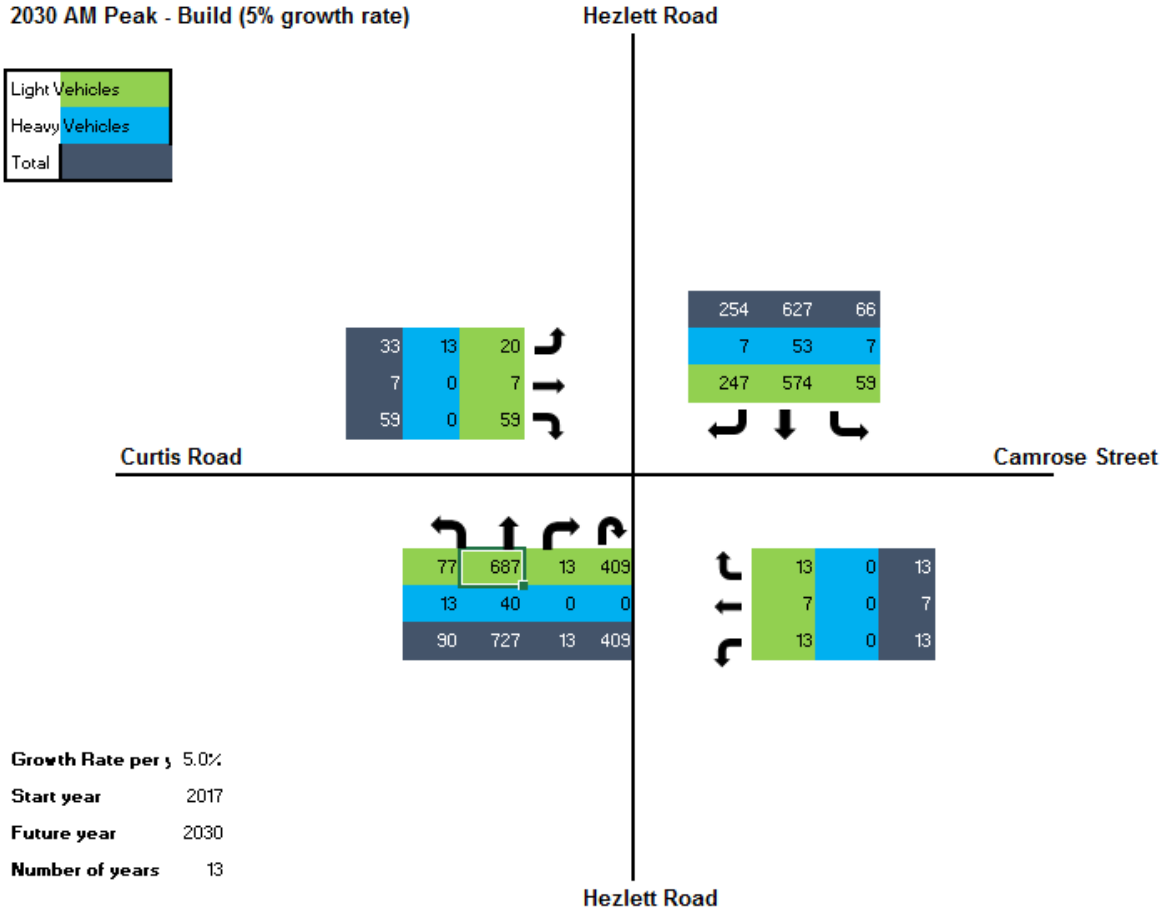
Growth Rate per y	5.0%
Start year	2017
Future year	2030
Number of years	13

2030 PM Peak - No Build (5% growth rate)



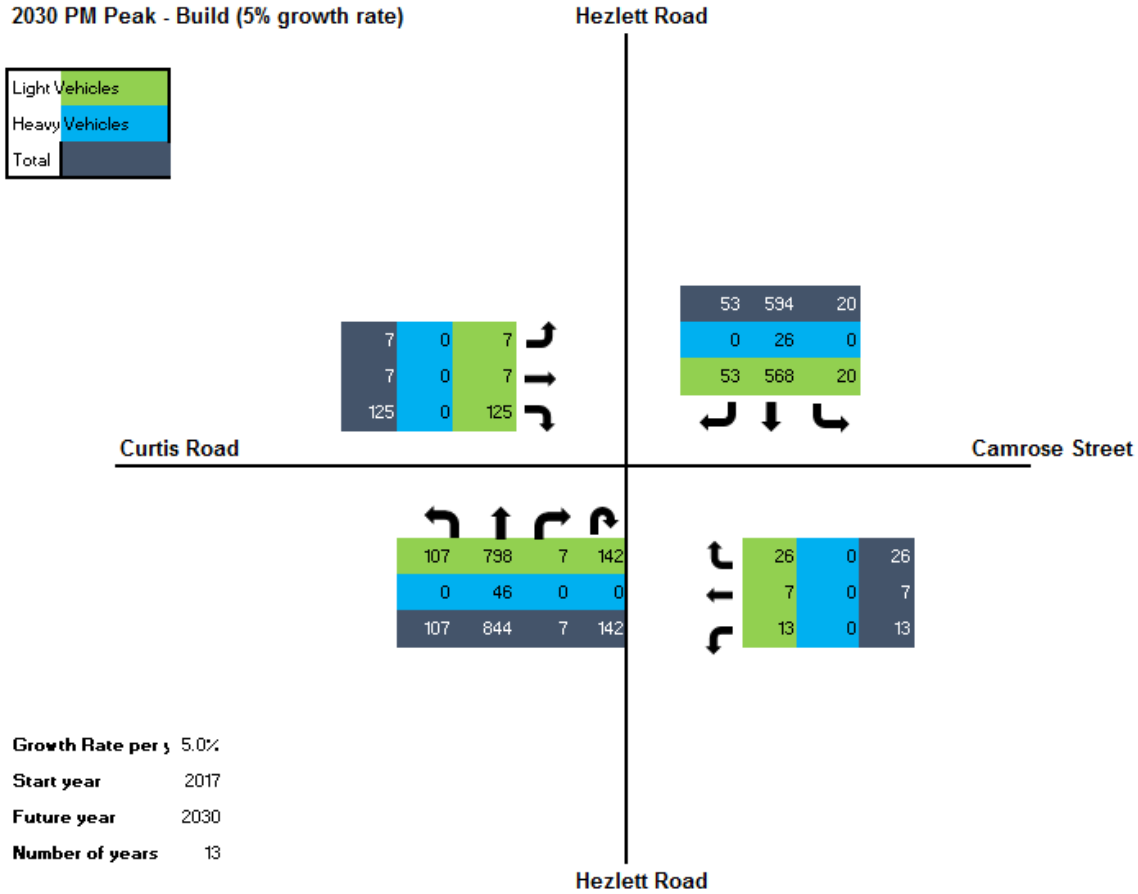
Growth Rate per y	5.0%
Start year	2017
Future year	2030
Number of years	13

2030 AM Peak - Build (5% growth rate)



Growth Rate per y	5.0%
Start year	2017
Future year	2030
Number of years	13

2030 PM Peak - Build (5% growth rate)



Growth Rate per y	5.0%
Start year	2017
Future year	2030
Number of years	13

Appendix C – Internet Questionnaire

1. How many of your children attend Beaumont Public School

- ◯ 1 Child
- ◯ 2 Children
- ◯ 3 Children
- ◯ 4 or more Children

2. What are the ages of your child/children?

Child 1

Child 2

Child 3

Child 4

3. How far did your child/children travel to school today?

- ◯ 0 km – 1 km
- ◯ 1 km – 2 km
- ◯ 2 km – 3 km
- ◯ 3 km – 4 km
- ◯ Greater than 4 km

4. Which mode of transport did your child/children use to travel to school this morning?

- ◯ a.) Private vehicle - dropped off outside school gates
- ◯ b.) Private vehicle – parked and then walked to school grounds
- ◯ c.) School Bus
- ◯ d.) Public Bus
- ◯ e.) Walked to school
- ◯ f.) Cycled to school

Other (please specify)

5. Did you accompany your child/children to school today?

- ◯ a.) Yes
- ◯ b.) No

6. If Yes, is your child's/children's trip to school part of another journey i.e. to work or shopping?

- ◯ a.) Yes
- ◯ b.) No
- ◯ c.) N/A

7. Which mode of transport did your child/children use to travel from school this afternoon?

- ◯ a.) Private vehicle – picked up outside school gates
- ◯ b.) Private vehicle - parked and then walked from school grounds
- ◯ c.) School Bus
- ◯ d.) Public Bus
- ◯ e.) Walked from school
- ◯ f.) Cycled from school

Other (please specify)

8. Do you accompany your child/children from school today?

- ◯ a.) Yes
- ◯ b.) No

9. If Yes, is your child's/children's trip from school part of another journey i.e. from work or shopping?

- ◯ a.) Yes
- ◯ b.) No
- ◯ c.) N/A

Appendix D – Manual Travel Mode Surveys

Client	GHD
Location	Beaumont Hills School
Date	Thu, 08st June 2017
Survey Time	08:00-09:30 & 14:30-16:00 (2.5 hours)
Description	Mode of travel school Survey

N

Location

- Yellow Line - Ped
- Blue Line - Vehicle
- Green Line - Bus

Location	Beaumont Hills School
Date	Thu, 08st June 2017
Survey Time	08:00-09:30 & 14:30-16:00 (2.5 hours)
Description	Mode of travel school Survey

[15mins interval]

Vehicle Drop Off Zone																													
Time Period	A														B														
	Vehicles Drop off							Vehicles Pick up							Vehicles Drop off							Vehicles Pick up						
	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total
8:00 to 8:15	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	3	0	0	0	0	0	**3**	0	0	0	0	0	0	**0**
8:15 to 8:30	2	0	0	0	0	0	**2**	0	0	0	0	0	0	**0**	5	2	0	0	0	0	**7**	0	0	0	0	0	0	**0**
8:30 to 8:45	2	2	0	0	1	0	**5**	0	0	0	0	0	0	**0**	23	10	1	0	0	0	**34**	0	0	0	0	0	0	**0**
8:45 to 9:00	1	9	2	1	0	1	**14**	0	0	0	0	0	0	**0**	31	19	3	0	0	0	**53**	0	0	0	0	0	0	**0**
9:00 to 9:15	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	5	0	0	0	0	0	**5**	0	0	0	0	0	0	**0**
9:15 to 9:30	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	1	0	0	0	0	0	**1**	0	0	0	0	0	0	**0**
Totals	**5**	**11**	**2**	**1**	**1**	**1**	**21**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**68**	**31**	**4**	**0**	**0**	**0**	**103**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
14:30 to 14:45	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**
14:45 to 15:00	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**
15:00 to 15:15	0	0	0	0	0	0	**0**	3	2	2	1	0	0	**8**	0	0	0	0	0	0	**0**	28	17	2	0	0	0	**47**
15:15 to 15:30	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	1	3	0	0	0	0	**4**
15:30 to 15:45	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**
15:45 to 16:00	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**	0	0	0	0	0	0	**0**
Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**2**	**1**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**29**	**20**	**2**	**0**	**0**	**0**	**51**

[Hourly Summary]

Vehicle Drop Off Zone																													
Time Period	A														B														
	Vehicles Drop off							Vehicles Pick up							Vehicles Drop off							Vehicles Pick up						
	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total
8:00 to 9:00	5	11	2	1	1	1	**21**	0	0	0	0	0	0	**0**	62	31	4	0	0	0	**97**	0	0	0	0	0	0	**0**
8:15 to 9:15	5	11	2	1	1	1	**21**	0	0	0	0	0	0	**0**	64	31	4	0	0	0	**99**	0	0	0	0	0	0	**0**
8:30 to 9:30	3	11	2	1	1	1	**19**	0	0	0	0	0	0	**0**	60	29	4	0	0	0	**93**	0	0	0	0	0	0	**0**
Totals	**5**	**11**	**2**	**1**	**1**	**1**	**21**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**68**	**31**	**4**	**0**	**0**	**0**	**103**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
14:30 to 15:30	0	0	0	0	0	0	**0**	3	2	2	1	0	0	**8**	0	0	0	0	0	0	**0**	29	20	2	0	0	0	**51**
14:45 to 15:45	0	0	0	0	0	0	**0**	3	2	2	1	0	0	**8**	0	0	0	0	0	0	**0**	29	20	2	0	0	0	**51**
15:00 to 16:00	0	0	0	0	0	0	**0**	3	2	2	1	0	0	**8**	0	0	0	0	0	0	**0**	29	20	2	0	0	0	**51**
Totals	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**2**	**1**	**0**	**0**	**8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**29**	**20**	**2**	**0**	**0**	**0**	**51**

[Peak Hour Summary]

	Vehicle Drop Off Zone																												
	Time Period	A														B													
		Vehicles Drop off							Vehicles Pick up							Vehicles Drop off							Vehicles Pick up						
		1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total
AM	8:15 to 9:15	5	11	2	1	1	1	21	0	0	0	0	0	0	0	64	31	4	0	0	0	99	0	0	0	0	0	0	0
PM	14:30 to 15:30	0	0	0	0	0	0	0	3	2	2	1	0	0	8	0	0	0	0	0	0	0	29	20	2	0	0	0	51

Vehicle entry continued:

Client	GHD
Location	Beaumont Hills School
Date	Thu, 08st June 2017
Survey Time	08:00-09:30 & 14:30-16:00 (2.5 hours)
Description	Mode of travel school Survey

MATRIX Traffic and Transport Data

MATRIX Traffic and Transport Data

C - ON STREET														C - CAR PARK												Grand Total
Vehicles Drop off							Vehicles Pick up							Vehicles Drop off							Vehicles Pick up							
1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	1	0	0	0	0	7	0	0	0	0	0	0	0	10
3	0	0	0	0	0	3	0	0	0	0	0	0	0	5	1	0	0	0	0	6	0	0	0	0	0	0	0	18
3	0	3	0	0	0	6	0	0	0	0	0	0	0	18	10	2	1	0	0	31	0	0	0	0	0	0	0	76
9	6	1	1	0	0	17	0	0	0	0	0	0	0	27	13	2	2	0	0	44	0	0	0	0	0	0	0	128
2	1	0	0	0	0	3	0	0	0	0	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
17	7	4	1	0	0	29	0	0	0	0	0	0	0	57	26	4	3	0	0	90	0	0	0	0	0	0	0	243
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	3	3
0	0	0	0	0	0	0	7	4	2	0	0	0	13	0	0	0	0	0	0	0	17	10	3	2	0	0	32	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	3	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	7	4	2	0	0	0	13	0	0	0	0	0	0	0	22	13	3	2	0	0	40	112

Vehicle Entry							Grand Total
Time Period	D			E			
	Entering School	Leaving School	Total	Entering School	Leaving School	Total	
8:00 to 8:15	12	0	12	8	10	18	30
8:15 to 8:30	5	1	6	6	5	11	17
8:30 to 8:45	5	1	6	31	22	53	59
8:45 to 9:00	3	2	5	44	39	83	88
9:00 to 9:15	1	4	5	2	13	15	20
9:15 to 9:30	0	0	0	0	1	1	1
Totals	26	8	34	91	90	181	215
14:30 to 14:45	1	1	2	10	1	11	13
14:45 to 15:00	2	1	3	13	3	16	19
15:00 to 15:15	0	5	5	18	32	50	55
15:15 to 15:30	1	3	4	1	3	4	8
15:30 to 15:45	0	10	10	0	0	0	10
15:45 to 16:00	1	2	3	0	1	1	4
Totals	5	22	27	42	40	82	109

C														C												Grand Total
Vehicles Drop off							Vehicles Pick up							Vehicles Drop off							Vehicles Pick up							
1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	
15	6	4	1	0	0	26	0	0	0	0	0	0	0	56	25	4	3	0	0	88	0	0	0	0	0	0	0	232
17	7	4	1	0	0	29	0	0	0	0	0	0	0	51	25	4	3	0	0	83	0	0	0	0	0	0	0	232
14	7	4	1	0	0	26	0	0	0	0	0	0	0	46	24	4	3	0	0	77	0	0	0	0	0	0	0	215
17	7	4	1	0	0	29	0	0	0	0	0	0	0	57	26	4	3	0	0	90	0	0	0	0	0	0	0	232
0	0	0	0	0	0	0	7	4	2	0	0	0	13	0	0	0	0	0	0	0	21	13	3	2	0	0	39	111
0	0	0	0	0	0	0	7	4	2	0	0	0	13	0	0	0	0	0	0	0	20	13	3	2	0	0	38	110
0	0	0	0	0	0	0	7	4	2	0	0	0	13	0	0	0	0	0	0	0	19	12	3	2	0	0	36	108
0	0	0	0	0	0	0	7	4	2	0	0	0	13	0	0	0	0	0	0	0	22	13	3	2	0	0	40	111

Vehicle Entry							Grand Total
Time Period	D			E			
	Entering School	Leaving School	Total	Entering School	Leaving School	Total	
8:00 to 9:00	25	4	29	89	76	165	194
8:15 to 9:15	14	8	22	83	79	162	184
8:30 to 9:30	9	7	16	77	75	152	168
Totals	26	8	34	91	90	181	215
14:30 to 15:30	4	10	14	42	39	81	95
14:45 to 15:45	3	19	22	32	38	70	92
15:00 to 16:00	2	20	22	19	36	55	77
Totals	5	22	27	42	40	82	109

C														C												Grand Total
Vehicles Drop off							Vehicles Pick up							Vehicles Drop off							Vehicles Pick up							
1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	1	2	3	4	5	6	Total	
17	7	4	1	0	0	29	0	0	0	0	0	0	0	51	25	4	3	0	0	83	0	0	0	0	0	0	0	232
0	0	0	0	0	0	0	7	4	2	0	0	0	13	0	0	0	0	0	0	0	21	13	3	2	0	0	39	111

Vehicle Entry							Grand Total
Time Period	D			E			
	Entering School	Leaving School	Total	Entering School	Leaving School	Total	
8:00 to 9:00	25	4	29	89	76	165	194
14:30 to 15:30	4	10	14	42	39	81	95

Client	GHD
Location	Beaumont Hills School
Date	Thu, 08st June 2017
Survey Time	08:00-09:30 & 14:30-16:00 (2.5 hours)
Description	Mode of travel school Survey

MATRIX Traffic and Transport Data

A (Bus drop off Zone)			
Arrival time	**Drop off**	**Pick up**	**Departure time**
8:03:00	0	0	8:03:00
8:26:00	1	0	8:27:00
8:33:00	1	0	8:34:00
8:34:00	16	0	8:36:00
8:37:00	2	0	8:37:00
8:47:00	1	0	8:47:00
8:58:00	3	0	8:59:00
9:04:00	0	0	9:04:00
AM Totals	**24**	**0**	**AM Totals**
14:42:00	0	0	14:42:00
14:45:00	0	0	14:45:00
15:02:00	0	4	15:10:00
15:04:00	0	16	15:10:00
15:10:00	0	10	15:13:00
15:15:00	0	11	15:16:00
15:16:00	0	1	15:17:00
15:16:00	0	7	15:18:00
15:17:00	0	4	15:17:00
15:22:00	0	14	15:24:00
PM Totals	**24**	**67**	**PM Totals**

B (Bus drop off Zone)			
Arrival time	**Drop off**	**Pick up**	**Departure time**
8:07:08	0	0	8:07:20
8:43:50	0	0	8:44:06
9:03:30	0	0	9:03:41
AM Totals	**0**	**0**	**AM Totals**
14:33:15	0	0	14:33:30
15:16:05	0	1	15:16:28
PM Totals	**0**	**1**	**PM Totals**

Client GHD
Location Beaumont Hills School
Date Thu, 08st June 2017
Survey Time 08:00-09:30 & 14:30-16:00 (2.5 hours)
Description Mode of travel school Survey

MATRIX Traffic and Transport Data

[15mins interval]

Time Period	Ped																																		Grand Total
	A						B						C						D						E						F						G						
	Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			
	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	
8:00 to 8:15	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
8:15 to 8:30	0	0	0	0	0	0	0	0	0	0	0	0	13	4	17	0	1	1	3	0	3	0	0	0	4	2	6	0	1	1	4	0	4	0	0	0	2	1	3	0	0	0	35
8:30 to 8:45	0	0	0	0	0	0	10	0	10	0	0	0	61	14	75	0	4	4	2	0	2	0	0	0	8	6	14	0	5	5	7	1	8	0	0	0	5	2	7	0	0	0	125
8:45 to 9:00	2	2	4	0	3	3	2	1	3	0	1	1	88	30	118	0	31	31	6	3	9	0	1	1	25	12	37	0	8	8	10	7	17	0	8	8	2	2	4	0	3	3	247
9:00 to 9:15	0	0	0	0	0	0	2	1	3	0	2	2	7	6	13	0	13	13	0	0	0	0	1	1	4	3	7	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0	47
9:15 to 9:30	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	2	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	1	1	7
Totals	2	2	4	0	3	3	14	2	16	0	3	3	173	55	228	0	51	51	11	3	14	0	2	2	41	23	64	0	23	23	21	8	29	0	9	9	9	5	14	0	4	4	464
14:30 to 14:45	0	0	0	0	0	0	0	2	2	0	0	0	0	10	10	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	14
14:45 to 15:00	0	6	6	0	0	0	0	19	19	0	0	0	0	42	42	0	1	1	0	10	10	0	0	0	0	14	14	0	0	0	0	23	23	2	1	3	0	13	13	0	0	0	131
15:00 to 15:15	0	0	0	0	0	0	0	3	3	51	13	64	0	22	22	168	67	236	0	6	6	31	18	49	0	10	10	43	23	66	0	4	4	48	22	70	0	7	7	19	14	33	570
15:15 to 15:30	0	0	0	0	0	0	0	0	0	34	4	38	0	0	0	34	2	36	0	0	0	0	0	0	0	0	0	4	2	6	0	0	0	4	3	7	0	0	0	2	3	5	92
15:30 to 15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
15:45 to 16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	5	5
Totals	0	6	6	0	0	0	0	24	24	85	17	102	0	75	75	203	71	274	0	17	17	31	18	49	0	24	24	47	25	72	0	27	27	54	26	80	0	21	21	23	20	43	814

[Hourly Summary]

Time Period	Ped																																		Grand Total
	A						B						C						D						E						F						G						
	Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			
	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	
8:00 to 9:00	2	2	4	0	3	3	12	1	13	0	1	1	165	48	213	0	36	36	11	3	14	0	1	1	37	20	57	0	14	14	21	8	29	0	8	8	8	5	14	0	3	3	410
8:15 to 9:15	2	2	4	0	3	3	14	2	16	0	3	3	168	54	223	0	49	49	11	3	14	0	2	2	41	23	64	0	22	22	21	8	29	0	8	8	8	5	14	0	3	3	454
8:30 to 9:30	2	2	4	0	3	3	14	2	16	0	3	3	157	51	208	0	50	50	8	3	11	0	2	2	37	21	58	0	22	22	17	8	25	0	9	9	7	4	11	0	4	4	426
Totals	2	2	4	0	3	3	14	2	16	0	3	3	173	55	228	0	51	51	11	3	14	0	2	2	41	23	64	0	23	23	21	8	29	0	9	9	9	5	14	0	4	4	454
14:30 to 15:30	0	6	6	0	0	0	0	24	24	85	17	102	0	74	74	203	70	273	0	17	17	31	18	49	0	24	24	47	25	72	0	27	27	54	26	80	0	21	21	21	17	38	807
14:45 to 15:45	0	6	6	0	0	0	0	22	22	85	17	102	0	65	65	203	71	274	0	16	16	31	18	49	0	24	24	47	25	72	0	27	27	54	26	80	0	20	20	21	17	38	795
15:00 to 16:00	0	0	0	0	0	0	0	3	3	85	17	102	0	23	23	203	70	273	0	6	6	31	18	49	0	10	10	47	25	72	0	4	4	52	25	77	0	7	7	23	20	43	669
Totals	0	6	6	0	0	0	0	24	24	85	17	102	0	75	75	203	71	274	0	17	17	31	18	49	0	24	24	47	25	72	0	27	27	54	26	80	0	21	21	23	20	43	807

Peak Hour Summary

	Time Period	Ped																																		Grand Total
		A						B						C						D						E						F						G						
		Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			Entering School			Leaving School			
		Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	Childre	Adult	Total	
AM	8:15 to 9:15	2	2	4	0	3	3	14	2	16	0	3	3	168	54	223	0	49	49	11	3	14	0	2	2	41	23	64	0	22	22	21	8	29	0	8	8	8	5	14	0	3	3	454
PM	14:30 to 15:30	0	6	6	0	0	0	0	24	24	85	17	102	0	74	74	203	70	273	0	17	17	31	18	49	0	24	24	47	25	72	0	27	27	54	26	80	0	21	21	21	17	38	820

Appendix E – SIDRA Outputs

2017 AM Peak

MOVEMENT SUMMARY

▽ **Site: 1 [Hezlett and Curtis - Existing_2017_AM Peak (School)]**

Hezlett and Curtis - Existing_2017_AM Peak (School)
8am - 9am
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: Hezlett Road - South											
1	L2	46	16.2	0.195	8.0	LOS A	0.1	0.7	0.04	0.09	54.9
2	T1	299	6.5	0.195	0.1	LOS A	0.1	0.7	0.04	0.09	59.4
3	R2	8	0.0	0.195	7.1	LOS A	0.1	0.7	0.04	0.09	57.7
Approach		354	9.5	0.195	1.0	NA	0.1	0.7	0.04	0.09	58.7
East: Cambrose Street - East											
4	L2	8	0.0	0.021	6.0	LOS A	0.1	0.5	0.41	0.62	53.6
5	T1	4	0.0	0.021	5.0	LOS A	0.1	0.5	0.41	0.62	44.6
6	R2	8	0.0	0.021	6.3	LOS A	0.1	0.5	0.41	0.62	48.0
Approach		21	0.0	0.021	5.9	LOS A	0.1	0.5	0.41	0.62	50.5
North: Hezlett Road - North											
7	L2	42	10.0	0.249	6.1	LOS A	0.1	1.1	0.04	0.06	56.0
8	T1	400	8.4	0.249	0.1	LOS A	0.1	1.1	0.04	0.06	59.6
9	R2	8	50.0	0.249	6.1	LOS A	0.1	1.1	0.04	0.06	52.0
Approach		451	9.3	0.249	0.6	NA	0.1	1.1	0.04	0.06	59.3
West: Curtis Road - West											
10	L2	21	40.0	0.065	6.5	LOS A	0.2	1.6	0.40	0.67	48.3
11	T1	4	0.0	0.065	5.1	LOS A	0.2	1.6	0.40	0.67	44.4
12	R2	38	0.0	0.065	6.3	LOS A	0.2	1.6	0.40	0.67	52.0
Approach		63	13.3	0.065	6.3	LOS A	0.2	1.6	0.40	0.67	50.7
All Vehicles		888	9.5	0.249	1.4	NA	0.2	1.6	0.06	0.13	56.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

2017 PM Peak

MOVEMENT SUMMARY

▽ **Site: 1 [Hezlett and Curtis - Existing_2017_PM Peak (School)]**

Hezlett and Curtis - Existing_2017_PM Peak (School)
3pm - 4pm
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: Hezlett Road - South											
1	L2	38	0.0	0.253	5.7	LOS A	0.1	0.4	0.02	0.05	55.3
2	T1	429	6.9	0.253	0.0	LOS A	0.1	0.4	0.02	0.05	59.7
3	R2	4	0.0	0.253	7.0	LOS A	0.1	0.4	0.02	0.05	58.0
Approach		472	6.3	0.253	0.5	NA	0.1	0.4	0.02	0.05	59.2
East: Cambrose Street - East											
4	L2	8	0.0	0.030	5.9	LOS A	0.1	0.6	0.42	0.64	53.5
5	T1	4	0.0	0.030	5.2	LOS A	0.1	0.6	0.42	0.64	44.4
6	R2	17	0.0	0.030	6.5	LOS A	0.1	0.6	0.42	0.64	48.8
Approach		29	0.0	0.030	6.1	LOS A	0.1	0.6	0.42	0.64	50.0
North: Hezlett Road - North											
7	L2	13	0.0	0.212	6.3	LOS A	0.1	0.7	0.04	0.03	56.9
8	T1	379	4.4	0.212	0.1	LOS A	0.1	0.7	0.04	0.03	59.7
9	R2	8	0.0	0.212	7.2	LOS A	0.1	0.7	0.04	0.03	53.0
Approach		400	4.2	0.212	0.4	NA	0.1	0.7	0.04	0.03	59.6
West: Curtis Road - West											
10	L2	4	0.0	0.096	6.3	LOS A	0.3	1.9	0.46	0.74	49.2
11	T1	4	0.0	0.096	5.3	LOS A	0.3	1.9	0.46	0.74	44.1
12	R2	80	0.0	0.096	6.7	LOS A	0.3	1.9	0.46	0.74	51.8
Approach		88	0.0	0.096	6.6	LOS A	0.3	1.9	0.46	0.74	51.6
All Vehicles		989	4.7	0.253	1.2	NA	0.3	1.9	0.08	0.12	58.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.

2020 AM Peak – No Build (1.5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2020_AM Peak (School) - No Build]

Hezlett and Curtis - Future_2020_AM Peak (School)
8am - 9am
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	48	17.4	0.066	2.2	LOS A	0.4	2.9	0.14	0.28	39.5
2	T1	313	8.4	0.185	1.4	LOS A	1.2	8.9	0.13	0.21	40.2
3	R2	8	0.0	0.185	5.6	LOS A	1.2	8.9	0.13	0.20	40.6
3u	U	1	0.0	0.185	7.0	LOS A	1.2	8.9	0.13	0.20	47.8
Approach		371	9.4	0.185	1.6	LOS A	1.2	8.9	0.13	0.22	40.2
East: Cambrose Street - East											
4	L2	8	0.0	0.020	2.7	LOS A	0.1	0.4	0.33	0.48	38.6
5	T1	4	0.0	0.020	2.3	LOS A	0.1	0.4	0.33	0.48	39.1
6	R2	8	0.0	0.020	6.5	LOS A	0.1	0.4	0.33	0.48	39.5
Approach		21	0.0	0.020	4.1	LOS A	0.1	0.4	0.33	0.48	39.1
North: Hezlett Road - North											
7	L2	44	9.5	0.089	2.5	LOS A	0.5	3.6	0.24	0.29	38.6
8	T1	418	8.3	0.248	1.6	LOS A	1.7	12.9	0.22	0.23	40.1
9	R2	8	50.0	0.248	6.1	LOS A	1.7	12.9	0.22	0.22	40.2
Approach		471	9.2	0.248	1.8	LOS A	1.7	12.9	0.23	0.24	40.0
West: Curtis Road - West											
10	L2	22	38.1	0.066	2.9	LOS A	0.2	1.4	0.28	0.52	38.5
11	T1	4	0.0	0.066	2.0	LOS A	0.2	1.4	0.28	0.52	38.6
12	R2	40	0.0	0.066	6.2	LOS A	0.2	1.4	0.28	0.52	39.6
Approach		66	12.7	0.066	4.6	LOS A	0.2	1.4	0.28	0.52	39.3
All Vehicles		928	9.3	0.248	2.0	LOS A	1.7	12.9	0.19	0.25	40.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2020 PM Peak – No Build (1.5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2020_PM Peak (School) - No Build]

Hezlett and Curtis - Future_2020_PM Peak (School)
3pm - 4pm
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	40	0.0	0.087	2.2	LOS A	0.5	3.6	0.17	0.25	39.6
2	T1	448	6.8	0.245	1.5	LOS A	1.7	12.6	0.16	0.21	40.2
3	R2	4	0.0	0.245	5.6	LOS A	1.7	12.6	0.16	0.20	40.5
3u	U	1	0.0	0.245	7.1	LOS A	1.7	12.6	0.16	0.20	47.8
Approach		494	6.2	0.245	1.6	LOS A	1.7	12.6	0.16	0.21	40.1
East: Cambrose Street - East											
4	L2	8	0.0	0.030	2.7	LOS A	0.1	0.6	0.34	0.53	38.6
5	T1	4	0.0	0.030	2.3	LOS A	0.1	0.6	0.34	0.53	38.7
6	R2	18	0.0	0.030	6.5	LOS A	0.1	0.6	0.34	0.53	39.1
Approach		31	0.0	0.030	4.8	LOS A	0.1	0.6	0.34	0.53	38.8
North: Hezlett Road - North											
7	L2	14	0.0	0.082	2.8	LOS A	0.5	3.4	0.32	0.29	38.4
8	T1	396	4.5	0.229	1.8	LOS A	1.6	11.4	0.30	0.26	40.0
9	R2	8	0.0	0.229	5.9	LOS A	1.6	11.4	0.30	0.25	40.2
Approach		418	4.3	0.229	1.9	LOS A	1.6	11.4	0.30	0.26	39.9
West: Curtis Road - West											
10	L2	4	0.0	0.089	2.8	LOS A	0.3	1.8	0.34	0.61	38.2
11	T1	4	0.0	0.089	2.4	LOS A	0.3	1.8	0.34	0.61	38.0
12	R2	83	0.0	0.089	6.5	LOS A	0.3	1.8	0.34	0.61	39.4
Approach		92	0.0	0.089	6.2	LOS A	0.3	1.8	0.34	0.61	39.3
All Vehicles		1034	4.7	0.245	2.2	LOS A	1.7	12.6	0.24	0.28	40.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2020 AM Peak – Build (1.5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2020_AM Peak (School) - Build]

Hezlett and Curtis - Future_2020_AM Peak (School)
8am - 9am
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	55	15.4	0.122	3.2	LOS A	0.7	5.6	0.37	0.36	39.3
2	T1	404	6.5	0.344	2.9	LOS A	2.7	19.7	0.37	0.44	42.4
3	R2	8	0.0	0.344	7.2	LOS A	2.7	19.7	0.37	0.45	44.3
3u	U	146	0.0	0.344	6.9	LOS A	2.7	19.7	0.37	0.45	50.5
Approach		614	5.7	0.344	4.4	LOS A	2.7	19.7	0.37	0.44	44.2
East: Cambrose Street - East											
4	L2	8	0.0	0.024	3.5	LOS A	0.1	0.6	0.47	0.55	38.6
5	T1	4	0.0	0.024	3.1	LOS A	0.1	0.6	0.47	0.55	38.7
6	R2	8	0.0	0.024	7.2	LOS A	0.1	0.6	0.47	0.55	39.1
Approach		21	0.0	0.024	4.9	LOS A	0.1	0.6	0.47	0.55	38.8
North: Hezlett Road - North											
7	L2	44	9.5	0.125	4.0	LOS A	0.7	5.3	0.47	0.43	37.9
8	T1	418	6.3	0.347	2.6	LOS A	2.6	19.1	0.48	0.41	39.6
9	R2	95	4.4	0.347	6.7	LOS A	2.6	19.1	0.49	0.41	39.6
Approach		557	7.8	0.347	3.4	LOS A	2.6	19.1	0.48	0.41	39.5
West: Curtis Road - West											
10	L2	22	38.1	0.075	3.7	LOS A	0.2	1.9	0.41	0.60	38.3
11	T1	4	0.0	0.075	2.7	LOS A	0.2	1.9	0.41	0.60	38.3
12	R2	40	0.0	0.075	6.8	LOS A	0.2	1.9	0.41	0.60	39.5
Approach		66	12.7	0.075	5.5	LOS A	0.2	1.9	0.41	0.60	39.1
All Vehicles		1258	6.9	0.347	4.0	LOS A	2.7	19.7	0.43	0.44	41.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2020 PM Peak – Build (1.5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2020_PM Peak (School) - Build]

Hezlett and Curtis - Future_2020_PM Peak (School)
3pm - 4pm
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	55	0.0	0.109	2.3	LOS A	0.6	4.5	0.21	0.27	39.5
2	T1	503	6.1	0.305	1.8	LOS A	2.2	16.3	0.20	0.29	41.0
3	R2	4	0.0	0.305	6.1	LOS A	2.2	16.3	0.20	0.29	41.8
3u	U	45	0.0	0.305	7.6	LOS A	2.2	16.3	0.20	0.29	48.7
Approach		607	5.0	0.305	2.3	LOS A	2.2	16.3	0.20	0.28	41.5
East: Cambrose Street - East											
4	L2	8	0.0	0.031	2.9	LOS A	0.1	0.7	0.37	0.55	38.5
5	T1	4	0.0	0.031	2.5	LOS A	0.1	0.7	0.37	0.55	38.6
6	R2	18	0.0	0.031	6.6	LOS A	0.1	0.7	0.37	0.55	39.0
Approach		31	0.0	0.031	5.0	LOS A	0.1	0.7	0.37	0.55	38.8
North: Hezlett Road - North											
7	L2	14	0.0	0.089	3.2	LOS A	0.5	3.6	0.38	0.34	38.2
8	T1	396	4.5	0.247	2.1	LOS A	1.7	12.1	0.37	0.31	39.8
9	R2	21	0.0	0.247	6.2	LOS A	1.7	12.1	0.37	0.30	40.0
Approach		431	4.2	0.247	2.3	LOS A	1.7	12.1	0.37	0.31	39.8
West: Curtis Road - West											
10	L2	4	0.0	0.094	3.2	LOS A	0.3	2.1	0.39	0.64	38.1
11	T1	4	0.0	0.094	2.7	LOS A	0.3	2.1	0.39	0.64	37.9
12	R2	83	0.0	0.094	6.9	LOS A	0.3	2.1	0.39	0.64	39.3
Approach		92	0.0	0.094	6.5	LOS A	0.3	2.1	0.39	0.64	39.2
All Vehicles		1160	4.2	0.305	2.7	LOS A	2.2	16.3	0.28	0.33	40.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2030 AM Peak – No Build (1.5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2030_AM Peak (School) - No Build]

Hezlett and Curtis - Future_2030_AM Peak (School)
8am - 9am
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	56	18.9	0.077	2.3	LOS A	0.4	3.4	0.17	0.29	39.5
2	T1	358	8.5	0.215	1.5	LOS A	1.4	10.7	0.15	0.21	40.2
3	R2	11	0.0	0.215	5.6	LOS A	1.4	10.7	0.15	0.21	40.5
3u	U	1	0.0	0.215	7.1	LOS A	1.4	10.7	0.15	0.21	47.8
Approach		425	9.7	0.215	1.7	LOS A	1.4	10.7	0.15	0.22	40.1
East: Cambrose Street - East											
4	L2	11	0.0	0.027	2.9	LOS A	0.1	0.6	0.37	0.50	38.8
5	T1	5	0.0	0.027	2.5	LOS A	0.1	0.6	0.37	0.50	39.0
6	R2	11	0.0	0.027	6.7	LOS A	0.1	0.6	0.37	0.50	39.4
Approach		26	0.0	0.027	4.3	LOS A	0.1	0.6	0.37	0.50	39.0
North: Hezlett Road - North											
7	L2	51	10.4	0.103	2.6	LOS A	0.6	4.5	0.26	0.30	38.5
8	T1	478	8.4	0.287	1.7	LOS A	2.1	15.6	0.25	0.24	40.0
9	R2	11	50.0	0.287	6.2	LOS A	2.1	15.6	0.25	0.23	40.2
Approach		539	9.4	0.287	1.8	LOS A	2.1	15.6	0.25	0.24	40.0
West: Curtis Road - West											
10	L2	25	41.7	0.077	3.1	LOS A	0.2	1.7	0.31	0.54	38.4
11	T1	5	0.0	0.077	2.2	LOS A	0.2	1.7	0.31	0.54	38.5
12	R2	45	0.0	0.077	6.3	LOS A	0.2	1.7	0.31	0.54	39.6
Approach		76	13.9	0.077	5.0	LOS A	0.2	1.7	0.31	0.54	39.2
All Vehicles		1066	9.6	0.287	2.1	LOS A	2.1	15.6	0.22	0.26	40.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2030 PM Peak – No Build (1.5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2030_PM Peak (School) - No Build]

Hezlett and Curtis - Future_2030_PM Peak (School)
3pm - 4pm
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	45	0.0	0.100	2.2	LOS A	0.6	4.3	0.19	0.26	39.5
2	T1	513	6.8	0.282	1.5	LOS A	2.1	15.2	0.18	0.22	40.1
3	R2	5	0.0	0.282	5.7	LOS A	2.1	15.2	0.18	0.21	40.5
3u	U	1	0.0	0.282	7.1	LOS A	2.1	15.2	0.18	0.21	47.7
Approach		564	6.2	0.282	1.6	LOS A	2.1	15.2	0.18	0.22	40.1
East: Cambrose Street - East											
4	L2	11	0.0	0.036	2.9	LOS A	0.1	0.8	0.38	0.55	38.6
5	T1	5	0.0	0.036	2.5	LOS A	0.1	0.8	0.38	0.55	38.7
6	R2	20	0.0	0.036	6.7	LOS A	0.1	0.8	0.38	0.55	39.1
Approach		36	0.0	0.036	5.0	LOS A	0.1	0.8	0.38	0.55	38.8
North: Hezlett Road - North											
7	L2	15	0.0	0.096	2.9	LOS A	0.6	4.0	0.35	0.31	38.3
8	T1	453	4.4	0.266	1.9	LOS A	1.9	13.7	0.34	0.27	39.9
9	R2	11	0.0	0.266	6.0	LOS A	1.9	13.7	0.34	0.27	40.1
Approach		478	4.2	0.266	2.1	LOS A	1.9	13.7	0.34	0.27	39.9
West: Curtis Road - West											
10	L2	5	0.0	0.107	3.1	LOS A	0.3	2.4	0.38	0.64	38.1
11	T1	5	0.0	0.107	2.6	LOS A	0.3	2.4	0.38	0.64	38.0
12	R2	96	0.0	0.107	6.8	LOS A	0.3	2.4	0.38	0.64	39.3
Approach		106	0.0	0.107	6.4	LOS A	0.3	2.4	0.38	0.64	39.2
All Vehicles		1184	4.6	0.282	2.3	LOS A	2.1	15.2	0.27	0.29	39.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2030 AM Peak – Build (1.5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2030_AM Peak (School) - Build]

Hezlett and Curtis - Future_2030_AM Peak (School)
8am - 9am
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	75	14.1	0.277	5.3	LOS A	1.9	14.0	0.65	0.59	38.9
2	T1	628	4.9	0.777	7.2	LOS A	12.7	91.1	0.89	0.78	42.4
3	R2	11	0.0	0.777	12.1	LOS A	12.7	91.1	0.95	0.83	44.8
3u	U	431	0.0	0.777	13.9	LOS A	12.7	91.1	0.95	0.83	50.9
Approach		1144	3.6	0.777	9.6	LOS A	12.7	91.1	0.90	0.78	45.5
East: Cambrose Street - East											
4	L2	11	0.0	0.050	7.0	LOS A	0.3	1.8	0.75	0.76	37.6
5	T1	5	0.0	0.050	6.5	LOS A	0.3	1.8	0.75	0.76	37.1
6	R2	11	0.0	0.050	10.7	LOS A	0.3	1.8	0.75	0.76	37.3
Approach		26	0.0	0.050	8.4	LOS A	0.3	1.8	0.75	0.76	37.4
North: Hezlett Road - North											
7	L2	51	10.4	0.246	7.1	LOS A	1.8	11.9	0.76	0.73	36.4
8	T1	478	6.4	0.685	8.0	LOS A	8.9	65.6	0.93	0.95	38.4
9	R2	263	2.0	0.685	12.4	LOS A	8.9	65.6	0.97	1.00	37.9
Approach		792	6.4	0.685	9.4	LOS A	8.9	65.6	0.93	0.95	38.2
West: Curtis Road - West											
10	L2	25	41.7	0.148	6.8	LOS A	0.7	5.6	0.74	0.84	37.5
11	T1	5	0.0	0.148	5.1	LOS A	0.7	5.6	0.74	0.84	37.0
12	R2	45	0.0	0.148	9.3	LOS A	0.7	5.6	0.74	0.84	38.9
Approach		76	13.9	0.148	8.2	LOS A	0.7	5.6	0.74	0.84	38.4
All Vehicles		2039	5.0	0.777	9.5	LOS A	12.7	91.1	0.90	0.85	42.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2030 PM Peak – Build (1.5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2030_PM Peak (School) - Build]

Hezlett and Curtis - Future_2030_PM Peak (School)
3pm - 4pm
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	95	0.0	0.175	2.7	LOS A	1.1	7.6	0.31	0.32	39.4
2	T1	693	5.0	0.491	2.5	LOS A	4.6	33.5	0.35	0.38	41.7
3	R2	5	0.0	0.491	6.8	LOS A	4.6	33.5	0.36	0.39	43.0
3u	U	149	0.0	0.491	8.4	LOS A	4.6	33.5	0.36	0.39	49.6
Approach		942	3.7	0.491	3.4	LOS A	4.6	33.5	0.35	0.38	42.8
East: Cambrose Street - East											
4	L2	11	0.0	0.041	3.6	LOS A	0.2	1.1	0.48	0.61	38.4
5	T1	5	0.0	0.041	3.2	LOS A	0.2	1.1	0.48	0.61	38.4
6	R2	20	0.0	0.041	7.4	LOS A	0.2	1.1	0.48	0.61	38.7
Approach		36	0.0	0.041	5.6	LOS A	0.2	1.1	0.48	0.61	38.5
North: Hezlett Road - North											
7	L2	15	0.0	0.120	4.2	LOS A	0.7	4.8	0.51	0.45	37.7
8	T1	453	4.4	0.333	3.0	LOS A	2.4	17.2	0.52	0.43	39.6
9	R2	52	0.0	0.333	6.9	LOS A	2.4	17.2	0.53	0.42	39.6
Approach		519	3.9	0.333	3.4	LOS A	2.4	17.2	0.52	0.43	39.5
West: Curtis Road - West											
10	L2	5	0.0	0.134	4.5	LOS A	0.5	3.8	0.56	0.75	37.7
11	T1	5	0.0	0.134	4.1	LOS A	0.5	3.8	0.56	0.75	37.4
12	R2	96	0.0	0.134	8.2	LOS A	0.5	3.8	0.56	0.75	39.0
Approach		106	0.0	0.134	7.8	LOS A	0.5	3.8	0.56	0.75	39.0
All Vehicles		1603	3.4	0.491	3.8	LOS A	4.6	33.5	0.42	0.42	41.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2020 AM Peak – No Build (5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2020_AM Peak (School) - No Build]

Hezlett and Curtis - Future_2020_AM Peak (School)
8am - 9am
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	53	18.0	0.073	2.3	LOS A	0.4	3.3	0.16	0.28	39.5
2	T1	344	8.6	0.206	1.5	LOS A	1.3	10.1	0.14	0.21	40.2
3	R2	9	0.0	0.206	5.6	LOS A	1.3	10.1	0.14	0.21	40.5
3u	U	1	0.0	0.206	7.1	LOS A	1.3	10.1	0.14	0.21	47.8
Approach		407	9.6	0.206	1.7	LOS A	1.3	10.1	0.15	0.22	40.1
East: Cambrose Street - East											
4	L2	9	0.0	0.024	2.9	LOS A	0.1	0.5	0.36	0.49	38.8
5	T1	5	0.0	0.024	2.4	LOS A	0.1	0.5	0.36	0.49	39.1
6	R2	9	0.0	0.024	6.6	LOS A	0.1	0.5	0.36	0.49	39.5
Approach		24	0.0	0.024	4.2	LOS A	0.1	0.5	0.36	0.49	39.0
North: Hezlett Road - North											
7	L2	48	10.9	0.099	2.6	LOS A	0.6	4.3	0.25	0.29	38.6
8	T1	460	8.5	0.275	1.6	LOS A	2.0	14.8	0.24	0.24	40.0
9	R2	11	50.0	0.275	6.2	LOS A	2.0	14.8	0.24	0.23	40.2
Approach		519	9.5	0.275	1.8	LOS A	2.0	14.8	0.24	0.24	40.0
West: Curtis Road - West											
10	L2	24	39.1	0.073	3.0	LOS A	0.2	1.6	0.30	0.53	38.5
11	T1	5	0.0	0.073	2.1	LOS A	0.2	1.6	0.30	0.53	38.6
12	R2	43	0.0	0.073	6.3	LOS A	0.2	1.6	0.30	0.53	39.6
Approach		73	13.0	0.073	4.9	LOS A	0.2	1.6	0.30	0.53	39.3
All Vehicles		1023	9.6	0.275	2.0	LOS A	2.0	14.8	0.21	0.26	40.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2020 PM Peak – No Build (5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2020_PM Peak (School) - No Build]

Hezlett and Curtis - Future_2020_PM Peak (School)
3pm - 4pm
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	43	0.0	0.096	2.2	LOS A	0.6	4.1	0.18	0.26	39.5
2	T1	494	6.8	0.271	1.5	LOS A	1.8	14.4	0.16	0.21	40.2
3	R2	5	0.0	0.271	5.6	LOS A	1.8	14.4	0.17	0.21	40.5
3u	U	1	0.0	0.271	7.1	LOS A	1.9	14.4	0.17	0.21	47.8
Approach		543	6.2	0.271	1.6	LOS A	1.9	14.4	0.16	0.22	40.1
East: Cambrose Street - East											
4	L2	9	0.0	0.034	2.9	LOS A	0.1	0.7	0.37	0.54	38.6
5	T1	5	0.0	0.034	2.4	LOS A	0.1	0.7	0.37	0.54	38.7
6	R2	19	0.0	0.034	6.6	LOS A	0.1	0.7	0.37	0.54	39.1
Approach		34	0.0	0.034	4.9	LOS A	0.1	0.7	0.37	0.54	38.8
North: Hezlett Road - North											
7	L2	15	0.0	0.092	2.9	LOS A	0.5	3.8	0.34	0.30	38.3
8	T1	436	4.3	0.255	1.9	LOS A	1.8	13.0	0.33	0.27	39.9
9	R2	9	0.0	0.255	6.0	LOS A	1.8	13.0	0.33	0.26	40.1
Approach		460	4.1	0.255	2.0	LOS A	1.8	13.0	0.33	0.27	39.9
West: Curtis Road - West											
10	L2	5	0.0	0.102	3.0	LOS A	0.3	2.2	0.37	0.63	38.1
11	T1	5	0.0	0.102	2.5	LOS A	0.3	2.2	0.37	0.63	38.0
12	R2	92	0.0	0.102	6.7	LOS A	0.3	2.2	0.37	0.63	39.3
Approach		102	0.0	0.102	6.3	LOS A	0.3	2.2	0.37	0.63	39.3
All Vehicles		1139	4.6	0.271	2.3	LOS A	1.9	14.4	0.26	0.29	39.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2020 AM Peak – Build (5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2020_AM Peak (School) - Build]

Hezlett and Curtis - Future_2020_AM Peak (School)
8am - 9am
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	59	16.1	0.131	3.2	LOS A	0.8	6.0	0.36	0.36	39.3
2	T1	436	6.8	0.367	2.9	LOS A	3.0	21.5	0.39	0.44	42.3
3	R2	9	0.0	0.367	7.2	LOS A	3.0	21.5	0.39	0.45	44.1
3u	U	146	0.0	0.367	8.9	LOS A	3.0	21.5	0.39	0.45	50.4
Approach		651	6.0	0.367	4.3	LOS A	3.0	21.5	0.39	0.43	43.9
East: Cambrose Street - East											
4	L2	9	0.0	0.028	3.7	LOS A	0.1	0.7	0.49	0.57	36.5
5	T1	5	0.0	0.028	3.3	LOS A	0.1	0.7	0.49	0.57	36.7
6	R2	9	0.0	0.028	7.4	LOS A	0.1	0.7	0.49	0.57	39.0
Approach		24	0.0	0.028	5.1	LOS A	0.1	0.7	0.49	0.57	36.7
North: Hezlett Road - North											
7	L2	46	10.9	0.136	4.1	LOS A	0.8	5.9	0.46	0.44	37.8
8	T1	460	8.5	0.379	2.7	LOS A	2.9	21.5	0.50	0.42	39.6
9	R2	96	5.5	0.379	6.8	LOS A	2.9	21.5	0.51	0.41	39.6
Approach		604	8.2	0.379	3.5	LOS A	2.9	21.5	0.50	0.42	39.5
West: Curtis Road - West											
10	L2	24	39.1	0.085	3.9	LOS A	0.3	2.2	0.44	0.62	38.3
11	T1	5	0.0	0.085	2.8	LOS A	0.3	2.2	0.44	0.62	38.3
12	R2	43	0.0	0.085	7.0	LOS A	0.3	2.2	0.44	0.62	39.5
Approach		73	13.0	0.085	5.6	LOS A	0.3	2.2	0.44	0.62	39.1
All Vehicles		1352	7.2	0.379	4.0	LOS A	3.0	21.5	0.44	0.44	41.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2020 PM Peak – Build (5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2020_PM Peak (School) - Build]

Hezlett and Curtis - Future_2020_PM Peak (School)
3pm - 4pm
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	59	0.0	0.118	2.3	LOS A	0.7	5.0	0.22	0.28	39.5
2	T1	547	6.2	0.331	1.6	LOS A	2.5	18.3	0.22	0.29	40.9
3	R2	5	0.0	0.331	6.1	LOS A	2.5	18.3	0.22	0.29	41.7
3u	U	45	0.0	0.331	7.6	LOS A	2.5	18.3	0.22	0.29	48.6
Approach		657	5.1	0.331	2.3	LOS A	2.5	18.3	0.22	0.29	41.3
East: Cambrose Street - East											
4	L2	9	0.0	0.035	3.0	LOS A	0.1	0.8	0.40	0.56	38.5
5	T1	5	0.0	0.035	2.6	LOS A	0.1	0.8	0.40	0.56	38.6
6	R2	19	0.0	0.035	6.8	LOS A	0.1	0.8	0.40	0.56	39.0
Approach		34	0.0	0.035	5.1	LOS A	0.1	0.8	0.40	0.56	38.8
North: Hezlett Road - North											
7	L2	15	0.0	0.099	3.3	LOS A	0.6	4.0	0.40	0.35	38.1
8	T1	436	4.3	0.274	2.2	LOS A	1.9	13.8	0.39	0.32	39.8
9	R2	22	0.0	0.274	6.2	LOS A	1.9	13.8	0.39	0.31	39.9
Approach		473	4.0	0.274	2.4	LOS A	1.9	13.8	0.39	0.32	39.8
West: Curtis Road - West											
10	L2	5	0.0	0.108	3.3	LOS A	0.4	2.5	0.42	0.66	38.1
11	T1	5	0.0	0.108	2.9	LOS A	0.4	2.5	0.42	0.66	37.9
12	R2	92	0.0	0.108	7.1	LOS A	0.4	2.5	0.42	0.66	39.3
Approach		102	0.0	0.108	6.6	LOS A	0.4	2.5	0.42	0.66	39.2
All Vehicles		1265	4.2	0.331	2.6	LOS A	2.5	18.3	0.30	0.33	40.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2030 AM Peak – No Build (5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2030_AM Peak (School) - No Build]

Hezlett and Curtis - Future_2030_AM Peak (School)
8am - 9am
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	76	18.1	0.106	2.4	LOS A	0.6	4.9	0.20	0.30	39.5
2	T1	494	8.5	0.299	1.5	LOS A	2.2	16.5	0.20	0.23	40.1
3	R2	14	0.0	0.299	5.7	LOS A	2.2	16.5	0.20	0.22	40.4
3u	U	1	0.0	0.299	7.1	LOS A	2.2	16.5	0.20	0.22	47.7
Approach		584	9.5	0.299	1.8	LOS A	2.2	16.5	0.20	0.24	40.0
East: Cambrose Street - East											
4	L2	14	0.0	0.040	3.7	LOS A	0.1	1.0	0.48	0.58	38.5
5	T1	7	0.0	0.040	3.3	LOS A	0.1	1.0	0.48	0.58	38.7
6	R2	14	0.0	0.040	7.4	LOS A	0.1	1.0	0.48	0.58	39.1
Approach		35	0.0	0.040	5.1	LOS A	0.1	1.0	0.48	0.58	38.7
North: Hezlett Road - North											
7	L2	69	10.6	0.146	2.6	LOS A	0.9	6.7	0.32	0.33	39.3
8	T1	660	8.5	0.406	1.9	LOS A	3.4	25.6	0.34	0.27	39.9
9	R2	15	50.0	0.406	6.5	LOS A	3.4	25.6	0.34	0.26	40.0
Approach		744	9.5	0.406	2.1	LOS A	3.4	25.6	0.34	0.27	39.8
West: Curtis Road - West											
10	L2	35	39.4	0.114	3.7	LOS A	0.4	2.9	0.39	0.60	38.3
11	T1	7	0.0	0.114	2.7	LOS A	0.4	2.9	0.39	0.60	38.4
12	R2	62	0.0	0.114	6.8	LOS A	0.4	2.9	0.39	0.60	38.5
Approach		104	13.1	0.114	5.5	LOS A	0.4	2.9	0.39	0.60	39.1
All Vehicles		1467	9.5	0.406	2.3	LOS A	3.4	25.6	0.29	0.29	39.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2030 PM Peak – No Build (5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2030_PM Peak (School) - No Build]

Hezlett and Curtis - Future_2030_PM Peak (School)
3pm - 4pm
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hezlett Road - South											
1	L2	62	0.0	0.141	2.4	LOS A	0.9	6.3	0.23	0.28	39.5
2	T1	708	6.8	0.395	1.6	LOS A	3.3	24.8	0.25	0.23	40.0
3	R2	7	0.0	0.395	5.8	LOS A	3.3	24.8	0.25	0.23	40.3
3u	U	1	0.0	0.395	7.2	LOS A	3.3	24.8	0.25	0.23	47.6
Approach		779	6.2	0.395	1.7	LOS A	3.3	24.8	0.25	0.24	40.0
East: Cambrose Street - East											
4	L2	14	0.0	0.057	3.7	LOS A	0.2	1.5	0.49	0.63	38.4
5	T1	7	0.0	0.057	3.3	LOS A	0.2	1.5	0.49	0.63	38.4
6	R2	27	0.0	0.057	7.4	LOS A	0.2	1.5	0.49	0.63	38.7
Approach		48	0.0	0.057	5.7	LOS A	0.2	1.5	0.49	0.63	38.5
North: Hezlett Road - North											
7	L2	21	0.0	0.138	3.3	LOS A	0.8	6.0	0.42	0.37	38.0
8	T1	625	4.4	0.363	2.3	LOS A	3.1	22.6	0.45	0.32	39.7
9	R2	14	0.0	0.363	6.3	LOS A	3.1	22.6	0.45	0.31	39.9
Approach		660	4.1	0.363	2.4	LOS A	3.1	22.6	0.45	0.32	39.7
West: Curtis Road - West											
10	L2	7	0.0	0.167	3.9	LOS A	0.6	4.3	0.50	0.72	37.9
11	T1	7	0.0	0.167	3.5	LOS A	0.6	4.3	0.50	0.72	37.6
12	R2	132	0.0	0.167	7.7	LOS A	0.6	4.3	0.50	0.72	39.2
Approach		146	0.0	0.167	7.3	LOS A	0.6	4.3	0.50	0.72	39.1
All Vehicles		1634	4.6	0.395	2.6	LOS A	3.3	24.8	0.36	0.33	39.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2030 AM Peak – Build (5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2030_AM Peak (School) - Build]

Hezlett and Curtis - Future_2030_AM Peak (School)
8am - 9am
Roundabout

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: Hezlett Road - South											
1	L2	95	14.4	0.320	5.5	LOS A	2.2	16.7	0.68	0.62	38.9
2	T1	765	5.5	0.698	12.1	LOS A	23.4	168.2	0.95	0.98	40.8
3	R2	14	0.0	0.698	17.8	LOS B	23.4	168.2	1.00	1.05	41.9
3u	U	431	0.0	0.698	19.6	LOS B	23.4	168.2	1.00	1.05	46.8
Approach		1304	4.3	0.698	14.1	LOS A	23.4	168.2	0.94	0.98	43.5
East: Cambrose Street - East											
4	L2	14	0.0	0.088	9.9	LOS A	0.5	3.4	0.85	0.86	36.7
5	T1	7	0.0	0.088	9.5	LOS A	0.5	3.4	0.85	0.86	35.7
6	R2	14	0.0	0.088	13.6	LOS A	0.5	3.4	0.85	0.86	35.7
Approach		35	0.0	0.088	11.3	LOS A	0.5	3.4	0.85	0.86	36.2
North: Hezlett Road - North											
7	L2	69	10.6	0.319	7.6	LOS A	2.1	15.9	0.80	0.78	36.1
8	T1	660	8.5	0.686	17.5	LOS B	20.9	154.3	0.97	1.35	36.4
9	R2	267	2.8	0.686	23.5	LOS B	20.9	154.3	1.00	1.46	34.7
Approach		997	7.1	0.686	18.4	LOS B	20.9	154.3	0.96	1.34	36.0
West: Curtis Road - West											
10	L2	35	39.4	0.247	8.5	LOS A	1.3	10.2	0.82	0.90	37.0
11	T1	7	0.0	0.247	6.6	LOS A	1.3	10.2	0.82	0.90	36.3
12	R2	62	0.0	0.247	10.6	LOS A	1.3	10.2	0.82	0.90	36.6
Approach		104	13.1	0.247	9.7	LOS A	1.3	10.2	0.82	0.90	36.6
All Vehicles		2440	5.7	0.698	15.7	LOS B	23.4	168.2	0.95	1.12	40.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

2030 PM Peak – Build (5% growth rate)

MOVEMENT SUMMARY

Site: 1 [Hezlett and Curtis - Future_2030_PM Peak (School) - Build]

Hezlett and Curtis - Future_2030_PM Peak (School)
3pm - 4pm
Roundabout

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: Hezlett Road - South											
1	L2	113	0.0	0.218	2.6	LOS A	1.4	10.2	0.35	0.35	39.3
2	T1	888	5.5	0.613	2.6	LOS A	6.8	50.4	0.46	0.39	41.2
3	R2	7	0.0	0.613	6.9	LOS A	6.8	50.4	0.47	0.39	42.3
3u	U	149	0.0	0.613	8.5	LOS A	6.9	50.4	0.47	0.39	49.1
Approach		1158	4.2	0.613	3.4	LOS A	6.9	50.4	0.45	0.38	42.1
East: Cambrose Street - East											
4	L2	14	0.0	0.067	4.7	LOS A	0.3	2.0	0.60	0.70	38.1
5	T1	7	0.0	0.067	4.2	LOS A	0.3	2.0	0.60	0.70	37.9
6	R2	27	0.0	0.067	8.4	LOS A	0.3	2.0	0.60	0.70	38.2
Approach		48	0.0	0.067	6.7	LOS A	0.3	2.0	0.60	0.70	38.1
North: Hezlett Road - North											
7	L2	21	0.0	0.166	4.7	LOS A	1.0	7.1	0.57	0.51	37.5
8	T1	625	4.4	0.466	3.5	LOS A	3.8	27.6	0.63	0.49	39.4
9	R2	56	0.0	0.466	7.4	LOS A	3.8	27.6	0.64	0.49	39.4
Approach		702	3.9	0.466	3.8	LOS A	3.8	27.6	0.63	0.49	39.4
West: Curtis Road - West											
10	L2	7	0.0	0.223	6.1	LOS A	1.1	7.4	0.69	0.86	37.3
11	T1	7	0.0	0.223	5.6	LOS A	1.1	7.4	0.69	0.86	36.6
12	R2	132	0.0	0.223	9.8	LOS A	1.1	7.4	0.69	0.86	36.7
Approach		146	0.0	0.223	9.4	LOS A	1.1	7.4	0.69	0.86	36.8
All Vehicles		2055	3.7	0.613	4.1	LOS A	6.9	50.4	0.53	0.46	40.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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.
Roundabout Capacity Model: SIDRA Standard.
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.

GHD

Level 3
22 Giffnock Avenue
T: 61 2 9239 7100 F: 61 2 9239 7199 E: sydmail@ghd.com

GHDDocId/N:\AU\Sydney\Projects\21\26108\Tech\Traffic\North Kellyville\2126108_REP-North Kellyville TIA rev 2- Final.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	Mark Lucas, Shane Quinn, Owen Peel	Simon Payne				
1	Mark Lucas	Simon Payne				
2	Shane Quinn	Mark Lucas				~~25~~ 30/08/17

www.ghd.com