WestConnex M4-M5 Link

Rozelle Interchange – Modification: Iron Cove ventilation underground

Modification report

Appendix B

Traffic and transport

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Roads and Maritime Services

WestConnex - M4-M5 Link

Iron Cove Ventilation Underground Modification Report

Modification report

Appendix B Traffic and Transport

November 2019

Prepared for

Roads and Maritime Services

Prepared by

The Transport Planning Partnership

Contents

1 Introduction

TTPP has been commissioned to assess the construction traffic and access impacts in relation to relocating the substation and ventilation infrastructure at the Iron Cove Motorway Operations Complex (MOC4) underground (referred as the “modification” hereafter).

All plant, equipment and materials required to construct the proposed new ventilation tunnel and caverns would be supported from the Iron Cove civil site (C8), with the potential for some tunnelling to be supported from the Rozelle civil and tunnel site (C5) later in the construction program. As such this assessment has been completed assuming the worst-case impacts of all deliveries and spoil transportation occurring from either:

- Iron Cove civil site (C8), or
- Rozelle civil and tunnel site (C5).

The assessment considers the traffic impacts of the modification and provides a comparison with the impacts assessed as part of the approved project. The assessment has been prepared to address the relevant environmental assessment requirements for the modification as described in Secretary’s Environmental Assessment Requirements (SEARs).

2 Compliance with SEARs

Table 1 sets out the relevant SEARs related to construction traffic and access and identifies where they have been addressed in this report.

Table 1 SEARS Compliance

SEARs	Where Addressed
The assessment must detail the additional construction traffic (both light and heavy vehicles) that would be generated by the proposal, including:	-
The estimated number of spoil haulage movements associated with the construction of the underground cavern and access tunnel	Section 4.1.1 Section 4.2.1
The proposed access and egress arrangements.	Section 3.2.3
The impact of the additional traffic movements on mid-block road capacity and intersection performance must be quantitatively assessed.	Section 4.1.2
The traffic assessment must compare the proposed number of construction light and heavy vehicle movements associated with the modification with the original proposed and any changes to access and egress movements to the site.	Section 4.1.2

3 Overview of Approved Project and Modification

3.1 Approved Project

The EIS concept design includes the construction of the Iron Cove Link motorway operation complex (MOC4) ventilation facility above ground as shown in Figure 1. The EIS described this facility as being located south of Victoria Road between Springside Street and Toelle Street.

Figure 1 EIS Location of Operational Ancillary Facilities at Iron Cove Link

The EIS indicates that all plant, equipment and materials required to construct the proposed ventilation facilities would be supported from the Iron Cove civil site (C8). The associated environmental impact assessment included in the EIS was limited to key plant and equipment likely to be used for these surface construction works but does not provide detailed traffic information on the construction of this ventilation infrastructure.

3.2 Modification

3.2.1 Overview of modification

The proposed modification involves relocating the Iron Cove Motorway Operations Complex (MOC4) underground within caverns housing the electrical substation and ventilation facilities and a ventilation tunnel connecting to the ventilation outlet. Only a switch room, high voltage regulators, alternative Operational Motorway Control System (OMCS) room and a separate stair access leading down to the ventilation tunnel would be required on the surface.

The main elements of the proposed new ventilation tunnel and caverns at Iron Cove are detailed below:

- Construction of a ventilation tunnel about 340 metres in length that connects the Iron Cove Link tunnel, at an underground location between Cambridge and Waterloo Streets, with the Iron Cove cut and cover structure near Callan Street

- The ventilation tunnel would include two caverns for the housing of ventilation equipment and the electrical substation, along with access tunnels to be used for maintenance and in the event of an emergency
- A five-metre wide and 20-metre long access tunnel, to facilitate personnel access from the exhaust fan cavern into the substation cavern
- The Iron Cove cut and cover area would include a side access for the vent tunnel to connect to the cut and cover about 7 metres wide and 17 metres long. This area would also accommodate the access stairs to the surface.

3.2.2 Construction of Surface Works at the Iron Cove civil site (C8)

Typically, five light vehicles per day and less than three trucks per day, and a peak of 10 trucks per day are anticipated during peak construction activities for the surface works on the western side of Victoria Road associated with the modification.

The traffic volumes under the modification would reduce compared to the approved project due to the extent of the above ground ventilation infrastructure works required on the western side of Victoria Road being limited to the construction of the switch room, high voltage regulators and access stairs. No traffic modelling was undertaken for these surface works due to the reduction to construction traffic volumes associated with the modification.

3.2.3 Tunnelling support haulage routes

The proposed new Iron Cove ventilation tunnel and cavern can be easily accessed from within the Iron Cove cut and cover using a single roadheader. Tunnelling works using a roadheader launched from Iron Cove would commence once the southern half of the cut and cover structure has been constructed (see Figure 2).

All plant, equipment and materials required to construct the proposed new ventilation tunnel and caverns would be supported from the Iron Cove civil site (C8), with the potential for some tunnelling to be supported from the Rozelle civil and tunnel site (C5) later in the construction program.

As such this assessment has been completed assuming the worst-case impacts of all deliveries and spoil transportation occurring from both these sites and addresses two haulage route options for spoil removal and material deliveries associated with the construction of the ventilation infrastructure via from one or both of the following sites:

- Iron Cove civil site (C8) as shown in Figure 3, or
- Rozelle civil and tunnel site (C5) as shown in Figure 4.

North of Iron Cove Bridge, the haulage route will continue north along Victoria Road, Church Street, Concord Road and Homebush Bay Drive towards the M4 Motorway.

Any tunnelling of the new ventilation tunnel and caverns supported from the Rozelle civil and tunnelling site (C5) would commence from within the Iron Cove Link Tunnel once it is excavated. This would not require the installation of any additional temporary surface support infrastructure at the Rozelle civil and tunnelling site (C5).

3.2.4 Construction Program

The proposed durations for tunnelling of the modification are different for the two haulage route options:

- Iron Cove civil site (C8) – Tunnelling works at the Iron Cove cut and cover have been scheduled to occur over about 15 months between about Q3 2020 and the end of 2021.
- Rozelle civil and tunnel site (C5) – Excavation of the ventilation tunnel and caverns would occur from about Q2 2021 if required.

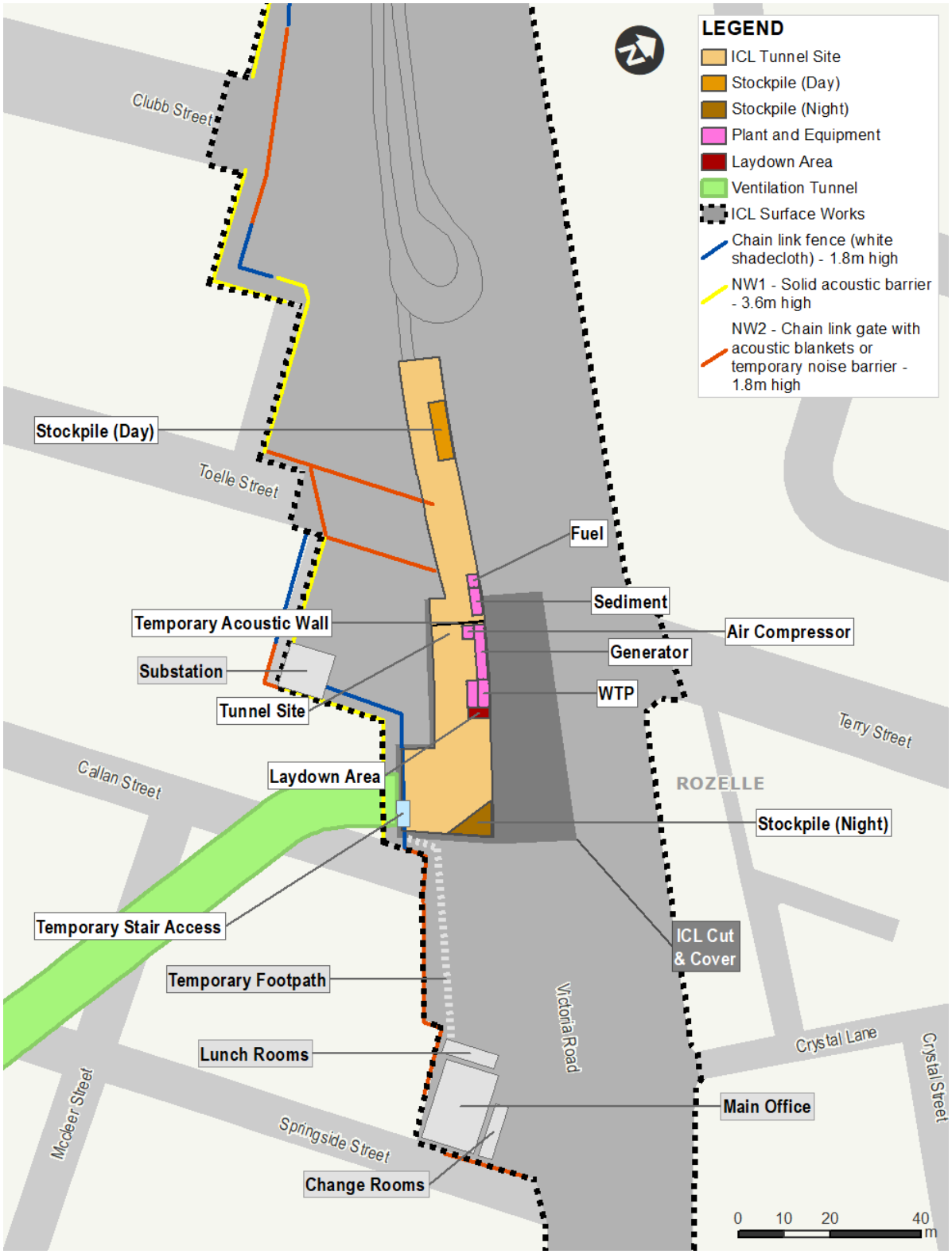

Figure 2 Indicative Layout of tunnel support site within the Iron Cove cut and cover

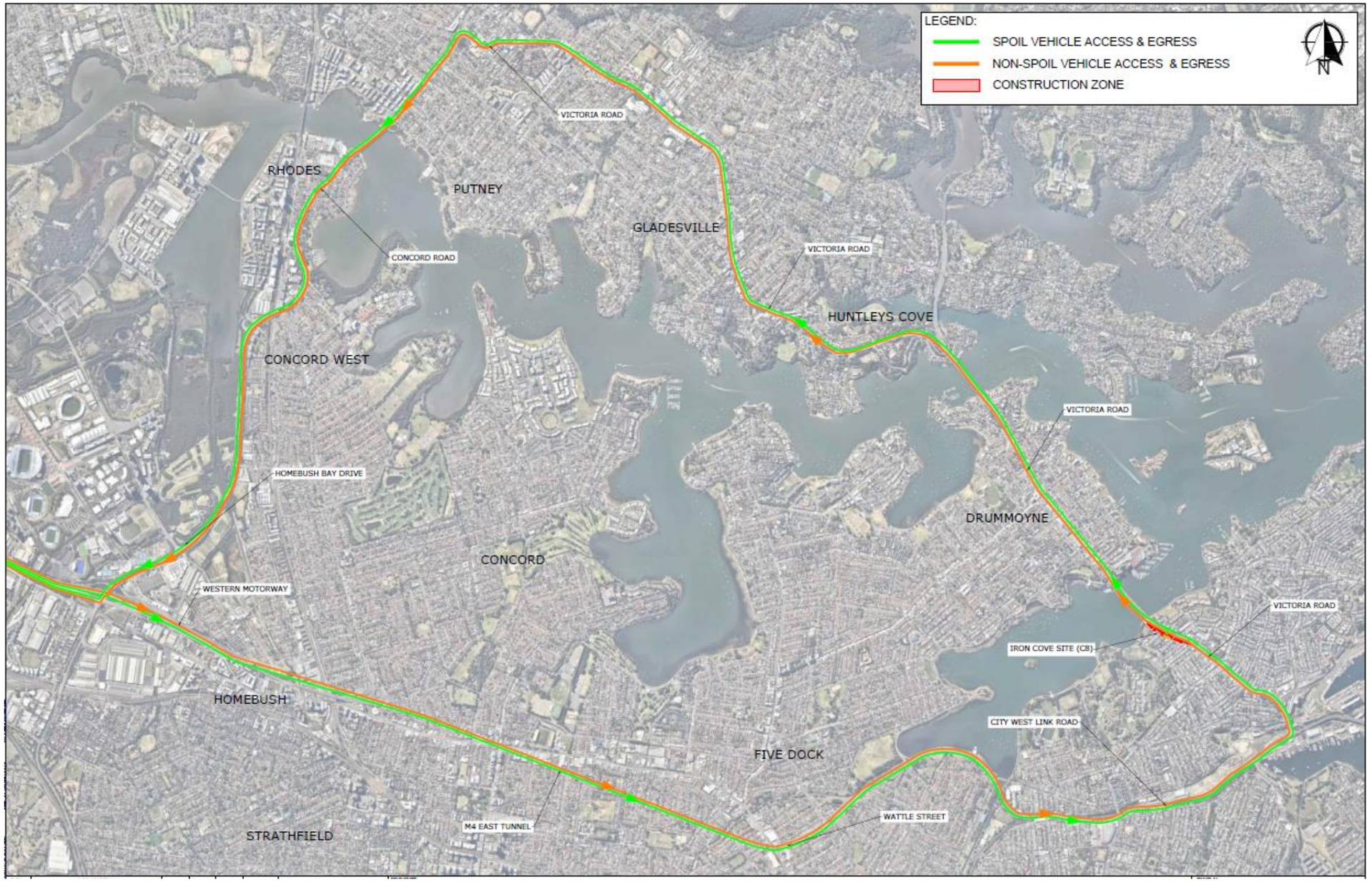

Figure 3 Haulage Routes via the Iron Cove Civil Site (C8)

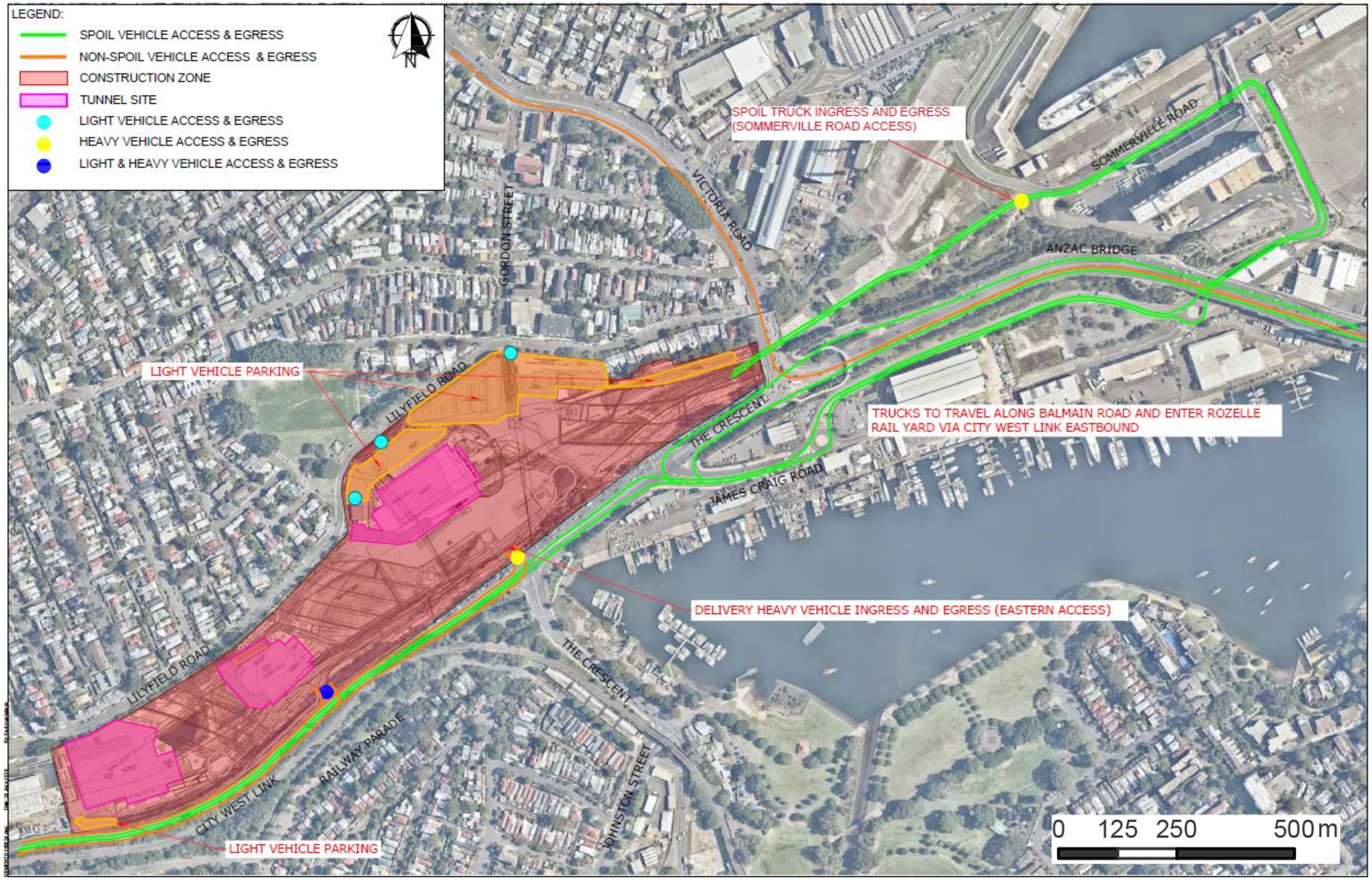

Figure 4 Haulage Routes via the Rozelle Civil and Tunnel Site (C5)

4 Impact Assessment

As the construction of the proposed new ventilation tunnel and cavern works would be supported from the Iron Cove civil site (C8) but could also use the Rozelle civil and tunnel site (C5) later in the construction program, this assessment has been completed assuming the worst-case impacts of all deliveries and spoil transportation occurring from both these sites:

- Access via the Iron Cove civil site (C8), or
- Access via the Rozelle civil and tunnel site (C5).

This assessment provides a comparison between the modification and the approved project in terms of construction traffic volumes and impacts on the road network. The two haulage route options are discussed in detail in the following sections:

- Construction traffic volumes and duration.
- Level of service assessment including intersection operating conditions in Linsig modelling and mid-block level of service.

4.1 Access via Iron Cove Civil Site (C8)

4.1.1 Construction traffic volumes and duration

The following construction vehicles would access the Iron Cove civil site (C8):

- Light vehicles
- Rigid trucks
- Concrete agitators
- Spoil trucks (truck and trailers and/or single tippers).

Work hours for construction of the ventilation tunnel and caverns from within the Iron Cove cut and cover would be in accordance with those prescribed In Planning Approval Condition E70, which allow tunnelling activities and tunnel fit out works to occur 24 hours a day, seven days a week.

Additional workforce required for tunnelling operations from the Iron Cove tunnelling site would typically range from six to ten people at any one time, made up of supervision, workforce and maintenance personnel.

Additional spoil excavated from the proposed ventilation tunnel and caverns would be transported underground to the Iron Cove cut and cover site. This would involve a total of up to 61,000 Bank Cubic Metres (BCM) to be removed, resulting in an increase of up to 4,800 truck and trailer loads exiting the project from the Iron Cove cut and cover.

The following daily traffic volumes are anticipated during peak construction activities involving spoil load out and concrete works to support tunnelling from Iron Cove, typically:

- 3 light vehicles per hour
- 3 spoil truck and trailers per hour during standard daytime hours in accordance with Planning Approval Conditions E68 and E69. The EIS identified 145 heavy vehicles per hour use Victoria Rd during the day and evening
- Six shotcrete deliveries by agitator trucks per day, with 2 concrete deliveries in the evening (6:00 pm to 10:00 pm) and typically 1 truck at night (10:00 pm to 7:00 am). A maximum of 3 in the evening and 3 at night
- Six additional heavy vehicles per day.

Tunnelling works at the Iron Cove cut and cover would commence once the southern half of the cut and cover structure has been constructed in about Q3 2020. The tunnelling works including tunnel

excavation, ground support and tunnel lining as well as the concrete works in the floor of the tunnel are anticipated to be completed by the end of 2021.

The modification would overlap with peak construction activities associated with the overall Rozelle Interchange project scheduled to occur in March 2021.

Table 2 shows a comparison of the approved project and the forecasted construction traffic volumes for the modification during the AM peak hour and PM peak hour.

Table 2 Peak Hour Construction Traffic Volumes at the Iron Cove Civil Works Site (C8) for Approved Project and Modification

Design	Daily		AM Peak Hour (7:30am-8:30am)					PM Peak Hour (4:15pm-5:15pm)				
	Heavy Vehicles	Light Vehicles	Heavy Vehicles		Light Vehicles		Total	Heavy Vehicles		Light Vehicles		Total
	One-way	One-way	In	Out	In	Out	2-Way	In	Out	In	Out	2-Way
Approved Project	102	60	13	13	18	0	44	13	13	0	18	44
Approved Project + Modification	144	90	18	18	27	0	63	18	18	0	27	63
Difference (Modification)	42	30	5	5	9	0	19	5	5	0	9	19

Table 2 indicates that the peak hourly traffic volumes associated with the modification would increase by 10 two-way heavy vehicle movements in the AM peak hour and PM peak hour, as compared with the approved project.

In order to assess the impacts of the increase in construction traffic volumes from the approved project, traffic modelling has been undertaken to assess the traffic impacts during peak construction activities (March 2021).

4.1.2 Level of Service Assessment

Roads and Maritime Services provided TTPP with the Linsig models developed as part of the EIS. LinSig is a modelling package that assesses traffic signal intersections individually and in a network of several junctions.

For the purposes of this assessment, TTPP has updated the Linsig models to accommodate the changes in road network and traffic signal phasing, and construction traffic volumes based on detailed construction traffic planning to enable a like-for-like comparison with the approved project modelling results.

Intersection Operating Conditions

TTPP updated the Linsig model to assess the impacts of the additional traffic generated by the modification and compared with the intersection performance results of the approved project for the following intersections:

- Victoria Road and Evan Street
- Victoria Road and Darling Street
- Victoria Road and Wellington Street.

The results are summarised in Table 3 Intersection Level of Service is described in Appendix A.

Table 3 Approved Project and Predicted Intersection Operating Conditions under the Modification

Scenario	Intersection	LoS	
		AM Peak Hour (7:30am-8:30am)	PM Peak Hour (4:15pm-5:15pm)
Approved Project (March 2021)	Victoria Road and Evan Street	B	E
	Victoria Road and Darling Street	E	F
	Victoria Road and Wellington Street	F	B
Approved Project + Modification (March 2021)	Victoria Road and Evan Street	B	E
	Victoria Road and Darling Street	E	F
	Victoria Road and Wellington Street	F	B

As shown in Table 3 the operational performance of the assessed intersections under the modification scenario are consistent with the modelling results of the approved project scenario.

Mid-Block Level of Service

A mid-block level of service assessment has been undertaken to determine the impact of the traffic associated with the modification compared with the approved project traffic in March 2021. The results of this assessment are summarised in Table 4.

Table 4 Road Level of Service for the Approved Project and Modification

Design	Road	Direction	Mid-Block Capacity	AM Peak Hour (veh/hr)			PM Peak Hour (veh/hr)		
				With Construction			With Construction		
				Flow	V/C	LoS	Flow	V/C	LoS
Approved Project (March 2021)	Victoria Road, east of Darling Street	Eastbound	3,250	3,576	1.10	F	2,515	0.77	D
		Westbound	3,200	1,761	0.55	C	3,078	0.95	E
Approved Project + Modification (March 2021)		Eastbound	3,250	3,576	1.10	F	2,518	0.77	D
		Westbound	3,200	1,769	0.55	C	3,082	0.96	E

The modification would result in no additional traffic during the AM peak hour and three additional light vehicles (construction workers) during the PM peak hour along Victoria Road in the eastbound direction.

The modification would result in an additional five heavy vehicles and four light vehicles in the AM peak hour, and five heavy vehicles in the PM peak hour along Victoria Road in the westbound direction.

The additional traffic volumes associated with the modification are minimal and therefore the Volume/Capacity (V/C) ratio and mid-block LoS would remain consistent with the approved project.

4.2 Access via the Rozelle civil and tunnel site (C5)

4.2.1 Construction traffic volumes and duration

Any tunnelling of the new ventilation tunnel and caverns supported from the Rozelle civil and tunnelling site (C5) would commence from within the Iron Cove Link Tunnel once it is excavated.

Work hours for construction of the ventilation tunnel would be in accordance with those prescribed by the Planning Approval Conditions, which allow tunnelling activities (excluding cut and cover tunnelling) and tunnel fit out works to occur 24 hours a day, seven days a week.

Additional spoil excavated from the proposed ventilation tunnel and caverns would be transported underground to the Rozelle civil and tunnel site (C5) and stockpiled within one of the acoustic sheds.

All plant, equipment and materials required to construct the proposed new ventilation tunnel and caverns would be supported from the Iron Cove civil site (C8), with the potential for some tunnelling to

be supported from the Rozelle civil and tunnel site (C5). As such this assessment has been completed assuming the worst-case impacts of all deliveries and spoil transportation occurring from the Rozelle civil and tunnel site (C5). The worst-case total and daily traffic volumes would therefore be as set out above in Section 4.1.1.

Excavation of the ventilation tunnel and caverns from the Rozelle civil and tunnel site (C5) would occur from about Q2 2021 if required. As such, the excavation works involving spoil haulage from the Rozelle civil and tunnel site (C5) would not overlap with peak construction activities associated with the overall Rozelle Interchange project which is scheduled to occur in March 2021.

Figure 5 shows the estimated daily number of heavy vehicles associated with the construction of the modification (green columns), in addition to the approved project construction activities (blue columns) between January 2020 and July 2022.

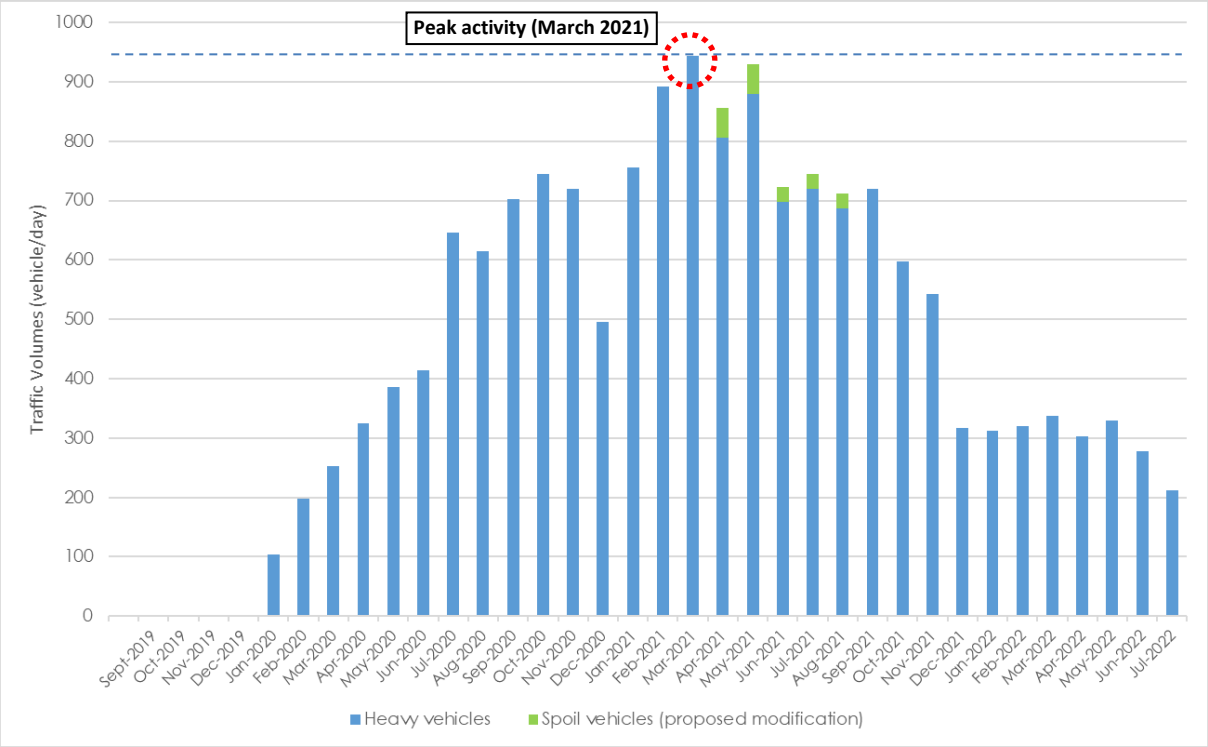

Figure 5 Construction Daily Heavy Vehicle Volumes between January 2020 and July 2022 at the Rozelle Civil and Tunnel Site (C5)

Any excavation of the proposed ventilation tunnel and caverns from the Rozelle tunnel and civil site would occur between April and August 2021 following peak production in March 2021. As such, the traffic volumes for the approved project at peak tunnel excavation are greater than during construction of the proposed ventilation tunnel and caverns, as shown in Figure 5.

5 Summary and Conclusions

This assessment was prepared to review the construction traffic and access impacts of the modification of the ventilation infrastructure at the Iron Cove Link site. The additional tunnelling required under the modification would be supported predominately from the Iron Cove civil site (C8) with some tunnelling also supported from the Rozelle civil and tunnel site (C5) later in the construction program. As such this assessment has been completed assuming the worst-case impacts of all deliveries and spoil transportation occurring from either:

- Iron Cove civil site (C8), or
- Rozelle civil and tunnel site (C5), or simultaneously.

The following conclusions are drawn based on the findings in this assessment:

- Tunnel support from within the Iron Cove cut and cover (C8): The additional construction traffic generated by the modification would not impact the operational performance of Victoria Road intersections with Evans Street, Darling Street and Wellington Street when compared the performance of the intersections generated by the approved project
- Tunnel Support from Rozelle civil and tunnel site (C5): The total volume of construction traffic generated by the modification would occur following peak construction activities in March 2021 and be less than the approved project during the peak construction activities. As such, it is concluded that the intersection and mid-block LoS during the construction of the modification would not impact the road network along City West Link.

It is important to note that surface tunnel support for the modification entirely from within the Iron Cove cut and cover or the Rozelle tunnel and civil site (C5) represent two worst case scenarios for haulage route options. However, traffic impacts associated with these worse cases are consistent with the modelling results for the approved project, indicating that either option is acceptable. Notwithstanding this, the additional tunnelling required under the modification would be supported predominately from the Iron Cove civil site (C8) with the potential for some tunnelling to be supported from the Rozelle civil and tunnel site (C5) later in the construction program. Utilising both the Iron Cove civil site (C8) and the Rozelle civil and tunnel site (C5) to support this tunnel excavation would disperse impacts on the road network.

The proposed new ventilation tunnel and caverns would equate to a total length of about 425 metres. This calculation is based on a length of about 340 metres for the ventilation tunnel alignment and the ventilation fan cavern, 65 metres for the substation cavern and about 20 metres of access tunnel connecting the two caverns. It is important to note that Rozelle Interchange (which is Stage 2 of the M4-M5 Link Project) includes excavation of approximately 22 kilometres of tunnels and that the modification is limited to the construction of about 425 metres of additional tunnels and caverns, which represents a very small increase in the extent of tunnelling and associated construction traffic impacts.

Appendix A

Level of Service Criteria

Intersection level of Service

Average delay is commonly used to assess the operational performance of intersections, with level of service used as an index. A summary of the intersection level of service criteria is shown in Table 5.

For the purpose of analysing intersection performance in this assessment, all exit blocking constraints, applied in the microsimulation models to reflect network congestion beyond the modelled network extents, were removed. This allows for an assessment of the intersections within the modelled network, irrespective of any downstream queuing that would mask the actual operation of the intersection.

Similar to the mid-block performance measures, common practice suggests that when intersection performance falls to LoS D, investigations should be initiated to determine if suitable remediation can be provided. However, limited road capacity and high demand mean that LoS E and LoS F are regularly experienced by motorists at pinch points on the existing strategic road network in Sydney, generally during peak periods. It should also be noted that capacity constraint can be used as a demand management technique, which discourages car travel and that conversely, over-provision of capacity can encourage more car use.

Table 5 Level of Service Criteria for intersections

LoS	Average delay/vehicles (sec/veh)	Traffic signals/roundabouts	Give way and stop signs
A	≤ 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents would cause excessive delays	At capacity; requires other control mode
F	>70	Roundabouts require other control mode	At capacity; requires other control mode

Mid-Block Level of Service

Table 6 shows the six levels of service for mid-block carriageway locations, ranging from LoS A–F, with LoS A representing optimum operating conditions (free flow) and LoS F the poorest (forced or breakdown in flow). When a roadway performance falls below LoS D, investigations are generally initiated to determine if suitable remediation can be provided. In built up areas, limited road capacity and high demand mean that LoS E and LoS F are regularly experienced by motorists at pinch points on the existing strategic road network in Sydney. These conditions are generally experienced during peak periods. Roads and Maritime has an established program office (Easing Sydney's Congestion) aimed at delivering improvements to relieve congestion at pinch points and improving performance on strategic roads.

Table 6 Mid-Block Level of Service Definitions and Criteria

LoS	Definition	V/C Ratio
A	A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high.	≤ 0.26
B	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort is a little less than with level of service A.	0.27 to 0.41
C	Also, in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.	0.42 to 0.59
D	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow would generally cause operational problems.	0.60 to 0.81
E	Traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream would cause breakdown.	0.82 to 1.00
F	In the zone of forced flow, where the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.	> 1.00

Source: Austroads, Guide to Traffic Management – Part 3 Traffic Studies and Analysis, Second Edition 2013