[redacted]

Traffic and Transport Impact Technical Report

Elizabeth Drive Landfill Expansion Environmental Impact Statement

Prepared for:
SUEZ Recycling and Recovery Pty Ltd

July 2019

Document control

Project title	Elizabeth Drive Landfill Expansion EIS
Prepared for	SUEZ Recycling and Recovery Pty Ltd
Document title	Traffic and Transport Impact Technical Report
Document status	Final
Date	12 July 2019

Contents

Glossary of terms and abbreviations

Term	Definition
AM peak hour	Unless otherwise stated, this refers to vehicle trips arriving at their destination during the average peak one hour in the AM peak period between 7.00 am–9.00 am on a normal working weekday
EIS	Environmental Impact Statement
Capacity	The nominal maximum number of vehicles which has a reasonable expectation of passing over a given section of a lane or roadway in one direction during a given time period under prevailing roadway conditions
Local road	A road or street used primarily for access to abutting properties
LoS	Level of service. A qualitative measure describing operational conditions within a traffic stream or intersection and the perception by motorists and/or passengers
Motorway	Fast, high volume controlled access roads. May be tolled or untolled
PM peak hour	Unless otherwise stated, this refers to trips travelling on the network during the average peak one hour in the PM peak period between 3.00 pm–6.00 pm on a weekday hour
Public transport	Includes train, bus (government and private), ferry (government and private) and light rail (government and private) services
SEARs	Secretary's Environmental Assessment Requirements
SUEZ	SUEZ Recycling and Recovery Pty Ltd
the existing landfill	Elizabeth Drive Landfill
the Project	Increase the capacity of the existing landfill by raising the currently approved finished height by 15 metres, from RL80 to RL95
the Site	existing Elizabeth Drive Landfill at Badgerys Creek
tpa	tonnes per annum

Executive Summary

This report assesses traffic impacts associated with the extension of the operating life and increase in the annual rate of filling of the Elizabeth Drive Landfill (the Project). The Project includes an additional 4.8 million m^3 of landfill volume, as well as an increase in the landfilling rate from 750,000 tpa to 950,000 tpa. This would facilitate approximately another five and a half years of operation, until 2031.

The Site is accessed from Elizabeth Drive via the existing Site Access Road. A turning lane for westbound traffic on Elizabeth Drive is available for vehicles entering the Site Access Road.

This assessment has reviewed the following scenarios:

- Existing operation (2019)
- Future operation without project (2025)
- Future operation with project (2025)
- Future operation with project (2031).

These scenarios have been based upon traffic volumes which were surveyed at the intersection of the Site Access Road and Elizabeth Drive in May 2019, as well as operational records. Future year scenarios have been scaled upwards to account for the increased filling rate. This scaling results in an additional four two-way trips in the AM peak hour and 12 two-way trips in the PM peak hour.

Intersection modelling used SIDRA 8 to assess the existing and future intersection performance. The peak periods used in the model were based on those for the surrounding road network:

- AM weekday peak hour: 7.00am – 8.00am
- PM weekday peak hour: 4.00pm – 5.00pm
- Weekend peak hour: 12.15pm – 1.15pm.

Modelling for future year operations (i.e. 2025 and 2031) accounted for background traffic growth on Elizabeth Drive (currently around 1.57% per annum). The modelling did not however account for traffic associated with the future Western Sydney Airport or other major road upgrades such as the M12 Motorway, Elizabeth Drive and The Northern Road as many of these projects are not yet approved and their effects on the local road network were not possible to predict with certainty.

Modelling of the existing road network performance (i.e. 2019 scenario) indicated that the intersection operates with a Level of Service (LoS) A for traffic travelling in both directions along Elizabeth Drive. Traffic exiting the Site Access Road experiences LoS F during peak periods.

Future year modelling for 2025 showed no substantial decrease in the performance of the intersection. Under both the ‘with’ and ‘without Project’ scenarios, through traffic on Elizabeth Drive continued to operate at LoS A, with the right turn from Elizabeth Drive into the Site Access Road also continuing to operate at LoS D in the AM peak hour and maintaining the same level of average delay and queue length under both scenarios. The traffic exiting the Site Access Road continued to operate at LoS F under both ‘with’ and ‘without Project’ scenarios during both the AM and PM peak hours. This is due to the delay caused by vehicles turning out of the site waiting for appropriate gaps in traffic along Elizabeth Drive.

Future year modelling for 2031 showed a deterioration in the operation of the intersection. Through traffic on Elizabeth Drive continued to operate at LoS A, however the right turn from Elizabeth Drive into the Site Access Road deteriorated to LoS F in the AM peak hour. Queues are expected to be contained within the holding capacity of the right turn lane on Elizabeth Drive and as such, would not obstruct westbound through traffic. The traffic entering the Site Access Road is forecast to continue to operate at LoS F due to constraints presented by right turning vehicles onto Elizabeth Drive.

As part of the delivery of the Western Parkland City, Roads and Maritime have identified the need to plan for increased capacity and to improve access and safety on Elizabeth Drive. Any increase in the capacity along Elizabeth Drive would improve traffic flows and is likely to improve the Site Access

Road intersection performance. This in turn could assist drivers entering and exiting the SUEZ site in finding safe gaps in traffic flow, therefore reducing the forecast queue lengths and delays.

1.0 Introduction

1.1 Description of the Project

SUEZ Recycling and Recovery Pty Ltd (SUEZ) currently owns and operates the Elizabeth Drive Landfill at Badgerys Creek (the Site). In response to future projected market demand for waste disposal in an area experiencing rapid growth, SUEZ is proposing to increase the capacity of the existing landfill by raising the currently approved finished cap height by 15 metres, from RL 80 to RL 95 (the Project). The existing landfill currently receives non-putrescible general solid waste and restricted solid waste. This is not proposed to change under the Project.

The Project would provide an additional landfill airspace capacity of approximately 4.8 million cubic metres and extend the life of the landfill by approximately five and a half years (from 2025 to 2031) at a proposed disposal rate of 950,000 tonnes per annum (tpa). This filling rate would increase from the existing rate of approximately 750,000 tpa.

The Site also includes the SUEZ Advanced Waste Treatment facility (SAWT), which operates under separate consent. The operation of this facility, including the traffic associated with it, would not change as a result of the Project and may continue beyond 2031.

1.2 Purpose of this report

This report provides a traffic impact assessment of the extension of the operating life and increase in the annual rate of fill of the existing landfill. It addresses the traffic and transport component of the Secretary's Environmental Assessment Requirements (SEARs) for the Project, dated 20 July 2018.

1.3 Secretary's Environmental Assessment Requirements

Table 1.1 sets out the Secretary's Environmental Assessment Requirements (SEARs) relevant to Traffic and Transport Impact Assessment and identifies where the requirements have been addressed in this report.

Table 1.1 – SEARs Project description

SEARs	Addressed in
Details of road transport routes and access to the Site	**Section 2.2**
Road traffic predictions for the development during construction and operation	**Section 4.3**
An assessment of impacts to the safety and function of the road network and the details of any road upgrades required for the development	**Section 4.4**

1.4 Structure of this technical report

This report has been structured as follows:

- Section 2 – Description of the existing environment
- Section 3 – Assessment methodology
- Section 4 – Existing road network performance and assessment of project impacts
- Section 5 – Assessment of cumulative impacts
- Section 6 – Conclusion.

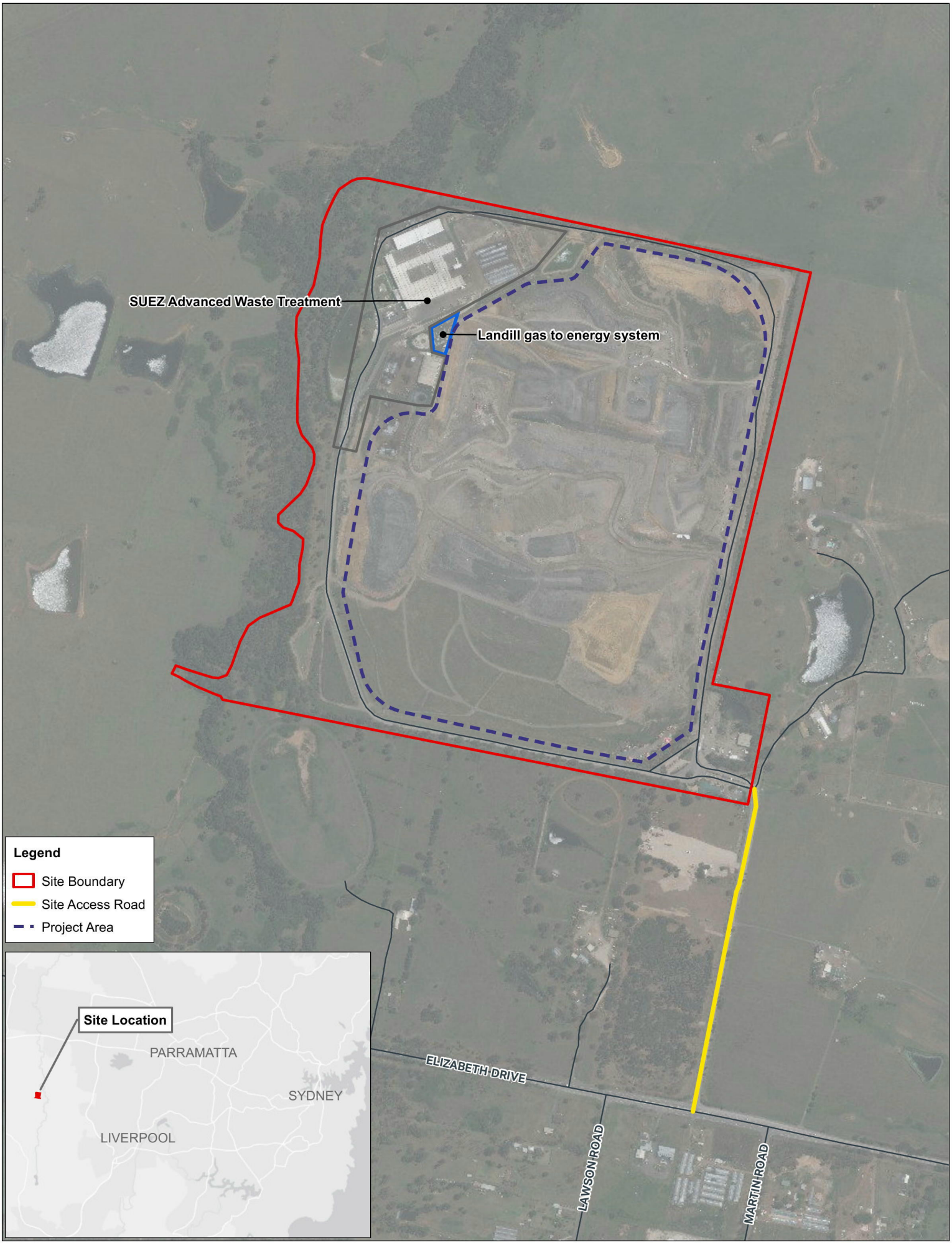
2.0 Existing environment

2.1 Site description

The Project is located at the existing SUEZ Elizabeth Drive Landfill, Badgerys Creek. The Site is located approximately 41 kilometres west of the Sydney Central Business District (CBD), within the Penrith Local Government Area (LGA) to which the *Penrith Local Environmental Plan 2010* (Penrith LEP 2010) applies. The Site is accessed from Elizabeth Drive and is shown in **Figure 2.1**.

The only public road access to the Site is via the Site Access Road, which forms a T-intersection with Elizabeth Drive to the south. The intersection is approximately eight kilometres east of the junction of Elizabeth Drive and the M7 Motorway, which is part of the Sydney Orbital Road network.

It is noted that the Western Sydney Airport Site is situated in close proximity to the south west of the Site. Detailed plans are being prepared for the airport to support its initial construction and operation, which is expected to commence in late 2026. In addition, the NSW Government plans to deliver a Western Sydney Aerotropolis in the area around the Site. As part of the Aerotropolis, it is expected that there will be an intensification of land use as more employment and urban activity develops in the area. While there are currently no approved development figures against which assessment can be carried out for these major proposed developments, a cumulative impact assessment has been prepared which considers the Western Sydney Airport and Western Sydney Aerotropolis (see **Section 5.0)**.



AECOM

SUEZ

SUEZ ELIZABETH DRIVE LANDFILL

FIGURE 2.1: SITE LOCATION

0 50 100 200 m

N

DATE	10/07/2019
SCALE	1:8,604
PROJECT	60571292
DRAWN	CP

2.2 Road Network

A description of the road network is provided in the following section, and is illustrated in **Figure 2.2**.

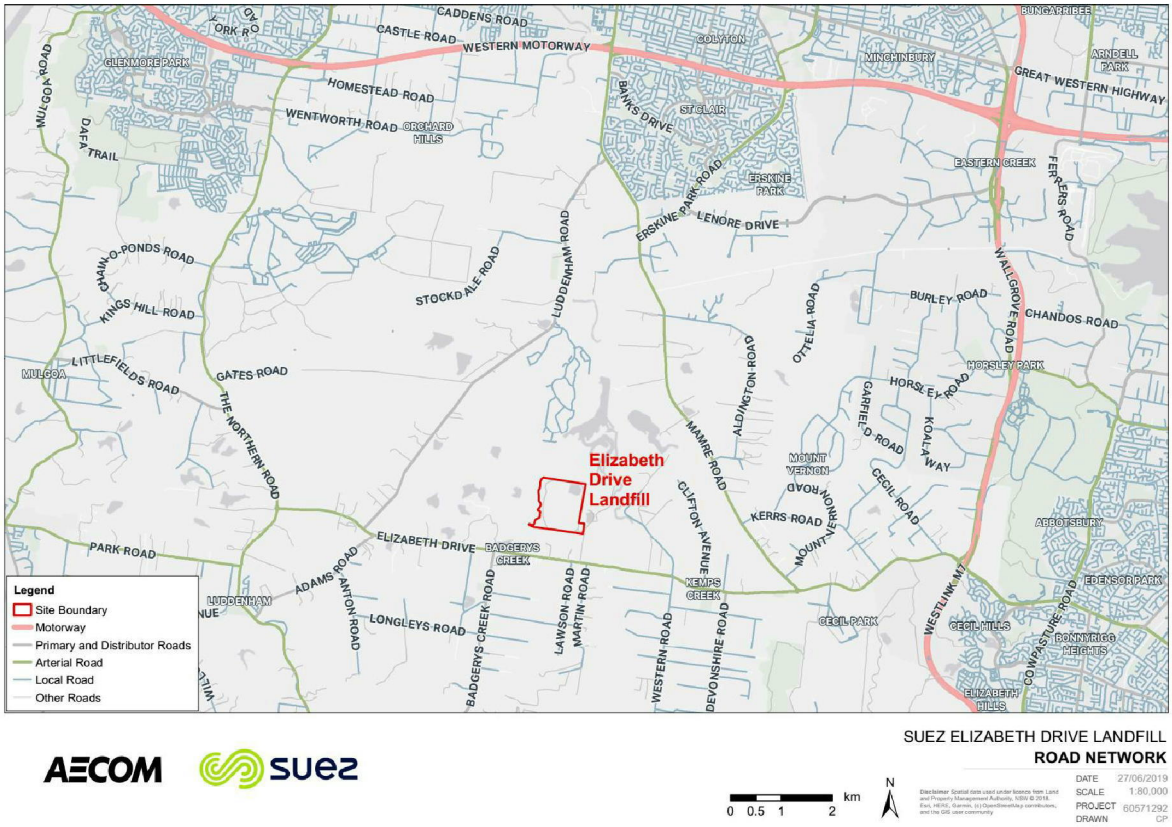


Figure 2.2 Surrounding road network

Source: AECOM 2019

2.2.1 Elizabeth Drive

Elizabeth Drive is a State road which connects traffic from Westlink Motorway(also known as the M7) near Cecil Hills with The Northern Road (A9) and Luddenham Road near Luddenham. The route is predominately signed at 80 km/h in both directions. It currently caters for regional and local access, and through traffic linking the M7 Motorway and the A9 The Northern Road. As well as connecting the Site to these regional north-south links, it also provides access to key links to the north on Luddenham Road and Mamre Road (which forms part of a State road link), as well as to key links to the south on Badgerys Creek Road and Devonshire Road.

2.2.2 Westlink Motorway (M7)

The M7, is a tolled motorway with two lanes in each direction. The route is signed at 100 km/h in both directions. The motorway provides a strategic north/south link in Sydney's west, intersecting with the M5 Motorway to its south and the M2 Motorway to its north. The motorway also provides access to the M4 Motorway south of Penrith. Access between the Site and the M7 would be via Elizabeth Drive. There are entry and exit ramps from the M7 onto/from Elizabeth Drive servicing travel in all directions.

2.2.3 Western Motorway (M4)

The Western Motorway, also known as the M4, is a motorway with three lanes in each direction. The route is predominately signed at 110 km/h in both directions. The motorway provides a strategic east-west link across Sydney, intersecting with the Great Western Highway (A4) at Homebush to its east, and the A32 at its west. Site traffic would be able to access the M4 via Mamre Road, utilising the entry and exit ramps onto Mamre Road from the M4 or via the M7 or The Northern Road, which also connect to the M4.

2.2.4 The Northern Road (A9)

The Northern Road, also known as the A9, is an arterial road with between one and three lanes in each direction. The route is predominately signed at 80 km/h in both directions. The route provides a strategic north-south link in Sydney's west, intersecting with Windsor Road (A2) to its north, and Camden Valley Way to its south. The A9 continues as Narellan Road from this point to provide a connection to the Hume Motorway (M31). Site traffic would be able to use The Northern Road via Elizabeth Road and a roundabout intersection which provides access from The Northern Road onto the western most section of Elizabeth Drive.

2.2.5 Mamre Road

Mamre Road is part of a State road link between Elizabeth Drive and the Great Western Highway. It is a two lane road and is predominately signed at 80 km/h in both directions. It provides a key link for the Site to the M4 and to the Great Western Highway.

2.2.6 Luddenham Road

Luddenham Road is a local two lane road. Site vehicles would be able to access Luddenham Road via Elizabeth Drive, to connect to Mamre Road near St Clair. Luddenham Road is signed at 80 km/h in both directions.

2.2.7 Site Access Road

The Site Access Road between Elizabeth Drive and the Site is 600 metres in length and provides one traffic lane in each direction. This road is a public road, managed by PCC, which provides access both to the existing landfill operation and the adjacent neighbouring rural residential property. The road is used by both light and heavy vehicles.

2.3 Public Transport Network

Sydney buses operate the 801 service along Elizabeth Drive, which connects Badgerys Creek and Liverpool on weekdays. There are two bus stops located within 200 metres of the Site servicing both directions. The 801 bus route and the location of its stops are illustrated in **Figure 2.3**.

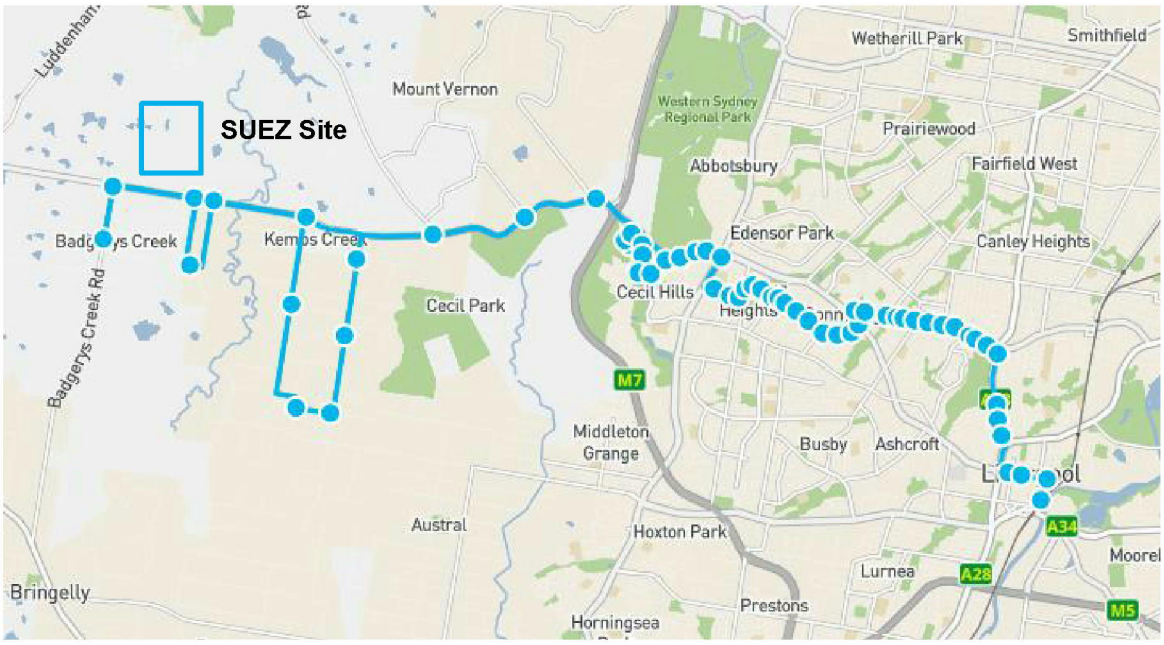


Figure 2.3 – Bus route between Badgerys Creek and Liverpool

Source: Transport for New South Wales, 2018

2.4 Pedestrian and cycle routes and facilities

There are no pedestrian or cycle routes/facilities in the vicinity of the Site. There are no formal footpaths on either side of Elizabeth Drive.

2.5 Existing traffic volumes

2.5.1 Traffic survey volumes

Intersection counts were undertaken at the intersection of Elizabeth Drive/Access road on Thursday 16 May 2019 between 7.00am – 9.00am and 4.00pm – 6.00pm and on Saturday 18 May 2019 between 10.00am – 2.00pm. Analysis of the counts at the intersection had the following peak hours:

- AM weekday peak hour: 7.00am – 8.00am
- PM weekday peak hour: 4.00pm – 5.00pm
- Weekend peak hour: 12.15pm – 1.15pm.

A summary of the turning movements recorded at this intersection during the weekday AM, PM and weekend peak hours are illustrated in **Figure 2.4** to **Figure 2.6**.

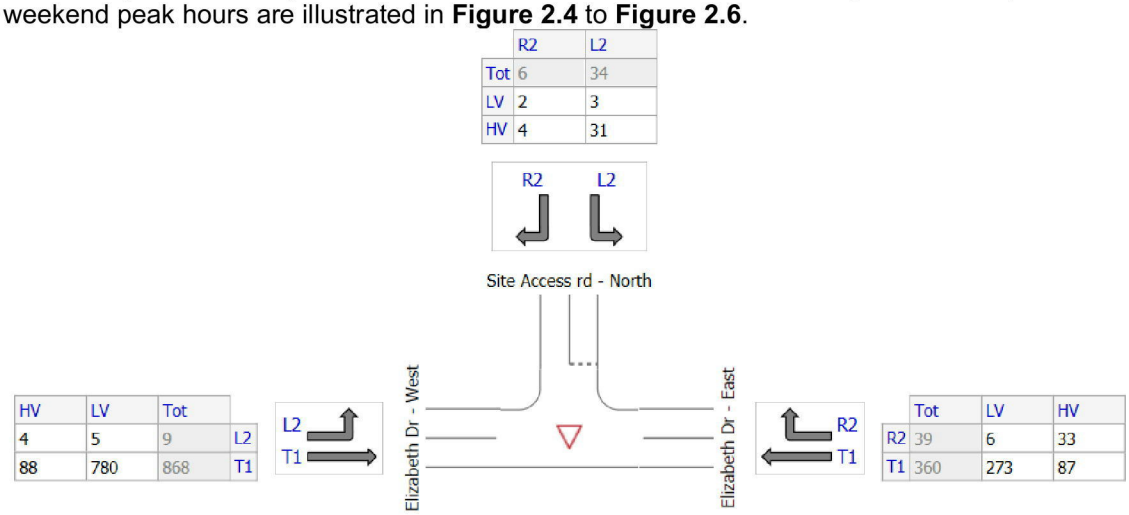


Figure 2.4 – Surveyed weekday AM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

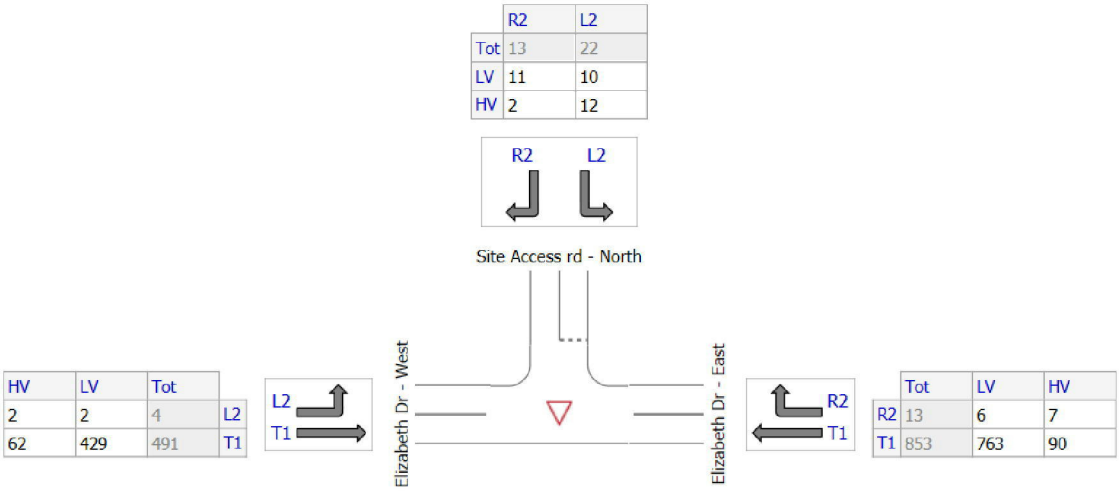


Figure 2.5 – Surveyed weekday PM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

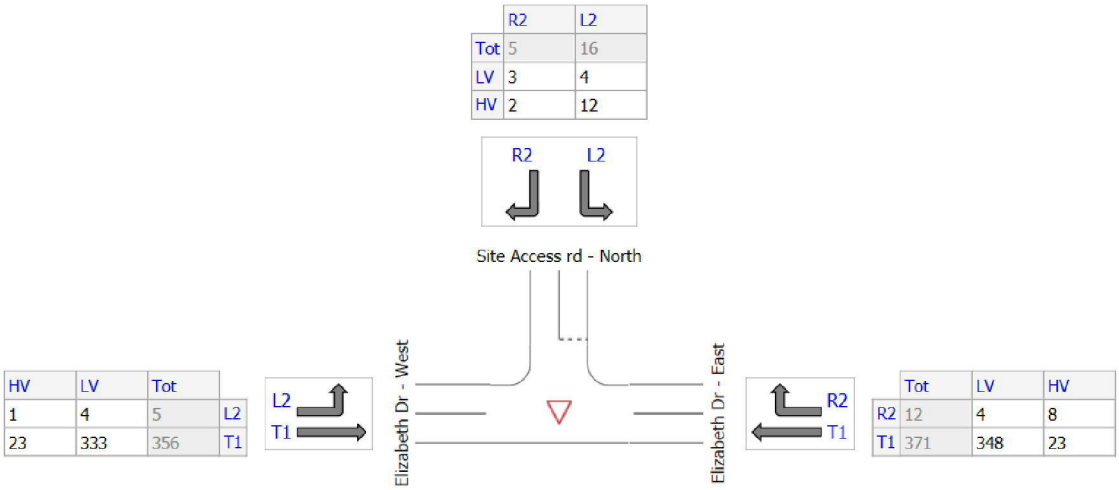


Figure 2.6 – Surveyed weekend peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

2.6 Site access and haulage routes

Site access routes for heavy vehicles were derived from traffic surveys undertaken at the intersection of Elizabeth Drive and the access road leading to the Site. Vehicles predominantly access the Site by travelling westbound along Elizabeth Drive and making a right turn into the Site Access Road. A smaller proportion travel eastbound along Elizabeth Drive and turn left into the Site Access Road. Vehicles predominantly exit the Site by travelling southbound along the Site Access Road and turning left to travel eastbound on Elizabeth Drive, accounting for 89% of vehicles in the AM peak hour and 86% in the PM peak hour. A smaller proportion of vehicles travel southbound on the Site Access Road and turn right to travel westbound on Elizabeth Drive; 11% in the AM peak hour and 14% in the PM peak hour.

The various Site access routes for heavy vehicles and the percentage split for each of these routes for each of the peak periods are shown in **Figure 2.7** and **Figure 2.8**.

Figure 2.7 – Site access routes and distribution for heavy vehicles – AM and PM peak hours

Source: AECOM 2019 using survey data. Basemap: ESRI.

Figure 2.8 – Site egress routes and distribution for heavy vehicles – AM and PM peak hours

Source: AECOM 2019 using survey data. Basemap: ESRI.

3.0 Assessment methodology

This section details the methodology adopted for the existing and future year traffic assessments.

3.1 Modelled scenarios

The intersection modelling has reviewed the following four scenarios.

- Existing operation (2019)
- Future operation without project (2025)
- Future operation with project (2025)
- Future operation with project (2031).

The peak hours used in the model were based on the peak hours surveyed for the surrounding road network. These were:

- AM weekday peak hour: 7.00am – 8.00am
- PM weekday peak hour: 4.00pm – 5.00pm
- Weekend peak hour: 12.15pm – 1.15pm.

The volumes for each of the modelled scenarios are detailed below.

3.1.1 Existing operation (2019)

Traffic volumes in this scenario consider typical existing traffic volumes accessing the Site to use the landfill based on the Site operating at 750,000 tpa. In order to assess this scenario impact, the traffic volumes were derived from the following:

- Site access and egress and non-Site background traffic volumes along Elizabeth Drive were derived from the intersection counts undertaken on Thursday 16 May 2019 and on Saturday 18 May 2019.
- Weighbridge data was provided by SUEZ detailing the truck movements and load volumes for trucks accessing the landfill on Thursday 16 May 2019 and on Saturday 18 May 2019. In addition to the weighbridge data provided for the landfill, data was also provided for the operation of the SAWT located adjacent to the Site on the Site Access Road.
- These datasets were used to validate the truck volumes captured by the intersection counts. It is confirmed that the weighbridge data and the intersection counts correlate with regard to the truck volumes generated by the Site.

The following sections detail the calculations undertaken in order to understand the peak hour, daily, weekly and yearly traffic volumes and waste volumes generated by the Site under existing conditions. This will provide a baseline to forecast the future impacts of the Project.

Average waste volume per truck

Operations data detailing daily total vehicles and total waste at the landfill were provided by SUEZ. From this data, an average load per truck for each day was calculated. It is assumed that all vehicles will enter and exit the site within the same hour, which will represent the number of daily vehicle movements generated by the Site. This analysis is shown in **Table 3.1**, and the full dataset provided in **Appendix A**.

Table 3.1 – Daily profile of vehicles entering Site

Day	Number of trucks	Number of daily vehicle movements	Total daily tonnage of all vehicles	Average tonnage of vehicles
Thursday	222	444	2,818	12.7
Saturday	55	110	820	14.9

Source: AECOM 2019, based on data provided by SUEZ

The annual waste volumes that the Site would accommodate if the weekday and weekend waste volumes for landfill were projected across the year was calculated. Projecting the daily total waste volumes for May across a yearly period would result in an annual Site waste volume which fell within 1% of 750,000 tpa (the baseline EIS assumption for existing operations). This is shown in **Table 3.2**.

Table 3.2 – Projected annual waste based on 2019 daily waste volumes

Day	Total daily t of all vehicles	Projected yearly load calculation	Yearly tonnage of all vehicles	Daily proportion of weekday or weekend yearly totals	Split of yearly operation
Thursday	2,818	2,818 x 252^	710,247	0.40%	94%
Saturday	820	820 x 52^	42,621	1.92%	6%
Total	3,638	-	752,868	-	100%

Source: AECOM 2019, based on data provided by SUEZ

^ Note in calculations it has been considered that there are 252 working weekdays and 52 Saturdays in 2019.

Site heavy vehicle weekday peak hour trips

SUEZ also provided hourly vehicle volumes for Thursday 16 May 2019. This data was used to derive an hourly distribution profile for weekday Site heavy vehicles, which is shown in **Figure 3.1**.

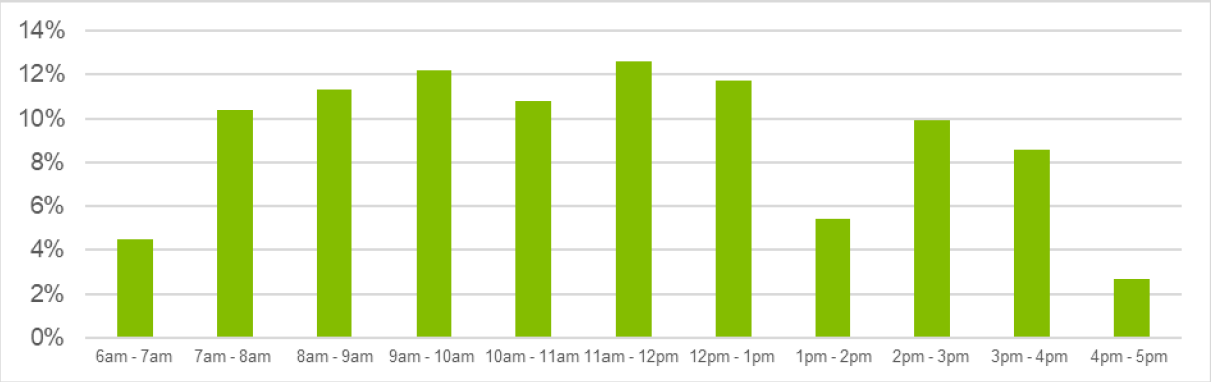


Figure 3.1 – Existing landfill operation hourly distribution of weekday heavy vehicle trips

Source: AECOM 2019, based on data provided by SUEZ

It was observed that the Site peak occurs from 11am – 12pm which means that there is no overlap between the Site peak and the road network peak of 7am – 8am. Assessment was limited to the two network peak hours of 7.00am – 8.00am and 4.00pm – 5.00pm. This is due to the intersection generally experiencing the highest levels of demand of through traffic along Elizabeth Drive during

these two hours, and it is standard transport planning practice to assess the impacts to the network peak hours.

3.1.2 Future operation without project (2025)

Traffic volumes in this scenario consider the expected typical traffic volumes accessing the Site for landfill based on the Site continuing to operate at 750,000 tpa in 2025. This forecasts the expected intersection performance under the current approval, and is used to compare the impact of the project in 2025. In order to assess this scenario impact, the traffic volumes were derived from the following:

- Non-Site traffic volumes had a background growth factor applied based on annual traffic count data from key roads close to the Site, which is detailed in **Section 3.3**
- Site access/egress light vehicle traffic remained the same as in 2019 as it is anticipated that staff accessing the Site generating light vehicle movements will not change in the future
- Site access/egress heavy vehicle traffic remained the same as in 2019 as the Site is still operating at 750,000 tpa.

3.1.3 Future operation with project (2025 & 2031)

Traffic volumes in this scenario consider the expected typical future year traffic volumes accessing the Site for landfill based on the Site operating at 950,000 tpa in 2025 and 2031 (with the Project). This forecasts the expected intersection performance with the Project in the existing consent year (2025) and the expected landfill closure date of Site (2031). In order to assess this scenario impact, the traffic volumes were derived from the following:

- Non-Site traffic volumes had a background growth factor applied based on annual traffic count data from key roads close to the Site, which is detailed in **Section 3.3**
- Site access/egress light vehicle traffic remained the same as in 2019 as it is anticipated that staff accessing the Site generating light vehicle movements will not change in the future
- Site access/egress heavy vehicle traffic was calculated based the annual Site waste tonnage of 950,000 tpa contained as specified in the Project and existing operations data provided by SUEZ.

Future waste volume per truck

The May 2019 weekday average waste load of 12.7 tonnes per truck, calculated in **Table 3.1**, has been adopted for the purpose of generating the volume of heavy vehicles accessing the Site for landfill when the Project is in operation.

The future annual Site waste volume of 950,000 tpa was broken down using the same daily proportion of yearly trips between weekdays and Saturdays. This figure was then multiplied by the daily proportion of the yearly tonnage to derive a weekday daily total waste volume if the site was operating at an annual fill rate of 950,000 tpa. The figures in these calculations are detailed in **Table 3.3**.

Table 3.3 – Future annual waste based on 2019 daily waste volumes

Day	Split of yearly operation	Yearly tonnage of all vehicles	Daily proportion of weekday or weekend yearly totals	Total daily tonnage of vehicles
Weekday	94%	893,000	0.40%	3,544
Saturday	6%	57,000	1.92%	1,096
Total	100%	950,000	-	4,640

Source: AECOM 2019, based on data provided by SUEZ

The difference between the current and future operation of the Site is shown in **Table 3.4**.

Table 3.4 – Difference in current and future Site operations

Scenario	Yearly operation (tpa)	Daily operation (t)
Current Site operation	752,868	2,818
Future Site operation with Project	950,000	3,544
Difference	197,132	726

Source: AECOM 2019, based on data provided by SUEZ

Trips per weekday

At the existing Site, with an annual landfill capacity of 750,000 tpa, 222 heavy vehicles access the the Site per weekday, with an average waste load per truck of 12.7 tonnes.

Using these assumptions, the Project with an annual landfill capacity of 950,000 tpa, is forecast to generate approximately 280 heavy vehicles per weekday. This represents an increase of 58 heavy vehicles per day and is detailed in **Table 3.5**.

Table 3.5 – Difference between current and future daily operations

Scenario	Daily vehicle calculation	Vehicles
Current daily number of vehicles	2,818 ÷ 12.7	222
Future daily number of vehicles	3,544 ÷ 12.7	280
Difference	3,544 – 2,818 = 726	58

Source: AECOM 2019, based data provided by SUEZ

Traffic survey counts (**Section 3.1.1**) identified an AM and PM peak hour of 7.00am – 8.00am and 4.00pm – 5.00pm respectively. The Site heavy vehicle volume profile illustrated in **Figure 3.1** shows that 10% of the daily traffic access the site in the AM peak hour and 3% of the daily traffic accesses the site in the PM peak hour. Therefore, an increase in peak hour heavy vehicles is presented in **Table 3.6**.

Table 3.6 – Daily distribution of weekday heavy vehicle trips at Site waste capacities of 750,000 tpa and 950,000 tpa

Hour	Weekday heavy vehicles at 750,000 tpa		Weekday heavy vehicles at 950,000 tpa		Increase in heavy vehicles	
	Hourly distribution	Percentage of daily vehicles	Hourly distribution	Percentage of daily vehicles	Number	Percentage
6am – 7am	10	5%	13	5%	3	30%
7am – 8am	23	10%	29	10%	6	26%
8am – 9am	25	11%	31	11%	6	24%
9am – 10am	27	12%	34	12%	7	26%
10am – 11am	24	11%	30	11%	6	25%
11am – 12pm	28	13%	35	13%	7	25%
12pm – 1pm	26	12%	33	12%	7	27%
1pm – 2pm	12	5%	15	5%	3	25%
2pm – 3pm	22	10%	28	10%	6	27%
3pm – 4pm	19	8%	24	8%	5	26%
4pm – 5pm	6	3%	8	3%	2	33%
Daily Total Vehicles	**222**	**100%**	**280**	**100%**	**58**	**-**
Daily Total Vehicle Movements	**444**	**100%**	**560**	**100%**	**116**	**-**

Source: AECOM 2019, based data provided by SUEZ

It is therefore expected that the Project would generate an additional 6 heavy vehicles during the AM peak hour, and 2 heavy vehicles during the PM peak hour. These heavy vehicles are expected to enter and exit the site within the same hour, and therefore it is forecast that an additional 12 heavy vehicle movements (6 in, 6 out) would be generated during the AM peak hour, and an additional 4 heavy vehicle movements (2 in, 2 out) would be generated during the PM peak hour.

3.1.4 SAWT Facility

As previously discussed, the SAWT facility on the Site will continue to operate as existing with the Project. In this case, 40 heavy vehicles access the facility per day (weekdays and Saturdays), resulting in 80 heavy vehicle movements per day. These heavy vehicle movements would have been captured in the traffic surveys, and therefore are not required to be considered as additional trips during the modelled scenarios.

3.1.5 Summary of Future Daily Heavy Vehicle Trips with Project

The existing consent for the Site limits the number of daily heavy vehicle movements per day to 780. Based on the future site operation with the Project, it is expected that the forecast daily heavy vehicle movements generated by the Site will remain under 780 (**Table 3.7**).

Table 3.7 – Forecast total daily vehicle movements for SUEZ's Elizabeth Drive Resource Recovery Park with the Project

Day	Number of daily heavy vehicle movements – landfill without project	Number of additional daily heavy vehicle movements – landfill with project	Number of daily heavy vehicle movements – SAWT	Total daily heavy vehicle movements
Typical weekday	444	116	80	640

3.2 Traffic modelling

Traffic modelling was undertaken to determine any impacts on the operation of the Elizabeth Drive/ Site Access Road intersection. Intersection modelling was undertaken in modelling package SIDRA 8 to assess the existing performance, and the future performance of this intersection. It should be noted that only the weekday AM and PM peak periods have been modelled. Background traffic volumes and trips generated by the site are significantly lower on a Saturday, and therefore this has not been modelled as the weekday AM and PM peak periods would provide the 'worst case' assessment.

3.2.1 Intersection assessments

The intersection performance was evaluated using SIDRA Intersection 8.0, a computer-based modelling package designed to calculate isolated intersection performance. The performance indicators for SIDRA 8.0 applicable to the Project are:

- Degree of Saturation (DoS) – measure of the ratio between traffic volumes and capacity of the intersection is used to measure the performance of isolated intersections. As DoS approaches 1.0, both queue length and delays increase rapidly. Satisfactory operations usually occur with a DoS of less than 0.9
- Average Delay – duration, in seconds, of the average vehicle waiting at an intersection, which corresponds to the Level of Service (LoS) – a measure of the overall performance of the intersection. Intersection performance criteria are outlined below in **Table 3.8**.

Table 3.8 – Level of service performance criteria

Level of Service	Average Delay (secs/veh)	Give Way and Stop Signs
A	Less than 14	Good Operation
B	15 to 28	Acceptable delays and spare capacity
C	29 to 42	Satisfactory, but accident study required
D	43 to 56	Near capacity and accident study required
E	57 to 70	At capacity; requires other control mode
F	>70	At capacity; requires other control mode

Source: Guide to Traffic Generating Developments, RTA, 2002

The intersection layout is shown in **Figure 3.2**. As can be seen, the modelled intersection has two westbound through lanes. This replicates on Site conditions where physically two through lanes pass westbound through the intersection. The southernmost westbound lane on Elizabeth Drive would have low traffic volumes as vehicles using this lane would be left turn out vehicles from Martin Road, and these vehicles would likely merge before they reached the intersection. The low volume of vehicles in this lane has been accounted for in the model by setting the intersection utilisation at 1%.

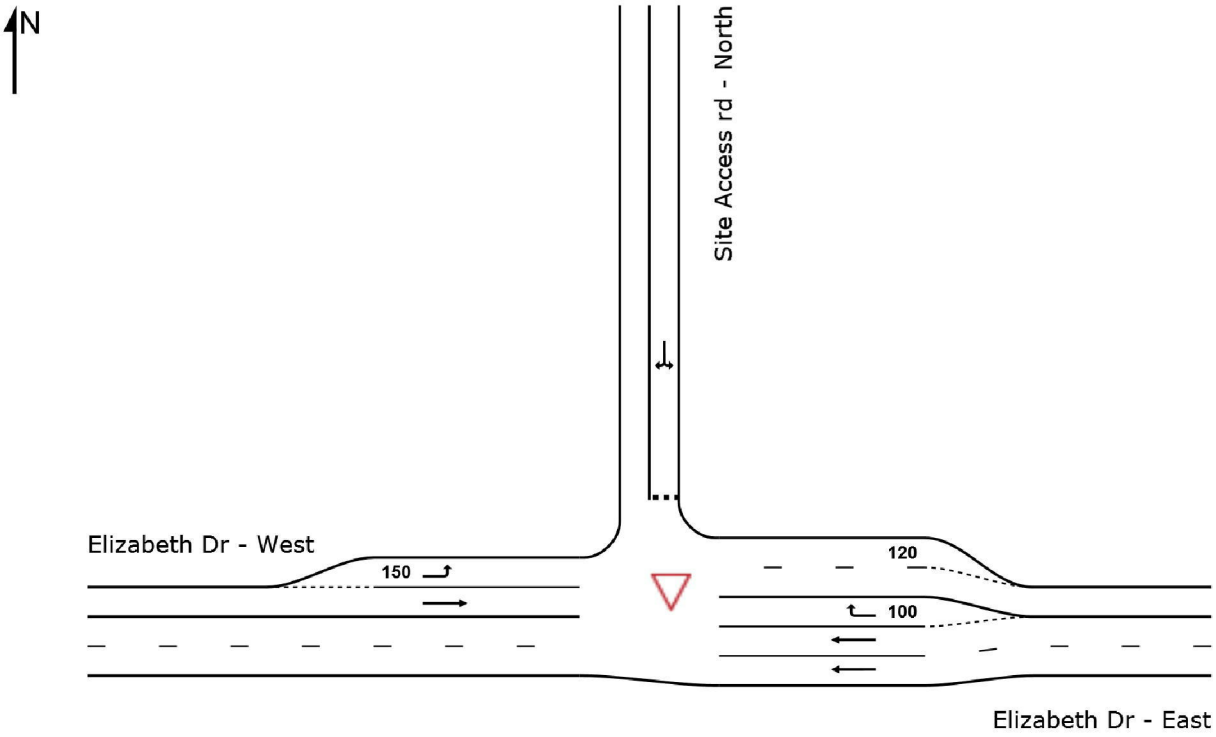


Figure 3.2 – Existing Elizabeth Drive / Site Access Road modelled intersection layout

Source: AECOM 2019

3.3 Background traffic growth

Calculating background traffic growth allows the future year traffic impact assessments to consider the effects of projected increased traffic, resulting from local development in the surrounding areas. The Roads and Maritime *Traffic Volume Viewer* tool provides historic average daily traffic counts at a number of locations throughout Sydney. There are two permanent count locations in proximity to the Site which have recent count data available. These two permanent counters located on Elizabeth Drive to the east of the Site, are shown in **Figure 3.3**. They provide two-way average daily traffic volumes from 2009 to 2019.

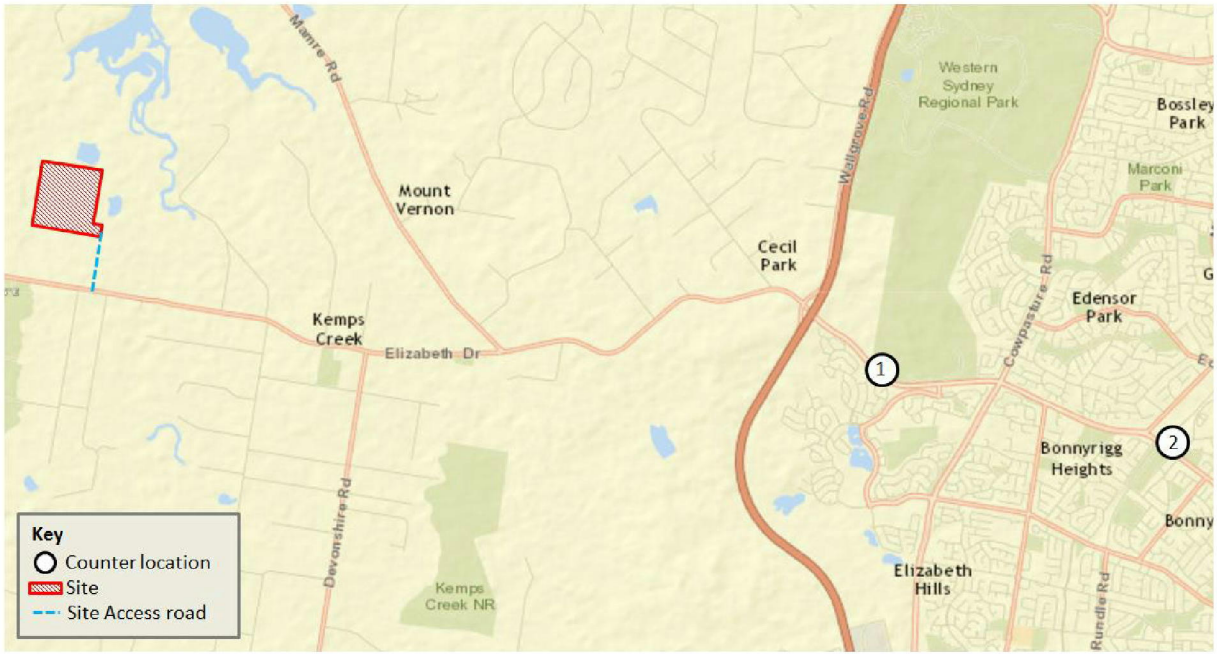


Figure 3.3 – Roads and Maritime traffic counter locations on Elizabeth Drive used in traffic forecasts

Source: AECOM 2019 using RMS Traffic Volume Viewer.

The average daily traffic volumes for each Site from 2009 to 2019 are presented in **Table 3.9**.

Table 3.9 – Average daily traffic volumes on Elizabeth Drive

Year	Counter location 1	Counter location 2
2009	22,695	36,886
2010	24,387	36,282
2011	24,879	36,578
2012	25,204	37,108
2013	26,084	38,038
2014	26,696	38,182
2015	23,627	38,628
2016	26,605	38,925
2017	30,413	41,203
2018	29,877	41,130
2019	29,005	38,200

When considering the historic data that has been provided as part of this study, a compound growth rate calculation has been used to identify trends in this traffic data to establish a growth rate factor that can be used to assess the future year intersection performance. A compounded growth rate is a growth rate which is compounded annually, whereas a linear growth rate results in a constant increase in traffic each year. The compound traffic growth formula is shown below:

$$AADT_x = AADT_{y1} \times (1+ GR)^{(x-y1)}$$

$AADT_x$ = AADT in year x
$AADT_{y1}$ = AADT in the first year of calculation
GR = Growth Rate
y1 = First year (1)
x = year of calculation

Using a variation of this formula to identify the historic background traffic growth rates, **Table 3.10** presents the compound traffic growth rates at each of the traffic counter locations.

Table 3.10 – Average daily traffic volumes on Elizabeth Drive

	Counter location 1	Counter location 2
Growth rate factor	2.74%	0.40%

The growth rates differs between the two counter locations. For the purpose of the analysis, the average growth rate across both Sites has been used and a compound growth rate factor of 1.57% has been established.

It should be noted that traffic volumes on Elizabeth Drive are likely to be significantly affected by the development of the Western Sydney Airport, the construction of the M12 motorway link, industrial and commercial precincts associated with the Aerotropolis development, adjoining land releases for residential precincts and employment zones. However, as there is insufficient information available to undertake a quantitative assessment at this time, these impacts have been assessed qualitatively only in the cumulative impact assessment presented in **Section 5.0**.

4.0 Operational traffic impacts

4.1 Existing operation (2019)

This section will assess the intersection performance under existing Site operations to create a baseline for future Project scenarios to be tested.

4.1.1 Peak hour traffic volumes

The traffic volumes representing typical Site operation were derived from the intersection count surveys and used to model the existing operation 2019 scenario were. The traffic volumes are illustrated in **Figure 4.1** and **Figure 4.2**.

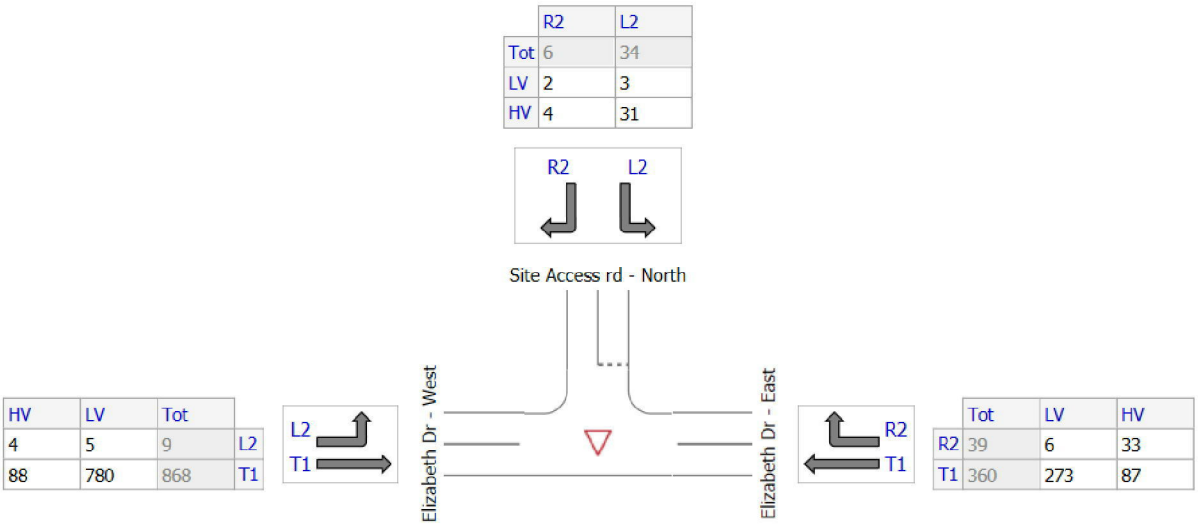


Figure 4.1 – Existing Standard operation weekday AM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

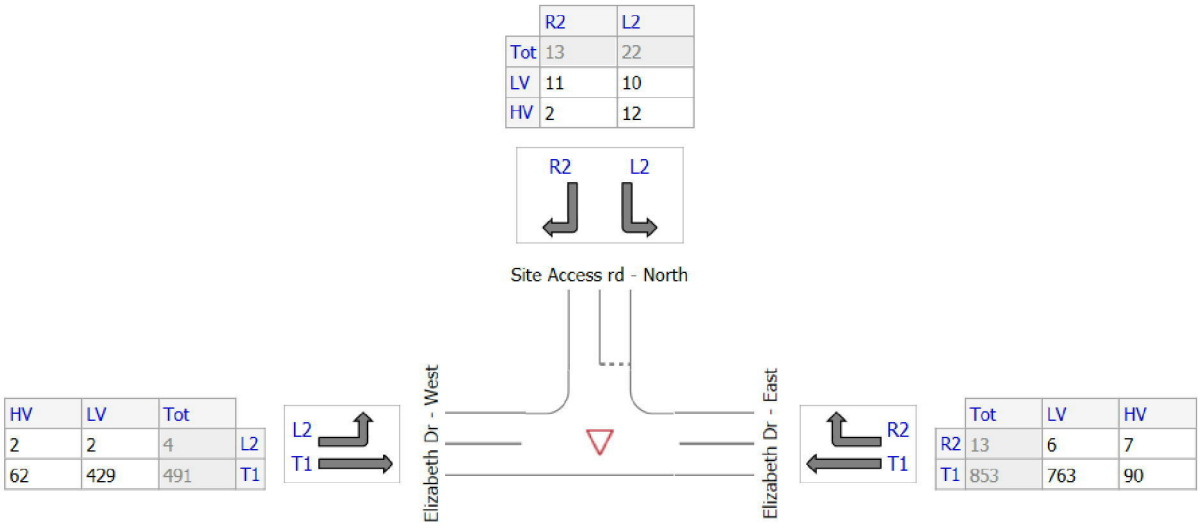


Figure 4.2 – Existing Standard operation weekday PM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

4.1.2 Intersection assessment

Table 4.1 and **Table 4.2** present the weekday AM and PM peak hour intersection performance under existing operating conditions.

Table 4.1 – Summary of existing intersection LoS under Standard operating conditions in AM peak hour

Turn	Demand Total (vehicles / hr)	Heavy Vehicle %	Degree Saturation (v/c)	Average Delay (sec)	Level of Service	Queue Vehicles	Queue Distance
East: Elizabeth Drive							
T1	379	24.2	0.224	0.0	LOS A	0.0	0.0
R2	41	84.6	0.307	38.0	LOS C	1.0	12.6
Approach	420	30.1	0.307	3.7	N/A	1.0	12.6
North: from Site Access Road							
L2	36	91.2	0.755	100.0	LOS F	2.7	33.5
R2	6	66.7	0.755	311.6	LOS F	2.7	33.5
Approach	42	87.5	0.755	131.7	LOS F	2.7	33.5
West: Elizabeth Drive							
L2	9	44.4	0.007	6.1	LOS A	0.0	0.0
T1	914	10.1	0.499	0.1	LOS A	0.0	0.0
Approach	923	10.5	0.499	0.1	N/A	0.0	0.0
All Vehicles	1385	18.8	0.755	5.2	N/A	2.7	33.5

Source: AECOM 2019, based on data provided by SUEZ

Table 4.2 – Summary of existing intersection LoS under Standard operating conditions in PM peak hour

Turn	Demand Total (vehicles / hr)	Heavy Vehicle %	Degree Saturation (v/c)	Average Delay (sec)	Level of Service	Queue Vehicles	Queue Distance
East: Elizabeth Drive							
T1	898	10.6	0.487	0.1	LOS A	0.0	0.0
R2	14	53.8	0.027	11.2	LOS A	0.1	1.0
Approach	912	11.2	0.487	0.2	N/A	0.1	1.0
North: from Site Access Road							
L2	23	54.5	0.454	29.2	LOS C	1.5	13.8
R2	14	15.4	0.454	128.6	LOS F	1.5	13.8
Approach	37	40.0	0.454	66.1	LOS E	1.5	13.8
West: Elizabeth Drive							
L2	4	50.0	0.003	6.1	LOS A	0.0	0.0
T1	517	12.6	0.287	0.0	LOS A	0.0	0.0
Approach	521	12.6	0.287	0.1	N/A	0.0	0.0
All Vehicles	1469	12.5	0.487	1.8	N/A	1.5	13.8

Source: AECOM 2019, based on data provided by SUEZ

The intersection generally performs satisfactorily during the AM and PM peaks hours, with an average delay of 5.2 seconds in the AM peak hour, and 1.8 seconds in the PM peak hour.

- The through movement along Elizabeth Drive in both directions operates at LoS A during both peak periods.
- The right turn from Elizabeth Drive into the Site Access Road operates at LoS C during the AM peak hour with an average delay of 38 seconds. This level of delay is considered acceptable, and queue lengths are contained within the extremities of the right turn bay on Elizabeth Drive.
- In both the AM and PM peak hours, the right turn out from the Site Access Road performs at LoS F. These vehicles need to wait on average between 2 and 5 minutes to turn right at the intersection. This is likely to be attributed to the high traffic flows along Elizabeth Drive, with right turning vehicles from the site finding it difficult to find gaps in traffic flow to exit. As there is only one exit lane on the Site Access Road, this would also explain why left turning vehicles may also experience delays exiting. Queue lengths however are not significant on the Site Access Road due to the low vehicles demand volumes.
- The percentage of vehicles turning right from the Site Access Road onto Elizabeth Drive is 14% in the AM peak hour and 38% in the PM peak hour.

4.2 Future operation without project (2025)

The future year operation without project scenario assesses how the Elizabeth Drive / Access road intersection will perform under the daily level of Site haulage activity required to service the Site at the existing disposal rate of 750,000 tpa in 2025.

4.2.1 Peak hour traffic volumes

Traffic volumes in this scenario consider typical future year traffic volumes accessing the Site without the Project as per existing approvals. Under this scenario, the existing Site vehicle generation will not change, however the background traffic along Elizabeth Drive will be treated with a growth factor to replicate future traffic growth in the area. The volumes of the Elizabeth Drive intersection without the project in 2025 are illustrated in **Figure 4.3** and **Figure 4.4**.

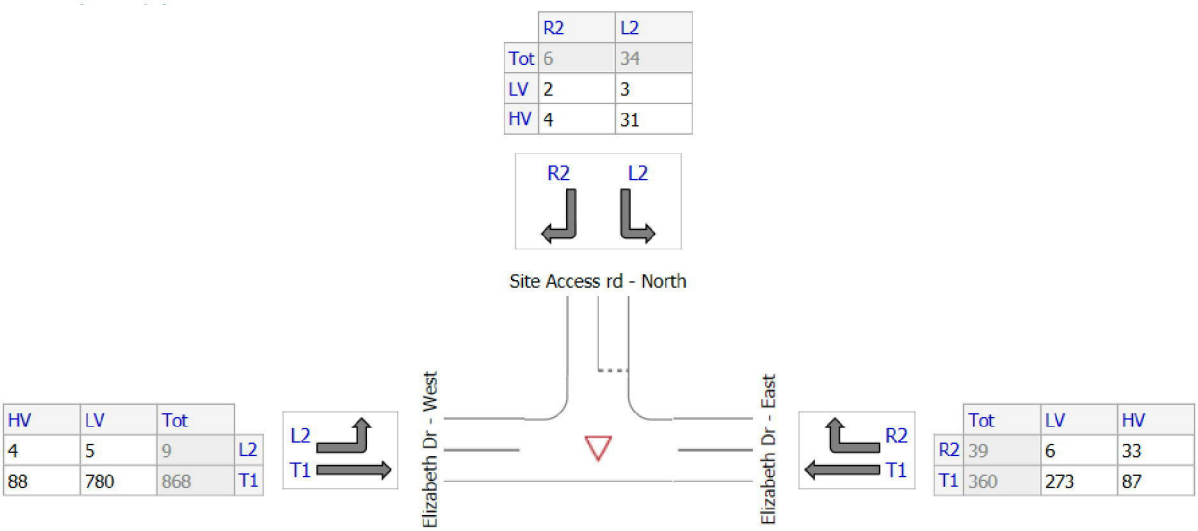


Figure 4.3 – 2025 Standard operation without project weekday AM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

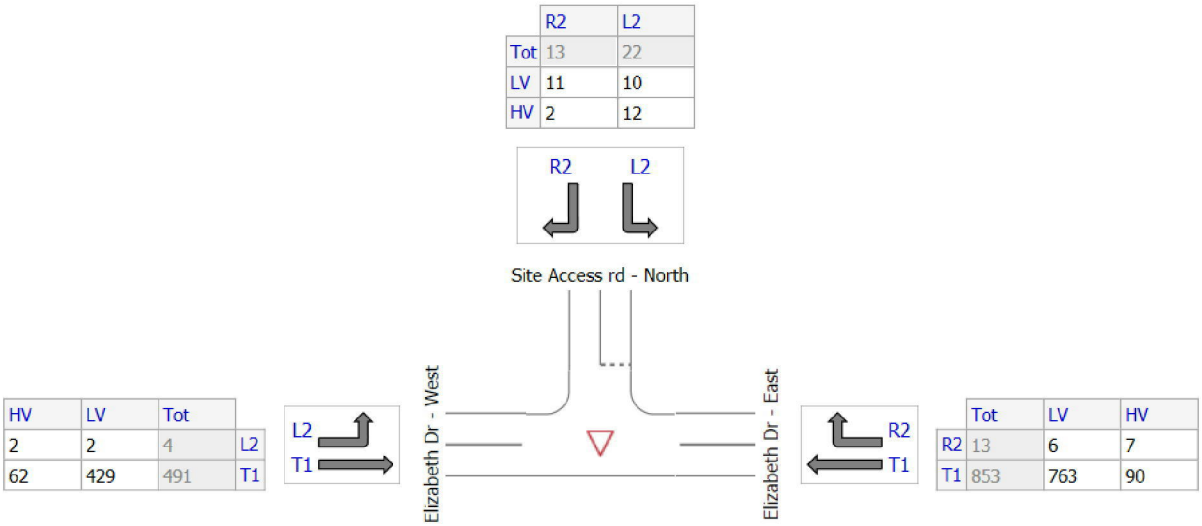


Figure 4.4 – 2025 Standard operation without project weekday PM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

4.2.2 Intersection assessment

Table 4.3 and **Table 4.4** present the weekday AM and PM peak hour intersection performance under 2025 Standard operating conditions without the Project.

Table 4.3 – Summary of 2025 intersection LoS under Standard operating conditions without Project in AM peak hour

Turn	Demand Total (vehicles / hr)	Heavy Vehicle %	Degree Saturation (v/c)	Average Delay (sec)	Level of Service	Queue Vehicles	Queue Distance
East: Elizabeth Drive							
T1	416	24.2	0.246	0.0	LOS A	0.0	0.0
R2	41	84.6	0.429	56.2	LOS D	1.4	17.5
Approach	457	29.6	0.429	5.1	N/A	1.4	17.5
North: from Site Access Road							
L2	36	91.2	1.253	400.6	LOS F	9.5	115.9
R2	6	66.7	1.253	702.5	LOS F	9.5	115.9
Approach	42	87.5	1.253	445.9	LOS F	9.5	115.9
West: Elizabeth Drive							
L2	9	44.4	0.007	6.1	LOS A	0.0	0.0
T1	1003	10.1	0.548	0.1	LOS A	0.0	0.0
Approach	1013	10.5	0.548	0.2	N/A	0.0	0.0
All Vehicles	1512	18.4	1.253	14.1	N/A	9.5	115.9

Source: AECOM 2019, based on data provided by SUEZ

Table 4.4 – Summary of 2025 intersection LoS under Standard operating conditions without Project in PM peak hour

Turn	Demand Total (vehicles / hr)	Heavy Vehicle %	Degree Saturation (v/c)	Average Delay (sec)	Level of Service	Queue Vehicles	Queue Distance
East: Elizabeth Drive							
T1	986	10.6	0.535	0.1	LOS A	0.0	0.0
R2	14	53.8	0.030	12.1	LOS A	0.1	1.1
Approach	1000	11.1	0.535	0.3	N/A	0.1	1.1
North: from Site Access Road							
L2	23	54.5	0.730	92.3	LOS F	2.6	24.6
R2	14	15.4	0.730	257.2	LOS F	2.6	24.6
Approach	37	40.0	0.730	153.5	LOS F	2.6	24.6
West: Elizabeth Drive							
L2	4	50.0	0.003	6.1	LOS A	0.0	0.0
T1	567	12.6	0.315	0.0	LOS A	0.0	0.0
Approach	572	12.9	0.315	0.1	N/A	0.0	0.0
All Vehicles	1608	12.4	0.730	3.7	N/A	2.6	24.6

Source: AECOM 2019, based on data provided by SUEZ

The intersection generally performs satisfactorily during the AM and PM peaks hours with an overall average delay of 14.1 seconds in the AM peak hour and 3.7 seconds in the PM peak hour.

- The through movement along Elizabeth Drive in both directions operates at LoS A during both peak periods.
- The right turn from Elizabeth Drive into the Site Access Road operates at LoS D during the AM peak hour with an average delay of 56 seconds. This level of delay is considered acceptable, and queue lengths are contained within the extremities of the right turn bay on Elizabeth Drive.
- In both the AM and PM peak hours, the right turn out from the Site Access Road performs at LoS F. These vehicles need to wait on average between 4 and 12 minutes to turn right at the intersection. This is likely to be attributed to the high traffic flows along Elizabeth Drive, which are expected to increase due to background traffic growth compared to existing conditions. Queue lengths along the Site Access Road are expected to be in the region of 115 metres.
- The percentage of vehicles turning right from the Site Access Road onto Elizabeth Drive is 14% in the AM peak hour and 38% in the PM peak hour.

4.3 Future operation with project (2025)

The future operation with project scenario assesses how the Elizabeth Drive / Access road intersection will perform under the daily level of Site haulage activity required to service the Site disposal rate of 950,000 tpa proposed by the Project in 2025.

4.3.1 Peak hour traffic volumes

Traffic volumes in this scenario consider typical future year traffic volumes accessing the Site with the Project. Under this scenario, the existing Site vehicle generation will increase as per the analysis presented in **Section 3.1.3**, and the background traffic along Elizabeth Drive will be treated with a growth factor to replicate future traffic growth in the area. The future operation with the project in 2025 peak hour intersection volumes are illustrated in **Figure 4.5** and **Figure 4.6**.

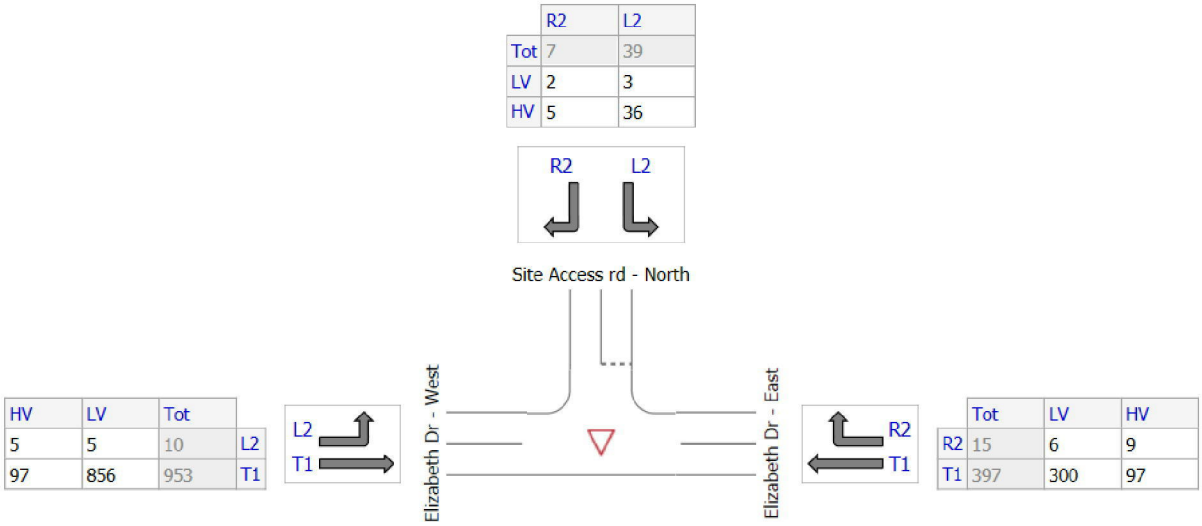


Figure 4.5 – 2025 Standard operation weekday AM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

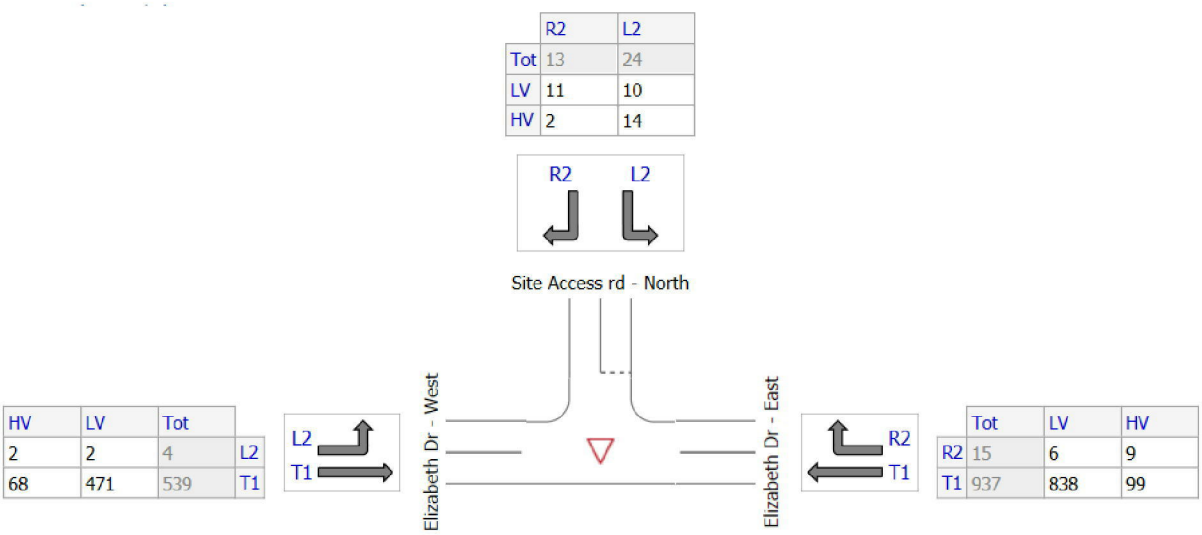


Figure 4.6 – 2025 Standard operation weekday PM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

4.3.2 Intersection assessment

Table 4.5 and **Table 4.6** present the weekday AM and PM peak hour intersection performance under 2025.

Table 4.5 – Summary of 2025 intersection LoS under Standard operating conditions with Project in AM peak hour

Turn	Demand Total (vehicles / hr)	Heavy Vehicle %	Degree Saturation (v/c)	Average Delay (sec)	Level of Service	Queue Vehicles	Queue Distance
East: Elizabeth Drive							
T1	417	24.4	0.247	0.0	LOS A	0.0	0.0
R2	52	77.6	0.492	55.0	LOS D	1.7	20.2
Approach	469	30.2	0.492	6.1	N/A	1.7	20.2
North: from Site Access Road							
L2	41	92.3	1.613	685.1	LOS F	16.1	199.4
R2	7	71.4	1.613	958.5	LOS F	16.1	199.4
Approach	48	89.1	1.613	726.7	LOS F	16.1	199.4
West: Elizabeth Drive							
L2	11	50.0	0.008	6.1	LOS A	0.0	0.0
T1	1003	10.1	0.548	0.1	LOS A	0.0	0.0
Approach	1014	10.6	0.548	0.2	N/A	0.0	0.0
All Vehicles	1531	19.1	1.613	25.0	N/A	16.1	199.4

Source: AECOM 2019, based on data provided by SUEZ

Table 4.6 – Summary of 2025 intersection LoS under Standard operating conditions with Project in PM peak hour

Turn	Demand Total (vehicles / hr)	Heavy Vehicle %	Degree Saturation (v/c)	Average Delay (sec)	Level of Service	Queue Vehicles	Queue Distance
East: Elizabeth Drive							
T1	986	10.6	0.535	0.1	LOS A	0.0	0.0
R2	16	60.0	0.036	12.6	LOS A	0.1	1.4
Approach	1002	11.3	0.535	0.3	N/A	0.1	1.4
North: from Site Access Road							
L2	25	58.3	0.741	92.2	LOS F	2.7	26.1
R2	14	15.4	0.741	258.3	LOS F	2.7	26.1
Approach	39	43.2	0.741	150.5	LOS F	2.7	26.1
West: Elizabeth Drive							
L2	4	50.0	0.003	6.1	LOS A	0.0	0.0
T1	567	12.6	0.315	0.0	LOS A	0.0	0.0
Approach	572	12.9	0.315	0.1	N/A	0.0	0.0
All Vehicles	1612	12.7	0.741	3.9	N/A	2.7	26.1

Source: AECOM 2019, based on data provided by SUEZ

The intersection generally performs satisfactorily during the AM and PM peaks hours, with an average delay of 25 seconds in the AM peak hour, and 3.9 seconds in the PM peak hour.

- The through movement along Elizabeth Drive in both directions operates at LoS A during both peak periods.
- The right turn from Elizabeth Drive into the Site Access Road operates at LoS D during the AM peak hour with an average delay of 55 seconds. This level of delay is considered acceptable, and queue lengths are contained within the extremities of the right turn bay on Elizabeth Drive.
- In both the AM and PM peak hours, the right turn out from the Site Access Road performs at LoS F with 15% of vehicles performing this movement in the AM peak hour and 36% in the PM peak hour. These vehicles need to wait on average between 4 and 16 minutes to turn right at the intersection. This is likely to be attributed to the high traffic flows along Elizabeth Drive, which are expected to increase due to background traffic growth compared to existing conditions. Queue lengths along the Site Access Road are expected to be in the region of 200 metres.

When comparing the future operation without and with project scenarios in 2025, the overall intersection performance experiences an average of 10 seconds of additional delay.

- Traffic flows along Elizabeth Drive continue to operate at LoS A during both peak periods.
- The right turn from Elizabeth Drive into the Site Access Road also continues to operate at LoS D in the AM peak hour with the same level of average delay and queue length.
- In both the AM and PM peak hours, the right turn out from the Site Access Road continues to perform at LoS F. Due to the degree of saturation surpassing 1 in the AM peak hour in both the without and with Project scenarios, this represents a failure at the intersection, and therefore the average delay and queue lengths increase exponentially. Queue lengths are expected to increase by 95 metres, and delays by 4 minutes. This is to be expected as background traffic volumes along Elizabeth Drive will have experienced traffic growth, with over 1,000 vehicles travelling in a single direction within a single lane. Traffic volumes along Elizabeth Drive are therefore approaching mid-block capacity, which may have detrimental impacts to traffic speeds and queueing along Elizabeth Drive. This would likely occur regardless of the Project.
- Right turning vehicles will continue to find it increasingly more difficult to find suitable gaps in traffic to exit with or without the Project, with delays and queue lengths increasing due to the increase in heavy vehicle movements generated by the Project. It should however be noted that the proposed increase in heavy vehicle movements is of a low volume, however as the Site Access Road leg of the intersection is saturated, small traffic volume increases would yield significant increases in the reported delay and queue lengths.
- An additional six vehicles are expected to be observed in 2025 with Project during the AM peak hour and two in the PM peak hour when compared to the 2025 without Project scenario.

4.4 Future operation with project (2031)

The future operation with project scenario assesses how the Elizabeth Drive / Access road intersection will perform under the daily level of Site haulage activity required to service the Site disposal rate of 950,000 tpa proposed by the Project in 2031.

4.4.1 Peak hour traffic volumes

Traffic volumes in this scenario consider typical future year traffic volumes accessing the Site with the Project at the end of the estimated life of the Project. Under this scenario, the existing Site vehicle generation will increase as per the analysis presented in **Section 3.1.3**, and the background traffic along Elizabeth Drive will be treated with a growth factor to replicate future traffic growth in the area. The 2031 Standard operation peak hour intersection counts are shown in **Figure 4.7** and **Figure 4.8**.

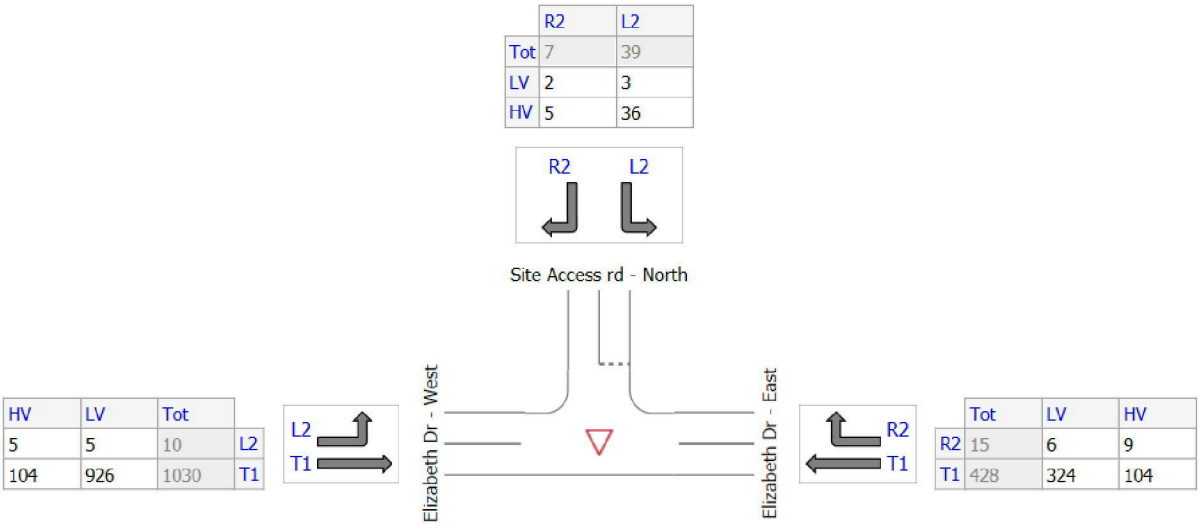


Figure 4.7 – 2031 Standard operation weekday AM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

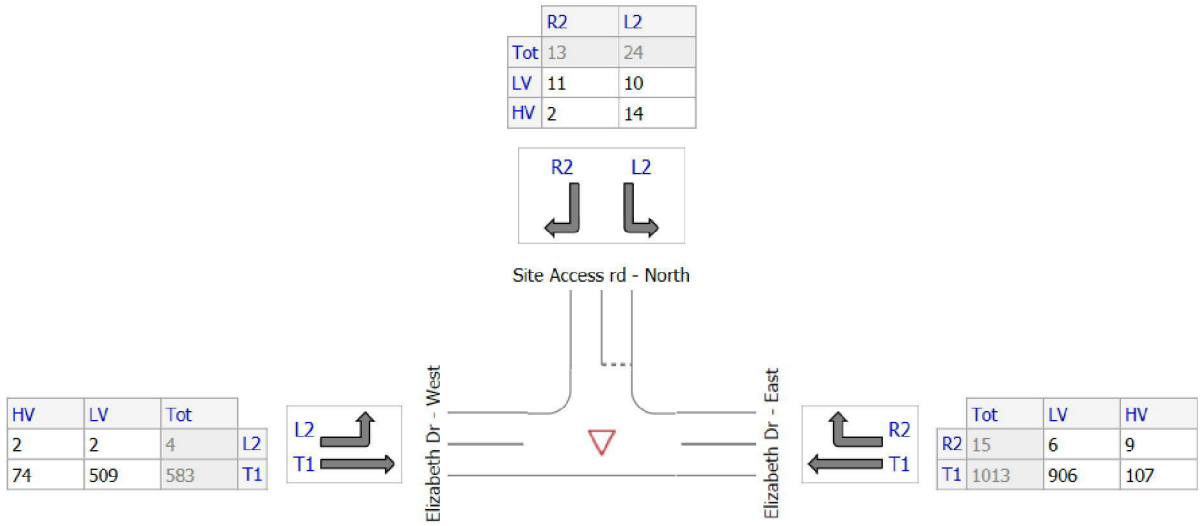


Figure 4.8 – 2031 Standard operation weekday PM peak hour traffic volumes

'HV' refers to Heavy Vehicles, 'LV' refers to Light Vehicles, 'Tot' refers to Total Vehicles

4.4.2 Intersection assessment

Table 4.7 and **Table 4.8** present the weekday AM and PM peak hour intersection performance under 2031 Standard operating conditions with the Project.

Table 4.7 – Summary of 2031 intersection LoS under Standard operating conditions with Project in AM peak hour

Turn	Demand Total (vehicles / hr)	Heavy Vehicle %	Degree Saturation (v/c)	Average Delay (sec)	Level of Service	Queue Vehicles	Queue Distance
East: Elizabeth Drive							
T1	451	24.4	0.268	0.0	LOS A	0.0	0.0
R2	46	86.4	0.698	106.4	LOS F	2.5	30.9
Approach	497	30.1	0.698	9.9	N/A	2.5	30.9
North: from Site Access Road							
L2	41	92.3	2.012	1041.3	LOS F	20.5	253.2
R2	7	71.4	2.012	1270.1	LOS F	20.5	253.2
Approach	48	89.1	2.012	1076.1	LOS F	20.5	253.2
West: Elizabeth Drive							
L2	11	50.0	0.008	6.1	LOS A	0.0	0.0
T1	1084	10.1	0.593	0.1	LOS A	0.0	0.0
Approach	1095	10.5	0.593	0.2	N/A	0.0	0.0
All Vehicles	1641	18.8	2.012	34.9	N/A	20.5	253.2

Source: AECOM 2019, based on data provided by SUEZ

Table 4.8 – Summary of 2031 intersection LoS under Standard operating conditions with Project in PM peak hour

Turn	Demand Total (vehicles / hr)	Heavy Vehicle %	Degree Saturation (v/c)	Average Delay (sec)	Level of Service	Queue Vehicles	Queue Distance
East: Elizabeth Drive							
T1	1066	10.6	0.578	0.1	LOS A	0.0	0.0
R2	16	60.0	0.040	13.7	LOS A	0.1	1.5
Approach	1082	11.3	0.578	0.3	N/A	0.1	1.5
North: from Site Access Road							
L2	25	58.3	1.202	376.0	LOS F	8.5	81.1
R2	14	15.4	1.202	605.4	LOS F	8.5	81.1
Approach	39	43.2	1.202	456.6	LOS F	8.5	81.1
West: Elizabeth Drive							
L2	4	50.0	0.003	6.1	LOS A	0.0	0.0
T1	613	12.6	0.340	0.0	LOS A	0.0	0.0
Approach	618	12.9	0.340	0.1	N/A	0.0	0.0
All Vehicles	1738	12.6	1.202	10.5	N/A	8.5	81.1

Source: AECOM 2019, based on data provided by SUEZ

The intersection generally performs satisfactorily during the AM and PM peaks hours, with an average delay of 34.9 seconds in the AM peak hour, and 10.5 seconds in the PM peak hour.

- The through movement along Elizabeth Drive in both directions operates at LoS A during both peak periods.
- The right turn from Elizabeth Drive into the Site Access Road would operate at LoS F during the AM peak hour with an average delay of 106.4 seconds. This level of delay would generally be considered unacceptable. However as queue lengths would still be contained within the extremities of the right turn bay on Elizabeth Drive, and due to the increase in background traffic volumes on Elizabeth Drive, this level of delay could be considered acceptable
- In both the AM and PM peak hours, the right turn out from the Site Access Road performs at LoS F. These vehicles need to wait on average between 10 and 21 minutes to turn right at the intersection. As previously explained, right turning vehicles will continue to find it increasingly more difficult to find suitable gaps in traffic to exit due to the high vehicle volumes travelling along Elizabeth Drive. Queue lengths along the Site Access Road are expected to be in the region of 253 metres.
- An additional six vehicles are expected to be observed in 2031 with Project during the AM peak hour and two in the PM peak hour when compared to the 2025 without Project scenario.

4.5 Impacts on road safety

The NSW Centre for Road Safety does not provide crash and casualty statistics for the road network surrounding the site. Therefore, a crash analysis cannot be undertaken. However, a qualitative assessment on the impacts that the Project may have on road safety has been undertaken:

- As the mid-block reaches capacity along Elizabeth Drive, vehicles turning into / out of the Site Access Road will struggle to find suitable gaps in traffic to complete the manoeuvre. Longer delays can contribute to drivers accepting shorter than recommended gaps as they become frustrated. This may lead to an increase in right angle crashes between turning vehicles and through traffic along Elizabeth Drive. This is not necessarily due to the Project, and is likely to be the case under the existing approved operations in 2025 with mid-block volumes reaching 1,000 vehicles per hour along Elizabeth Drive.

- As previously discussed, the queue for right turning vehicles into the Site from Elizabeth Drive is not expected to queue out of the right turn lane. However, the queue is forecast to extend to the end of the right turn lane in 2031. Under periods of unexpectedly high traffic volumes, vehicles may queue outside of the right turn lane bay, and obstruct through traffic. This may lead to an increase in rear crashes between vehicles waiting to turn right and through traffic westbound along Elizabeth Drive.

5.0 Assessment of cumulative impacts

5.1 Western Sydney Infrastructure Plan

The Western Sydney Infrastructure Plan (WSIP) is the Australian and NSW Governments' 10 year, $3.6 billion road investment program for Western Sydney. It will deliver major road infrastructure upgrades and provide improved road transport capacity ahead of future traffic demand, as planned residential and employment development comes online in Western Sydney growth areas and the Western Sydney employment area.

Major components of the WSIP in the vicinity of the Site include:

- Upgrade of The Northern Road to a minimum of four lanes from Narellan to Jamison Road, Penrith
- Construction of the M12 Motorway which will be a new east-west motorway to the airport between the M7 Motorway and The Northern Road. This is shown in **Figure 5.1**.

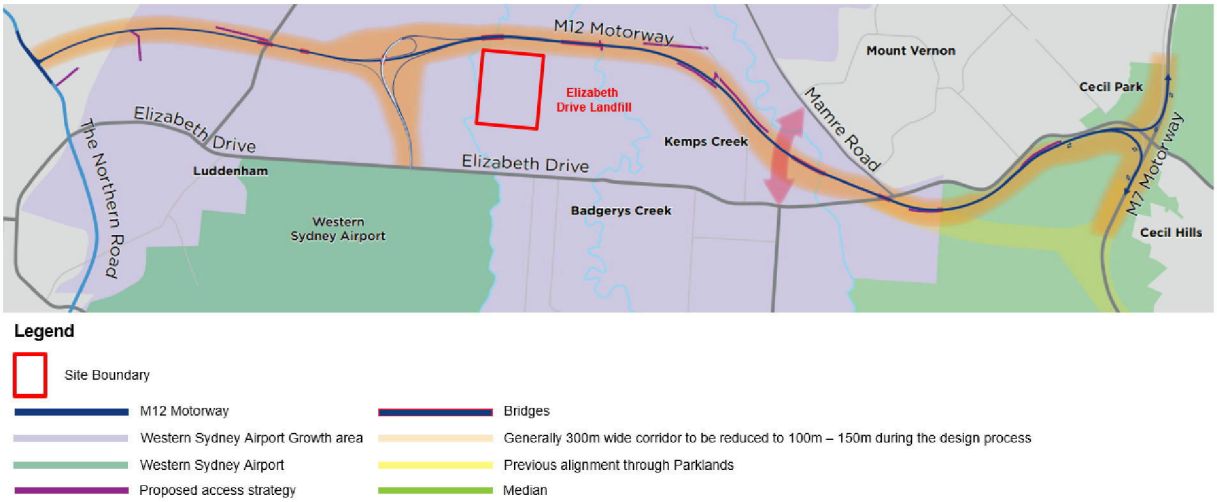


Figure 5.1 – Proposed M12 Motorway alignment

Source: Roads and Maritime https://www.rms.nsw.gov.au/projects/sydney-west/m12-motorway/index.html

Construction of the M12 will provide a bypass for traffic around Elizabeth Drive, generally for through traffic. It is expected therefore that through traffic volumes would decrease as a result of the M12 Motorway. However, this fall in through traffic on Elizabeth Drive is expected to be accompanied by an increase in freight traffic as future freight demands are expected to grow considerably in the local area, with Elizabeth Drive located within the Western Sydney airport growth area (WSAGA), and the M12 Motorway expected to unlock development opportunities along Elizabeth Drive.

The impacts of the proposed Western Sydney airport, construction of the M12 Motorway and the proposed upgrade of Elizabeth Drive have not been considered as a part of the future year modelling assessment as there is insufficient information and data available. However it is noted that upgrades have been recently announced to Elizabeth Drive, now to be a key east-west road link for the south of the Aerotropolis, outlined in the Western Sydney Aerotropolis Land Use and Infrastructure Implementation Plan Stage 1, released in August 2018 by the Department of Planning and Environment. It is also understood that there will be significant land rezoning in the area. A Structure Plan for the Western Sydney Aerotropolis, which is shown in **Figure 5.2**, indicates that the area around the Site will be zoned for flexible employment, and urban land is planned for areas to the north and south of the Site.

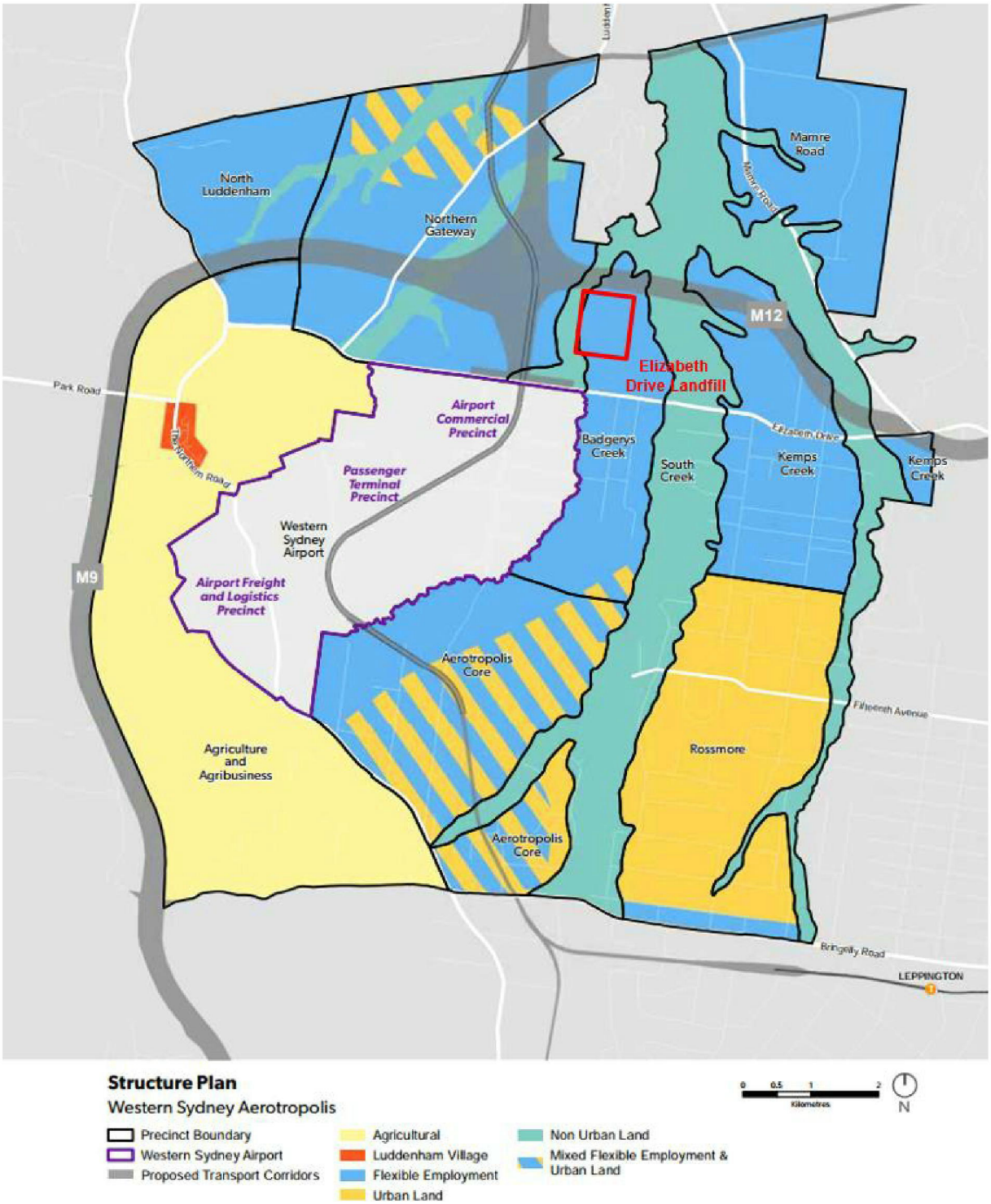


Figure 5.2 – Structure Plan for the Western Sydney Aerotropolis

Source: Western Sydney Aerotropolis Land Use and Infrastructure Implementation Plan Stage 1, Department of Planning and Environment

In response to this, Roads and Maritime are committed to supporting the delivery of the new Western Sydney Airport and the Western Parkland City, and are currently investigating options to improve Elizabeth Drive with funding allocated to the upgrade. Key features of the upgrade include:

- A 14 kilometre east-west link between the M7 Motorway and The Northern Road
- An upgraded four lane (with the provision for up to six lanes) road with a central median to safely separate traffic in each direction
- Traffic lights at a number of intersections to reduce queueing and improve safety including at Elizabeth Drive and Martin Road, 140 metres east of the intersection with the Site Access Road
- Pedestrian, cycling and bus stop infrastructure along the length of Elizabeth Drive
- A direct connection to Western Sydney Airport and access across the Western Parkland City.

Figure 5.3 shows the early stages of the Elizabeth Drive upgrade.

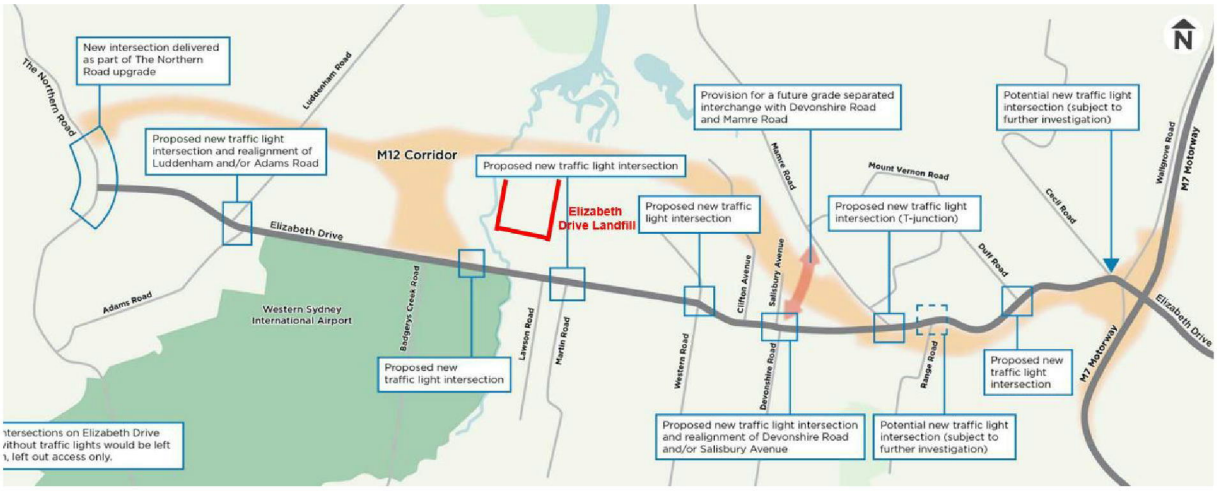


Figure 5.3 – Options for the Elizabeth Drive upgrade

Source: Roads and Maritime https://www.rms.nsw.gov.au/documents/projects/sydney-west/elizabeth-drive-upgrade/elizabeth-drive-upgrade-community-update-june-2019.pdf

Any changes to the road geometry and capacity of Elizabeth Drive is likely to have a direct impact on the performance of the intersection with the Site Access Road. The planned increase in the capacity along Elizabeth Drive would likely improve intersection performance and traffic flows along Elizabeth Drive. In addition, the installation of traffic lights at Elizabeth Drive and Martin Road is likely to assist drivers entering and exiting the SUEZ Site in finding safe gaps in traffic flow, and therefore reduce the forecast queue lengths and delays highlighted in this assessment.

6.0 Conclusion

The Project proposes to increase the rate of fill at the Site from 750,000 tpa to 950,000 tpa. This would result in daily heavy vehicle movements of approximately 560 two-way movements being generated by the site. The increase in the rate of fill at the Site would result in an additional generation of 12 two-way heavy vehicle movements during the AM weekday peak hour, and 4 two-way heavy vehicle movements during the PM weekday peak hour.

Modelling of the existing road network performance indicated that the intersection operates with a LoS A for traffic travelling in both directions along Elizabeth Drive. Traffic exiting the Site Access Road experiences LoS F during peak periods.

The future modelled scenarios of 2025 and 2031 show that there are forecast operational issues at the intersection of Elizabeth Street and the Site Access Road under the with Project and without Project scenarios:

- Future year modelling for 2025 showed no substantial decrease in the performance of the intersection. Under both the with and without Project scenarios, through traffic on Elizabeth Drive continued to operate at LoS A, with the right turn from Elizabeth Drive into the Site Access Road continuing to operate at LoS D in the AM peak hour and maintaining the same level of average delay and queue length under both scenarios. The Site Access Road continued to operate at LoS F under both with and without Project scenarios during both the AM and PM peak hours. This is due to the delay caused by vehicles turning out of the site waiting for appropriate gaps in traffic.
- The number of vehicles making the right turn is considered to be a small percentage of the overall total of vehicles entering the Site.
- Future year modelling for 2031 showed a deterioration in the operation of the intersection. Through traffic on Elizabeth Drive continued to operate at LoS A, however the right turn from Elizabeth Drive into the Site Access Road deteriorated to LoS F in the AM peak hour. Queues are expected to be contained within the holding capacity of the right turn lane on Elizabeth Drive and as such, would not obstruct westbound through traffic. The Site Access Road is forecast to continue to operate at LoS F due to constraints presented by right turning vehicles.

The increase in weekday peak hour trips is nominal, and represents an additional trip every thirty minutes during AM peak hour and every ten minutes during the PM peak hour. Although the traffic modelling presents failures at the intersection, the impact that the Project will have on intersection performance is minimal, and the modelling shows an exponential increase in delay for a minor increase in trips generated by the site due to the failures that are forecast along Elizabeth Drive given the increase in background traffic growth.

Growth in background traffic results in the mid-block reaching capacity on Elizabeth Drive by 2025. As a result, heavy vehicles will struggle to find suitable gaps to turn into the site due to the constant nature of through traffic flow, and may experience significant delays entering the site. This issue is further exacerbated year on year. This would in turn cause the performance of Elizabeth Drive to deteriorate regardless of the Project. This would suggest that upgrades would be required to increase capacity along Elizabeth Drive to cater for any projected increases in background traffic growth.

As part of the growth of the Western Parkland City and the delivery of the new Western Sydney Airport, Roads and Maritime has identified upgrades to Elizabeth Drive to increase capacity and to improve access and safety. Any changes to the road geometry and capacity of Elizabeth Drive is likely to have a direct impact on the performance of the intersection with the Site Access Road. The planned increase in the capacity along Elizabeth Drive would likely improve intersection performance and traffic flows along Elizabeth Drive. In addition, the installation of traffic lights at Elizabeth Drive and Martin Road is likely to assist drivers entering and exiting the SUEZ Site in finding safe gaps in traffic flow, and therefore reduce the forecast queue lengths and delays highlighted in this assessment.

Annexure A – SIDRA results

Existing Standard operation – AM peak hour

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Elizabeth Dr - East												
5	T1	379	24.2	0.224	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	41	84.6	0.307	38.0	LOS C	1.0	12.6	0.90	1.00	1.04	34.9
Approach		420	30.1	0.307	3.7	NA	1.0	12.6	0.09	0.10	0.10	56.0
North: Site Access rd - North												
7	L2	36	91.2	0.755	100.0	LOS F	2.7	33.5	0.98	1.17	1.60	18.4
9	R2	6	66.7	0.755	311.6	LOS F	2.7	33.5	0.98	1.17	1.60	18.5
Approach		42	87.5	0.755	131.7	LOS F	2.7	33.5	0.98	1.17	1.60	18.4
West: Elizabeth Dr - West												
10	L2	9	44.4	0.007	6.1	LOS A	0.0	0.0	0.00	0.57	0.00	51.8
11	T1	914	10.1	0.499	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		923	10.5	0.499	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.7
All Vehicles		1385	18.8	0.755	5.2	NA	2.7	33.5	0.06	0.07	0.08	54.9

Existing Standard operation – PM peak hour

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Elizabeth Dr - East												
5	T1	898	10.6	0.487	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
6	R2	14	53.8	0.027	11.2	LOS A	0.1	1.0	0.57	0.74	0.57	47.7
Approach		912	11.2	0.487	0.2	NA	0.1	1.0	0.01	0.01	0.01	59.6
North: Site Access rd - North												
7	L2	23	54.5	0.454	29.2	LOS C	1.5	13.8	0.91	1.04	1.18	27.8
9	R2	14	15.4	0.454	128.6	LOS F	1.5	13.8	0.91	1.04	1.18	28.2
Approach		37	40.0	0.454	66.1	LOS E	1.5	13.8	0.91	1.04	1.18	28.0
West: Elizabeth Dr - West												
10	L2	4	50.0	0.003	6.1	LOS A	0.0	0.0	0.00	0.57	0.00	51.6
11	T1	517	12.6	0.287	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		521	12.9	0.287	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles		1469	12.5	0.487	1.8	NA	1.5	13.8	0.03	0.03	0.03	58.0

Standard operation without project 2025 – AM peak hour

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Elizabeth Dr - East												
5	T1	416	24.2	0.246	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	41	84.6	0.429	56.2	LOS D	1.4	17.5	0.94	1.04	1.16	29.7
Approach		457	29.6	0.429	5.1	NA	1.4	17.5	0.08	0.09	0.10	54.9
North: Site Access rd - North												
7	L2	36	91.2	1.253	400.6	LOS F	9.5	115.9	1.00	1.70	3.51	6.9
9	R2	6	66.7	1.253	702.5	LOS F	9.5	115.9	1.00	1.70	3.51	6.9
Approach		42	87.5	1.253	445.9	LOS F	9.5	115.9	1.00	1.70	3.51	6.9
West: Elizabeth Dr - West												
10	L2	9	44.4	0.007	6.1	LOS A	0.0	0.0	0.00	0.57	0.00	51.8
11	T1	1003	10.1	0.548	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1013	10.5	0.548	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.7
All Vehicles		1512	18.4	1.253	14.1	NA	9.5	115.9	0.05	0.08	0.13	48.1

Standard operation without project 2025 – PM peak hour

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Elizabeth Dr - East												
5	T1	986	10.6	0.535	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
6	R2	14	53.8	0.030	12.1	LOS A	0.1	1.1	0.61	0.77	0.61	47.2
Approach		1000	11.1	0.535	0.3	NA	0.1	1.1	0.01	0.01	0.01	59.6
North: Site Access rd - North												
7	L2	23	54.5	0.730	92.3	LOS F	2.6	24.6	0.96	1.16	1.57	16.7
9	R2	14	15.4	0.730	257.2	LOS F	2.6	24.6	0.96	1.16	1.57	16.8
Approach		37	40.0	0.730	153.5	LOS F	2.6	24.6	0.96	1.16	1.57	16.8
West: Elizabeth Dr - West												
10	L2	4	50.0	0.003	6.1	LOS A	0.0	0.0	0.00	0.57	0.00	51.6
11	T1	567	12.6	0.315	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		572	12.9	0.315	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
All Vehicles		1608	12.4	0.730	3.7	NA	2.6	24.6	0.03	0.03	0.04	56.4

Standard operation with project 2025 – AM peak hour

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Elizabeth Dr - East												
5	T1	417	24.4	0.247	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	52	77.6	0.492	55.0	LOS D	1.7	20.2	0.95	1.06	1.23	30.1
Approach		469	30.2	0.492	6.1	NA	1.7	20.2	0.10	0.12	0.14	54.0
North: Site Access rd - North												
7	L2	41	92.3	1.613	685.1	LOS F	16.1	199.4	1.00	2.01	4.62	4.4
9	R2	7	71.4	1.613	958.5	LOS F	16.1	199.4	1.00	2.01	4.62	4.4
Approach		48	89.1	1.613	726.7	LOS F	16.1	199.4	1.00	2.01	4.62	4.4
West: Elizabeth Dr - West												
10	L2	11	50.0	0.008	6.1	LOS A	0.0	0.0	0.00	0.57	0.00	51.6
11	T1	1003	10.1	0.548	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1014	10.6	0.548	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.7
All Vehicles		1531	19.1	1.613	25.0	NA	16.1	199.4	0.06	0.10	0.19	41.6

Standard operation with project 2025 – PM peak hour

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Elizabeth Dr - East												
5	T1	986	10.6	0.535	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
6	R2	16	60.0	0.036	12.6	LOS A	0.1	1.4	0.62	0.79	0.62	46.7
Approach		1002	11.3	0.535	0.3	NA	0.1	1.4	0.01	0.01	0.01	59.5
North: Site Access rd - North												
7	L2	25	58.3	0.741	92.2	LOS F	2.7	26.1	0.96	1.17	1.61	16.9
9	R2	14	15.4	0.741	258.3	LOS F	2.7	26.1	0.96	1.17	1.61	17.1
Approach		39	43.2	0.741	150.5	LOS F	2.7	26.1	0.96	1.17	1.61	17.0
West: Elizabeth Dr - West												
10	L2	4	50.0	0.003	6.1	LOS A	0.0	0.0	0.00	0.57	0.00	51.6
11	T1	567	12.6	0.315	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		572	12.9	0.315	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
All Vehicles		1612	12.7	0.741	3.9	NA	2.7	26.1	0.03	0.04	0.05	56.2

Standard operation with project 2031 – AM peak hour

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Elizabeth Dr - East												
5	T1	451	24.4	0.268	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	46	86.4	0.698	106.4	LOS F	2.5	30.9	0.98	1.14	1.48	21.1
Approach		497	30.1	0.698	9.9	NA	2.5	30.9	0.09	0.11	0.14	51.1
North: Site Access rd - North												
7	L2	41	92.3	2.012	1041.3	LOS F	20.5	253.2	1.00	2.05	4.84	3.0
9	R2	7	71.4	2.012	1270.1	LOS F	20.5	253.2	1.00	2.05	4.84	3.0
Approach		48	89.1	2.012	1076.1	LOS F	20.5	253.2	1.00	2.05	4.84	3.0
West: Elizabeth Dr - West												
10	L2	11	50.0	0.008	6.1	LOS A	0.0	0.0	0.00	0.57	0.00	51.6
11	T1	1084	10.1	0.593	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1095	10.5	0.593	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.7
All Vehicles		1641	18.8	2.012	34.9	NA	20.5	253.2	0.06	0.10	0.18	37.1

Standard operation with project 2031 – PM peak hour

Movement Performance - Vehicles												
Mov ID	Turn	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	Aver. No. Cycles	Average Speed km/h
East: Elizabeth Dr - East												
5	T1	1066	10.6	0.578	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
6	R2	16	60.0	0.040	13.7	LOS A	0.1	1.5	0.66	0.83	0.66	46.1
Approach		1082	11.3	0.578	0.3	NA	0.1	1.5	0.01	0.01	0.01	59.5
North: Site Access rd - North												
7	L2	25	58.3	1.202	376.0	LOS F	8.5	81.1	1.00	1.65	3.31	6.8
9	R2	14	15.4	1.202	605.4	LOS F	8.5	81.1	1.00	1.65	3.31	6.8
Approach		39	43.2	1.202	456.6	LOS F	8.5	81.1	1.00	1.65	3.31	6.8
West: Elizabeth Dr - West												
10	L2	4	50.0	0.003	6.1	LOS A	0.0	0.0	0.00	0.57	0.00	51.6
11	T1	613	12.6	0.340	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		618	12.9	0.340	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
All Vehicles		1738	12.6	1.202	10.5	NA	8.5	81.1	0.03	0.05	0.08	50.7

This page has been left blank intentionally.