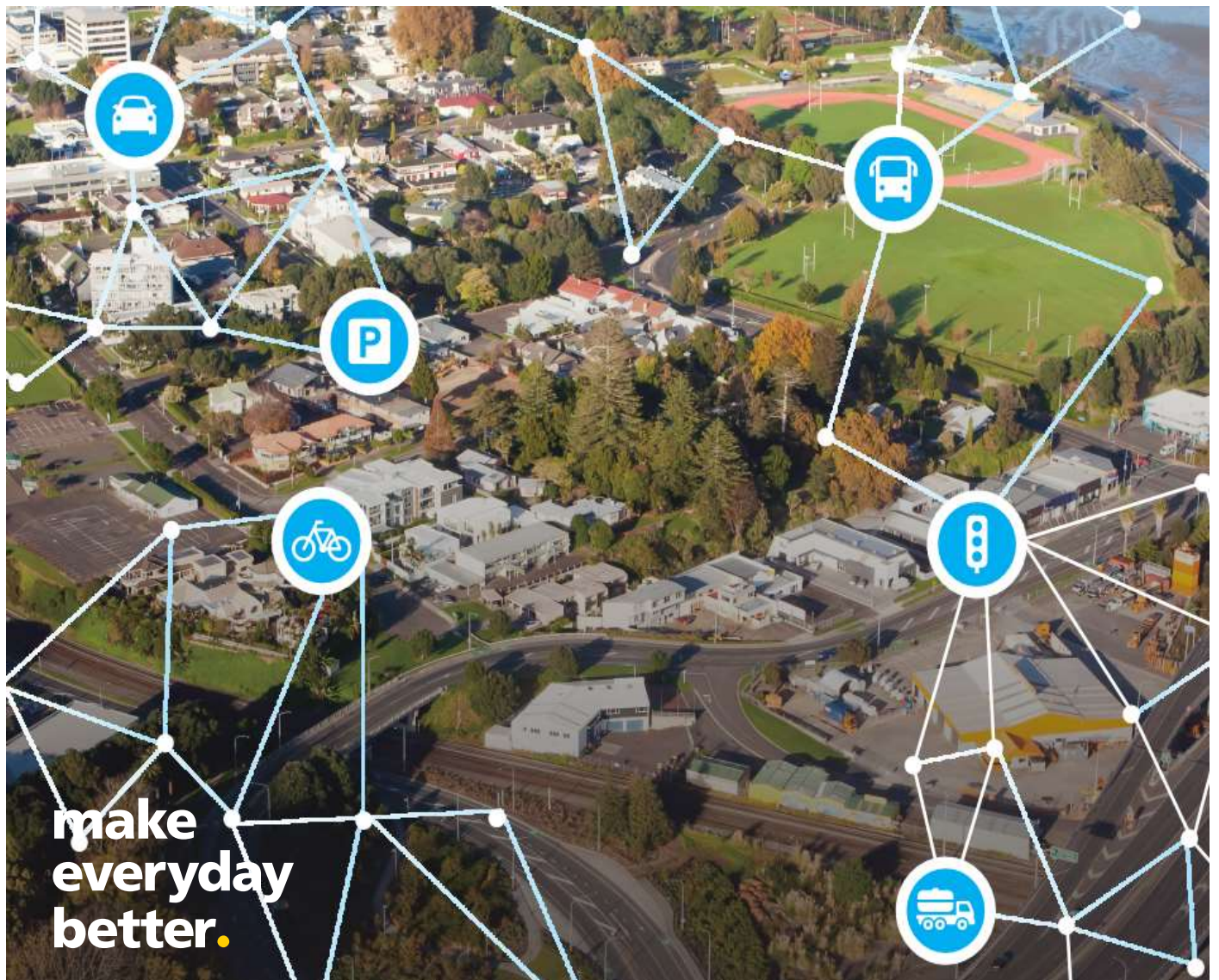


Girven Road Bus Facility Modelling Report

Prepared for Tauranga City Council

Prepared by Beca Limited

9 July 2020



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- Appendix A – Aimsun Signal Control**
- Appendix B – Bus Routes & Schedules**

Revision History

Revision N°	Prepared By	Description	Date
1.0	Ling Hoong	Draft for client review	6 July 2020
2.0	Ling Hoong	Final	9 July 2020

Document Acceptance

Action	Name	Signed	Date
Prepared by	Ling Hoong		9 July 2020
Reviewed by	Nyan Aung Lin		9 July 2020
Approved by	Andrew Murray		9 July 2020
on behalf of	Beca Limited		

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Executive Summary

Tauranga City Council is working on a new bus facility in the Arataki area and is considering two options, one near Bayfair and one on the location of the current St John's Ambulance site in Arataki Park. Tauranga City Council has asked Beca to test through Aimsun transport modelling the traffic impact of a '4th arm' to that intersection to access a new bus facility in Arataki Park.

This report outlines the methodology and findings of the transport modelling. Tauranga City Council's Aimsun simulation model was used for this study with local calibration/validation to 2018/19 traffic conditions. The base model development process was documented a separate report.

Two pedestrian crossing options were developed:

- Option 1 – a barnes dance crossing – all movements at once
- Option 2 – pedestrian crossings running parallel to non-conflicting vehicle movements with full red-arrow protection from conflicting movements

The impact of signalisation at the Girven Road / Marlin Street intersection was assessed for the forecast years 2022 and 2031. Travel time assessment along Girven Road showed:

- In the AM peak, no significant difference was found in travel time between Option 1 and the Base layout, while in Option 2 travel time was significantly higher (~10 minutes) in the eastbound direction.
- In the PM peak, no significant difference was found in travel time in the westbound direction between Option 1 and the Base layout, while Option 2 showed a difference in 2031. In the eastbound direction, travel time for Option 2 was significantly higher (~5 minutes). Option 1 showed higher travel time (~2 minutes) than the Base in 2031.

Traffic density plots were used to assess queuing in the model and showed:

- In the AM peak, Option 1 performs similar to the Base. Option 2 showed higher density on the intersection approaches, especially for the west approach, for forecast years 2022 and 2031.
- In the PM peak, density was high in both options for the eastbound direction along Girven Road, with Option 2 showing higher density. In 2031, it was found that this can cause queueing in Option 2 that extends back to the Maunganui roundabout and SH2 Maunganui Road. Queues on Marlin street were found to be high, backing up to Farm Street, in both options, however, this queuing was worse in Option 2.
- It was noted that queues on the B2B Flyover occur during the AM peak. This was found to originate from the capacity constraint of the Hewletts Road corridor. This was found common in all options including the base.

Key observations of traffic diversion based on the flow difference between Base and Options:

- Traffic along Grenada Street was diverted to Gloucester Street
- Traffic along Marlin / Farm and Link Avenue divert to SH2 Maunganui Road and Oceanbeach Road
- Traffic along Girven Road divert to Concord Avenue

Overall, the addition of the "4th" arm at the intersection is considered acceptable as modelled queuing and delays were localised. Further signal coordination with the existing Girven Road / Gloucester Road intersection will likely improve the operation of this intersection. Hence signalisation of this intersection is feasible and can be further explored with advice from Tauranga Transport Operations Centre (TTOC) regarding signal timing /coordination along the corridor.

1 Introduction

Tauranga City Council is working on a new bus facility in the Arataki area and is considering two options, one near Bayfair and one on the location of the current St John's Ambulance site in the Arataki Park. Tauranga City Council has asked Beca to test through Aimsun transport modelling whether a signalised intersection Girven Road/Marlin Street could accommodate a '4th arm' to access a new bus facility in Arataki Park.

This report outlines the methodology and findings of transport modelling regarding the Arataki Bus Facility project in Aimsun. The scope of the model network is shown in **Figure 1-1**. Although the full model covers a wide area, the focus of the project model is at Girven Road/ Marlin Street intersection where the bus facility will be located.

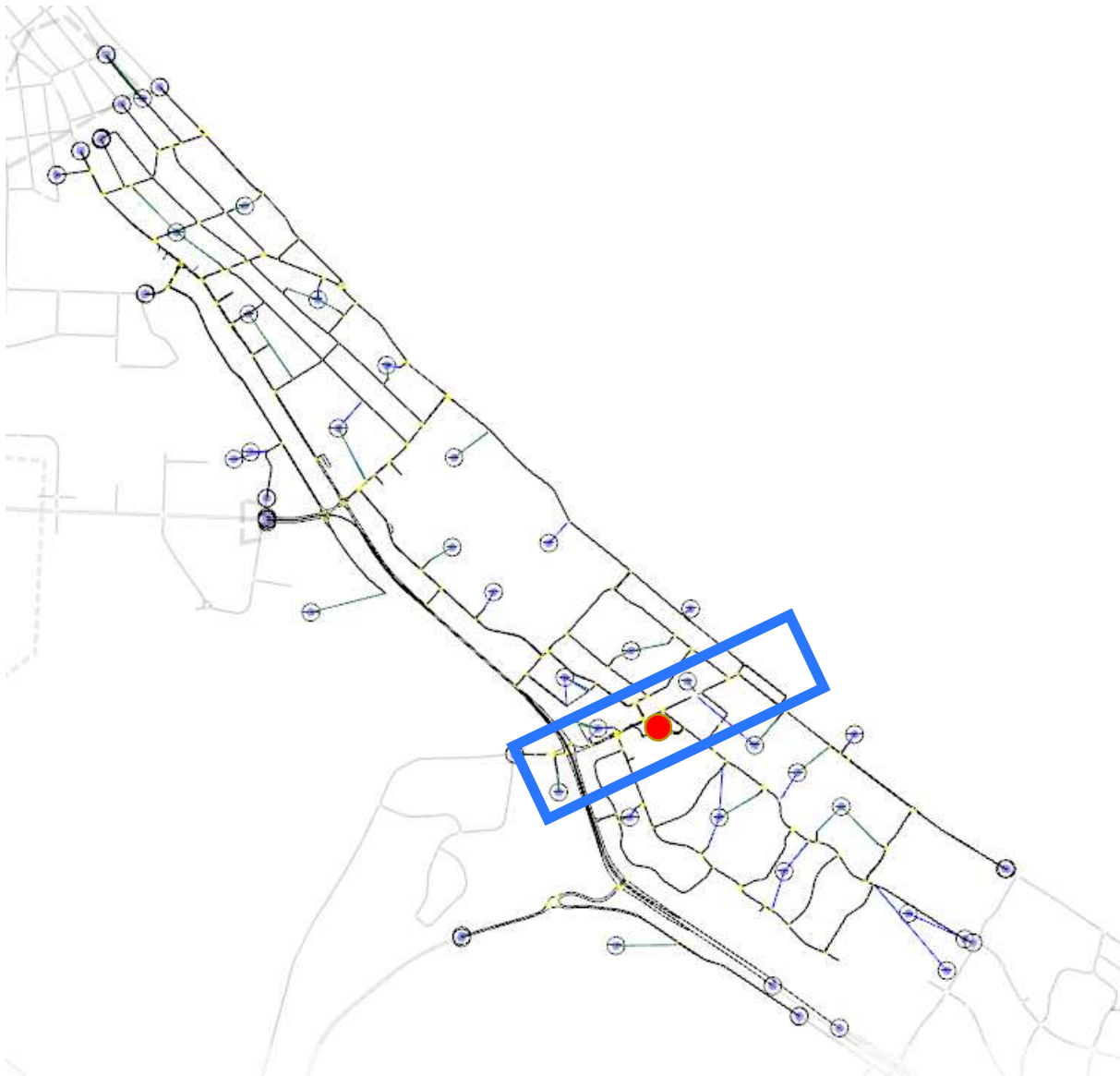


Figure 1-1: Model Extent (focus area outlined in blue, bus facility marked in red)

2 Methodology

The Aimsun Arataki Model was used for option testing to forecast years 2022 (anticipated opening year), and 2031.

The forecast year 2022 was developed as part of this project while the forecast year 2031 was already developed previously. The model is a subnetwork of the wider Tauranga Transport Hybrid Model (TTHM) hence the forecast demands were sourced from the TTHM, which are derived from the Tauranga Transport Strategic Model (TTSM). The demands for the forecast years utilise the Programme 8.1 PT and network assumptions. As agreed with Tauranga City Council, a simplified approach to developing a 2022 model was undertaken as follows:

- Utilise the available 2026 TTHM scenario
- Estimate the 2022 TTHM demands by interpolating between the 2018 and 2026 TTHM matrices
- Apply the demand adjustment from the 2018 model calibration exercise to the 2022 TTHM raw demand

A single design layout was used for a signalised intersection at Marlin Street and Girven Road as advised by Tauranga City Council, and two pedestrian crossing options tested (**Figure 2-1 and Figure 2-2**):

- Option 1 – a barnes dance crossing
- Option 2 – pedestrian crossings running parallel to non-conflicting vehicle movements with full protection from conflicting movements

Pedestrian crossing was called every cycle as a worst-case scenario assumption.

Cycle times at the intersection of interest was the same in both pedestrian crossing options and this was the same as the adjacent Girven / Gloucester intersection to facilitate coordination of the through movements along Girven Road between these intersections. For each approach, the phase is called based on the detection of a vehicle at the approach, a passage time-out detection of 3 seconds and inter-green time of 6 seconds. The signal control used in Aimsun are provided in **Appendix A**.

The model has two peak periods: AM (6:30am – 9:30am) and PM (3:30pm – 6:30pm).

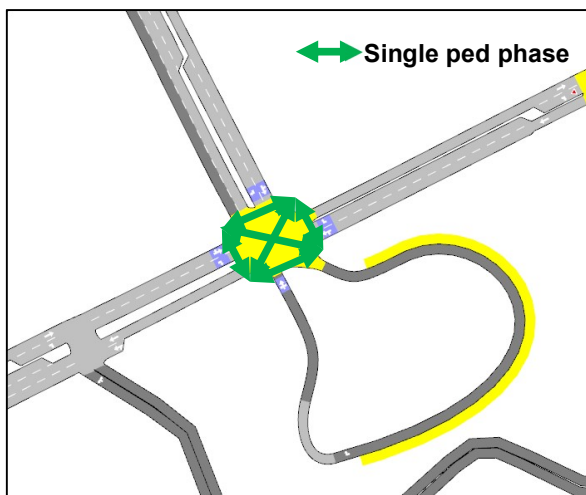


Figure 2-1: Option 1 - a barnes dance crossing

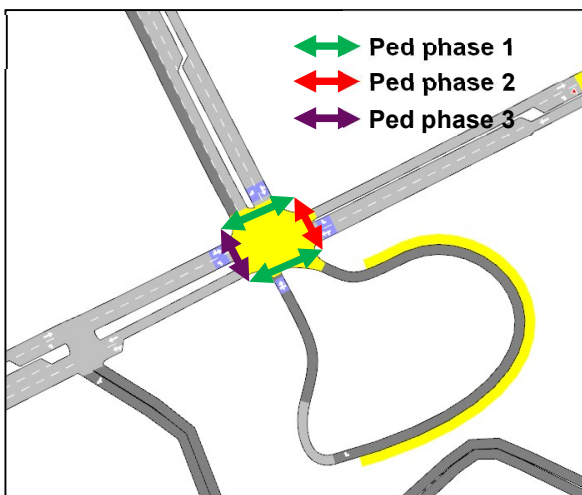


Figure 2-2: Option 2 - pedestrian crossings running parallel to non-conflicting vehicle movements with full protection from conflicting movements

2.1 Modelling Assumptions and Limitations

2.1.1 Assumptions

Bus routes required for the future years were identified by Tauranga City Council and the Bay of Plenty Regional Council. The corresponding bus schedules were retained from the forecast year 2026 assumptions in forecast year 2022 and for the forecast year 2031 previously developed. Bus stop locations in the network were also retained from these bus schedules. The routes and schedules are provided in **Appendix B**.

2.1.2 Limitations

This modelling is focused on testing the feasibility of a signalized intersection and bus facility at the intersection of Girven Road and Marlin Street. Further detailed coordination of signals with adjacent intersections i.e. Girven Rd / Gloucester Road intersection, would likely help improve traffic operation in the area, however these adjustments were not explored here.

3 Model Results

3.1 Travel Time

The travel time results for Girven Road between Oceanbeach Road and Maunganui Road (route shown in **Figure 3-1**) have been compared in the Aimsun model for both peaks, both directions. **Figure 3-2** shows the travel time differences between the Base and the Options for AM and PM peak hours: 7:00am – 8:00am, 8:00am – 9:00am, 4:00pm to 5:00pm, and 5:00pm to 6:00pm.

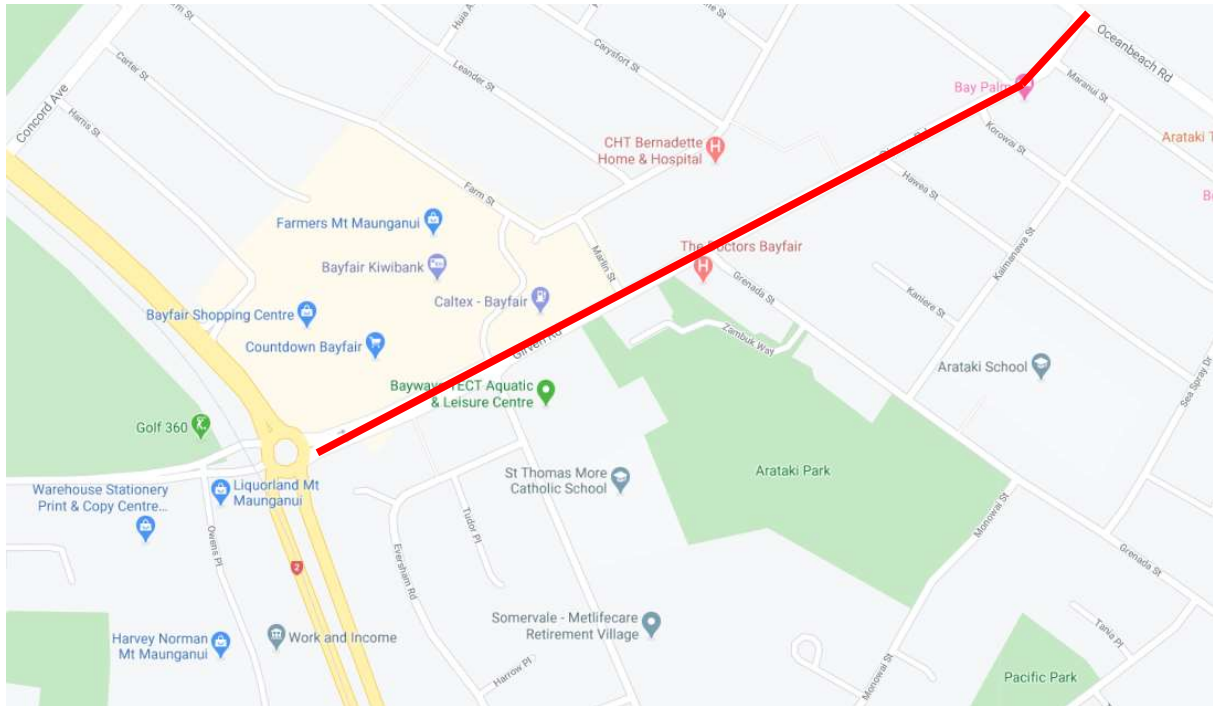


Figure 3-1: Travel Time Route

Key observations from the modelled travel time are as follows:

- In the AM peak, no significant difference was found in travel time between Option 1 and the Base layout, while in Option 2 travel time was significantly higher (~10 minutes) in the eastbound direction.
- In the PM peak, no significant difference was found in travel time in the westbound direction between Option 1 and the Base layout, while Option 2 showed a difference in 2031. In the eastbound direction, travel time for Option 2 was significantly higher (~5 minutes). Option 1 showed higher travel time (~2 minutes) than the Base in 2031.

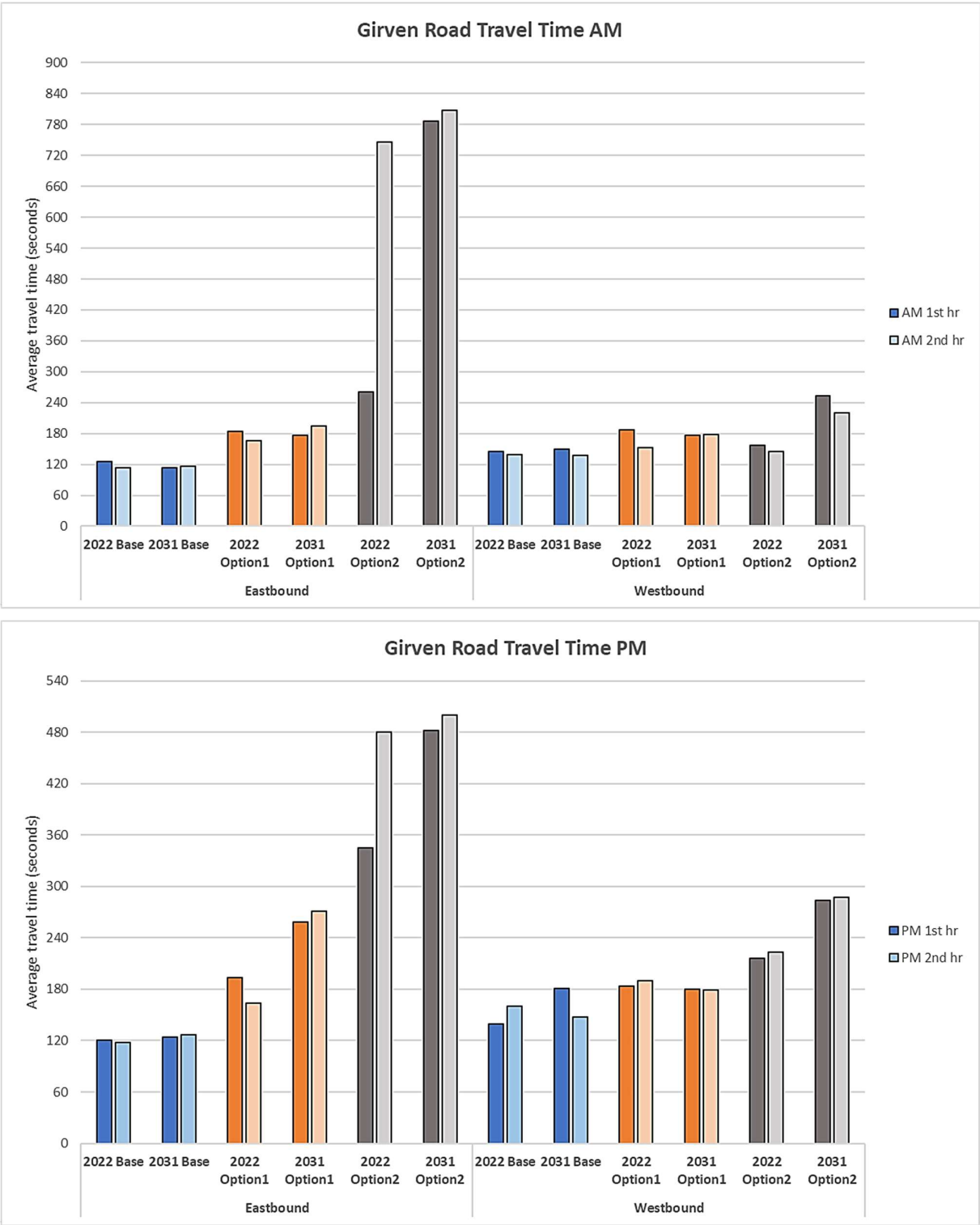


Figure 3-2: Base and Options Travel Time Comparison

3.2 Simulation Traffic Density

Simulation density in vehicle per hour was monitored on the model network and showed consistent results with modelled travel time through the Girven / Marlin intersection (Figure 3-3 and Figure 3-4):

- In the AM peak, Option 1 performs similar to the Base. Option 2 showed higher density on the intersection approaches, especially for the west approach, for forecast years 2022 and 2031.
- In the PM peak, density was high in both options for the eastbound direction along Girven Road, with Option 2 showing higher density. In 2031, it was found that this can cause queueing in Option 2 that extends back to the Maunganui roundabout and SH2 Maunganui Road. Queues on Marlin street were found to be high, backing up to Farm Street, in both options, however, this queueing was worse in Option 2.
- It was noted that queues on the B2B Flyover occur during the AM peak. This was found to originate from the capacity constraint of the Hewletts Road corridor. This was found common in all options including the base.

As mentioned, cycle times at the intersection of interest were the same in both pedestrian crossing options for the purpose of consistent comparison. Further signal optimisation of cycle time and cycle length could result in reduced queueing or blocking back.

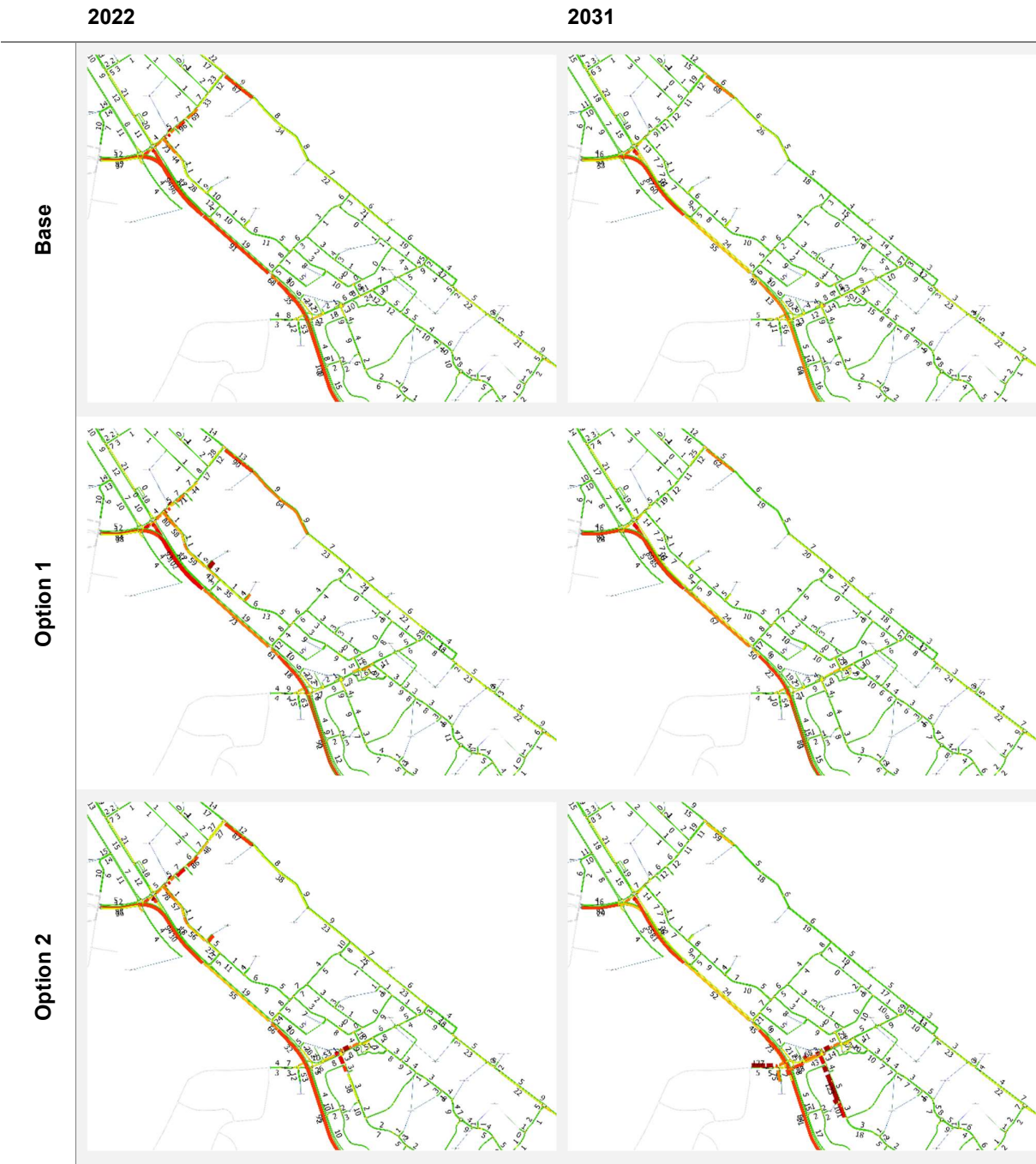


Figure 3-3: AM Peak model screenshots

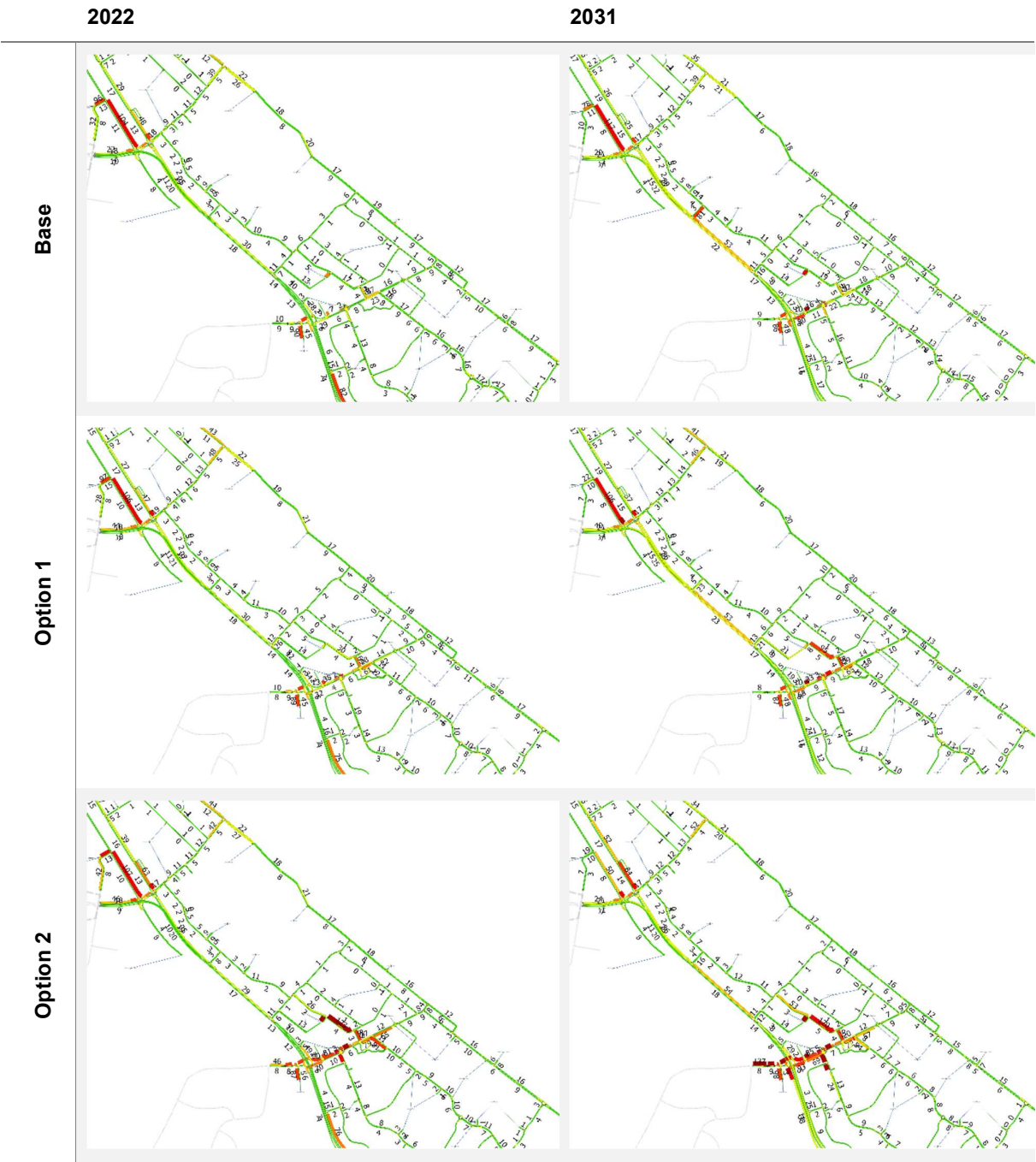


Figure 3-4: PM Peak model screenshots

3.3 Simulated Traffic Hourly Flow

Key observations of traffic diversion based on the flow difference between Base and Options:

- Traffic along Grenada Street was diverted to Gloucester Street
- Traffic along Marlin / Farm and Link Avenue divert to SH2 Maunganui Road and Oceanbeach Road
- Traffic along Girven Road divert to Concord Avenue

Figures 3-5 and 3-6 show simulated hourly flow for each peak, each option.

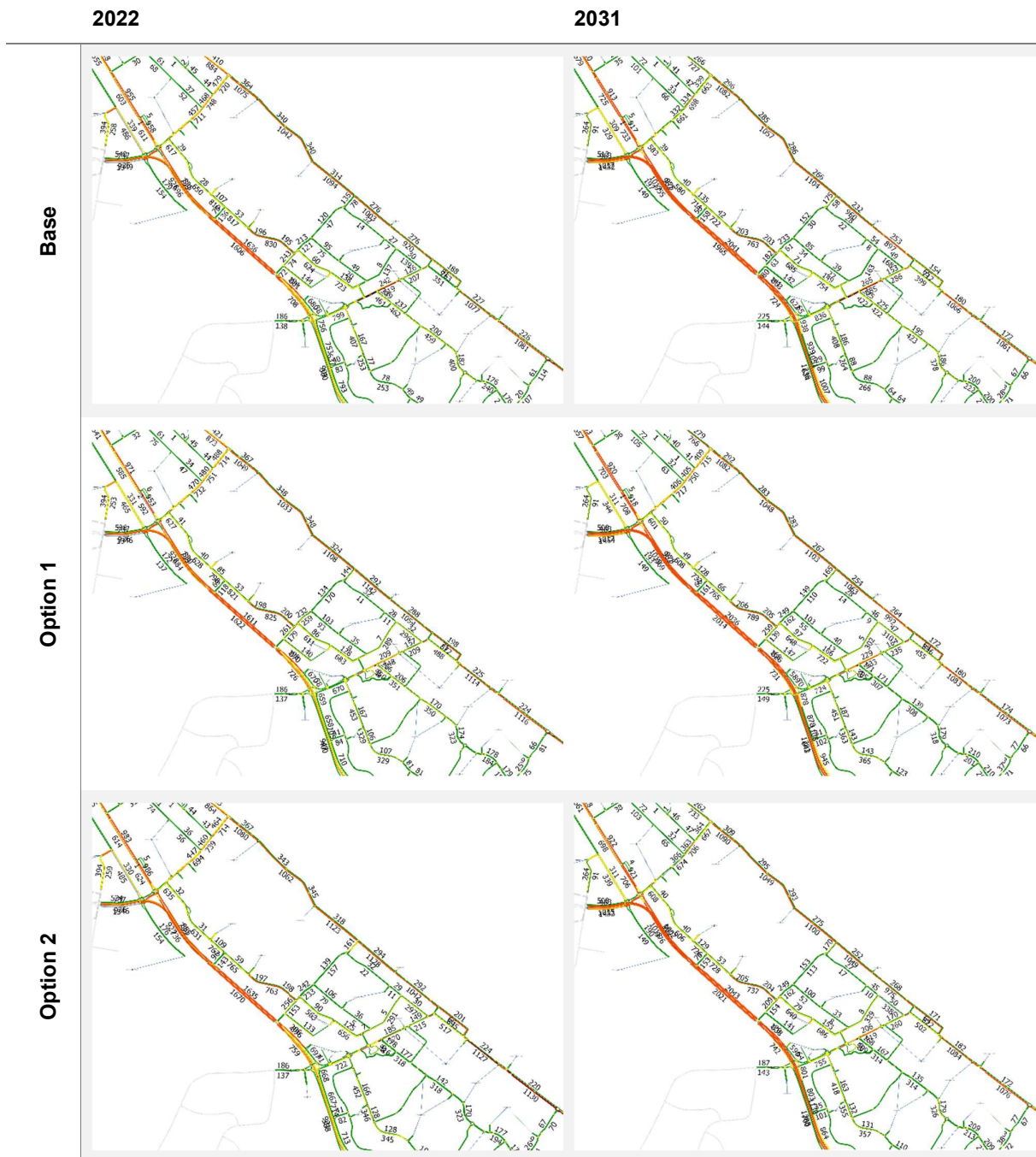


Figure 3-5: Simulated Flow (veh/hr) – 7.30am - 8.30am

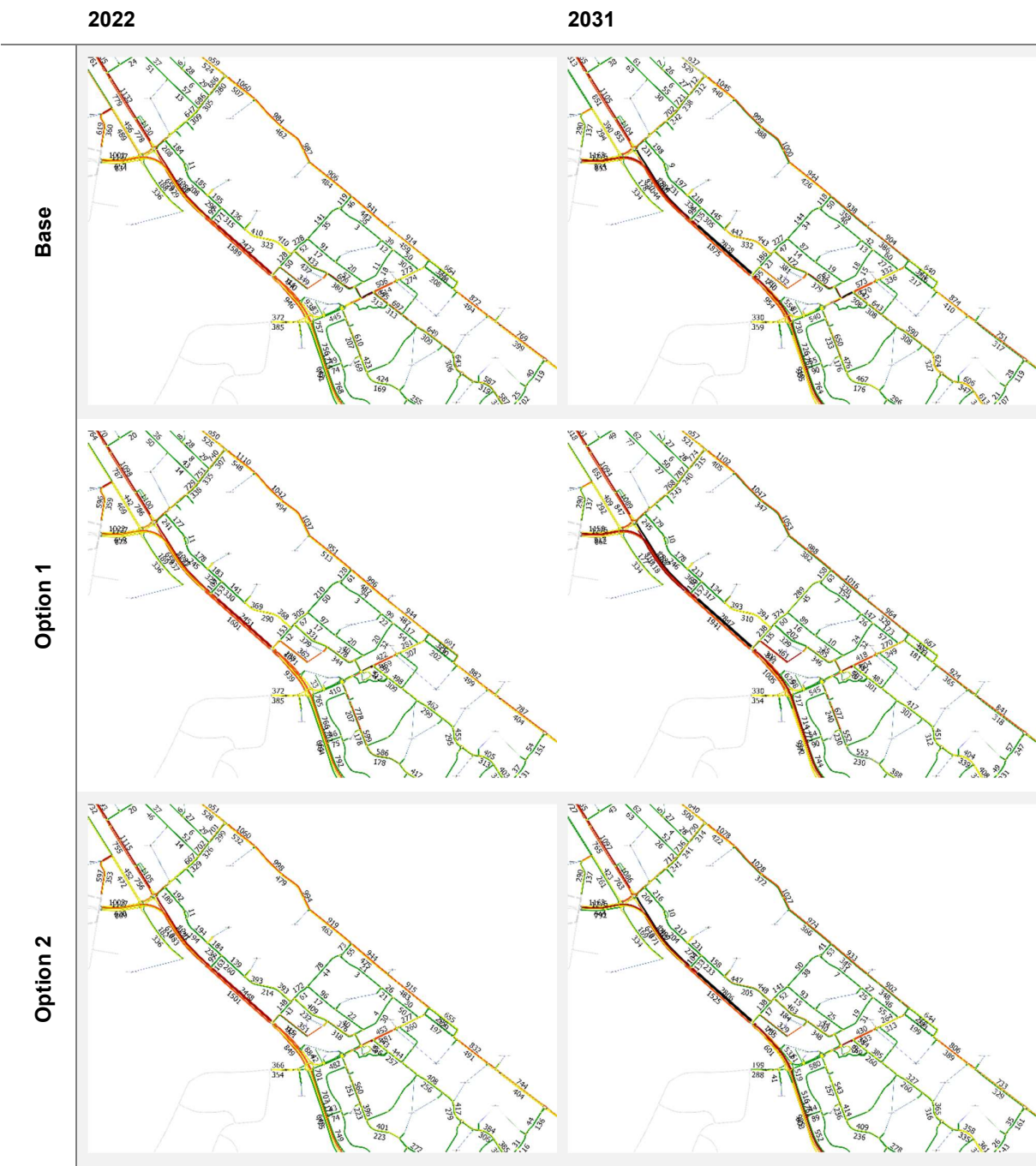


Figure 3-6: Simulated Flow (veh/hr) – 4.30pm - 5.30pm

3.4 Intersection Performance

Key performance measures for the intersection are shown in Figures 3-7 and 3-8.

Key observations are:

For the AM Peak:

- The intersection flow has generally reduced due to the introduction of the signals, especially on Girven Road (~100 – 300 vehicles per hour on the Girven Road approaches)
- In Option 1, there is an increase in delay (~1 minute) on the Girven Road west approach
- In Option 2 there is a significant increase in delay (~10 minutes) on the Girven Road west approach. However, this delay could potentially be redistributed to other approaches with further signal optimisation

For the PM Peak:

- The intersection flow has generally reduced due to the introduction of the signals, particularly on the Marlin Street approach (~200 vehicles per hour)
- In Option 1, there is an increase in delay (~2-3 minutes) on the Girven Road west approach
- In Option 2 there is a significant increase in delay (~6 minutes) on the Marlin Street approach

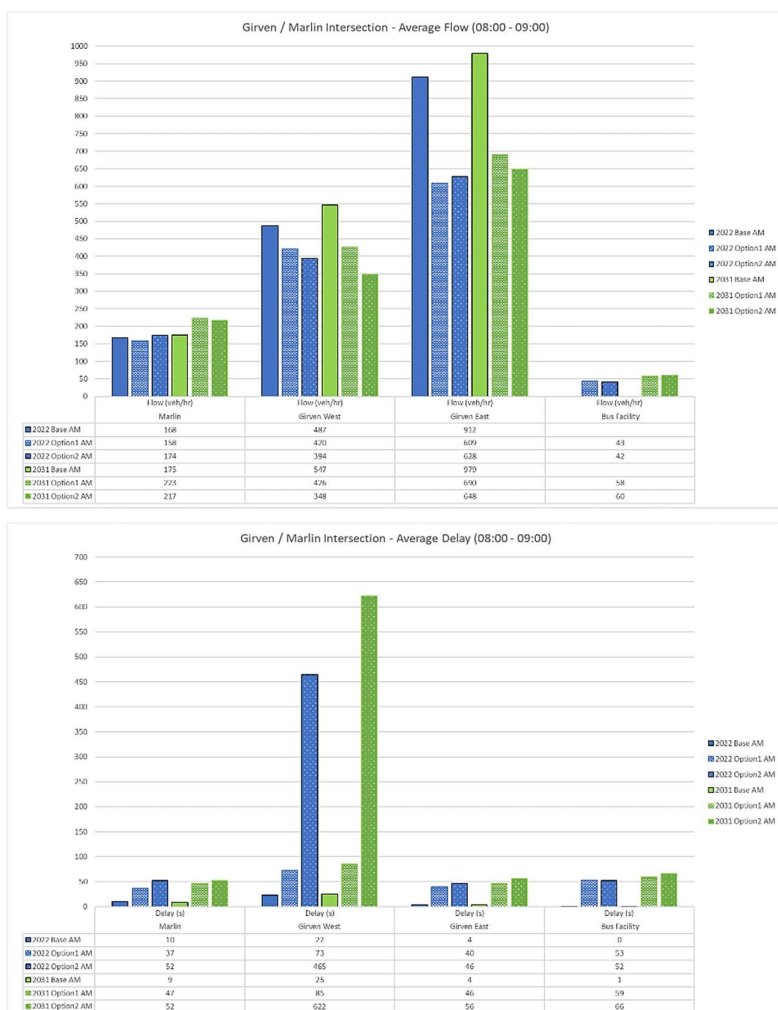


Figure 3-7: AM Intersection Performance – Average Flow and delay

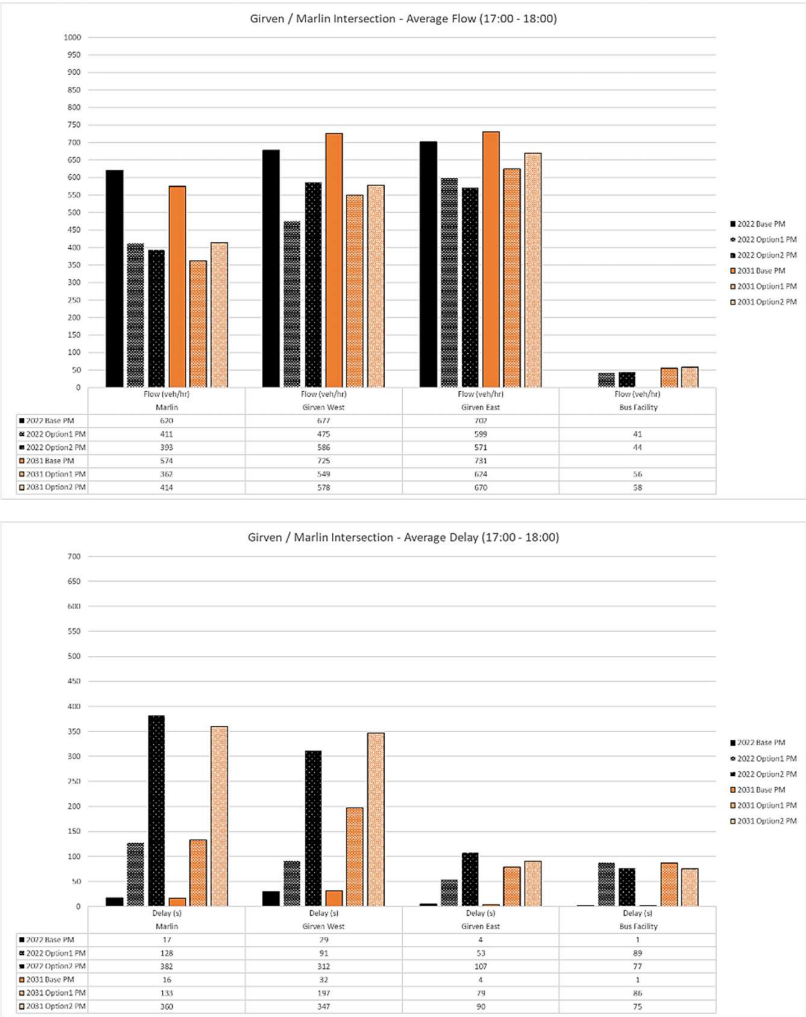


Figure 3-8: PM Intersection performance – Average Flow and delay

4 Summary

This report outlines the methodology and findings of transport modelling regarding the Arataki Bus Facility project in Aimsun. Tauranga City Council's Aimsun simulation model was used for this study with local calibration/validation to 2018/19 traffic conditions. The base model development process was documented a separate report.

Two pedestrian crossing options were developed:

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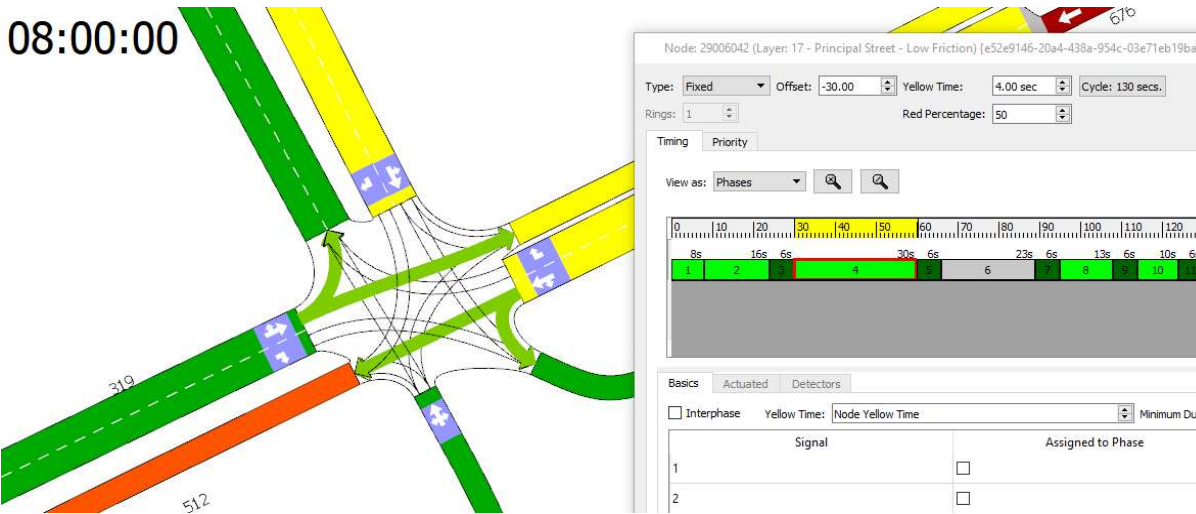
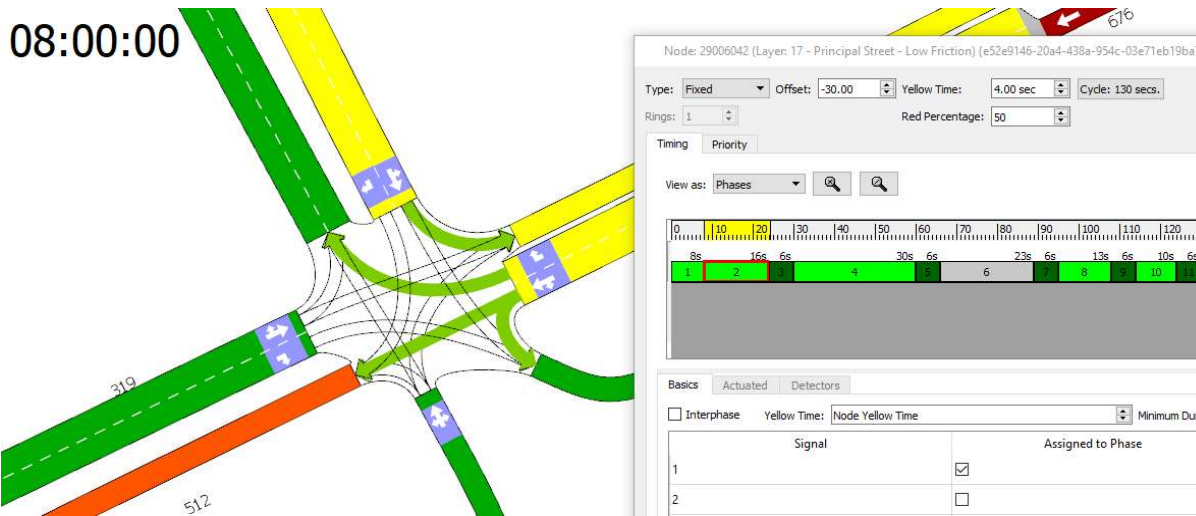
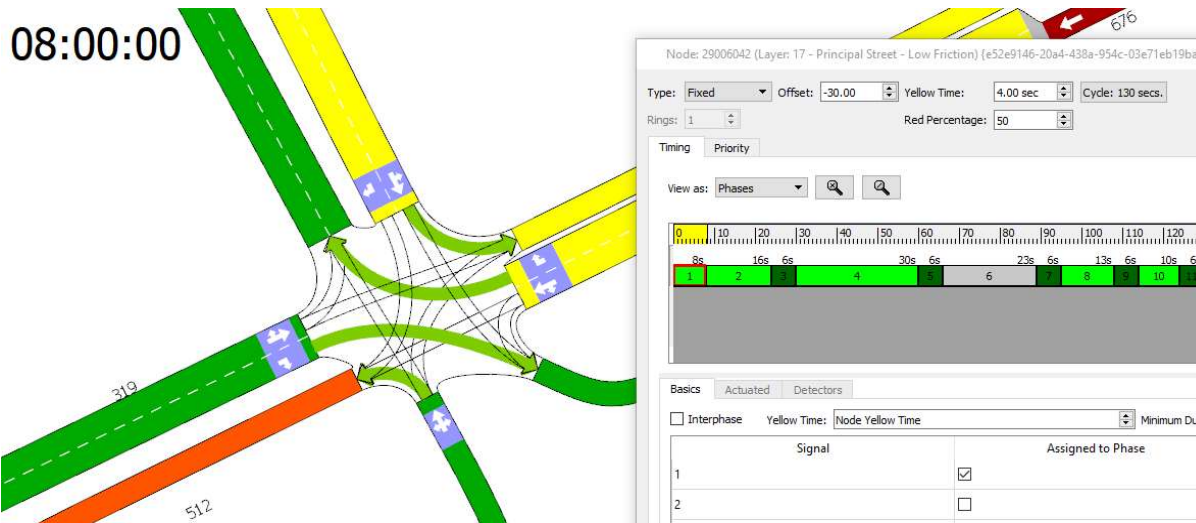
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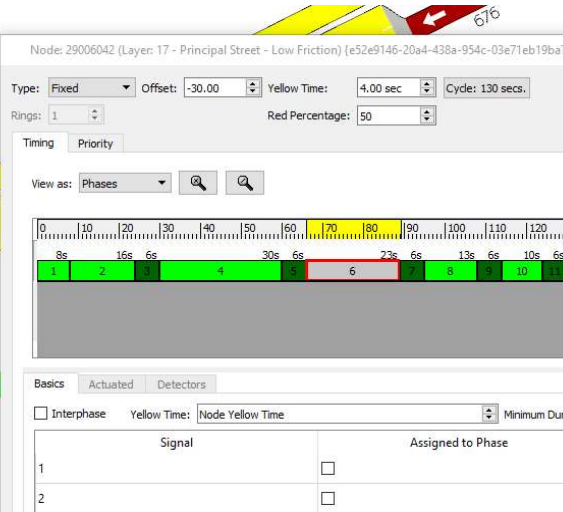
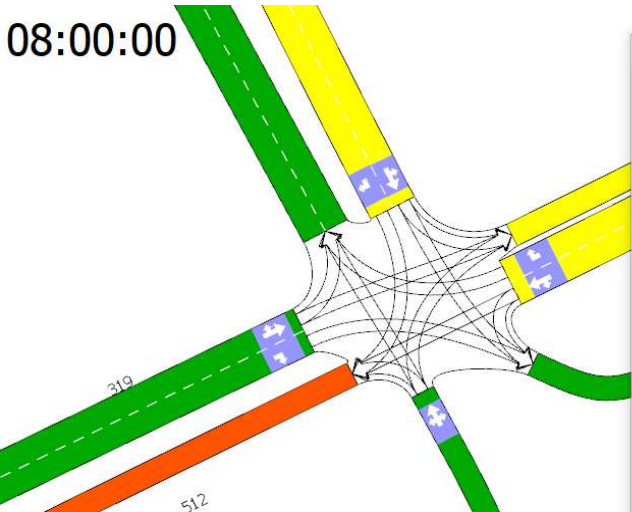
A

Appendix A – Aimsun Signal Control

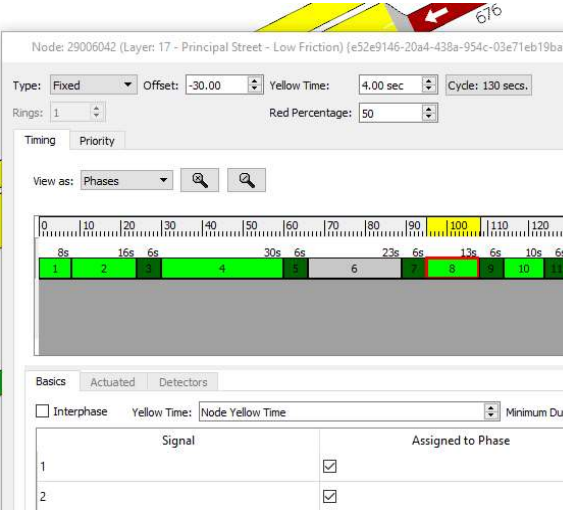
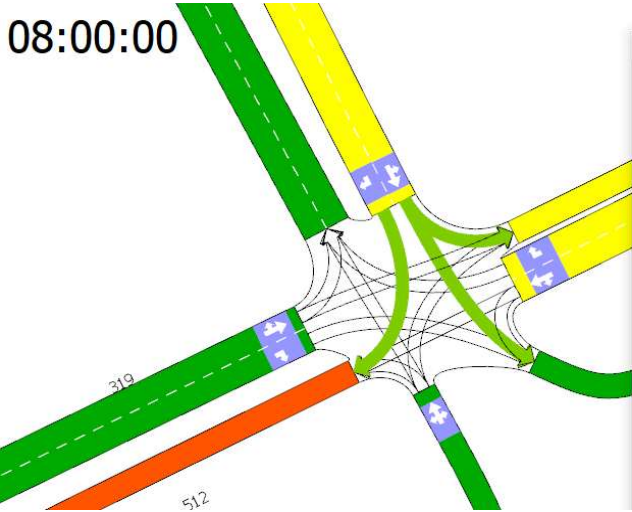
Option 1 AM



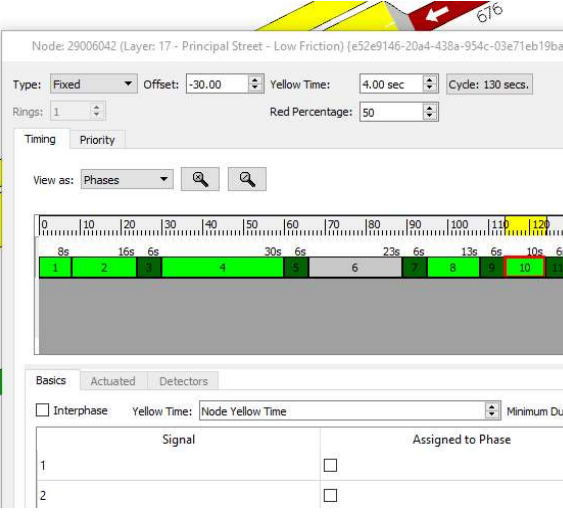
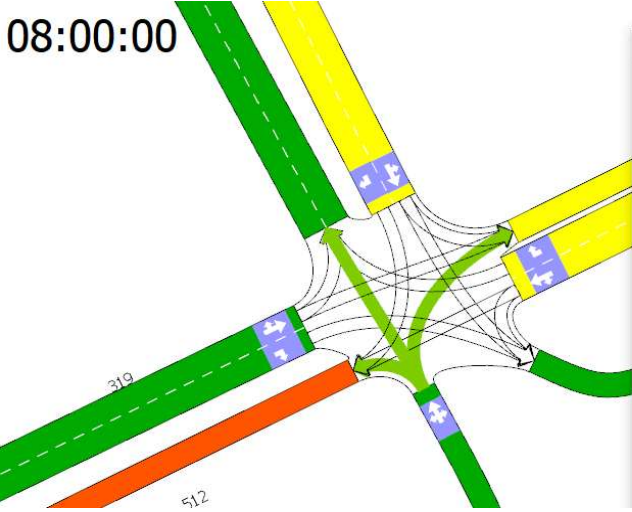
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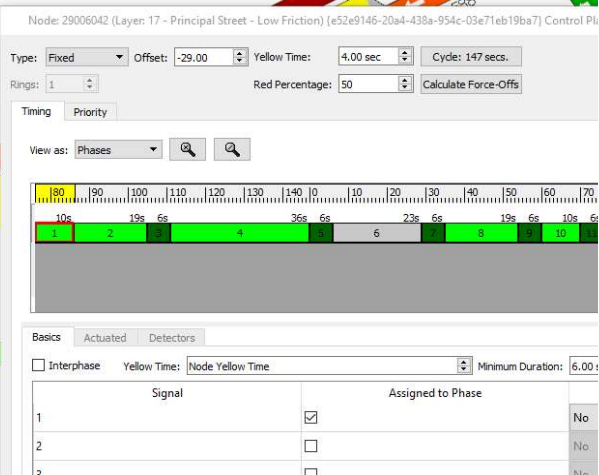
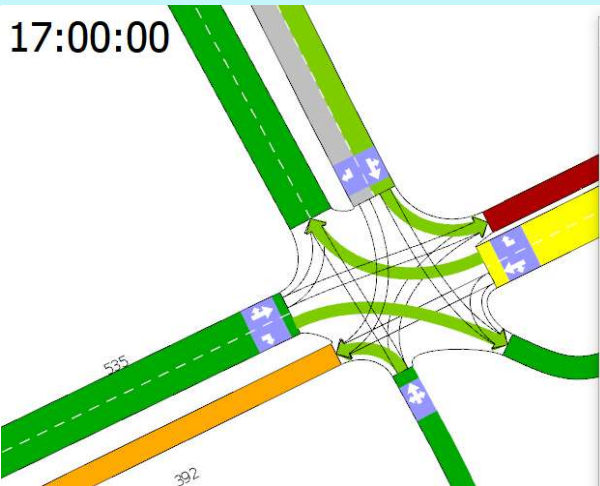


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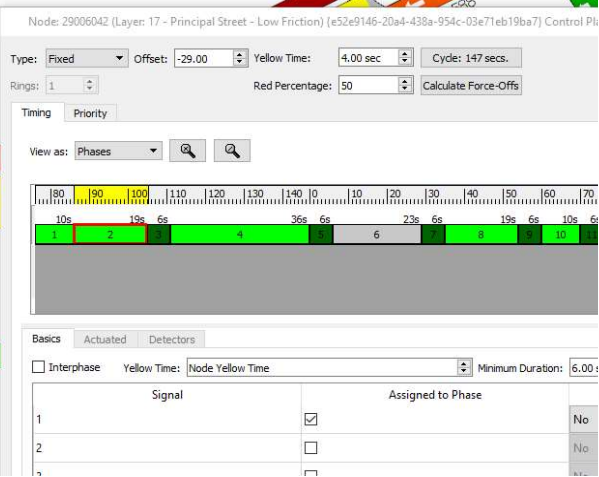
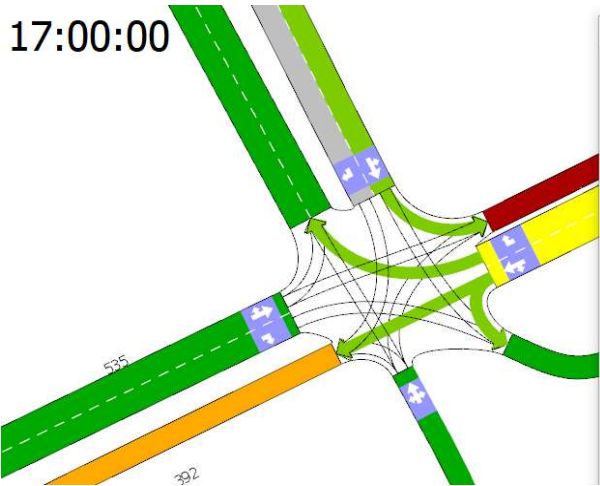


Option 1 PM

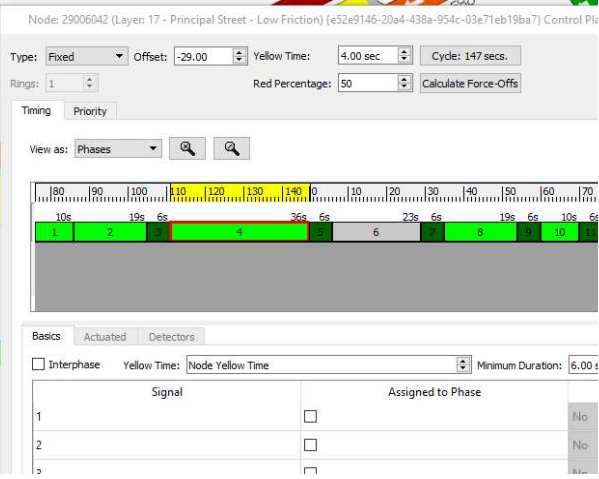
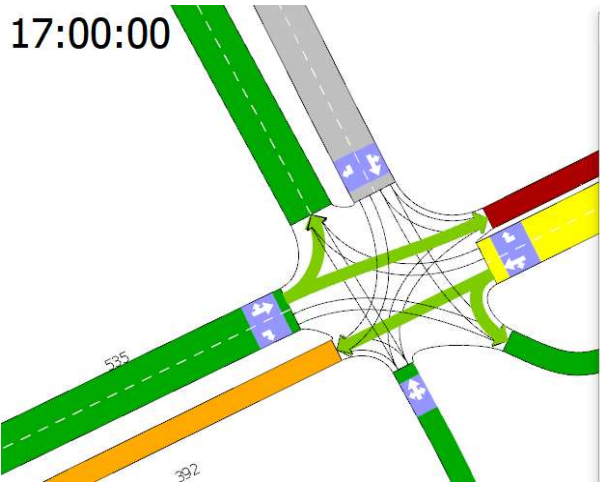
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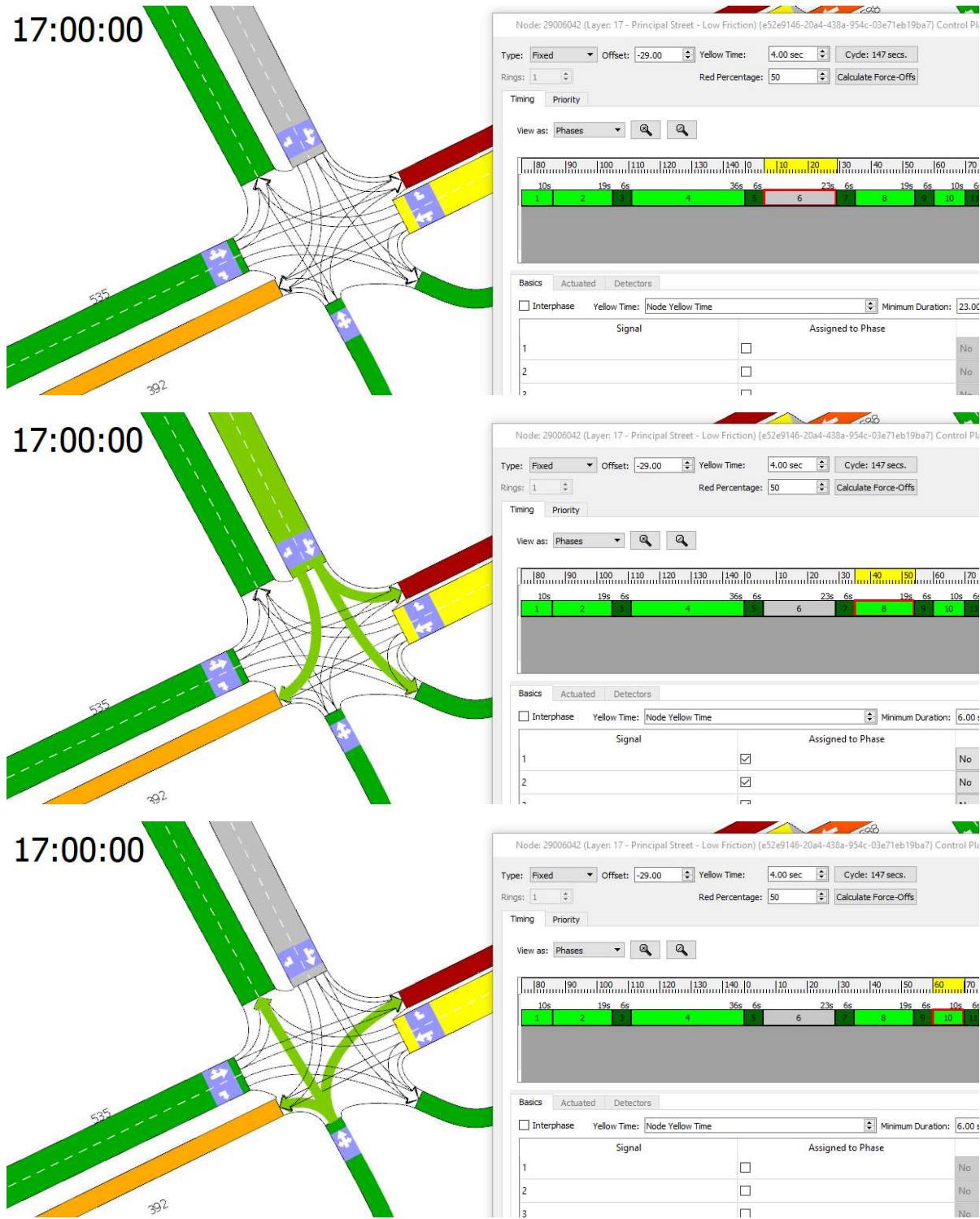


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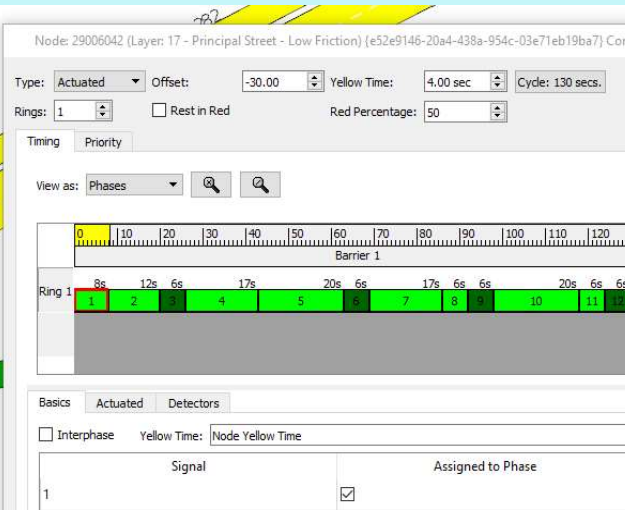
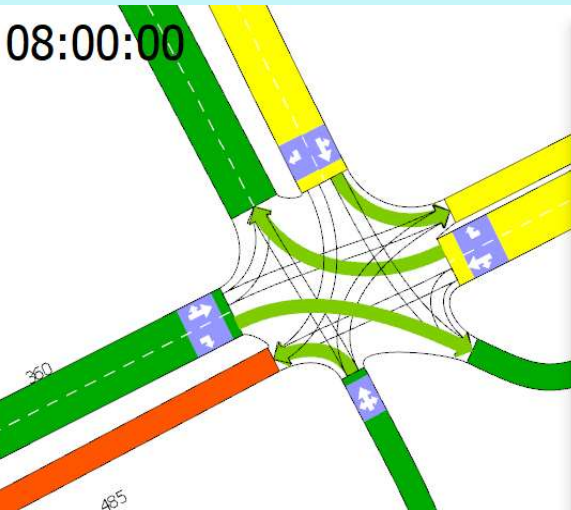
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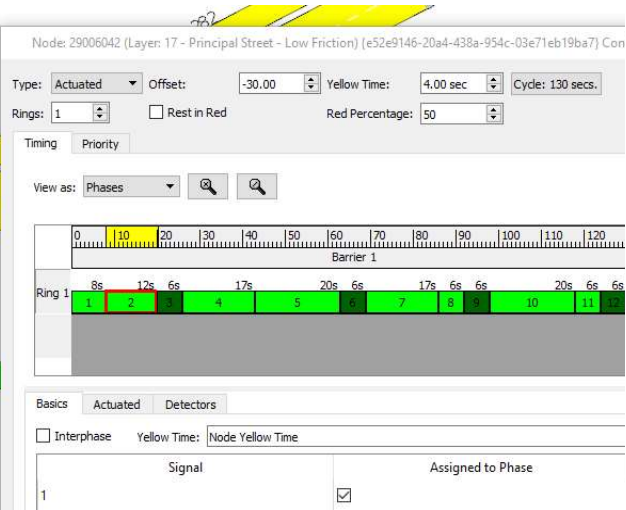
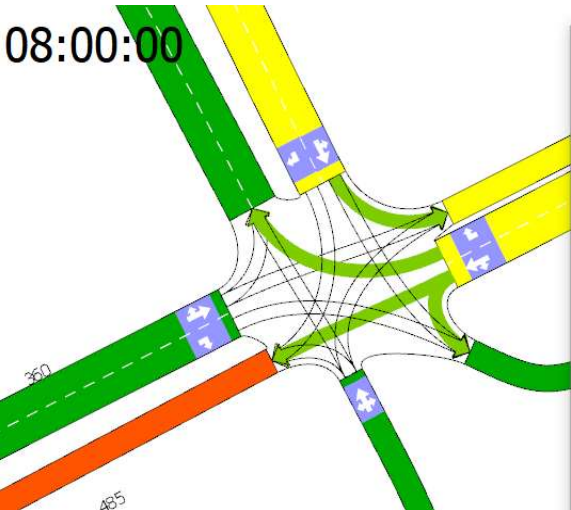


Option 2 AM

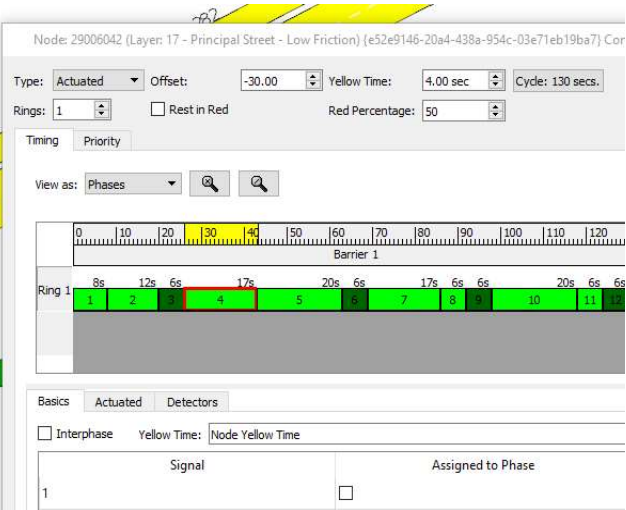
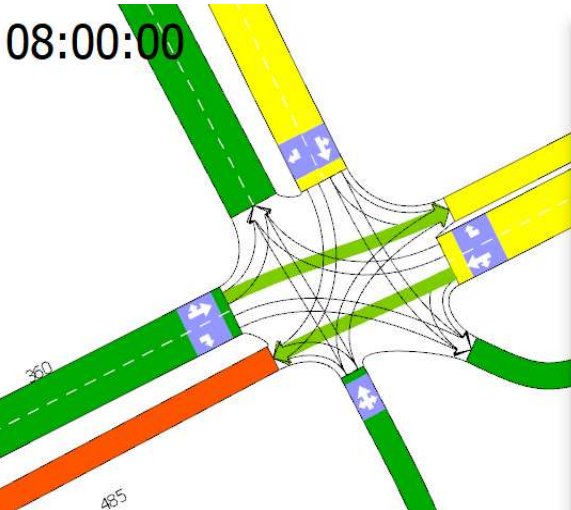
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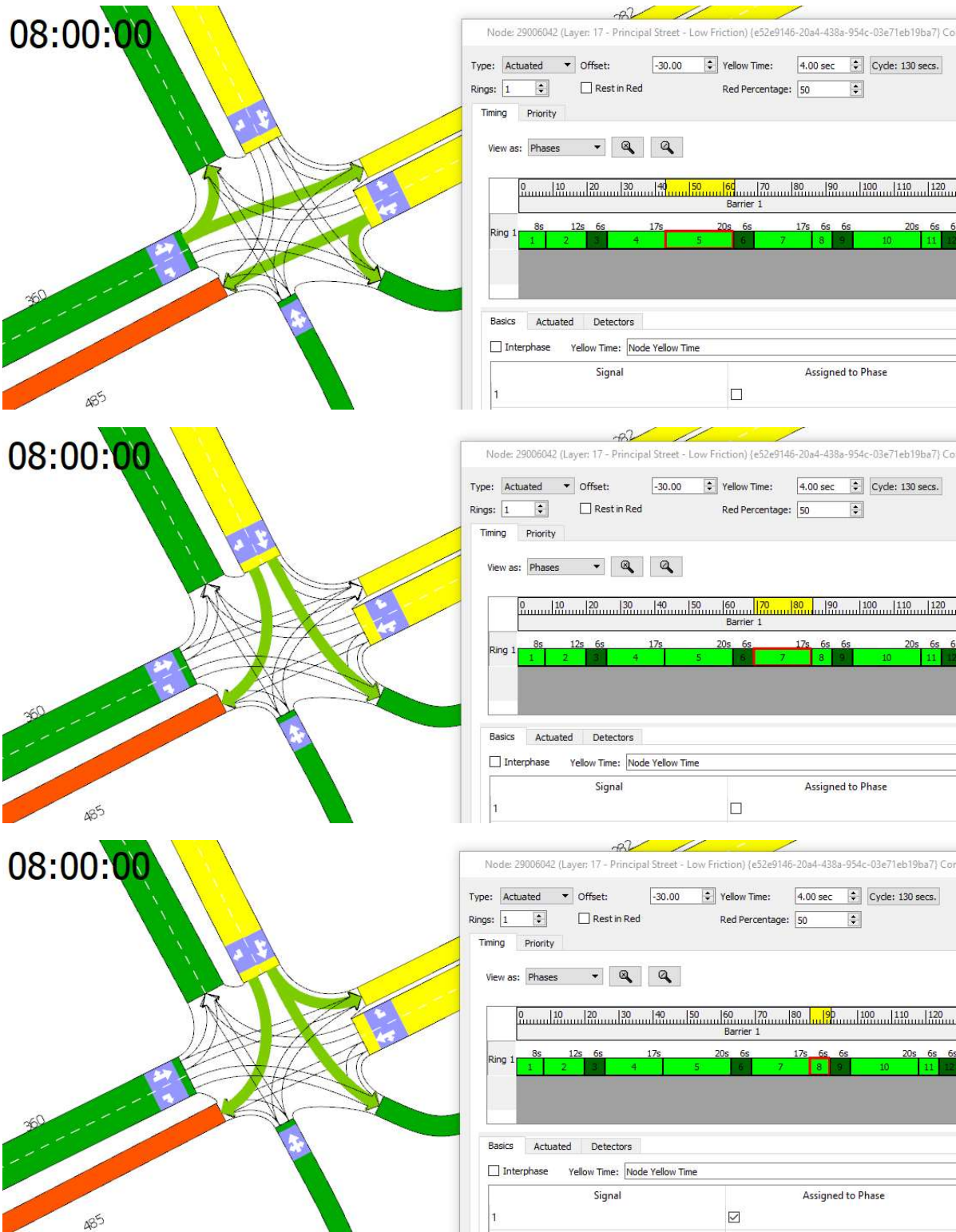


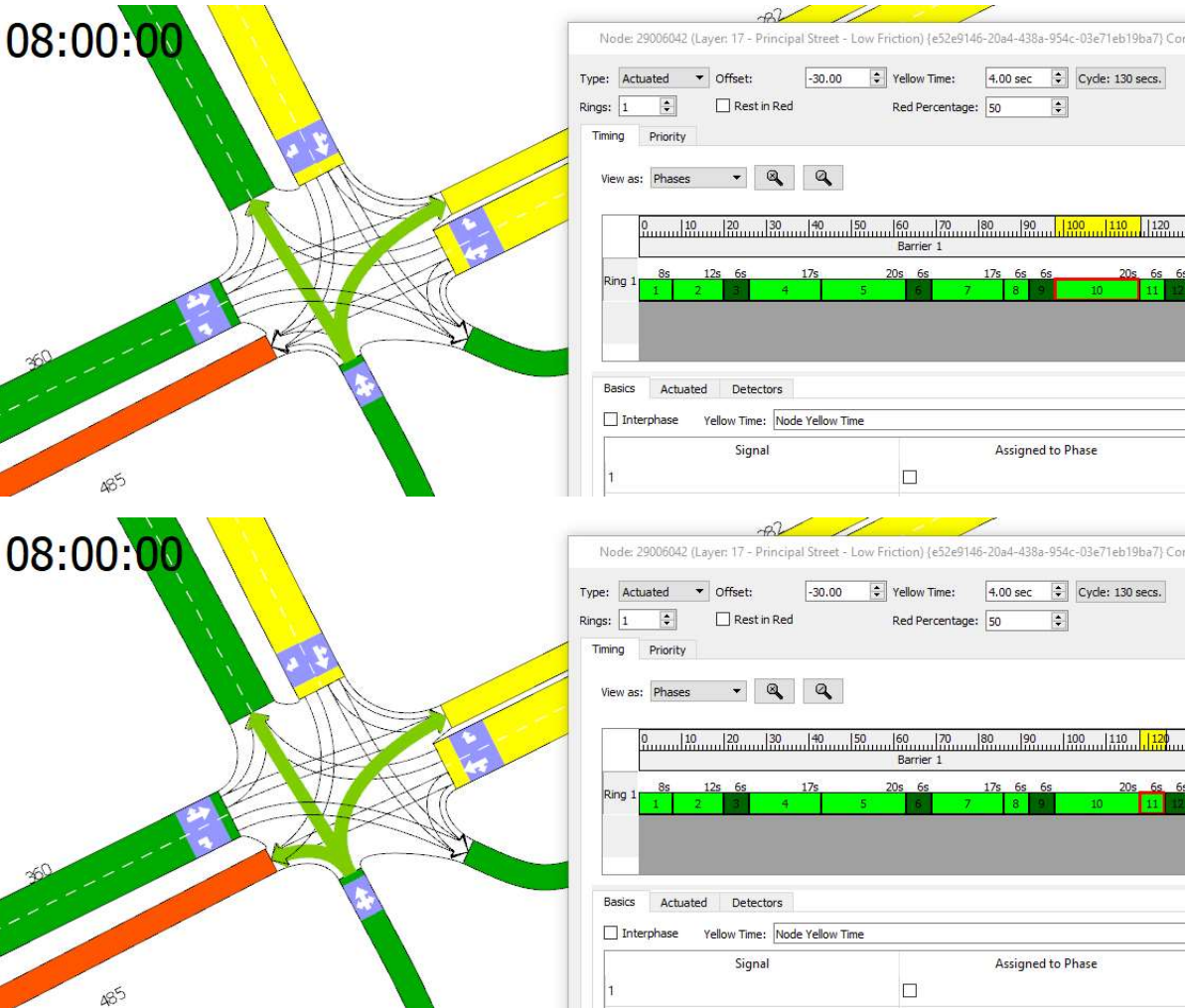
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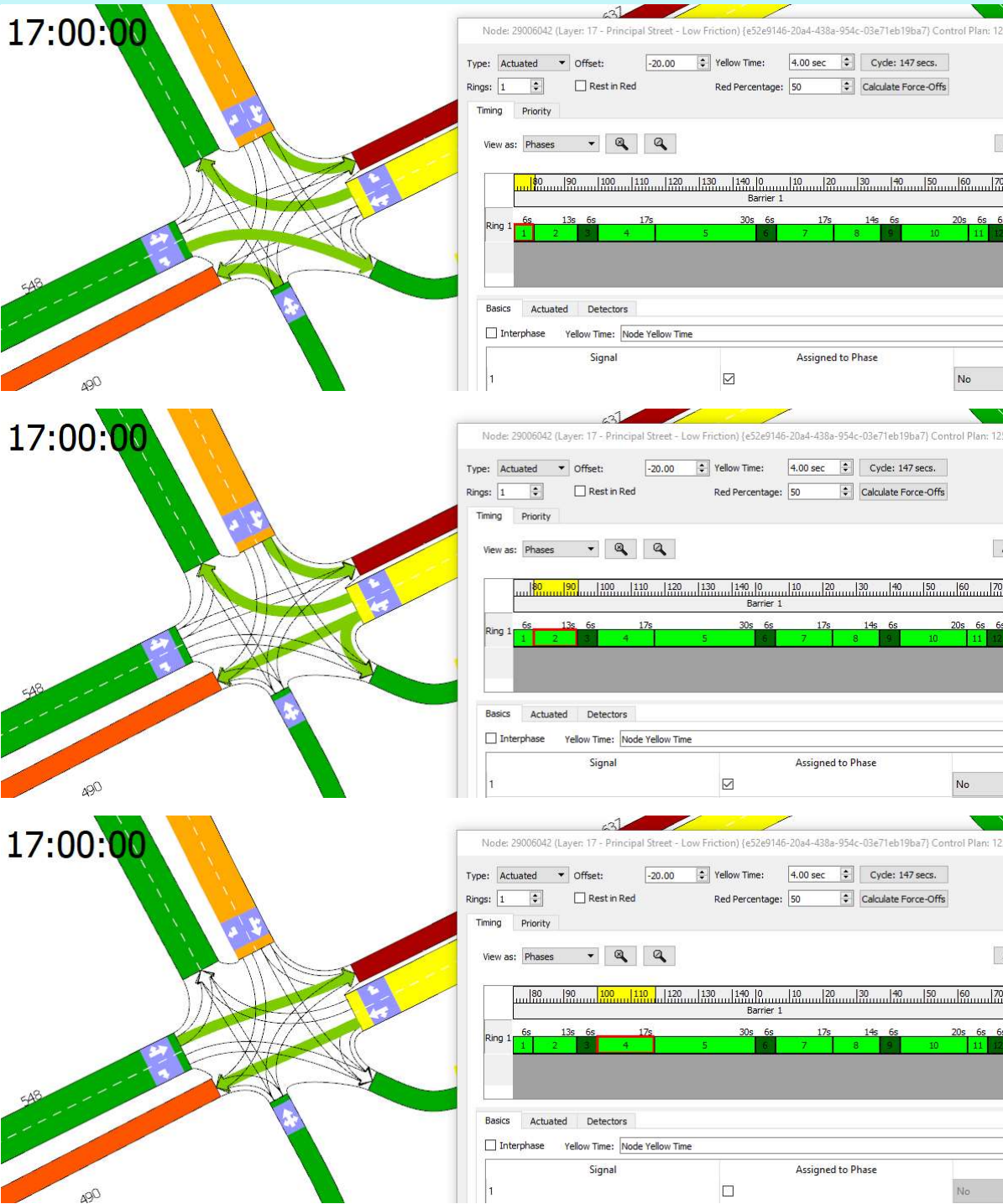
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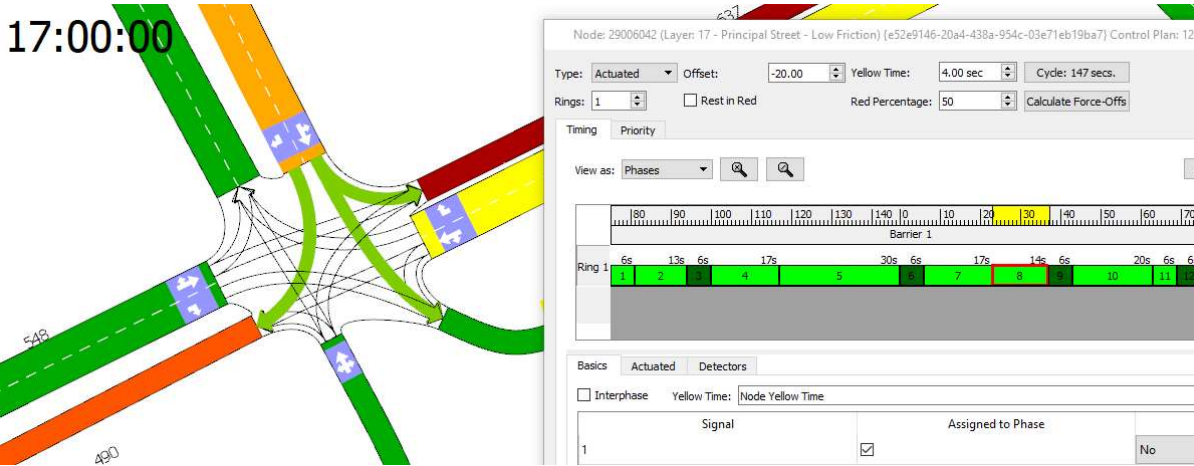
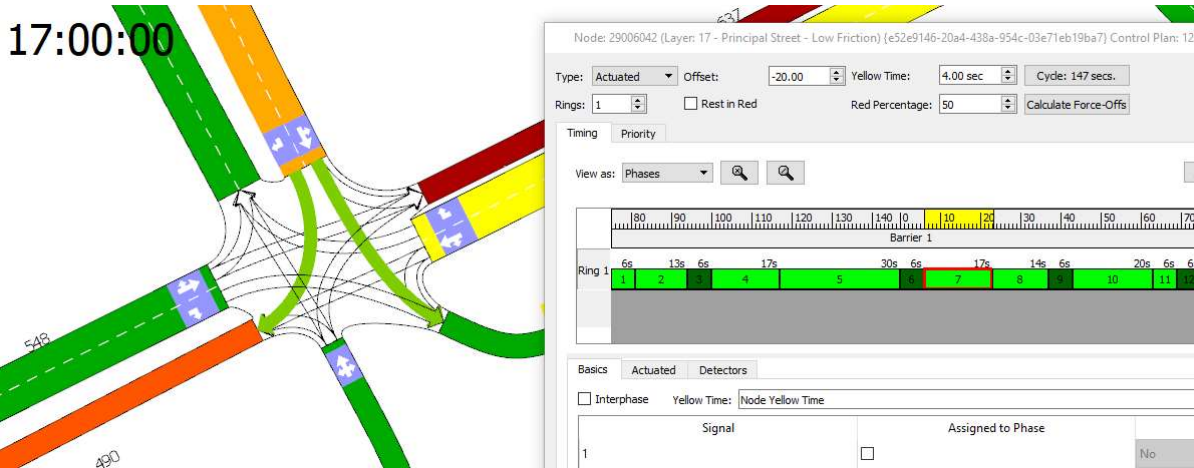
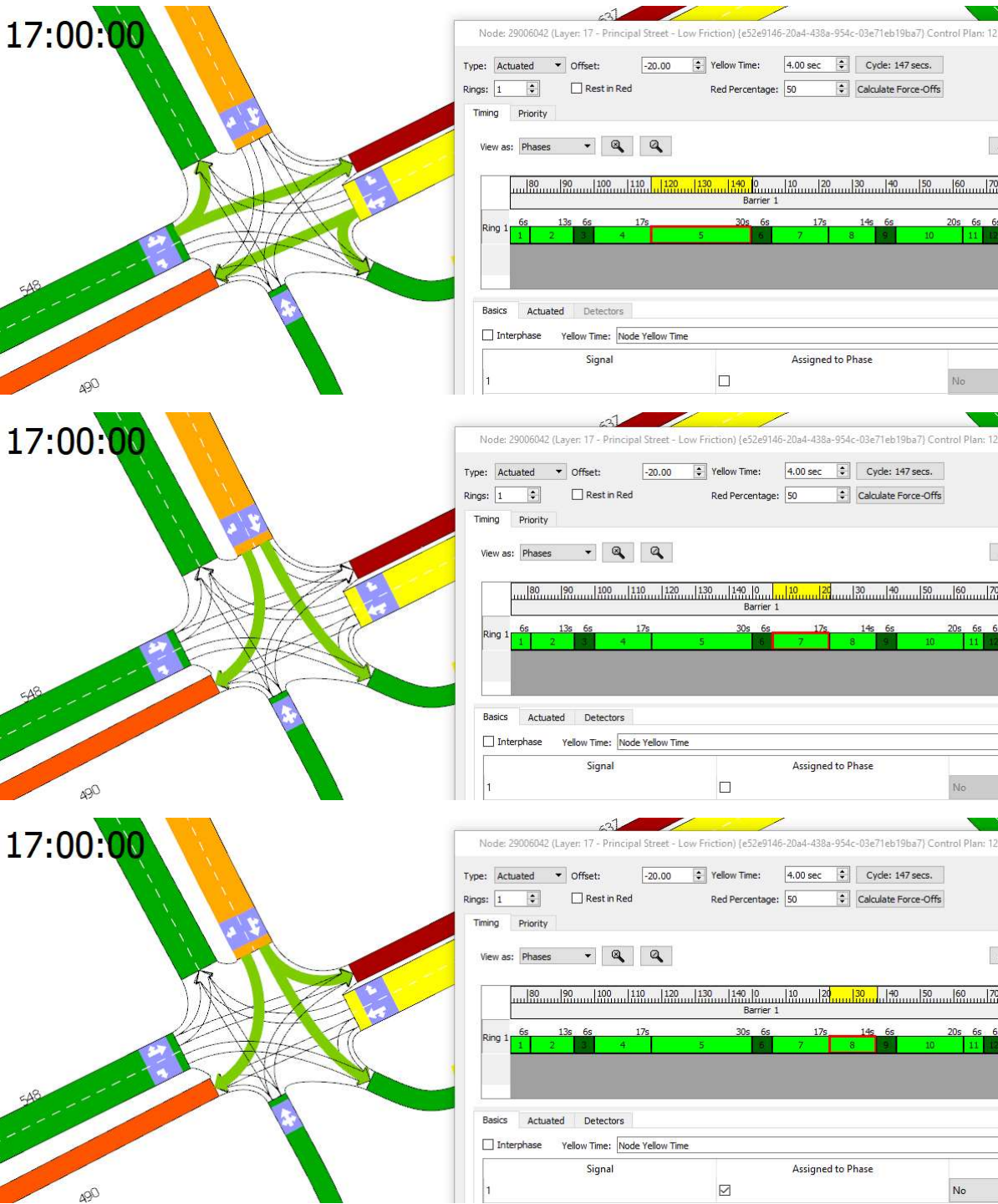


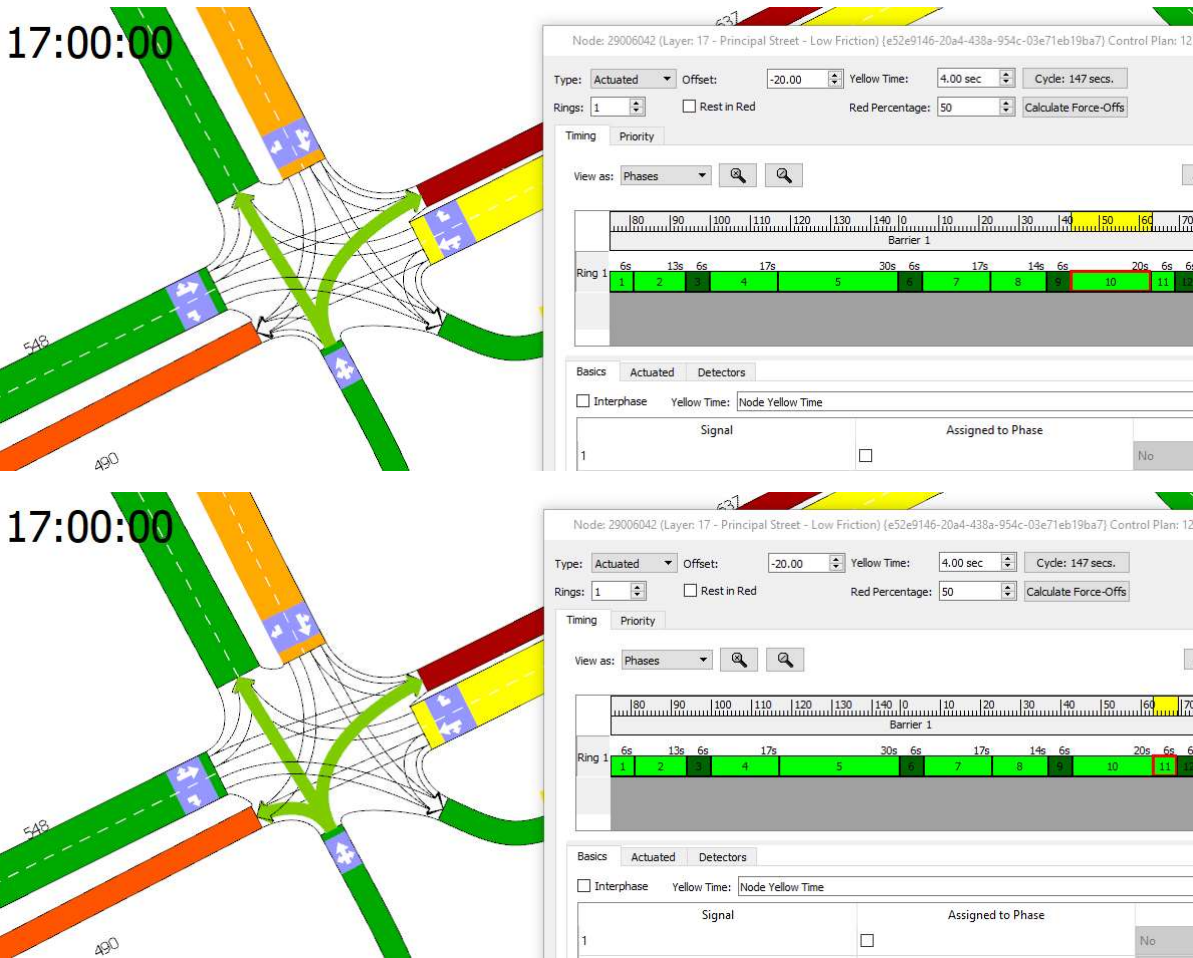




Option 2 PM







B

Appendix B – Bus Routes & Schedules

Bus Route	Start Time	Duration	2022 Frequency (min)	2031 Frequency (min)
30 Northbound	6:35:31 AM	03:15:00	24	20
30 Southbound	6:15:00 AM	03:15:00	24	20
30x Northbound	6:34:51 AM	03:15:00	40	30
30x Southbound	6:21:26 AM	03:15:00	60	60
33 Northbound	6:32:52 AM	03:15:00	24	20
33 Southbound	6:15:00 AM	03:15:00	24	20
221 Northbound	6:35:19 AM	03:15:00	40	30
221 Southbound	6:15:00 AM	03:15:00	40	40
221b Northbound	6:45:58 AM	03:15:00	40	30
221b Southbound	6:15:00 AM	03:15:00	40	30
CL Northbound	6:15:00 AM	03:15:00	14	10
CL Southbound	6:28:37 AM	03:15:00	14	10
CT Northbound	6:46:53 AM	03:15:00	14	10
CT Southbound	6:15:00 AM	03:15:00	14	10
HL Northbound	6:15:00 AM	03:15:00	14	10
HL Southbound	6:26:06 AM	03:15:00	14	10

Bus Route	Start Time	Duration	2022 Frequency (min)	2031 Frequency (min)
30 Northbound	3:35:31 PM	03:15:00	24	20
30 Southbound	3:15:00 PM	03:15:00	24	20
30x Northbound	3:34:51 PM	03:15:00	60	60
30x Southbound	3:21:26 PM	03:15:00	40	30
33 Northbound	3:32:52 PM	03:15:00	24	20
33 Southbound	3:15:00 PM	03:15:00	24	20
221 Northbound	3:35:19 PM	03:15:00	40	30
221 Southbound	3:15:00 PM	03:15:00	40	40
221b Northbound	3:45:58 PM	03:15:00	40	30
221b Southbound	3:15:00 PM	03:15:00	40	30
CL Northbound	3:15:00 PM	03:15:00	14	10
CL Southbound	3:28:37 PM	03:15:00	14	10
CT Northbound	3:46:53 PM	03:15:00	14	10
CT Southbound	3:15:00 PM	03:15:00	14	10
HL Northbound	3:15:00 PM	03:15:00	14	10
HL Southbound	3:26:06 PM		14	10