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1 PURPOSE

The objective of this study is to provide supporting information, including a high-level assessment of traffic impacts, to enable informed decisions to be made related to high-level options for removal of the Caledonian Avenue level crossing. Potential identified improvements within the study area should be further investigated in detail to understand the localised and network-wide impacts, as well as feasibility, cost and other impacts. VISSIM microsimulation models were developed to assess the impact of removing the level rail crossing with and without network improvements to mitigate any impacts to motorised traffic. This is not an area-wide road and network planning exercise. This report documents the development of the proposed models and a comparison of the model outputs for each of the scenarios.

2 INTRODUCTION

2.1 Project Details

Caledonian Avenue railway crossing is located on the Midland Railway Line. It has been identified by the Public Transport Authority (PTA) as a priority for removal due to planned increases to rail service frequency when the Forrestfield Airport Line opens. Removal options include a full closure of the existing intersection and the provision of a grade-separated crossing at a nearby location. In order to inform the design process for the closure or grade-separation of the railway crossing, microsimulation modelling of the existing and proposed local network are required.

2.2 Project Location and Modelling Area

Caledonian Avenue is a local collector road in Maylands under the jurisdiction of the City of Bayswater. It intersects with Guildford Road at its southern extent, and with Railway Parade at its northern extent. Guildford Road is a state road under the jurisdiction of Main Roads Western Australia. This project is concerned with the railway crossing at the northern extent of Caledonian Avenue, which is located between Railway Parade and Whatley Crescent. There are several other railway crossings located in the vicinity as illustrated in Figure 2-1.

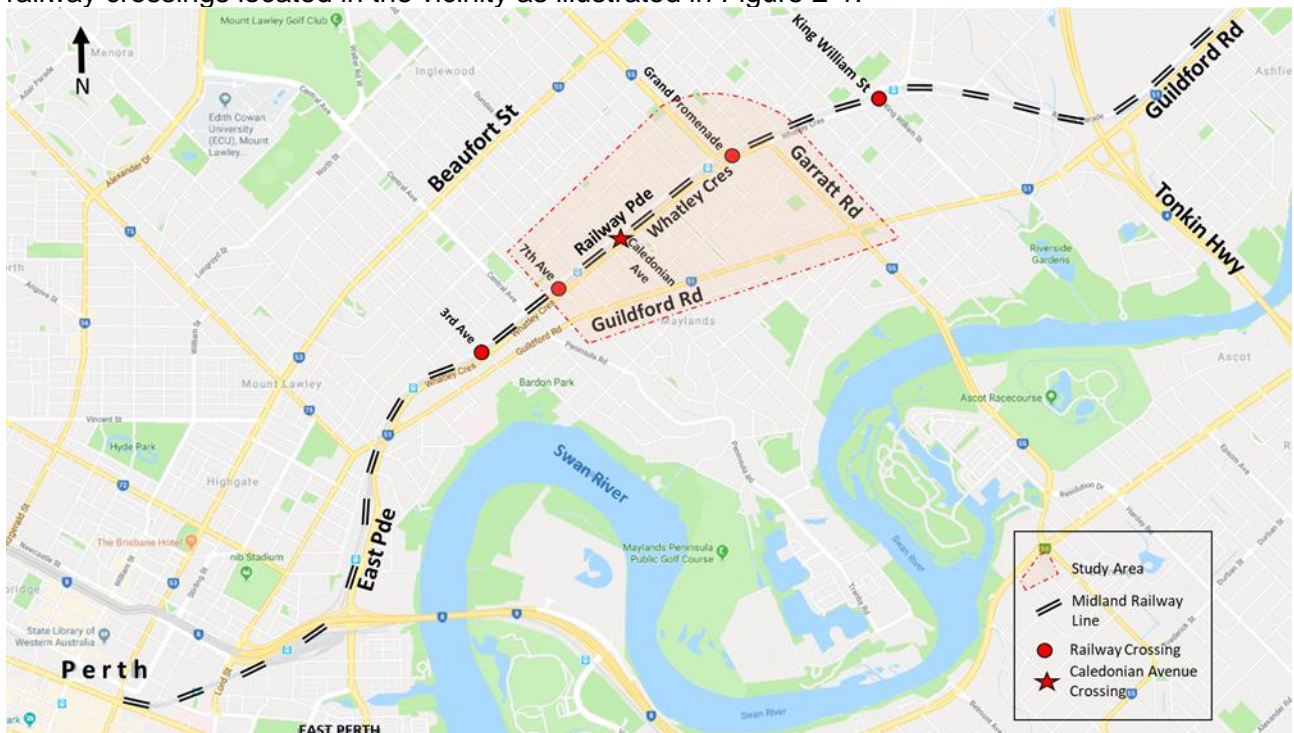


Figure 2-1 Midland Railway Line Crossing Locations (Map Data 2019 Google)

The agreed study area is shown in Figure 2-2. It is bounded by Coode Street, Harrow Street and Bowden Street to the north, Grand Promenade and Garratt Road to the east, Guildford Road to the south and Seventh Avenue to the west.

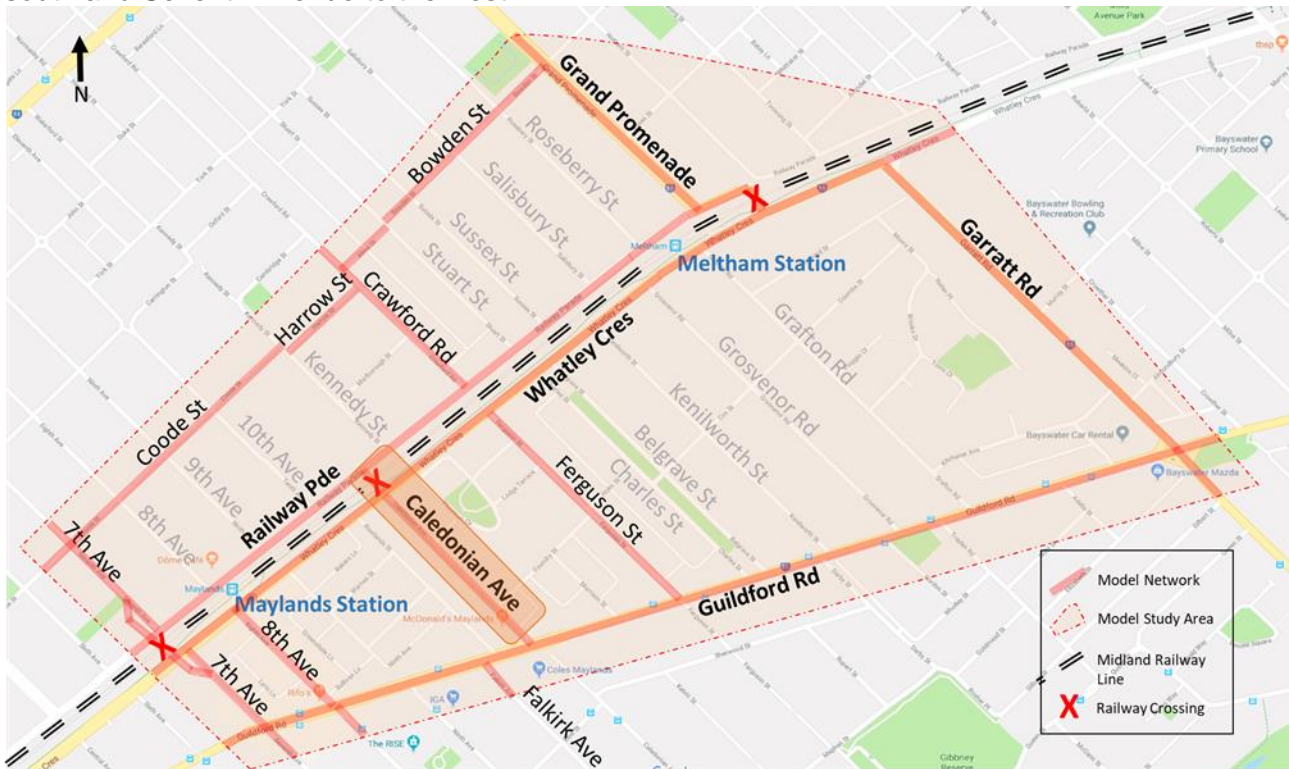


Figure 2-2 Caledonian Avenue Study Area (Map Data 2019 Google)

2.3 Predefined Modelling Scenarios for the Study

Proposed Vissim models were developed for the following scenarios:

- *Do Nothing*: this scenario models the closure of the Caledonian Avenue railway level crossing. It also includes local signal timing adjustments to alleviate any traffic issues that may arise from traffic redistributing throughout the local network.
- *Do Minimum*: this scenario models the Caledonian Avenue level crossing closure with signal timing adjustments and local intersection upgrades.
- *Do Something*: this scenario models the Caledonian Avenue at-grade crossing closure with signal timing adjustments, local intersection upgrades and provision of a grade-separated crossing.

Table 2-1 Horizon Years and Scenarios for modelling

Scenario/ Horizon Year		2019 (Base Year)	2021 (Opening Year)	2031 (Opening Year +10)
Base	Existing network configuration	X		
Do Nothing	Caledonian Avenue at grade crossing closure with signal timing adjustments		X	X
Do Minimum	Caledonian Avenue at grade crossing closure with signal timing adjustments and local intersection upgrades		X	X
Do Something	Caledonian Avenue at grade crossing closure with signal timing adjustments, local intersection upgrades and provision of a grade separated crossing		X	X

2.3.1 “Do Nothing” Scenario

The “Do Nothing” scenario is the closure of the at-grade railway crossing on Caledonian Avenue together with signal timing optimisation across the local network to assist with redistributed traffic. Due to the closure, Caledonian Avenue no longer intersects with Railway Parade so the traffic signals at this location must be removed. The intersection of Caledonian Avenue and Whatley Crescent remains as a T-intersection under signal control. The traffic signals at this location must be modified to fit the new road layout. Figure 2-3 shows the proposed road layout with the railway crossing closure in place. It is proposed that the crossing is closed to all users (i.e vehicles, cyclists and pedestrians). It should be noted that the Principal Shared Path (PSP) on the southern side of the railway crossing will remain.



Figure 2-3 Caledonian Avenue Railway Crossing Closure – Proposed Layout

2.3.2 “Do Minimum” Scenario

The “Do Minimum” scenario is the closure of the at-grade railway crossing on Caledonian Avenue together with signal timing optimisation and several intersection modifications or upgrades to the local network to further assist with redistributed traffic. The intersection modification and upgrade proposals are detailed below.

Guildford Road / Seventh Avenue

It is proposed that this intersection be signalised to better service side road demand. This will also resolve the spread of congestion in this part of the network. This intersection currently operates under give way priority control. Figure 2-4 shows the modelled intersection layout and Figure 2-5 shows the proposed signal phasing design that has been modelled. It should be noted that right-turn pockets will be required on Guildford Road, in both directions, for safety reasons when signalising this intersection. This will require road widening on Guildford Road and Seventh Avenue. Impacts to existing developments must be considered in any signal design proposals.



Figure 2-4 Guildford Road / Seventh Avenue Proposed Intersection Layout

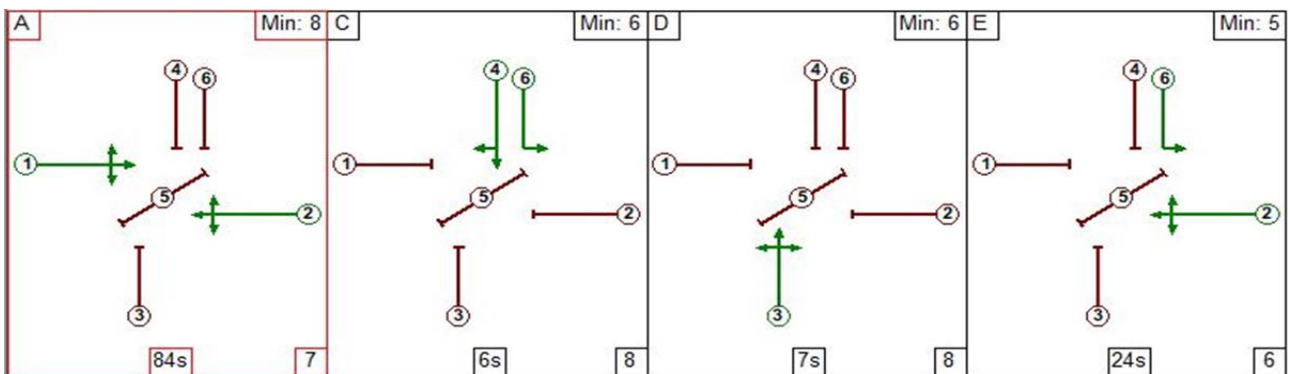


Figure 2-5 Guildford Road / Seventh Avenue Proposed Signal Phasing Design

Guilford Road / Garratt Road

In the 2031 PM peak model, extensive northbound queues were observed on the southern arm of this intersection. Northbound vehicles, using the right turn lane, queued beyond the storage length blocking the middle through lane. In order to alleviate this issue and to improve intersection signal operation, it is proposed that the middle through lane be changed to a shared through and right turn lane. The proposed intersection layout is shown in Figure 2-6. This also requires signal phasing adjustments, as filtering is not permitted for safety reasons, due to the proposed dual right turn. To note that these changes have been implemented as part of an overall safety upgrade of the intersection.

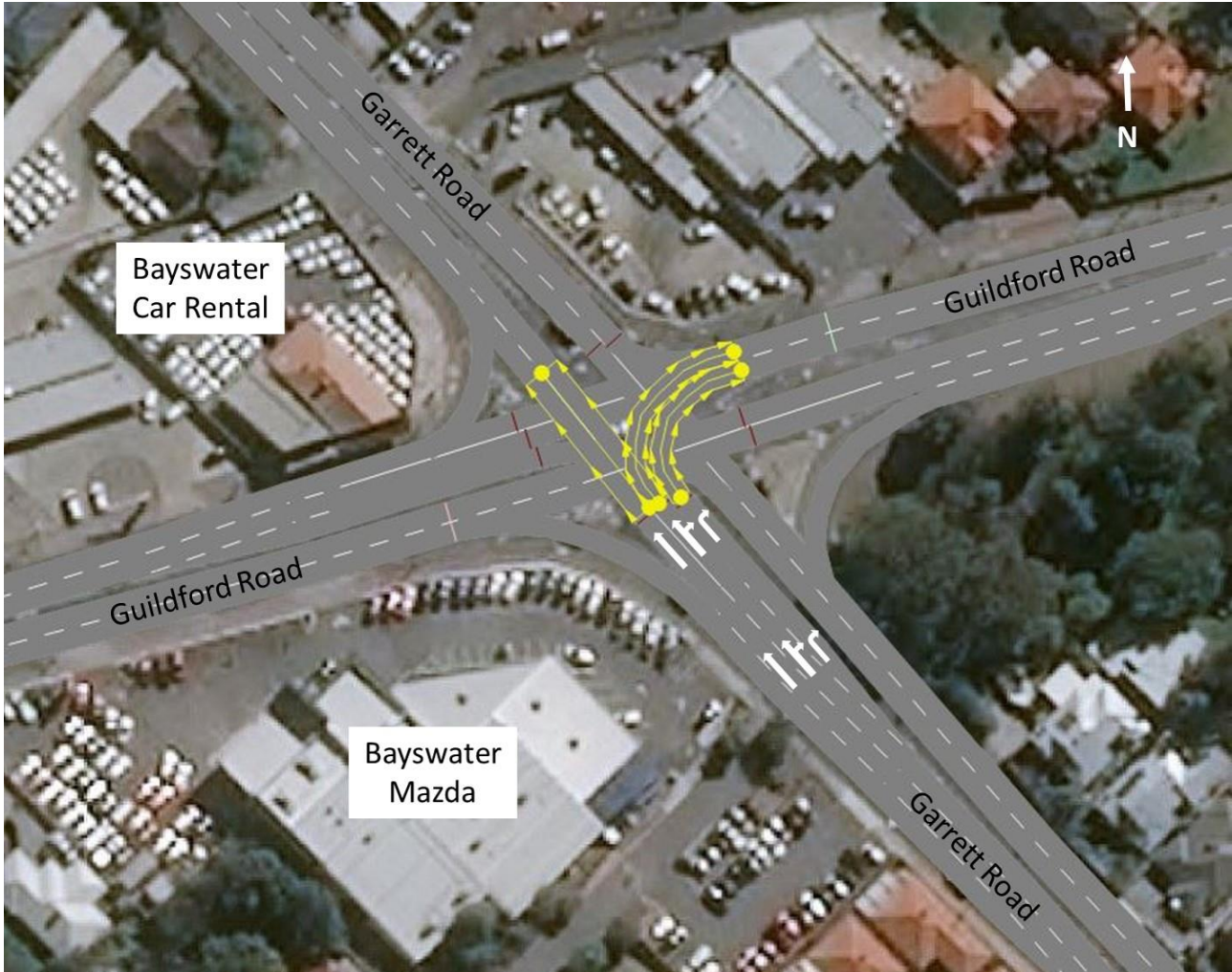


Figure 2-6 Guildford Road / Garrett Road Proposed Intersection Layout

Whately Crescent / Garrett Road

In the 2031 PM peak model, extensive eastbound queues were observed on the western arm of this intersection. Eastbound vehicles, using the right turn lane, queued beyond the storage length blocking the through lane. In order to alleviate this issue, it is proposed that the western arm be upgraded to two lanes. The existing dual lane line marking on the western arm should be extended 100 metres west effectively creating two full-length lanes from the existing 6.6m wide single lane. The offside lane will operate as a right-turn only lane and the nearside lane will operate as a through lane only. This may require the removal of parking on the western approach. Figure 2-7 shows the proposed changes to the line markings on the western approach of the intersection of Whately Crescent with Garratt Road.



Figure 2-7 Whatley Crescent / Garrett Road Proposed Lane Configuration

Whatley Crescent / Railway Parade

Queuing behaviour was observed on site, showing vehicles forming two lanes on the eastern approach of this intersection. The approach effectively operates as a two-lane approach with one through lane and one right-turn lane. This is due to the delay caused by the right-turn give way movement into Railway Parade and the ample road width which is informally used as two lanes. It is proposed that the eastern approach is line-marked as two lanes to formalise the current operations, as shown in Figure 2-8. This will require the removal of parking during peak times on the southern side of Whatley Crescent between Railway Parade and Garratt Road. An impact assessment for the removal of parking is required; however, this is outside of the scope of this study.



Figure 2-8 Whatley Crescent / Railway Parade Proposed Line Marking

Proposed Pedestrian Crossing - Whatley Crescent or Traffic Signals at Whatley Crescent/Railway Parade

In the 2031 PM peak model, extensive westbound queues were observed on the western arm of this intersection. Westbound right-turn vehicles must give way to eastbound vehicles but in 2031 traffic growth greatly reduces the operation of this give-way priority intersection. In order to alleviate this issue, it is proposed that a signalised pedestrian crossing is installed on the western arm of the intersection. This will create sufficient gaps for westbound right turn vehicles. It will align with the existing pedestrian bridge across the railway line to access Meltham Station. Figure 2-9 shows the proposed location of the pedestrian crossing.

Signalisation of the intersection of Whatley Crescent and Railway parade will be required if the signalised pedestrian crossing option is not progressed. This must be modelled separately and will require network modelling with the intersection of Grand Promenade and Railway Parade.



Figure 2-9 Whatley Crescent Pedestrian Crossing Proposed Location (Source: Bing Maps)

2.3.3 “Do Something” Scenario

The “Do Something” scenario involves the closure of the at-grade railway crossing on Caledonian Avenue, signal timing optimisation, local intersection modifications/upgrades and a new grade-separated railway crossing. The preferred option for a new grade-separated railway crossing is located at Ferguson St (south of Whatley Crescent) and at Crawford Avenue (north of Railway Parade). It is proposed to install cul-de-sacs at Ferguson Street and Whatley Crescent and at Crawford Avenue and Railway Parade to accommodate the proposed bridge.

Access to the bridge from the north shall be from Crawford Street via Railway Parade, Kennedy Street, and Marlborough Street. Access to the south side of the bridge shall be from Ferguson Street via Guildford Road or via Whatley Crescent, Caledonian Avenue and Foundry Street. Figure 2-10 shows the location of the proposed bridge over the railway line.

It should be noted that the new grade-separated bridge has been assumed to operate within the confines of existing local traffic network. It serves as a local connector for Railway Parade and

Whatley Crescent. A separate modelling exercise would be required if the new bridge was intended to provide more than a local connection.

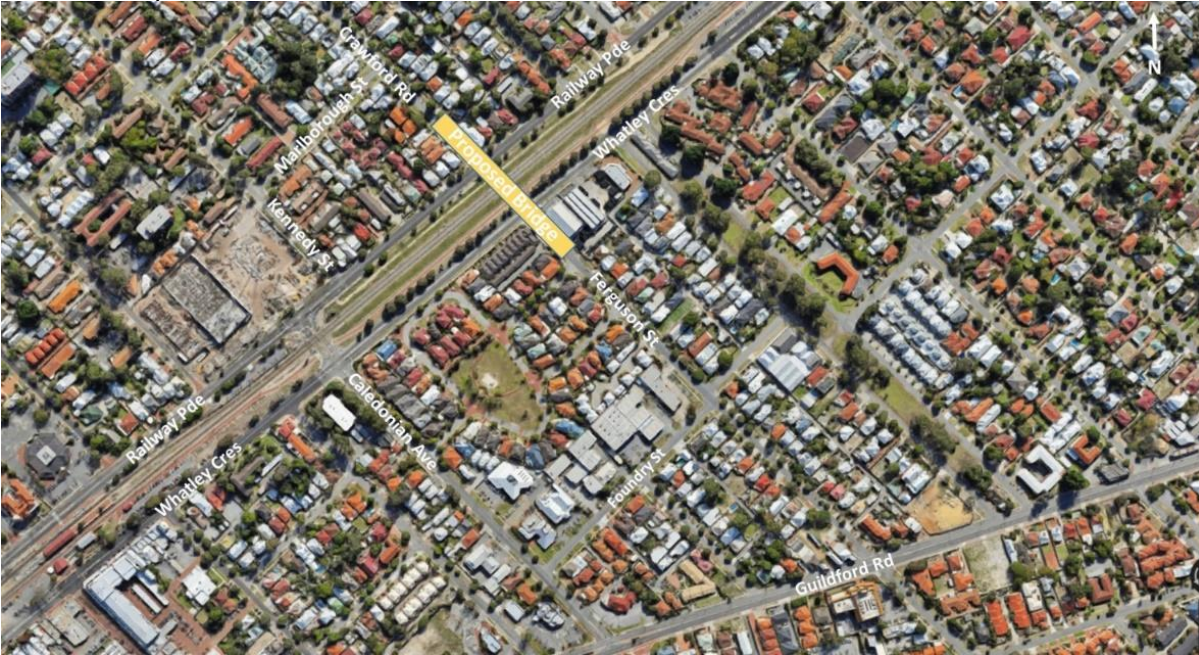


Figure 2-10 Location of Proposed Bridge

Figure 2-11 shows the Vissim network layout for the “Do Something” (new bridge) scenario.

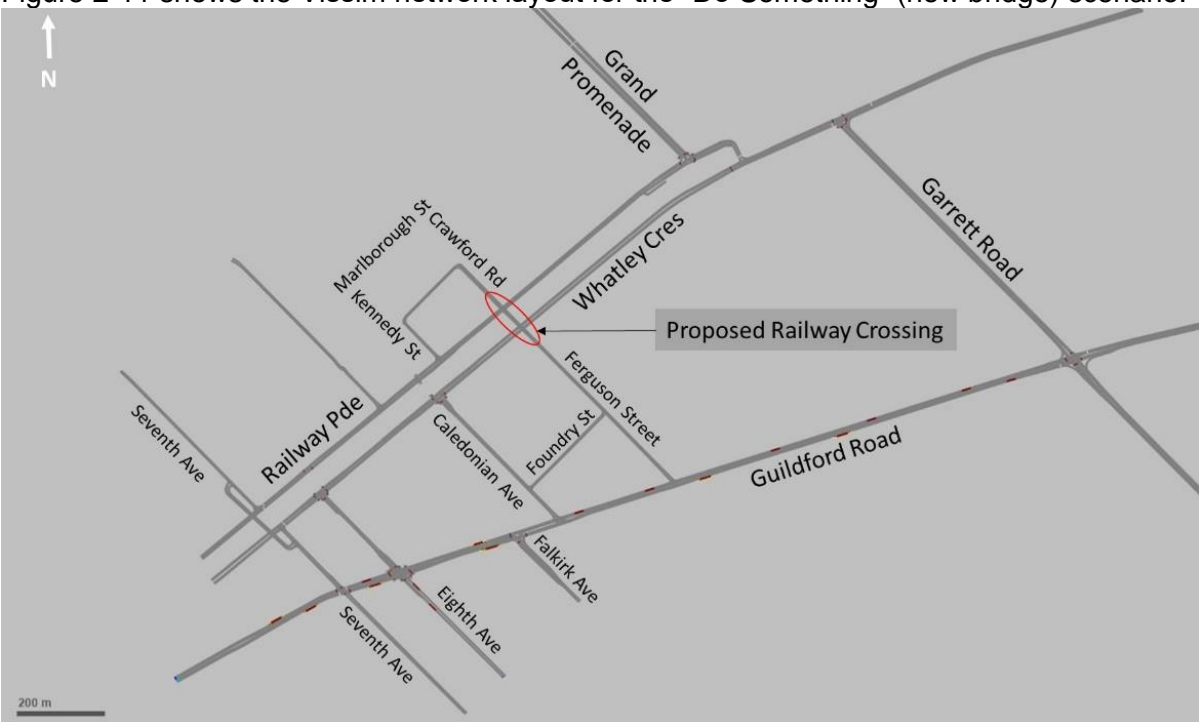


Figure 2-11 “Do Something” Scenario Vissim Network Layout

3 FUTURE SCENARIO MODEL RESULTS

3.1.1 Overview

Future models were developed based on the validated base model, with future traffic flows and the existing/proposed road layout. The outputs of the future models are presented in this section along with analysis of any major traffic impacts.

3.1.2 “Do Nothing” Scenario Results

In the “Do Nothing” 2021 AM and PM scenario results, network average delay decreases and average speed increases, when compared to the respective 2019 AM or PM base year model. This is largely due to the closure of the railway crossing and subsequent removal of the intersection of Caledonian Avenue and Railway Parade and the modification of the intersection of Whaley Crescent and Railway Parade.

In the “Do Nothing” 2031 PM peak model, extensive southbound queuing can be observed on Seventh Avenue between Whatley Crescent and Guildford Road. The queuing propagates north from the intersection with Guildford Road and causes heavy congestion at several neighbouring priority controlled intersections. Guildford Road / Seventh Avenue also operates under give way priority control. The congestion results in no vehicle movements across Seventh Avenue Bridge for periods during the peak hour. The congestion is caused by redistributed traffic, following the closure of Caledonian Avenue, travelling southbound on Seventh Avenue. These vehicles must give way to Guildford Road traffic, but have less opportunity to turn safely in gaps due to increased traffic volumes in both directions on Guildford Road.

At Guildford Road / Garratt Road, extensive northbound queues can be observed on the southern arm of this intersection. Northbound vehicles, using the right-turn lane, queue beyond the turning pocket storage length blocking the middle through lane.

At Whatley Crescent / Garratt Road, extensive eastbound queues can be seen on the western arm of this intersection. Eastbound vehicles, using the right-turn lane, queued beyond the existing turning pocket storage length blocking the through lane.

At Whatley Crescent / Railway Parade, extensive westbound queues are present on the western arm of this intersection. Westbound right-turn vehicles must give way to eastbound vehicles, but in 2031 traffic growth greatly reduces the operation of this give way priority intersection. Queuing of the westbound right-turn extends east to the intersection of Whatley Crescent / Garrett Road, affecting the northbound left-turn at Garrett Road and Whatley Crescent.

3.1.3 “Do Minimum” Scenario Results

In the “Do Minimum” 2021 AM and PM scenario results, network average delay decreases and average speed increases, when compared to the respective 2019 AM or PM base year model. This is due to the local network upgrades, which address the congestion issues experienced in the 2031 “Do Nothing” network.

In the “Do Minimum” 2031 AM and PM scenario results, network average delay increases and average speed decreases, when compared to the respective 2019 AM or PM base year model. This is due to increased background traffic growth. 2031 “Do Minimum” shows a significant improvement over the 2031 “Do Nothing” scenario. There are no major traffic issues in 2031 “Do Minimum”.

3.1.4 “Do Something” Scenario Results

In the “Do Something” 2021 AM and PM scenario results, network average delay decreases and average speed increases, when compared to the 2019 AM base year model. The results are very similar to the “Do minimum” scenarios. There are no major traffic issues.

In the “Do Something” 2031 AM and PM scenario results, network average delay increases and average speed decreases, when compared to the respective 2019 AM or PM base year model. This is due to increased background traffic growth. The “Do Something” 2031 offers some improvement to delay and average network speeds when compared to the “Do Minimum” scenario. There are no major traffic issues.

4 CONCLUSION

The purpose of the modelling was to assess any traffic impacts from the closure of Caledonian Avenue railway level crossing to the surrounding local road network. Vissim models were developed for 2021 (opening year) and 2031 (opening year +10) for the following scenarios:

- *Do Nothing*: this scenario models the closure of the Caledonian Avenue railway level crossing. It also includes local signal timing adjustments to alleviate any traffic issues that may arise from traffic redistributing throughout the local network.
- *Do Minimum*: this scenario models the Caledonian Avenue level crossing closure with signal timing adjustments and local intersection upgrades.
- *Do Something*: this scenario models the Caledonian Avenue at-grade crossing closure with signal timing adjustments, local intersection upgrades and provision of a grade separated crossing.

In the 2021 AM and PM “Do Nothing” modelling scenarios, the overall network results are positive with reduced delays and increased average speed. There are several contributing factors to these results. The closure of Caledonian Avenue railway crossing removes a complex and somewhat inefficient signalised intersection from the network and delivers improved journey times as a result. There are relatively low numbers of vehicles using the crossing during peak hours and also low background traffic growth in 2021. Signal timing optimisation of the surrounding signalised intersections also delivers additional network benefits. Traffic that is displaced by the crossing closure will reassign to the two adjacent crossing points at Railway Parade / Seventh Avenue and Railway Parade / Whatley Crescent. Both these intersections operate satisfactorily in the proposed opening year (2021) when compared to the base scenario (2019).

There is no requirement for intersection upgrades in 2021 although this has been tested (“2021 Do Minimum” scenario). There is minimal added benefit from providing an alternative grade-separated crossing in 2021, although this has also been tested (“2021 Do Something” scenario).

The results of the 2031 AM and PM “Do Nothing” modelling scenarios indicate that the network experiences significant congestion. The PM is the critical peak with the most congested conditions.

The “Do Minimum” scenario is required by 2031 to mitigate against the predicted congestion at several intersections. The following intersection modifications/upgrades are proposed for 2031.

- The intersection of Guildford Road / Seventh Avenue should be upgraded to traffic signals, with right-turn pockets provided on Guildford Road in both directions to improve intersection operation and alleviate local network congestion.
- The intersection of Guildford Road / Garratt Road should be upgraded to a dual right-turn on the southern approach to provide adequate intersection operation.
- The intersection of Whatley Crescent / Garratt Road requires the right-turn lane on the western approach to be extended by approximately 100m to allow more queuing capacity and improve the performance of this intersection. This can be achieved using line-marking as there is ample road width available.
- The intersection of Whatley Crescent / Railway Parade requires the eastern arm to be upgraded to a dual lane approach for its entire length. This allows more queuing capacity

and improves the performance of this intersection. This can be achieved using line-marking as there is ample road width available.

- A new signalised pedestrian crossing is proposed at Whatley Crescent, approximately 100 metres west of the intersection with Railway Parade. This will create sufficient opportunity for right-turning vehicles to turn safely when the pedestrian crossing has been activated. This will also improve pedestrian access to Meltham Train Station as the proposed location is in close proximity to the existing pedestrian station access point. Signalisation of the intersection of Whatley Crescent and Railway Parade will be required if the signalised pedestrian crossing option is not progressed. This must be modelled separately and will require network modelling with the intersection of Grand Promenade and Railway Parade.

In summary, the “Do Nothing” scenario (crossing closure with local network signal timing adjustments) is sufficient for 2021 but by 2031 the “Do Minimum” scenario (crossing closure with signal timing adjustments and local network upgrades) will be required to mitigate against expected network congestion.

The “Do Something” scenario (construction of a replacement grade-separated railway crossing) offers some additional benefit to the local network, but it has limited connectivity and attracts relatively low traffic volumes from other more direct routes. It should be noted that the new grade-separated bridge has been assumed to operate within the confines of existing local traffic network. It serves as a local connector for Railway Parade and Whatley Crescent. A separate modelling exercise would be required if the new bridge was intended to provide more than a local connection.

There are no wider network impacts in the future year scenarios. There is no latent demand as all vehicles can enter the network during the modelled period. Queues do not extend beyond the modelled network, hence there is no expected impact outside of the modelled network.