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Integrated Transport Assessment

Prepared for

CARTER GROUP LTD

**531 - 535 Mill Road & 347 Whites Road, Ōhoka
Waimakariri**

May 2026



Integrated Transport Assessment Prepared for

Carter Group Ltd

531 - 535 Mill Road & 347 Whites Road, Ōhoka
Waimakariri

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Executive Summary

Carter Group Ltd proposes to subdivide land at 531–535 Mill Road and 347 Whites Road, Ōhoka, to enable a mixed-use development comprising:

- 875 residential lots;
- Approximately 250 retirement dwellings;
- A commercial centre; and
- Polo grounds.

The development will take access from Bradleys Road (two intersections), Whites Road (four intersections), and Mill Road (one intersection). The subdivision layout includes internal roads, shared paths, and pedestrian links designed to support safe and efficient movement within the site.

At full build-out, the development is predicted to generate:

- 624 vehicle movements per hour in the AM peak;
- 715 vehicle movements per hour in the PM peak; and
- 6,046 vehicle movements per day.

Internal Transport Network

The internal road network includes a hierarchy of road types with corridor widths ranging from 16m to 22m. Shared paths and footpaths are provided throughout, with additional recreational links and cul-de-sacs designed to NZS4404 standards. While some technical non-compliances with the District Plan exist (e.g. corridor widths, intersection spacing, and accessway arrangements), these are considered acceptable given the residential nature of the development and alignment with national standards.

External Network Effects

The surrounding road network has been assessed for capacity and safety impacts. Key findings include:

- **Tram Road / Bradleys Road / McHughes Road:** Currently a high-risk intersection, but scheduled for roundabout upgrade in 2027/28. With development, the existing intersection remains within acceptable capacity limits as does the Council proposed roundabout upgrade;
- **Tram Road / Whites Road:** Also a high-risk intersection. Safety improvements such as Rural Intersection Activated Warning Signs (RIAWS) are recommended to mitigate increased crash risk regardless of the development;
- **Flaxton Road / Threlkelds Road:** Development of 310 dwellings plus 150 retirement dwellings could be accommodated prior to an upgrade. A roundabout upgrade is recommended;
- **Mill Road / Threlkelds Road:** A realignment is recommended to support use of upgraded Flaxton Road intersection; and
- **SH1 / Tram Road Interchange:** Inclusion of development traffic will lead to tolerable operation, although the AM peak right turn off the off-ramp will be over-capacity but queues would not extend to the SH1 main line. This can be mitigated through changes to the signal phasing.

The development supports active transport through shared paths and connections to Council's proposed walking and cycling network. Cycling distances to Kaiapoi (9km) and Rangiora (10.5km) are considered achievable, especially with increasing uptake of e-bikes.



Infrastructure Timing & Funding

The following table summarises recommended infrastructure upgrades, their necessity, timing, and funding mechanisms:

Upgrade	Existing Requirement	Recommended Timing (in relation to development staging)	Funding Mechanism
Speed limits and threshold treatments for Whites and Bradleys Roads.	Within Waimakariri Speed Management Plan	When the proposed development accesses these roads.	-
Shared paths on Whites, Bradleys and Mill Road frontages.	Planned, but not funded.	When the proposed development accesses these roads.	Part of the development.
Shared path upgrades on Mill Road from Whites Road to Ōhoka School.	Planned, but not funded.	-	Through Development Contributions.
Pedestrian crossings to / from the Ōhoka Domain.	No	When development occurs on that boundary.	Developer Funded.
Minor safety works to Bradleys, Whites, Mill and Threlkelds Roads.	No	When development accesses these roads (or when development commences for Threlkelds Road).	Development Contributions.
Tram Road / Bradleys Road / McHughes Road roundabout.	Yes, for safety reasons. This is already planned and funded.	N/A	Already funded in 2027 / 2028
Tram Road / Whites Road intersection safety improvements.	Yes, but not planned or funded.	From occupation of development.	Development Contributions.
Flaxton Road / Threlkelds Road roundabout, plus changes to the Mill Road / Threlkelds Road intersection.	Imminent, but not planned for.	After 310 dwellings plus 150 retirement dwellings.	Development Contributions.

Conclusion

The transport effects of the proposed subdivision are considered acceptable, subject to the timely implementation of the infrastructure upgrades outlined above and changes to the SH1 / Tram Road interchange signal phasing. The internal network is well-designed to support residential activity, and the external network can accommodate the development with appropriate mitigation measures.



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Introduction

1. Carter Group Ltd has commissioned Novo Group to prepare an Integrated Transport Assessment (ITA) for the subdivision of land to facilitate 875 residential lots, approximately 250 retirement dwellings, a commercial area and polo grounds at 531 - 535 Mill Road and 347 Whites Road, Ōhoka. **Appendix 1** sets out the authors experience.
2. This report provides an assessment of the transport aspects of the proposed development. It also describes the transport environment in the vicinity of the site, describes the transport related components of the proposal and identifies compliance issues with the transport provisions in the Operative Waimakariri District Plan (District Plan) and Partially Operative Waimakariri District Plan (PODP). It has been prepared broadly in accordance with the Integrated Transportation Assessment Guidelines specified in New Zealand Transport Agency Research report 422, November 2010.
3. The proposed subdivision plans are included in **Appendix 2**. The site location is illustrated in **Figure 1**. At full build-out / completion, the activity is predicted to generate 624 to 715 vehicle movements per hour in the weekday peak hours and 6,046 vehicle movements per day.



Figure 1: Site Location
[Background Image Sourced from canterburymaps.govt.nz]

4. The remainder of this report is structured as follows:
 - **Transport Network:** This sets out the context of the current transport network surrounding the Application Site and the key corridors to get to / from the wider transport network;
 - **The Proposal:** Sets out the transport aspects of the proposed subdivision and anticipated activities;
 - **District Plan Compliance:** Reviews the proposed subdivision against the transport requirements of the District Plan;
 - **Assessment of Transport Effects:** Discusses the transport effects of the proposed activity; and
 - **Summary & Conclusions:** Draws together the key findings of this assessment.



Transport Environment

Road Links

Whites Road

5. The transport details of Whites Road are set out in **Table 1** with a typical view looking south at the site boundary included in **Figure 2**.

Table 1: Whites Road Transport Details

Key Feature or Characteristic	Comment
Road Classification	Local Road in the District Plan and PODP.
Cross-Section Description	6.9m wide carriageway with wide grass berms.
Traffic Volumes	56 vph ¹ in the AM peak hour, 67 vph in the PM peak hour and 852 vpd ² .
Speed Limit	Speed limit of 60km/h from Mill Road to a point 240m south of the intersection. 100km/h beyond that point. Mean operating speed of 58km/h ³ .
Pedestrian & Cycling Infrastructure	None provided.
Public Transport	School buses were observed using this road.
Additional Notes	Whites Road is well used for parking associated with the Ōhoka Farmers Market at the Ōhoka Domain near Mill Road. That market occurs 09:00 to 12:30 every Friday. Extensive car parking can occur on the Whites Road berms / shoulders associated with the Ōhoka Farmers Market. This is more significant during Summer. Access is provided to a reserve on the eastern side of Whites Road, approximately 315m south of Mill Road. There is a service station in the south-western corner of the Whites Road / Mill Road intersection. The verge on the eastern side of Whites Road is used to accommodate parking associated with the service station. There are several culverts with headwalls in close proximity to the carriageway, plus drainage channels / stream along the corridor, as well as utility poles on the eastern side of the road.



Figure 2: Whites Road Looking South

¹ Vehicles per Hour from a traffic count on 28th and 29th July 2021.

² Vehicles per day from Waimakariri District Council data.

³ Mean operating speeds taken from NZTA Mega Maps.



Bradleys Road

6. **Table 2** sets out the transport characteristics of Bradleys Road with a typical view looking north to Mill Road shown in **Figure 3**.

Table 2: Bradleys Road Transport Characteristics

Key Feature or Characteristic	Comment
Road Classification	Local Road in the District Plan and Collector Road in the PODP.
Cross-Section Description	6.4m wide carriageway with wide grass berms.
Traffic Volumes	113 vph in the AM peak hour, 134 vph in the PM peak hour and 1,328 vpd ⁴ .
Speed Limit	Speed limit of 60km/h from Mill Road to a point 53m south of the intersection. 100km/h beyond that point to just north of Modena Place, where it reduces to 80km/h. Mean operating speed of 69km/h.
Pedestrian & Cycling Infrastructure	None provided at present, although this is on the route of a Council proposed off-road unsealed shared path.
Public Transport	This road is used as a school bus route.
Additional Notes	There are several culverts with headwalls in close proximity to the carriageway, plus drainage channels / stream and utility poles (westerb side of the road) along the corridor.



Figure 3: Bradleys Road Looking North to Mill Road

⁴ Vehicles per Hour from a traffic count on 28th and 29th July 2021. Vehicles per day from Waimakariri District Council data.



Mill Road

7. The transport details of Mill Road are set out in **Table 3** with a typical view looking west included in **Figure 4**.

Table 3: Mill Road Transport Details

Key Feature or Characteristic	Comment
Road Classification	Collector Road in the District Plan and PODP.
Cross-Section Description	7m wide carriageway with wide grass berms.
Traffic Volumes	146 vph in the AM peak hour, 148 vph in the PM peak hour and 1,612 vpd ⁵ .
Speed Limit	Speed limit of 60km/h within the vicinity of the site. Mean operating speed of 69km/h.
Pedestrian & Cycling Infrastructure	A 1.4m wide gravel path is provided on the southern side of this road between Bradleys Road and Whites Road. A 1.5m wide shared path on the southern side of Mill Road east of Whites Road to Jacksons Road, which links to Ōhoka School. An off-road unsealed shared path is proposed by Council on Mill Road from Bradleys Road to Threlkelds Road.
Public Transport	This road is used as a school bus route. A bus was observed stopping immediately west of the Whites Road intersection.
Additional Notes	Mill Road provides access to Ōhoka School on Jacksons Road. There are drainage channels / stream along the corridor, as well as utility poles (southern side of the road).



Figure 4: Mill Road Looking West

⁵ Vehicles per Hour from a traffic count on 28th and 29th July 2021. Vehicles per day from Waimakariri District Council data.



Tram Road

8. The transport details of Tram Road are set out in **Table 4** with a typical view looking east at the intersection with Bradleys Road included in **Figure 5**.

Table 4: Tram Road Transport Details

Key Feature or Characteristic	Comment
Road Classification	Arterial Road in the District Plan and the PODP.
Cross-Section Description	6.8m wide carriageway with 1.0m wide shoulders and wide grass berms both sides.
Traffic Volumes	727 vph in the AM peak hour, 733 vph in the PM peak hour and 7,790 vpd ⁶ .
Speed Limit	Speed limit of 100km/h, although reduced to 80km/h at the intersection with Bradleys Road. Mean operating speed of 95km/h immediately east of Whites Road.
Pedestrian & Cycling Infrastructure	None provided. Council are proposing an off-road unsealed shared path for approximately 450m from the Bradleys Road intersection to the east, which then alters to on-road cycle lanes or shoulders to the east.
Public Transport	This road is used as a school bus route and there is a bus stop located on the northern site of the road to the east of the Bradleys Road intersection.



Figure 5: Tram Road Looking East

⁶ From a traffic count west of Whites Road between 4 September 2025 to 10 September 2025.



Threlkelds Road

9. The transport details of Threlkelds Road are set out in **Table 5** with a typical view looking north east included in **Figure 6**.

Table 5: Threlkelds Road Transport Details

Key Feature or Characteristic	Comment
Road Classification	Collector Road in the District Plan and the PODP.
Cross-Section Description	7.2m wide carriageway and wide grass berms both sides.
Traffic Volumes	124 vph in the AM peak hour, 203 vph in the PM peak hour and 1,738 vpd ⁷ .
Speed Limit	Speed limit of 80km/h and mean operating speed of 76km/h.
Pedestrian & Cycling Infrastructure	None provided. Council is proposing on-road cycle lanes or shoulders linking to Flaxton Road.
Public Transport	Part of a school bus route (to Rangiora New Life School).



Figure 6: Threlkelds Road Looking North East

Flaxton Road / Skewbridge Road

10. The transport details of Flaxton Road are set out in **Table 6**.

⁷ Vehicles per Hour from a traffic count on 27th July 2023. Vehicles per day from Waimakariri District Council data.



Table 6: Flaxton Road Transport Details

Key Feature or Characteristic	Comment
Road Classification	Arterial Road in the District Plan and the PODP.
Cross-Section Description	6.8m wide carriageway with 1.0m wide shoulders and wide grass berms both sides.
Traffic Volumes	884 vph in the AM peak hour, 1,175 vph in the PM peak hour and 11,203 vpd ⁸ .
Speed Limit	Speed limit of 80km/h. Mean operating speed of 85km/h.
Pedestrian & Cycling Infrastructure	None provided. Council is proposing on-road cycle lanes or shoulders linking to Rangiora and Silverstream / Kaiapoi.
Public Transport	This road is used as a school bus route.

Intersections

Tram Road / Bradleys Road / McHughs Road

- This intersection is currently a four-arm priority-controlled cross-roads, with Tram Road having the priority. This intersection includes right turn bays and left turn deceleration lanes on Tram Road. The Bradleys Road and McHughs Road approaches are 'Stop' controlled. This is in an 80km/h speed limit area.



Figure 7: Tram Road / Bradleys Road / McHughs Road Intersection

⁸ From a traffic count west of Threlkelds Road between 4 September 2025 to 10 September 2025.



12. Traffic counts were undertaken at this intersection (on 28th and 29th July 2021 and as illustrated in **Appendix 3**) and these (along with the existing road geometry) have been used to create a SIDRA model of this intersection.
13. Observed delays on the through and right turn movements on the Bradleys Road and McHughes Road approaches have been used to assist in calibrating the operation of these minor approaches at the intersection. **Table 7** sets out the delay observed on site (in the peak hour), the initial modelled delay, the adjusted delay after validation and the adjustments made in the model. The changes made have been kept consistent between the AM and PM peak hour models.

Table 7: Tram Road / Bradleys Road Delay Validation

Approach	Time	Movement	Observed Average Delay (s)	Initial Model Average Delay (s)	Adjusted Model Average Delay (s)	Adjustments Made
Bradleys Road	AM Peak	Through	15	23	22	The Light Vehicle Gap Acceptance and Opposing Vehicle factors have both been altered to 0.95 for the through movements and right turns.
		Right	13	23	22	
	PM Peak	Through	13	29	26	
		Right	25	28	25	
McHughes Road	AM Peak	Through	10	27	21	The Light Vehicle Gap Acceptance and Opposing Vehicle factors have been altered to 0.95 for the through movements and 0.8 for the right turns.
		Right	15	37	23	
	PM Peak	Through	18	29	24	
		Right	18	38	23	

14. The above indicates that the delays modelled on the minor arms at the Tram Road / Bradleys Road intersection have been reduced to be closer to the observed delays. None of these have been reduced to below the observed delays, typically remaining well above the observed delays to provide a robust platform for assessing the effects of the proposed development.
15. The results of the existing intersection operation are included in **Appendix 4**, which indicate that this intersection is currently operating satisfactorily.
16. In addition to the above, the Waimakariri District Council Long Term Plan 2024 – 2034 (LTP 24) includes funding for safety improvements to Tram Road, which includes the Tram Road / Bradleys Road / McHughes Road intersection. It is understood that this is likely to result in a roundabout being constructed at this location, which is illustrated in **Figure 8**. The Draft Waimakariri District Council Annual Plan 2026 – 2027⁹ identifies the budget for constructing this upgrade is in 2027 / 2028.

⁹ Due to be adopted on 17th June 2026.

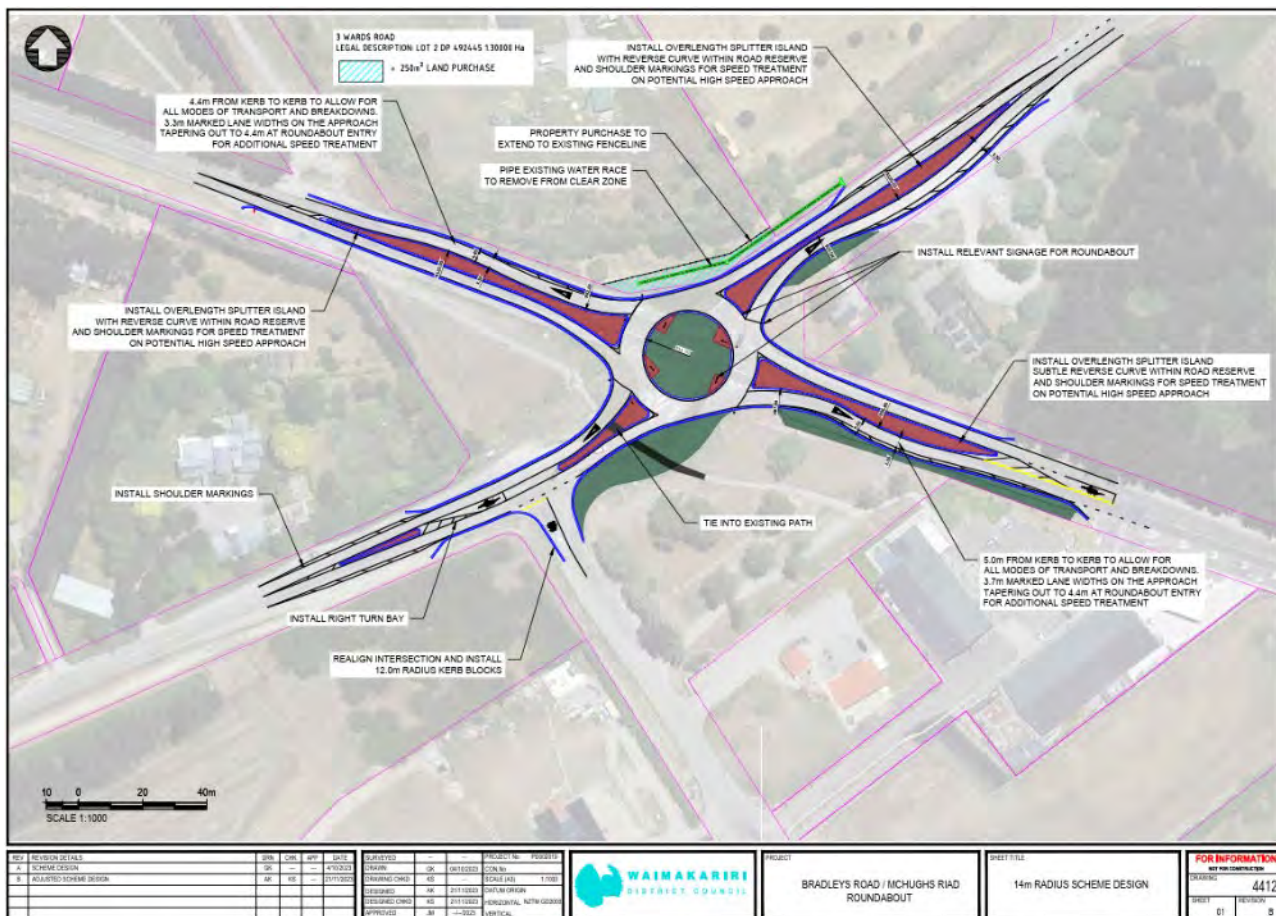


Figure 8: Council Proposed Tram Road / Bradleys Road / McHugh's Road Roundabout

17. The existing traffic volumes at the existing intersection layout have been input into a crash prediction model¹⁰. The output of that model predicts a five-year injury crash rate of 2.3 crashes, making this a *High Risk Intersection*¹¹. This reinforces the need for the intersection upgrade being planned and funded at this location.

Tram Road / Whites Road

18. This intersection is a four-arm priority-controlled cross-roads with Tram Road having the priority. This intersection includes right turn bays on Tram Road. The Whites Road approaches are 'Stop' controlled and this intersection is in a 100km/hr speed limit area.

¹⁰ The NZ Transport Agency *Crash Estimation Compendium – Second Edition. Section 8.4 fir high speed priority cross-roads.*

¹¹ The NZ Transport Agency *High Risk Intersections Guide* identifies greater than or equal to 1.6 Death or Serious Injury crashes per five years as being *High Risk*.



Figure 9: Tram Road / Bradleys Road / Whites Road Intersection

19. The counted traffic volumes along with the existing road geometry have been used to create a SIDRA model of this intersection. Observed delays on the through and right turn movements on the Whites Road approaches have been used to assist in calibrating the operation of these minor approaches at the intersection. **Table 8** sets out the delay observed on site (in the peak hours), the initial modelled delay, the adjusted delay after validation and the adjustments made in the model. The changes made have been kept consistent between the AM and PM peak hour models.
20. The above indicates that the delays modelled on the minor arms at the Tram Road / Whites Road intersection have been reduced to be closer to the observed delays. Generally, these remain above observed delays to provide a robust platform for assessing the effects of the proposed development. The exception to this is the through movement from the Whites Road south approach in the PM peak, although only one vehicle was observed undertaking this movement at this time, retaining a consistent approach to the AM peak was preferred.
21. The results of the existing intersection operation are included in **Appendix 5** which indicate that this intersection is currently operating satisfactorily. These use traffic counts on Tram Road (west of Whites Road) from 2025 to update the counts that were previously undertaken in 2021. That said, minimal changes were observed in the Tram Road traffic volumes between 2021 and 2025.
22. The existing traffic volumes at this intersection have also been input into a crash prediction model. The output of that model predicts a five-year injury crash rate of 1.7 crashes, making this a *High Risk Intersection*. This indicates that upgrades should already be under consideration by the Council to improve the safety of this intersection.



Table 8: Tram Road / Whites Road Delay Validation

Approach	Time	Movement	Observed Average Delay (s)	Initial Model Average Delay (s)	Adjusted Model Average Delay (s)	Adjustments Made
Whites Road North	AM Peak	Left	10	14	13	The Light Vehicle Gap Acceptance and Opposing Vehicle factors have both been altered to 0.9 for the left turn movements, 0.95 for the through movements and 0.7 for the right turns.
		Through	12	27	25	
		Right	18	48	43	
	PM Peak	Left	4	10	10	
		Through	26	32	29	
		Right	19	45	35	
Whites Road South	AM Peak	Left	5	11	10	The Light Vehicle Gap Acceptance and Opposing Vehicle factors have both been altered to 0.9 for the left turn movements, 0.95 for the through movements and 0.8 for the right turns.
		Through	21	24	21	
		Right	15	29	20	
	PM Peak	Left	8	14	13	
		Through	27	25	23	
		Right	13	30	20	

Mill Road / Bradleys Road

23. This intersection is a four-arm priority-controlled cross-roads with Mill Road having the priority. The Bradleys Road approaches are 'Stop' controlled, with the northern arm serving a limited rural residential catchment. This is in a 60km/hr speed limit area.



Figure 10: Mill Road / Bradleys Road Intersection

24. The counted traffic volumes presented in **Appendix 3** along with the existing road geometry have been used to create a SIDRA model of this intersection. The results of the existing intersection operation are included in **Appendix 6** and again indicate that this intersection is operating well at present.

Mill Road / Whites Road

25. This intersection is a three-arm priority-controlled cross-roads, with Mill Road having the priority. The Whites Road approach is 'Stop' controlled. This is in a 60km/hr speed limit area.



Figure 11: Mill Road / Whites Road Intersection



26. The counted traffic volumes presented in **Appendix 3** along with the existing road geometry have been used to create a SIDRA model of this intersection. The results of the existing intersection operation are included in **Appendix 7** and these indicate this intersection currently operates well.

Mill Road / Threlkelds Road

27. This intersection is a three-arm priority-controlled intersection with Mill Road having the priority. The Threlkelds Road approach is 'Stop' controlled and the intersection is approximately 1.5km east of the site. This is in a 60km/hr speed limit area.



Figure 12: Mill Road / Threlkelds Road Intersection

28. The counted traffic volumes presented in **Appendix 3** along with the existing road geometry have been used to create a SIDRA model of this intersection. The results of the existing intersection operation are included in **Appendix 8** and indicate that this intersection operates well.

Threlkelds Road / Flaxton Road

29. This intersection is also a three-arm priority-controlled intersection with Flaxton Road / Skewbridge Road having the priority and a right turn bay is provided to accommodate traffic turning into Threlkelds Road. The Threlkelds Road approach is 'Give-way' controlled. This is in an 80km/hr speed limit area and is approximately 3.3km north-east of the site.

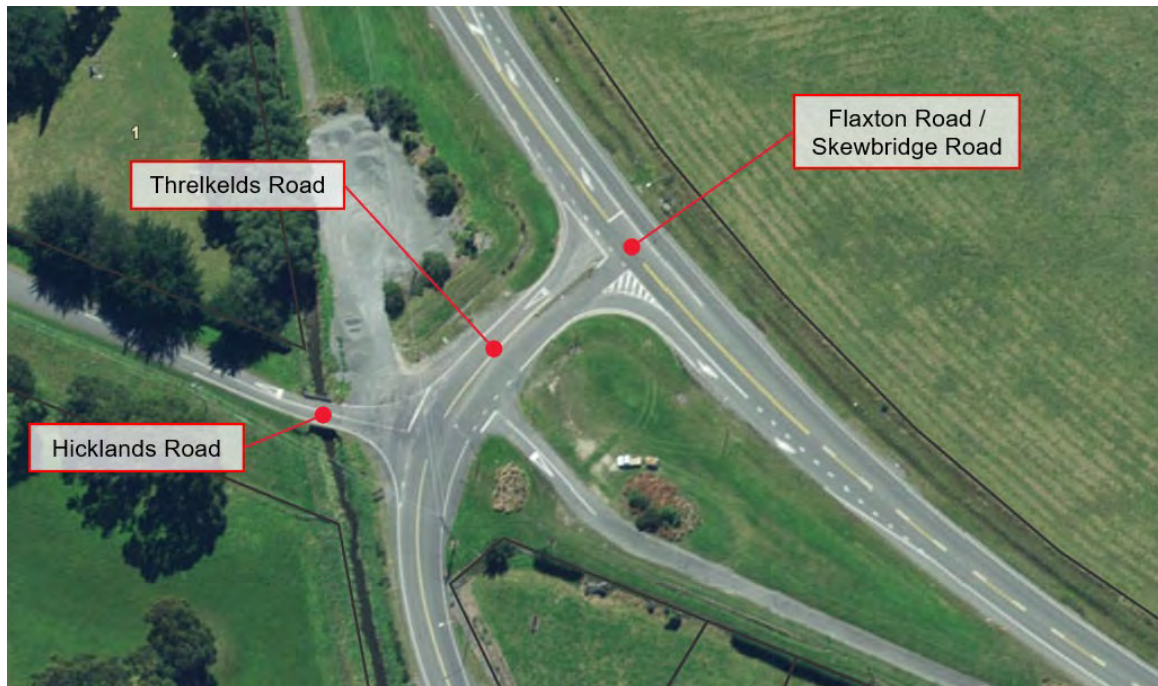


Figure 13: Flaxton Road / Threlkelds Road Intersection

30. The counted traffic volumes from 2023 when initially preparing this report along with the existing road geometry have been used to create a SIDRA model of this intersection. The delay of traffic turning right out of Threlkelds Road was observed to calibrate the intersection and the default parameters are considered to lead to a reasonable representation of the existing operation.
31. The 2025 traffic counts of Flaxton Road identified that traffic has notably increased on that corridor since the initial model we created and the updated 2025 traffic volumes have been used to assess the current day operation of the intersection. The results of the existing intersection operation are included in **Appendix 9** and indicate that this intersection operates satisfactorily.
32. The existing traffic volumes at this intersection have been input into a crash prediction model. The output of that model predicts a five-year injury crash rate of 0.7 crashes, making this a *Medium-High Risk Intersection* at present. This suggests that the Council should be considering the need for safety upgrades to accommodate traffic growth on this corridor, although they are arguably not required at present. The growth on this corridor is anticipated to arise primarily from zoned growth to the south-west of Rangiora, with Falxton Road / Skewbridge Road being an attractive route to / from SH1 and Christchurch.

Mill Road / Ōhoka Road

33. This intersection is also a three-arm priority-controlled intersection with Ōhoka Road / Skewbridge Road having the priority and a right turn bay is provided to accommodate traffic turning into Mill Road. The Mill Road approach is 'Stop' controlled. This is in an 80km/hr speed limit area and is approximately 5km east of the site.



Figure 14: Mill Road / Ōhoka Road Intersection

34. Counted traffic volumes from 2023 along with the existing road geometry have been used to create a SIDRA model of this intersection. The delay of traffic turning right out of Mill Road was observed to calibrate the intersection, with the observed, initial model and validated model delays set out as follows:
 - i. Observed delays: AM peak of 21 seconds and PM peak of 30 seconds;
 - ii. Initial model delays: AM peak of 22 seconds and PM peak of 37 seconds; and
 - iii. Calibrated model delays¹²: AM peak of 21 seconds and PM peak of 33 seconds.
35. The results of the 2023 intersection operation are included in **Appendix 10** and indicate that this intersection operated satisfactorily at that time. However, the volumes at this intersection have been updated to reflect the traffic growth along the Flaxton Road corridor¹³, with these results also included in **Appendix 10**. The 2025 model results indicate that the right turn out of Mill Road is at Level of Service (LoS) F in the weekday PM peak, which is considered over-capacity.

Tram Road Interchange

36. The State Highway 1 (SH1) / Tram Road interchange provides access to the State highway network, particularly for traffic heading to / from Christchurch and is approximately 8.9km east of the site. The interchange was initially upgraded in 2020 to signalise the on-ramp intersection with Tram Road.
37. Further upgrades were undertaken in early 2024 to signalise the off-ramp, which addressed safety concerns. The free left turn from the off-ramp to Tram Road was also altered to improve the merge arrangement. A cycle lane was installed to accommodate westbound cyclists on the southern side of the bridge. This facility crosses the free left turn from the off-ramp at 90-degrees and continues along Tram Road westwards.
38. The NZ Transport Agency *State Highway Investment Proposal 2024-34* identifies State Highway 1 at this location to be a Road of National Significance, with SH1 Belfast to Pegasus and the Woodend

¹² Alters the Gap Acceptance Factor for the right turn out of Mill Road to 0.98 in the AM and 0.95 in the PM.

¹³ Based on the 2025 counts near Threlkelds Road.



bypass projects proposed to support population growth by unlocking opportunities for housing development to the north of Christchurch¹⁴. This corridor encompasses the SH1 / Tram Road interchange.

39. A micro-simulation model of the Interchange has been created by Flow in 2025, with the modelling report included in **Appendix 11**. The report identifies that the interchange operates with some movements at LoS E during the weekday AM peak, which identifies these movements are approaching the capacity limit. These movements are the right turn from the SH1 off-ramp and the Tram Road left / through lane at the on-ramp (see .



Figure 15: SH1 / Tram Road Interchange

Crash History

40. The NZ Transport Agency Crash Analysis System (CAS) has been reviewed to identify crashes that have been reported within the area illustrated in **Figure 15**, which also illustrates the location and severity of these crashes. The review encompasses the five-year period 01 January 2021 to 01 January 2026 (the most recent full five-year period at the time of drafting this report). The crashes are summarised in **Table 9** and broken down by elements of the transport network.

¹⁴ Page 101 of the NZ Transport Agency State Highway Investment Proposal 2024-34.

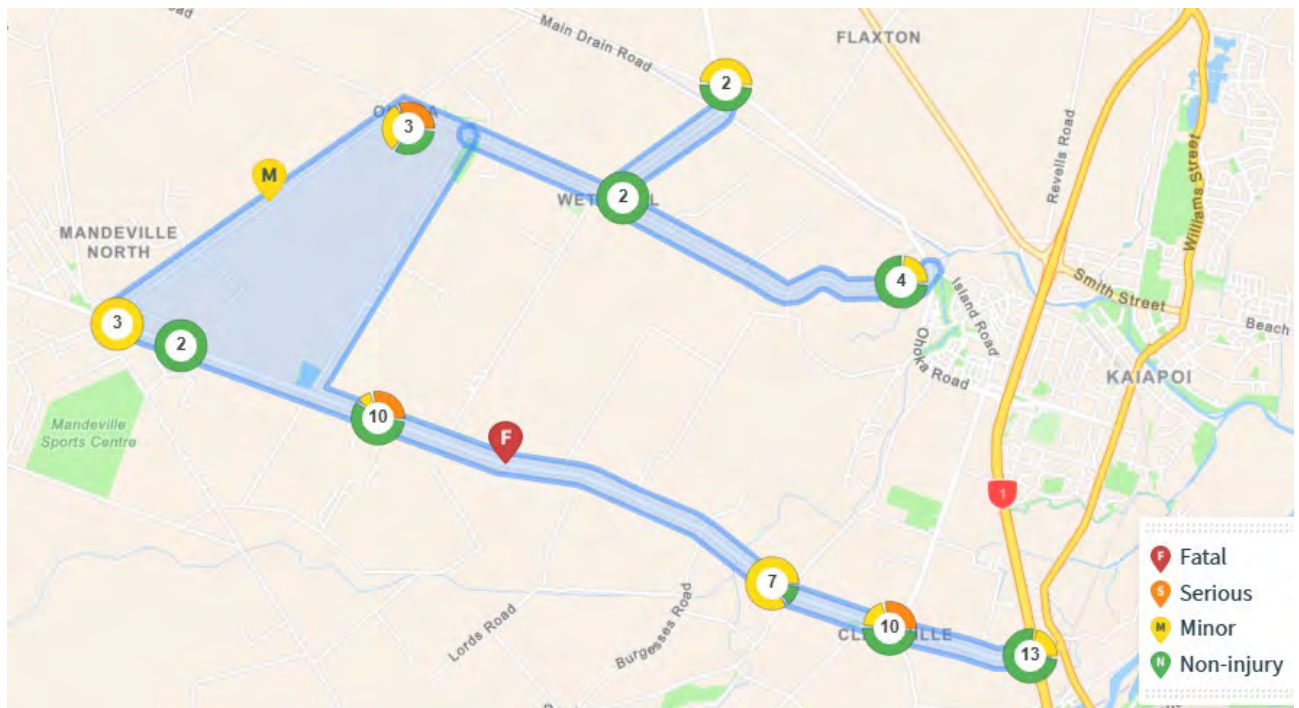


Figure 16: CAS Collision Diagram

41. Waimakariri District Council (the Council) commissioned a review of potential road safety upgrades for the Tram Road corridor in 2020¹⁵. This report identified a range of concerns and upgrades to address the safety record and it assumed 30% traffic growth along the corridor over a ten-year period. The proposed measures include:
 - i. Widening of shoulders to provide 1.5m to 2.0m of seal to enable a driver to ‘recover’ if a vehicle leaves the main carriageway. This would coincide with the draft Walking and Cycling Network Plan to provide a connection along Tram Road between SH1 and Oxford Road;
 - ii. Potential for a further 0.5m of seal widening to provide a wide centreline to provide further separation between road users;
 - iii. Upgraded street lighting at intersections;
 - iv. Installation of Rural Intersection Activated Warning Signs at key locations;
 - v. Undergrounding power poles at critical intersections; and
 - vi. Upgrading intersections, typically to provide separation between traffic turning left off Tram Road and through traffic.

42. We understand that the above proposals are funded in the LTP 24 and the Draft Annual Plan 2026 / 2027.

¹⁵ Tram Road Safety Improvements – Scheme Route Assessment report by WSP in August 2020.



Table 9: CAS Summary

Location	Crash Description	Comments
Tram Road / Bradleys Road Intersection	Minor crashes because of a failure to give-way pulling out of Bradleys Road north.	-
Bradleys Road (Mid-block)	Minor injury crash when a southbound driver hit stray cows on the road.	-
	Minor injury crash when a driver lost control with sun strike.	-
Mill Road / Bradleys Road Intersection	A Serious injury crash where a driver lost control travelling northbound through the intersection.	Alcohol was listed as a cause.
Mill Road / Whites Road Intersection	Non-injury crash where a driver has missed the intersection when travelling north on Whites Road.	Anti-social behaviour suspected as a cause.
Tram Road / Whites Road Intersection	Serious injury crash when a driver turning right into Whites Road north failed to give-way to oncoming traffic.	-
	A non-injury crash were a driver lost control when turning left into Whites Road (south).	-
Threlkelds Road / Flaxton Road Intersection	A minor injury plus a non-injury crash. The Minor injury crash involved a driver turning right into Threlkelds Road that failed to give-way. The non-injury crash was a northbound driver on Flaxton Road has lost control on surface flooding.	-
Threlkelds Road (Mid-block)	A non-injury crash where driver lost control.	Anti-social behaviour suspected as a cause.
Tram Road Corridor	29 crashes reported on the corridor between (but excluding) Bradleys Road and the SH1 Interchange (also excluding the Whites Road intersection). This includes one Fatal, four Serious, nine Minor and 15 Non-injury crashes. The fatal involved a vehicle that strayed across the centreline. Main causes of crashes were loss of control (three serious, three minor and two non-injury crashes) and a cluster of failing to give-way at the intersection with South Eyre Road, which has upgrades scheduled for 2028/2029 in the LTP 24 and draft Annual Plan.	
Tram Road Interchange	Six crashes on the interchange (plus three on the SH1 main line) including two Minor and four Non-injury crashes. The predominant crash types are failure to give-way / red light running at the on-ramp.	
Mill Road Corridor	Five crashes were reported, including one Minor injury and three Non-injury crashes. All crashes were loss of control.	

43. We also note that both the LTP 24 and Draft Annual Plan 2026 / 2027 include budgets for district wide transport improvements, which includes Flaxton Road and Skewbridge Road safety improvements.

Passenger Transport

44. Although there are no public bus services in the immediate vicinity of the site, there are two park and ride facilities within Kaiapoi (as well as further facilities in Rangiora). The northern Park and Ride site is on Charles Street and the southern Kaiapoi Park and Ride site is close to the Tram Road interchange with SH1. There are four buses into central Christchurch in the morning¹⁶ and five return services in the

¹⁶ Departing the southern Park and Ride at 6:45, 7:15, 7:45 and 8:15.



evening¹⁷. The trip to / from the City takes approximately 30 minutes and has no interim stops (after the Kaiapoi southern Park and Ride). The bus is able to use the 'T2' lanes on the State highway to avoid congestion.

45. The locations of the Kaiapoi Park and Ride facilities are illustrated in **Figure 16**. We note that the LTP 24 includes proposals for improvements to the Park and Ride sites within the District in 2027/2028 and 2028/2030.

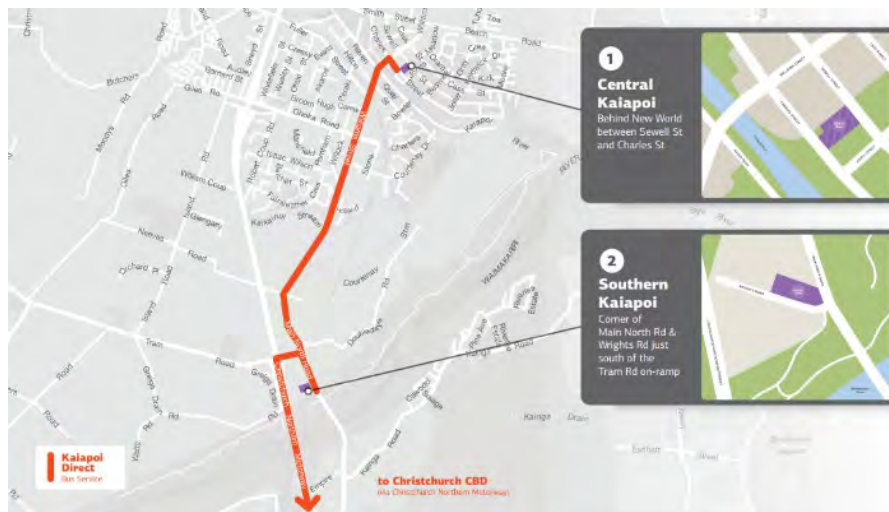


Figure 17: Kaiapoi Park & Ride

46. Two Ministry of Education funded school bus services operate in the immediate vicinity of the proposed Site, servicing Ōhoka School. The routes are shown below in **Figure 17**¹⁸.



Figure 18: Ōhoka Primary School Bus Services

47. The first route commences on Mill Road, heads west in the morning to collect students in the McRoberts Road / Patterson Road area, before turning south-east onto Tram Road, through Mandeville North and then back toward the school along Bradleys Road.

¹⁷ Departing the City Centre at 15:50, 16:20, 16:50, 17:20 and 17:50.

¹⁸ Sourced from <https://www.education.govt.nz/school/property-and-transport/transport/school-bus-route-maps/>



48. The second route commences in the Wilson's Siding area to the east of Ōhoka, travels south via Raddens Road, then through the southern part of Mandeville via Edmunds Road and Baileys Road before heading towards the school along Whites Road.
49. Ōhoka township is also linked to Kaiapoi High School via an anti-clockwise loop service (Mandeville (Eyreton 2)) that operates along Mill Road, Dawsons Road, Tram Road and Island Road. The AM route path is shown below in **Figure 18**¹⁹. The proposed development would be zoned for Kaiapoi High School.

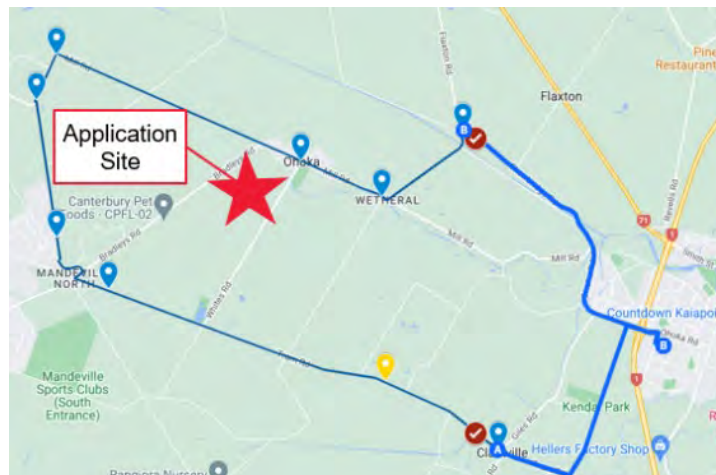


Figure 19: Mandeville (Eyreton 2) School Bus Route

Cycle Network

50. The Council has a recommended *Walking and Cycling Network Plan* that includes the area surrounding the Site. The road frontages of the Site (Bradleys Road, Whites Road and Mill Road) all include Grade 2 routes, which are described as 'unsealed path' (less than 2.5m wide). This network is illustrated in **Figure 19** and illustrates that the Site is well located within this planned network. This network also links the site to Ōhoka School on Jacksons Road, via Mill Road.
51. This network is largely yet to be established (noting that the segment on McHugh's Road from No. 10 Road to Tram Road has been completed), although the LTP 24 includes funding for implementation of the Walking and Cycling Strategy in 2024 to 2027.

¹⁹ Sourced from <https://www.kaiapoi.school.nz/bus-routes/#mandeville>

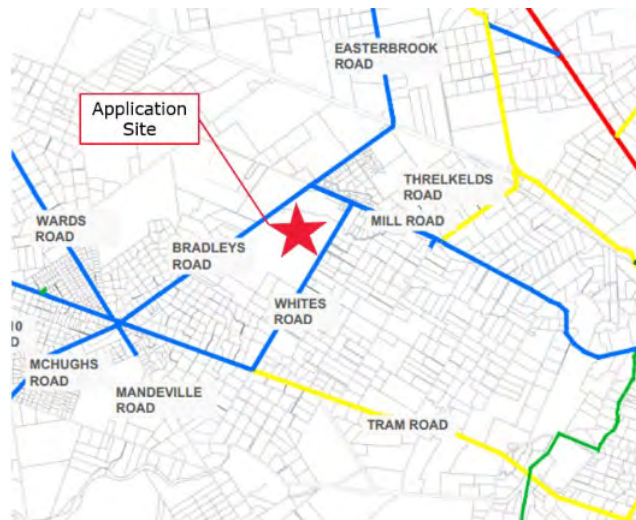


Figure 20: WDC Proposed Walking & Cycling Network

52. In addition to the above, Main Drain Road links from Bradleys Road and Threlkelds Road eastwards to Kaiapoi via Skewbank Lane and following the Cust and Kaiapoi Rivers. Although Main Drain Road and Skewbank Lane are roads, these are very lightly trafficked and cyclists could be safely accommodated and use these roads already. The exception to this is the required crossing of the Skewbridge Road bridge, although the LTP 24 has funding for a replacement in 2024/2025 to 2027/2028. A safe cycle crossing of that bridge could be included in the proposed design to continue this existing recreational route. This route is illustrated in **Figure 20**.

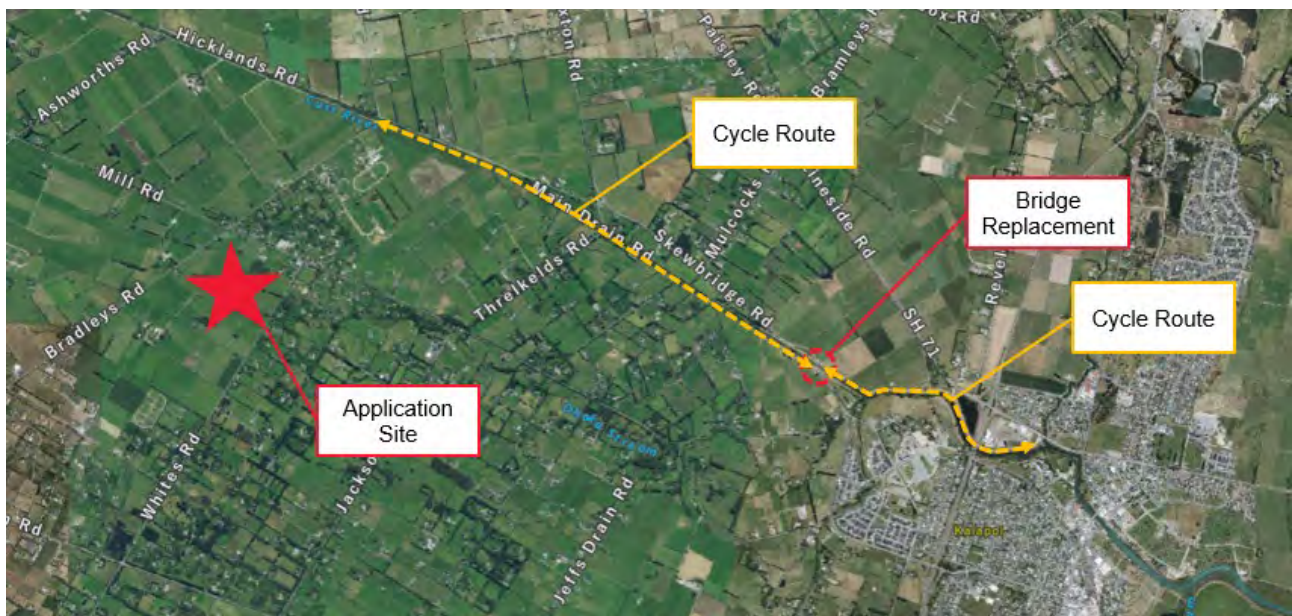


Figure 21: Main Drain Road Cycle Route

The Proposal

53. It is proposed to subdivide the site to facilitate 875 residential lots, approximately 250 retirement dwellings, a commercial area and polo grounds. The Site will take access to Whites Road (four intersections), Bradleys Road (two intersections) and Mill Road (one intersection).



54. The overall subdivision layout is illustrated in **Figure 21** and included in more detail on the plans in **Appendix 2**. The following sets out the transport details of the proposal.



Figure 22: Proposed Subdivision Layout

55. It is proposed to include conditions of consent that applies District Plan zone rules to the land within the site (rather than the underlying Rural zone rules). This is discussed further in the Assessment of Environmental Effects.

Site Layout

56. The following discusses the transport elements of the proposed subdivision. The layout of the retirement village, polo grounds and commercial centre are yet to be determined and will be subject to ongoing resource consent requirements.

Access Intersections

Concept Intersection Layouts

57. Vehicle access to the Site will be from Bradleys Road (two intersections); Mill Road (one intersection) and Whites Road (four intersections). Concept intersection arrangements for each of these roads are illustrated on the plans in **Appendix 11** to confirm that suitable access can be achieved to the Site. That said, these arrangements will need to undergo detailed design and subsequent approvals (such as Road Safety Audits) through the Engineering Approvals process.
58. The proposed intersections are priority controlled, with the new internal roads being the minor arms. The Whites Road and Bradleys Road intersections include right turn bays to provide a safe waiting



facility for vehicles turning into the Site. The concept arrangements are based on Whites Road and Bradleys Road being reduced to 80km/h speed limits, from the existing 100km/h limit on these roads. The exception to this is the northern Whites Road access intersection, which assumes a 60km/h speed as that is the proposed speed limit at that location.

59. The Mill Road access intersection has been designed as a flush median with a break to provide access to the site and to the existing properties on the northern side of the road. This intersection is in a 60km/h speed limit area and the design is consistent with that.

Intersection Separation

60. The separation of the proposed intersections (centre to centre) to each other and existing intersections is approximately as follows:
- i. Bradleys Road: 485m to 517m;
 - ii. Whites Road: 246m to 430m south of Ōhoka Stream and 262m north of Ōhoka Stream; and
 - iii. Mill Road: At least 232m.

Accesses

61. Most property access will be from within the Site and not to the existing road network. This is to reduce the number of vehicle crossings to these roads. The exception to this is development of the residential Lots at 531 Mill Road and access to the Polo Grounds.
62. There will be a range of accesses to Mill Road, including individual property access for nine dwellings. There will also be accessways serving four to nine dwellings, depending on the accessway.
63. The Polo Grounds will have access from within the subdivision, but also to Bradleys Road. The design of this access will be subject to ongoing resource consent processes, although it is anticipated it would be constructed as an NZ Transport Agency 'Diagram E' arrangement.

New Road Standards

64. The proposed internal road cross-sections are illustrated in **Appendix 2** and summarised in **Table 10**. These roads are all proposed to be *Local Roads*. The District Plan Local Road cross-section requirements are also presented at the bottom of this table.



Table 10: Proposed Internal Cross-Sections

	Corridor Width	Carriageway Width	Parking Lanes	Footpaths
Type A 22m Corridor with Kerb & Channel	22m	9m (2 x 4.5m lanes)	2 x 2.5m lanes (intermittent with street trees)	1 x 1.8m footpath plus 1 x 2.5m shared path
Type A.1 22m Corridor with Kerb & Channel one side plus Swale	22m	9m (2 x 4.5m lanes)	1 x 2.5m lanes (intermittent with street trees)	1 x 1.8m footpath plus 1 x 2.5m shared path
Type B 22m Corridor with Swale	22m	9m (2 x 4.5m lanes)	-	1 x 1.8m footpath plus 1 x 2.5m shared path
Type C 18m Corridor with Kerb & Channel	18m	7m (2 x 3.5m lanes)	2 x 2.5m lanes (intermittent with street trees)	2 x 1.8m footpath
Type D 18m Corridor with Swale	18m	7m (2 x 3.5m lanes)	-	2 x 1.8m footpath
Type E 16m Corridor with Kerb & Channel	16m	6m (2 x 3m lanes)	-	1 x 1.8m footpath
District Plan Requirements – Rural	20m	6m (2 x 3m lanes)	-	-
District Plan Requirements – Residential	16m	6m (2 x 3m lanes)	1 x 2.5m lane	1 x 1.5m footpath

65. **Figure 22** illustrates where each of the above road Types applies within the Site. The design speed and speed limit of the internal road network is 50km/h.
66. Three cul-de-sacs are proposed, which are on the western side of the site. These have turning heads with 10m radius turning heads.

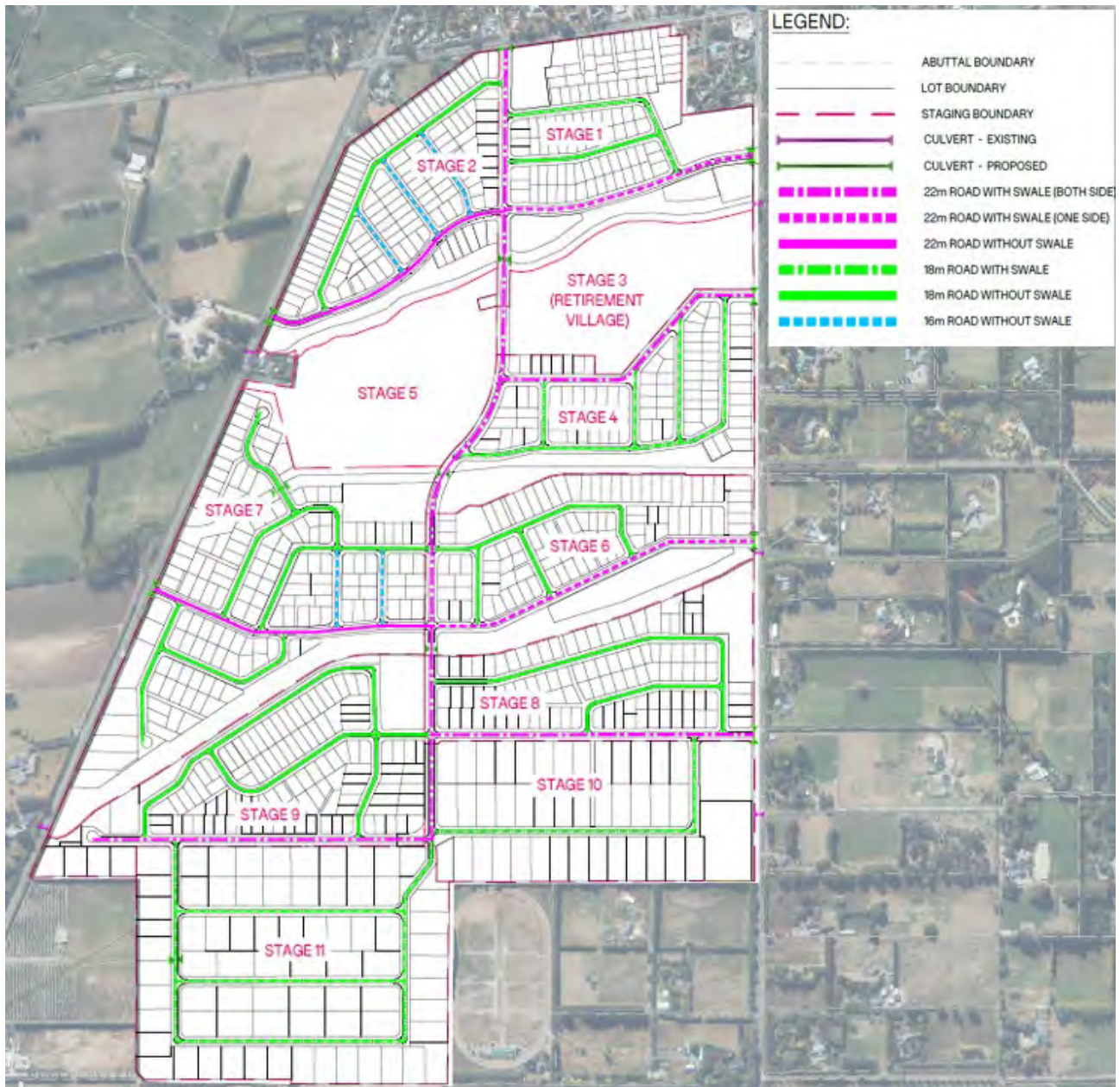


Figure 23: Internal Road Hierarchy

Internal Intersections

67. The internal intersections will be priority controlled, with the priority being given to the routes highlighted in **Figure 23**. The traffic volumes and speeds are sufficiently low that right turn bays will not be required. The internal intersections are typically separated by at least 40m (centre to centre), although the typical spacing is in the range of 60m to 80m.



Figure 24: Internal Intersection Priorities

68. Corner splays of 5m have been provided at the intersections.

Right of Ways / Accessways

69. The proposal includes a range of Right of Ways / Accessways and rear accesses. These are summarised in **Table 11**, along with the District Plan minimum accessway formation width requirements.



Table 11: Right of Ways and Rear Accesses

Lot No	Dwellings Served	Formed Width	Legal Width
169 / 183 / 309 / 450 / 719 / 860 / 872 28 & 29 / 118 & 119 / 252 & 253 / 362 & 363 / 293 & 394 / 374 & 375 / 506 & 507	1 – 2	3m minimum	3.6m minimum
574 to 576 / 711 to 713	3	3m minimum, although 5.5m is proposed for the initial 6m length (from the road boundary) to accommodate passing.	Minimum 5m, although 6m near the road boundary to accommodate passing.
23 to 26 / 495 to 499	4	3m minimum, although 5.5m is proposed for the initial 6m length (from the road boundary) to accommodate passing.	7m
682 to 686	5	3m minimum, although 5.5m is proposed for the initial 6m length (from the road boundary) to accommodate passing.	7m at the boundary, reducing to 3.6m where the number of dwellings reduces.
17 to 22 / 334 to 341 / 328 to 335 / 415 to 419 & 422 / 536 to 542	6 to 8	3m minimum, although 5.5m is proposed for the initial 6m length (from the road boundary) to accommodate passing. Additional 5.5m passing bays provided every 50m (if required).	7m
1 to 5 plus 14 to 16 plus 40	9	6m, with turning provided at the closed end.	12m
District Plan Residential Zones	0 to 2	3m	4m
District Plan Residential Zones	3 to 6	5m	7m
District Plan Rural Zones	Any	4m	10m

70. As set out in paragraphs 61 to 63, property access will generally be from the internal subdivision roads, except for access to the Polo Grounds and Lots on Mill Road.

Internal Pedestrian & Cycle Links

71. The site will include a walking and cycling network including a shared path along the primary north / south and east / west roads (22m corridor roads). There are also ancillary shared paths that link across the streams to reduce the distance between internal neighbourhoods, as well as the commercial centre.
72. Most roads will have either two footpaths or a footpath and a shared path, as illustrated on the cross-sections in **Appendix 2**. The exception is the 16m corridor roads, which will have a footpath on one side.

Passenger Transport

73. The higher order internal roads (Types A and B) will be able to accommodate bus services should these be provided through the site in the future by ECan. There is also a requirement to provide a bus shelter in the commercial area, should bus services be established through the site.



Boundary Treatments

Pedestrian & Cycle Links

74. The Council's proposed walking and cycling network in Ōhoka (as illustrated in **Figure 19**) includes proposed Grade 2 paths along the Site boundaries. Development of the Site will establish these networks along the Site boundary with at least 2.5m wide unsealed routes.
75. The above shared path will be within a landscape buffer along the Site boundaries of Bradleys Road and Whites Road. The existing path will be upgraded along the Mill Road corridor, including the existing bridges.



Figure 25: Proposed Shared Path Provision

Speed Limits & Threshold Treatments

76. Development of the Site and introduction of site access intersections make it beneficial to reduce the speed limits of the roads in the immediate vicinity of the Site. This is also consistent with the anticipated outcomes of the Waimakariri Speed Management Plan, which suggests that rural sealed roads be reduced to 80km/h (from the current 100km/h).
77. The proposed speed limits are illustrated in **Figure 25**. That said, changing speed limits requires public consultation and cannot be guaranteed. As such, there is potential that the site access intersection layouts for Whites Road and Bradleys Road will need to be updated at Engineering Approval stage to provide longer merge and diverge tapers.

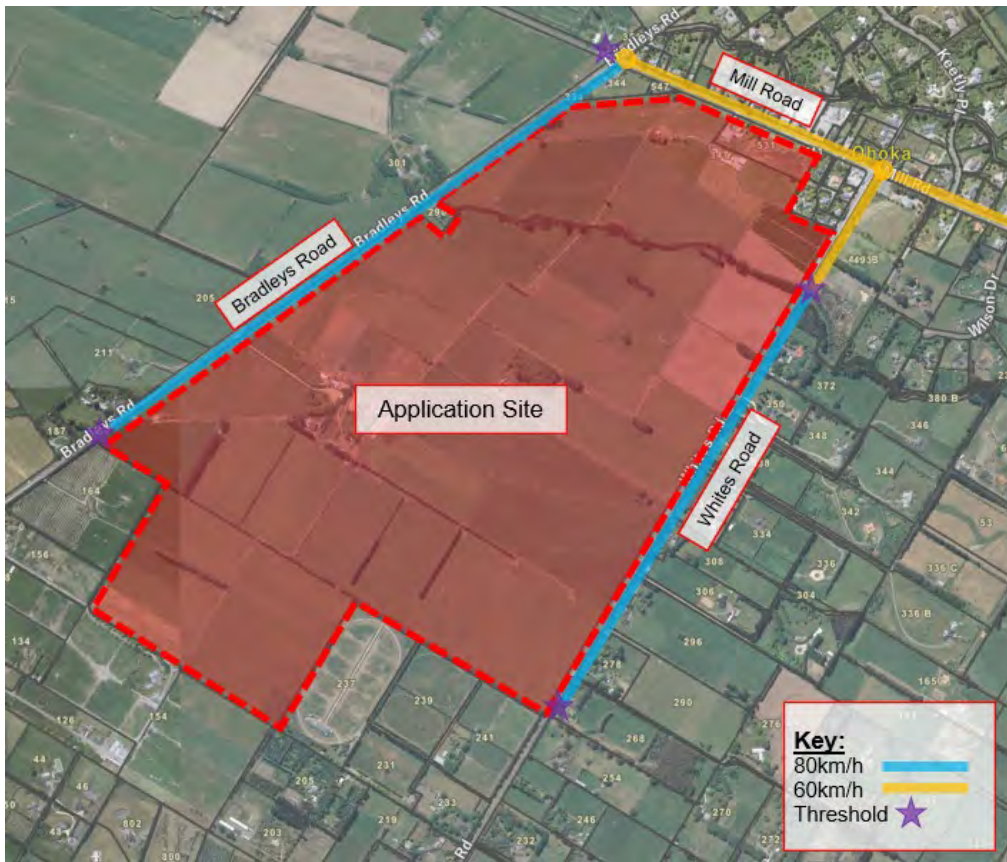


Figure 26: Proposed Speed Limit Alterations

78. The details of the threshold treatments would need to be agreed with the Council, although **Figure 26** illustrates a typical example of the layout of these facilities.

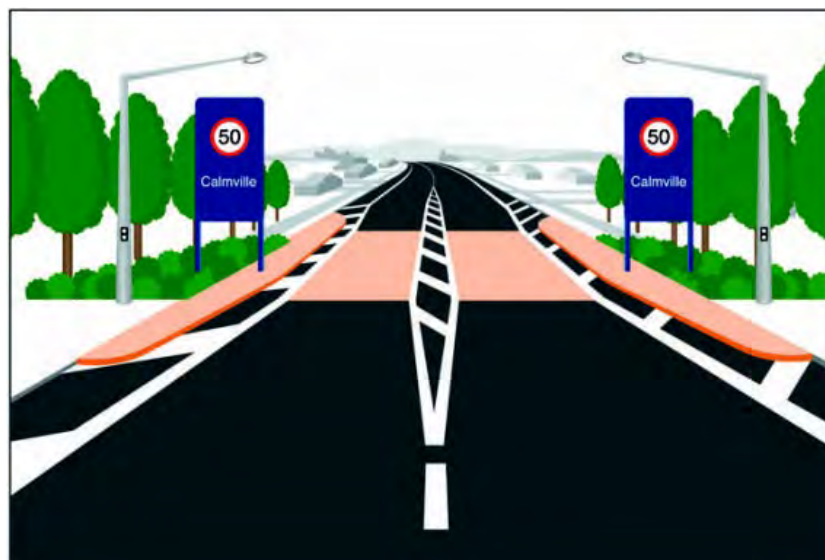


Figure 27: Example Threshold Treatment (Source – Road Traffic Standard 15)

79. The threshold treatments will be provided as part of the development of the Site, although the alterations to the speed limits is ultimately a matter for the Council as the Road Controlling Authority to address and implement.



Pedestrian Crossing Points

80. Two pedestrian crossing points are proposed on Whites Road to link the commercial area (within the Site) to the Ōhoka Domain on the eastern side of the road. The indicative location of these crossings are illustrated in **Figure 27**, although these will be confirmed with Council through subsequent design stages.

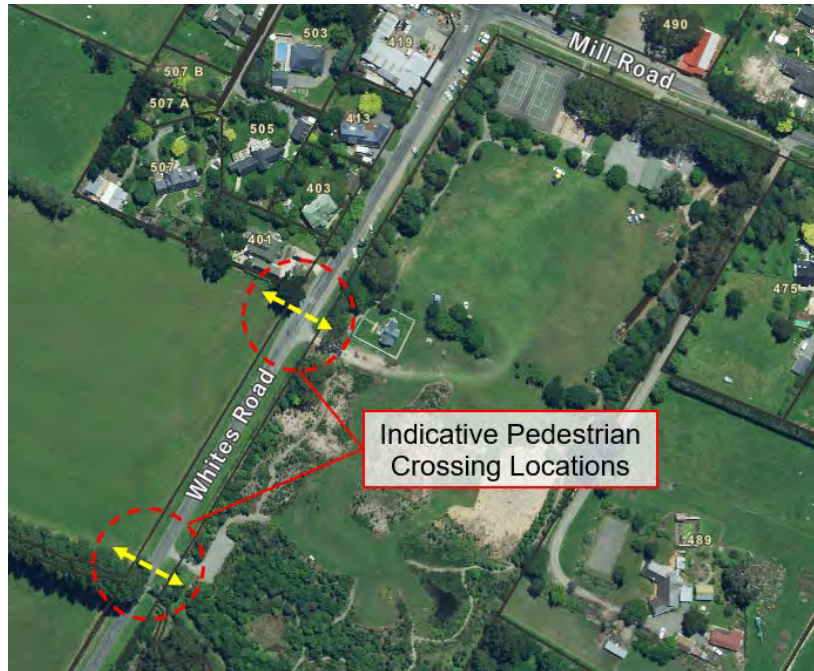


Figure 28: Indicative Whites Road Pedestrian Crossing Points

Traffic Generation & Assignment

Traffic Generation

Residential Traffic Generation

81. The residential traffic generation is based on trip rates surveyed from 202 dwellings in West Melton²⁰. These are considered to be a good proxy for the proposed development given West Melton had, at the time, similar facilities and similar distances to major centres of employment as the proposed development upon completion. The adopted trip rates are the 85th percentile peak hour rates and average daily rates for weekdays on a per dwelling basis. The traffic generation rates are set out in **Table 13**.

²⁰ This was a weeklong survey in June 2022, with the accesses at Brinsworth Avenue, Rotherham Drive and Ross Drive counted.



Table 12: Adopted Residential Traffic Generation Rates (per dwelling)

Time Period	Arrivals	Departures	Total
AM Peak Hour	0.13	0.52	0.65
PM Peak Hour	0.47	0.27	0.74
Daily	2.93	2.93	5.85

82. Applying the above traffic generation rates to the proposed 875 dwellings leads to the traffic generation set out in **Table 14** (some rounding errors occur in this table).

Table 13: Predicted Residential Traffic Generation

Time Period	Arrivals	Departures	Total
AM Peak Hour	114	456	569
PM Peak Hour	408	240	648
Daily	2,562	2,562	5,119

Retirement Village Generation

83. The traffic generation of the retirement village is based on traffic generation data in the Institute of Transportation Engineers *Trip Generation* guide books²¹. The traffic generation rates for *Senior Adult Housing – Detached* is set out in **Table 15**. The traffic generation based on the proposed 250 retirement village dwellings is set out in **Table 16** (some rounding errors occur in both tables).

Table 14: Adopted Retirement Village Traffic Generation Rates (per dwelling)

Time Period	Arrivals	Departures	Total
AM Peak Hour	0.08	0.14	0.22
PM Peak Hour	0.16	0.11	0.27
Daily	1.86	1.86	3.71

Table 15: Predicted Retirement Village Traffic Generation

Time Period	Arrivals	Departures	Total
AM Peak Hour	19	36	55
PM Peak Hour	41	26	68
Daily	464	464	928

²¹ 8th Edition.



84. The peak hour traffic generation rates set out in **Table 13** and **Table 15** suggest that a standard dwelling has the equivalent traffic generation of up to 2.74 retirement dwellings²². As such, there is an ability to trade retirement dwellings for standard dwellings by applying this ratio when considering the timing of infrastructure upgrades (see **Table 21**).

Commercial Area & Polo Grounds Traffic Generation

85. Whilst a commercial area is proposed within the Site, this is primarily intended to accommodate the day-to-day shopping needs of the residents of the Site and the existing Ōhoka area. This is not intended to draw traffic to the site from the wider area (and if it did so this would be at off-peak times), so no dedicated traffic generation has been assumed from this area.
86. Similarly, the traffic generation associated with the Polo grounds is anticipated to be minimal. This is particularly the case on a day-to-day basis and during the network peak hours. As such, no traffic generation has been assumed for the Polo grounds in this assessment.
87. The Polo grounds and development at the commercial centre will both likely require assessment of transport effects at the time of seeking resource consent. Further assessment of these activities and their access arrangements will be provided at that time²³ as these consents do not form part of this Application.

Total Traffic Generation

88. Based on the traffic generation estimates set out above, the traffic generation from the Site is summarised in **Table 17** (some rounding errors occur in this table).

Table 16: Rezoning Traffic Generation

Time Period	Arrivals	Departures	Total
AM Peak Hour	133	491	624
PM Peak Hour	450	266	715
Daily	3,026	3,026	6,046

Traffic Distribution

89. The traffic distribution is based on traffic model data from the Christchurch Traffic Model. The distribution of traffic is summarised in **Table 18**.

²² 0.74 vehicles per dwelling divided by 0.27 vehicles per retirement unit = 2.74 retirement units per dwelling.

²³ Noting that Rule 30.8.2 of the District Plan requires an assessment of effects where more than 20 car parking spaces are proposed and there is a wide range of transport related assessment matters. TRAN-R20 of the PODP sets out traffic generation thresholds and assessment requirements.



Table 17: Site Distribution

	AM Peak	PM Peak
Tram Road West	12%	11%
Tram Road East (to SH1 south)	45%	32%
Bradleys Road North	3%	3%
Skewbridge Road to Kaiapoi	12%	24%
Flaxton Road to Rangiora	28%	30%
Total	100%	100%

90. These distributions are illustrated on Diagrams 3 & 4 in **Appendix 3**, with the predicted development traffic assigned to the network on Diagrams 5 & 6. The predicted traffic generated by the Site plus the background traffic volumes (i.e. the existing traffic) is illustrated on Diagrams 7 & 8 in **Appendix 3**.

District Plan Compliance

91. The proposed development has been reviewed against the transport rules of the Operative District Plan, as set out in **Appendix 13** and the Partially Operative District Plan (**Appendix 14**). The identified non-compliances from the Partially Operative District Plan are summarised in **Table 19**, as we understand this has greater weighting than the Operative District Plan.



Table 18: Partially Operative District Plan Transport Non-Compliances

Rule	Nature of Non-Compliance
TRAN-R3 Formation of a new road	<p><u>Low Volume Local Roads (16m Corridor)</u></p> <p>Three roads are proposed in this category and the following non-compliances are noted:</p> <ul style="list-style-type: none"> • Two of these roads are longer than the maximum permitted 150m (Road 2-4 is 176m and Road 2-5 is 170m); • Footpaths of 1.8m width are required both sides of the road, whereas a footpath is proposed on one side only; and • The carriageway is required to be 6.5m wide (a 4m traffic lane plus a 2.5m wide parking lane). The proposed carriageway is 6m, with two traffic lanes of 3m proposed. <p><u>Local Road (18m corridor)</u></p> <p>The remaining roads are proposed to be local roads and the following is noted:</p> <ul style="list-style-type: none"> • Footpaths of 1.8m width are required both sides of the road. Cross-sections C & D have footpaths both sides, but cross-sections A & B have a footpath one side and a shared path the other; and • The carriageway is required to be 8m wide (4m traffic lane plus 2m parking lanes both sides). The carriageway for cross-section A is 9m with further space for 2.5m wide indented car parking both sides. The carriageway for cross-section B is 9m with no indented car parking. The carriageway for cross-section C is 7m with further space for 2.5m wide indented car parking both sides. The carriageway for cross-section D is 7m with no indented car parking.
TRAN-R4 Formation of a new road intersection	<p>The following intersection separations are proposed:</p> <ul style="list-style-type: none"> • Bradleys Road - 485m to 517m (800m required); and • Whites Road - 246m to 430m south of Ōhoka Stream and 262m north of Ōhoka Stream (800m required). • Internal intersections typically separated by at least 40m (centre to centre), although the typical spacing is in the range of 60m to 80m. 75m is required.
TRAN-R5 Formation of a new vehicle crossing	<ul style="list-style-type: none"> • Some accesses will be located within the intersection (opposite the minor arm) and therefore within the intersection. • The accesses to Lots 574 to 576 & 711 to 713 have a maximum formed width of 5.5m, compared to a maximum of 4.5m permitted by the District Plan. • A minimum sight distance of 90m is required from all vehicle accesses, which will not be achieved.
TRAN-R6 Formation of a new vehicle accessway	<p>Accesses in the Rural Zone are required to have a minimum legal width of 10m and minimum formed width of 4m, with passing bays provided. The accesses will not generally meet this standard.</p>
TRAN-R6 Formation of a new vehicle accessway	<p>The accesses to six or more sites will not be designed as roads.</p>
TRAN-R7 Formation of a new vehicle crossing on a sealed road where the posted speed limit is 60km/hr or above	<p>The proposal includes accesses to Mill Road, which is in a 60km/h zone. This requires accesses to be designed to comply with Diagram C (for four Lots or less) and Diagram D (for five to nine Lots). The proposed accesses will not comply with these requirements.</p>



Assessment of Effects

92. The transport related key matters for assessment associated with the proposed development are:
- i. **Parking, Loading & Internal Network:** Whether the District Plan rules adequately provide for the layout and provision of car parking and loading at the Site. In addition, the acceptability of the proposed Right of Way arrangements, road standards and intersection arrangements within the Site;
 - ii. **Access Arrangements:** Whether the accesses are anticipated to operate safely and efficiently and whether the District Plan rules adequately provide for internal access; and
 - iii. **Wider Network Effects:** Whether the proposed development can be satisfactorily accommodated by the surrounding road network. Whether the Site will be accessible by a range of transport modes.
93. The above matters are assessed in turn in the following sections.

Parking, Loading & Internal Arrangements

Parking & Loading

94. The District Plan rules regarding parking and loading will be adopted for this Site. This is sufficient to confirm that parking and loading will be satisfactorily provided for in a functional and practical manner.
95. On-street car parking will be accommodated in parking bays on the Type A and Type C roads and on-street for the Type B roads. It is anticipated that this will meet the requirement for providing one space per three dwellings²⁴, although this will be confirmed through the Detailed Design stage for the subdivision. No adverse effects are anticipated from parking being within the carriageway for the Type B roads, as traffic volumes and on-street parking demands will be reasonably low.
96. The Type D roads do not provide on-street car parking and these roads are within the Large Lot Residential area of the development. It is anticipated that visitor car parking demands would be accommodated within these Lots and there would be no significant demand for on-street car parking.
97. The Type E roads are for short segments that serve between eight and nineteen Lots. The proposed arrangement with a 6m carriageway that is shared for traffic and parking is consistent with the requirements of NZS4404-2010²⁵, which permits parking to be in the movement lane for roads serving up to 100 dwellings. As such, this arrangement is considered acceptable.

Accessways & Right of Ways

98. The dimensions of the proposed accessways and Right of Ways are set out in **Table 11** and it has been identified that these do not typically meet the requirements of the District Plan. However, the layout of these facilities has been designed to meet the requirements of NZ Standard 4404-2010. We consider that compliance with this national level standard will provide an acceptable and practical arrangement.
99. A non-compliance has also been identified in that a Right of Ways serve seven dwellings, whereas the District Plan requires access to greater than six dwelling to be via a road. The layout of these Lots is again consistent with the requirements of NZ Standard 4404 and is therefore considered acceptable. The transport arrangements of these accesses will adequately accommodate the traffic generated by

²⁴ As required by the Waimakariri Engineering Code of Practice – Part 8.

²⁵ NZ Standard for Land Development and Subdivision Infrastructure.



seven dwellings, noting there will be passing points at the road boundary and mid-way along the accesses. Provision for refuse collection at the road boundary will be addressed during the Detailed Design stage.

100. Covenants will be proposed at the ends of the Right of Ways to ensure that the District Plan pedestrian visibility splays are accommodated at the road boundary.

Vehicle Crossings

101. Vehicle crossings to individual properties are to be determined at the time of seeking Resource Consent for those Lots (if required). Compliant vehicle crossings are typically able to be provided, although there are likely to be some instances where these may not comply with the requirements of the PODP.

Vehicle Crossing Separation to Intersections

102. One anticipated non-compliance is that some vehicle crossing may be too close to intersections. An example of this is Lot 208 in **Figure 29**. This type of non-compliance is common where residential subdivisions have 'T' intersections and the effects are considered acceptable give the low traffic volumes on the road network and generated by that Lot.

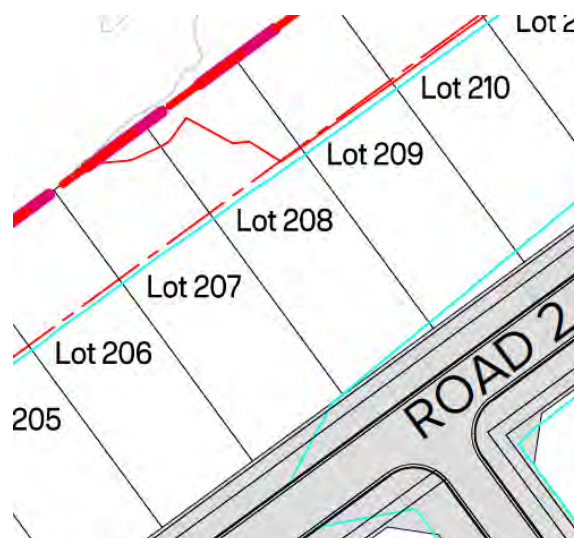


Figure 29: Lot 208 Non-Compliant Vehicle Crossing Location

Vehicle Crossing Sight Distances

103. Some Lots are anticipated to have non-compliant sight distances to the adjoining road network when assessed against the PODP. The District Plan does not require sight distance for accesses to Local Roads and sufficient sight distance is available for accesses to Mill Road (a Collector Road) to comply.
104. The PODP requires 90m sight distance for accesses to Local Roads and 125m to Collector Roads. The sight distance to Mill Road is anticipated to be available for those vehicle crossings, although not all internal vehicle crossings are anticipated to have the 90m sight distance. There are some bends in the internal roads that would limit the available sight distance, although these would also lower vehicle speeds around the bends.
105. **Figure 30** illustrates an example of this sight distance non-compliance, where Lot 53 is located close to a bend and therefore does not achieve 90m sight distance.



Figure 30: Lot 53 Non-Compliant Sight Distance

106. The bend in the road has a centre line radius of 15.4m and Austroads²⁶ formula suggest traffic would take this at a speed of 26km/h. This requires a Stopping Sight Distance of 17m, which can be provided and therefore acceptable sight distance for the speed environment can be achieved. This is also a common issue for residential subdivisions and the effects are considered acceptable.

Mill Road Vehicle Crossing Arrangements

107. The PODP requires some of the vehicle crossings to Mill Road (where they serve greater than four dwellings) to be consistent with Diagram D, as illustrated in **Figure 31**. Access to properties with one to three dwellings are required to have 9m radii, which again is not proposed.

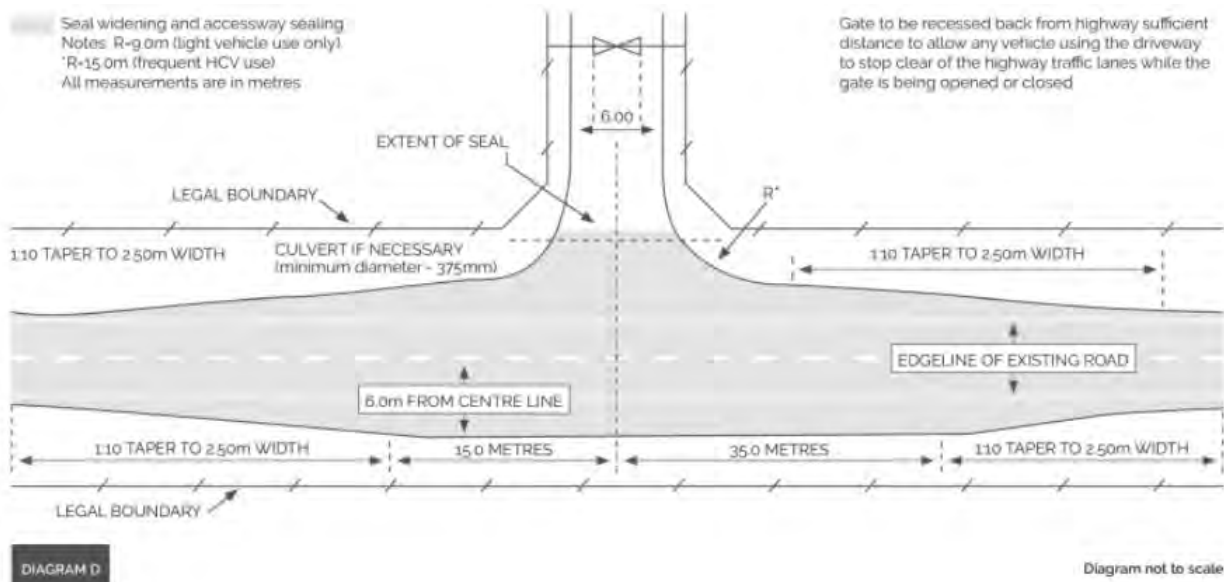


Figure 31: District Plan Diagram D Access

²⁶ Austroads Guide to Road Design Part 3 - Geometric Design.



108. The vehicle crossings are not proposed to include the radii as this would promote high speed enter and exit to Mill Road. We consider this to be inappropriate given these vehicles will be crossing the Mill Road shared path and drivers should be encouraged to travel slowly.
109. The accesses to four or more dwellings are not proposed to include the widening set out in Diagram D. Our understanding of Diagram D is that it is specifically to accommodate milk-tankers and the NZ Transport Agency (who originated the diagram) no longer recommend it for general access use. The widening opposite the access is to enable a driver to pull to the left and wait, if they are turning right into the site. We consider the low traffic volumes on Mill Road do not warrant this arrangement and the effects of occasionally slowing through traffic will be acceptable.
110. We also consider that the widening on the same side of the road as the access promotes high speed across the shared path that are inappropriate.
111. Overall, we consider the effects of non-compliant access arrangements to Mill Road to be acceptable.

Internal Roading – Cross-Sections & Cul-de-sacs

Footpath Provision

112. The PODP requires roads A and B to have footpaths on both sides of the road, whereas these roads have a footpath one side and a shared path the other. There is no loss of function for pedestrians with this arrangement, so it is considered acceptable.
113. The Type E road also has a footpath on one side only, whereas the PODP requires a footpath on both sides. NZS4404:2010 permits no footpath where the road serves 20 dwellings or less, as is the case of these roads. The provision of a footpath one side will require some residents to cross the road when walking to / from their property, but this would be for a short-length as the connecting roads have footpaths both sides. The effect of this non-compliance is considered acceptable.

Road Length

114. The PODP permits the Type E roads to be up to 150m long, whereas Road 2-4 and Road 2-5 are 176m and 170m long respectively. The proposed arrangement is consistent with that of NZS4404:2010 and therefore considered acceptable. The short additional road length is not anticipated to lead to any identifiable adverse effects.

Cul-de-sac Heads

115. The cul-de-sac heads are proposed to have a radius of 10m, which is greater than the 9.5m minimum radius required by NZ Standard 4404 and is therefore considered acceptable.

Internal Road – Intersections

Intersection Spacing

116. The internal intersections are proposed to be priority-controlled, with the anticipated priorities set out in **Figure 23**. The District Plan requires intersections to have a minimum spacing of 125m, whereas a minimum spacing of 40m (centre to centre) is generally proposed. The proposed spacing is consistent with the requirements of the Christchurch Infrastructure Design Standards, and although these are not applicable to the Waimakariri District they do indicate that a lesser spacing is acceptable in other urban environments.



117. The typical spacing of intersections is in the range of 60m to 80m, which is similar to the intersection spacing at Pegasus, Ravenswood and Silverstream (all in Waimakariri). This indicates that the proposed intersection spacing is consistent with other recently established residential areas in Waimakariri and is therefore considered acceptable.
118. There is an intersection within the Stage 10 that has approximately 15m separation between the minor arms on opposite sides of the road, effectively forming a staggered cross-roads (see **Figure 32**). Although this arrangement is not ideal, the low traffic volumes anticipated on this part of the road network make it acceptable. The primary concern would typically be that traffic turning right into the two minor arms (the eastern and western approaches) would conflict and these conflicts are considered to be infrequent. Furthermore, the proposed road boundaries enable the approaches to be altered at Detailed Design stage to better align the minors arms.

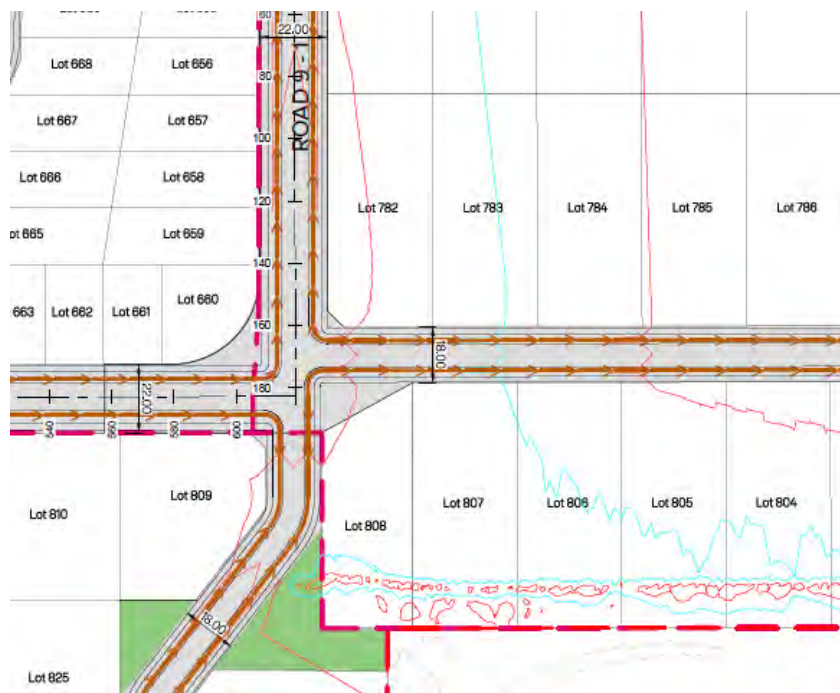


Figure 32: Staggered Cross-Roads

Intersection Splays & Radii

119. The road boundaries at the internal intersections include splays of 5m to assist with accommodating the future radii. The District Plan requires a splay of 6m to be provided, but the proposed arrangement is consistent with the 4m minimum requirement of NZ Standard 4404 and is therefore considered acceptable.
120. In addition, the internal intersections have been illustrated as having radii of at least 7.5m, which is greater than the 4m to 6m requirements of NZ Standard 4404. That said, these remain less than the 10m radius required by the Waimakariri Engineering Code of Practice. The proposed radii will assist in keeping vehicle speeds low within the subdivision while still accommodating vehicle manoeuvring.
121. The radii at the intersections between the Type A and Type B roads will be 10m, as these are higher-order roads in the context of the internal subdivision network.



Intersection Sight Distance

122. Although sight distances at each intersection have not been calculated, the road arrangements are typically able to provide the 97m sight distance required by Austroads. The exceptions to this are the intersections summarised in **Table 20** along with the available sight distance and speed environment (based on the immediately surrounding road geometry). This indicates that all but the Road 7-2 / Road 7-4 intersection have sight distances appropriate to the speed environment of their locations.

Table 19: Intersections with Non-Compliant Sight Distances

Intersection	Non-Compliant Sight Distance	Speed Environment	Safe Intersection Sight Distance for Speed Environment ²⁷
Road 1-1 / Road 1-2 Stage 1	67m to the north	27km/h, as limited by bend to the north.	46m
Road 4-2 / Road 4-3 Stage 4	63m to the north-west	25km/h, as limited by bend to the north-west.	41m
Road 4-2 / Road 4-6 Stage 4	79m to the north-east	25km/h, as limited by bend to the north-east.	41m
Road 4-3 / Road 4-6 Stage 4	59m to the east	Approximately 30km/h, as limited by bend to the east.	52m
Road 7-2 / Road 7-4 Stage 7	89m to the south-east	50km/h	97m
Road 7-3 / Road 7-4 Stage 7	94m to the west and 76m to the east.	35km/h to the west and 27km/hr to the east, as both limited by bends.	63m to the west and 45m to the east.
Road 7-4 / Road 7-5 Stage 7	80m to the west	25km/h, as limited by bend to the west.	57m
Road 8-1 / Road 8-2 Stage 8	88m to the north	26km/h, as limited by bend to the north.	44m
Road 9-2 / Road 9-3 Stage 9	75m to the west	33km/h, as limited by bend to the west.	58m

123. The Road 7-2 / Road 7-4 intersection has a sight distance to the south-east of 89m, whereas the required sight distance is 97m. The stopping sight distance for vehicles approaching the intersection on the major road (Road 7-2) is 55m, which means that the driver on the major road will be able to react and stop in time to avoid a crash. Whilst this is not ideal, it is a tolerable outcome.

Internal Walking & Cycling Network

124. The internal roads typically either provide footpaths on both sides or a combination of a footpath plus a shared path. The proposed shared path alignment follows the 22m corridor roads that form the primary internal road network. This provides good walking and cycling links through the site, with the traffic volumes generally being low enough to accommodate cycling on-road for more confident cyclists.

²⁷ Based on the requirements of Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections.



125. Additional links and recreation links are provided to reduce the walking length of blocks for Stages 6, 8 and 10. In addition, recreation paths are proposed through the stormwater management areas and reserves.

Access Arrangements

Site Accesses

Intersection Capacity

126. Concept intersection arrangements have been included in **Appendix 12**, which indicate the Whites Road and Bradleys Road intersections will provide right turn bays and the Mill Road intersection will incorporate a flush median to accommodate access to the properties opposite the Site. Further engineering details will be provided at Detailed Design stage, along with appropriate Road Safety Audits.
127. The sight distance requirements of Austroads will be met with confirmation at Detailed Design stage. Although the design and sight distances have been assessed based on the recommended 80km/h speed limit, we consider that satisfactory arrangements can be constructed for a 100km/h speed environment by increasing the taper lengths of the turning facilities. Ultimately, this is a matter to be resolved at Detailed Design stage.
128. The traffic diagrams in **Appendix 3** simplify the access arrangements and therefore over-state the volumes at the Bradleys Road and Whites Road accesses by representing only one access to these roads. In reality, there will be two accesses to Bradleys Road and four to Whites Road. Intersection models of these locations have been developed and the results are included in **Appendix 15**. These results indicate that the site access intersection will be able to operate satisfactorily.
129. **Appendix 15** also includes results for the Mill Road site access and again confirms this is predicted to operate satisfactorily.
130. **Appendix 16** includes results from a sensitivity test of the access operation which doubles the traffic volumes to / from the site and passing the access. The purpose of these is to confirm that the additional traffic that could be generated locally by the commercial area can be accommodated by these accesses, which it can.

Intersection Spacing

131. The District Plan requires the Site access intersections with Bradleys Road and Whites Road to be separated by 800m, as these are within a 100km/h speed limit area (although this would reduce to 550m if the speed limit were reduced to 80km/h). The access intersection to Mill Road is required to be separated to adjacent intersections by 160m, as this is within a 60km/hr speed limit area. The proposed intersection spacings are as follows:
- i. Bradleys Road: Separation of between 485m and 517m;
 - ii. Whites Road: Separation ranges between 246m and 430m; and
 - iii. Mill Road: Separation of at least 232m.
132. Regarding intersection separation, Austroads *Guide to Road Design Part 4a (Unsignalised and Signalised Intersections)* states:



Desirably, intersections should be separated by at least five seconds of travel time at the design speed to provide time for drivers to process information relating to traffic, the road layout and traffic signs.²⁸

133. A travel time of five seconds equates to the following distances:
- i. 83m for a speed of 60km/hr;
 - ii. 111m for a speed of 80km/hr; and
 - iii. 139m for a speed of 100km/hr.
134. Based on the above, the proposed intersection spacings are acceptable.

Wider Effects

135. The assessment of wider effects on the transport network has been undertaken on the basis of the existing traffic volumes on the road network. We have been advised that the basis of assessment is the reasonably foreseeable future environment, which includes the future environment as it might be modified by the utilisation of rights to carry out a permitted activity under the District Plan or by implementation of a resource consent. However, it excludes developments that would require future consent applications to be realised (such as subdivision consents). As such, traffic growth has not typically been accounted for in the following assessment.

Tram Road / Bradleys Road / McHughs Road Intersection

136. As previously identified, the Council are planning to upgrade this intersection to a roundabout with budgets included in 2027 / 2028 financial year.
137. Traffic capacity modelling has been undertaken of this intersection for a range of scenarios, with the results included in **Appendix 17**. These results are summarised as follows:
- i. **Existing Arrangement – 2025 plus Development:** No approach is predicted to operate worse than LoS²⁹ D and the worst individual movement is predicted to be at LoS D; and
 - ii. **Proposed Roundabout – 2025 plus Development Volumes:** No approach is predicted to operate worse than LoS B and the worst individual movement is also predicted to be at LoS B.
138. The operation of some movements at LoS D is acceptable during peak hour periods and it is not uncommon on busy parts of the rural road network. Overall, we consider the operation of the existing intersection to be acceptable with the development traffic added to the network. It is anticipated this intersection will imminently be upgraded to a roundabout, which is predicted to operate satisfactorily and has capacity to accommodate traffic growth on this corridor (should that occur).
139. The Crash Prediction model for this existing intersection has been updated to account for the addition of the development generated traffic, which indicates a predicted 2.4 crashes in the five-year period. This is an increase on the existing 2.3 crashes over a five-year period, although the increase is small (i.e. one additional crash every 72 years based on the calculated values) and the effects of the proposed development at this intersection are considered acceptable. Furthermore, we anticipate a marked safety improvement once this intersection is upgraded to a roundabout.

²⁸ Refer to B.2.2 – Proximity to Other Intersections

²⁹ LoS refers to Level of Service based on average delay. Level of Service A is considered excellent operation with little delay, Level of Service E is at or approaching capacity and Level of Service F is over-capacity.



Tram Road / Whites Road Intersection

140. The operation of the Tram Road / Whites Road intersection with the proposed development has been assessed in SIDRA. The results of this modelling are included in **Appendix 18** and these indicate no approach is predicted to operate worse than LoS C and the worst movement is predicted to be at LoS E.
141. We consider that the operation of some movements at LoS E is tolerable in peak hour periods and it is not uncommon on busy parts of the rural road network. We also consider that LoS E represents a movement that is approaching, or at capacity rather than being over-capacity. Overall, we consider the operation of the intersection with the development traffic added to the network is acceptable.
142. The Crash Prediction model for this existing intersection has been updated to include the development traffic and the resultant five-year injury crash prediction is 2.0 crashes during five-years.
143. The above with development result represents an increase in the existing injury crash prediction of 1.7 crashes over a five-year period. As set out earlier, this intersection is currently a *High Risk* Intersection with background traffic growth and development exacerbating this.
144. An option to improve road safety at this intersection includes sightline improvements along with improved signage and installation of Rural Intersection Activated Warning Signs (RIAWS). The RIAWS include detector loops on the side roads that trigger a temporary lower speed limit on the main road, with the signage being similar to that illustrated in **Figure 33**.



Figure 33: Example RIAWS

145. The NZ Transport Agency Crash Compendium (which the crash calculations are based on) suggests that installing RIAWS would reduce the crash risk by 35%. As such, the with development crash risk would be reduced to 1.3 crashes during five-years. On this basis the intersection would be a *Medium High Risk intersection*, which is not ideal but it is an improvement on the existing situation.
146. Overall, the operation of this intersection is not currently ideal and the existing traffic capacity and safety issues will be exacerbated by traffic generated by the proposed development. These effects are considered tolerable and the safety effects could be mitigated through the following measures, which would need to be undertaken by Council as the Road controlling Authority:
 - i. Visibility splay / sightline improvements;
 - ii. Improved signage on the approaches; and
 - iii. Rural Intersection Activated Warning Signs (RIAWS).



Mill Road / Bradleys Road Intersection

147. The operation of the Mill Road / Bradleys Road intersection has been assessed in the SIDRA model of the existing intersection, with the full development traffic on the network. The model results are included in **Appendix 19** and indicate that this intersection will continue to operate satisfactorily with the Site generated traffic on the network.
148. No safety assessment has been undertaken of this intersection because it is within a lower speed environment (compared to those on Tram Road) and the volumes through the intersection are also reasonably low. As such, it is anticipated that this intersection will operate safely.

Mill Road / Whites Road Intersection

149. The operation of the Mill Road / Whites Road intersection has been assessed in the SIDRA model of the existing intersection, again with the full development traffic on the network. The full results are contained in **Appendix 20**, which indicate that this intersection is predicted to operate satisfactorily with the proposed development generated traffic added to the network. A sensitivity test has been included of this intersection with the traffic volume doubled, given the proximity to the commercial area. These results (also included in **Appendix 20**) indicate that the intersection can satisfactorily accommodate the predicted sensitivity test traffic volumes.
150. As with the Mill Road / Bradleys Road intersection, no safety assessment is considered necessary at this location.

Flaxton Road / Threlkelds Road Intersection

151. Intersection modelling of the Flaxton Road / Threlkelds Road intersection with the full development added to the network is included in **Appendix 21**. This indicates that the intersection will operate within acceptable limits during the AM peak hour, the Threlkelds Road approach is notably over-capacity during the PM peak. In particular, the Threlkelds Road approach is predicted to be at LoS F with average delays of 247 seconds (4 minutes and 7 seconds). It is unlikely that this level of delay would occur at this location, as drivers would seek other routes to turn right onto Skewbridge Road. That said, the operation of the Mill Road / Ōhoka Road intersection is currently over-capacity (see paragraph 35), suggesting there are no other routes that could be reasonably expected to satisfactorily accommodate this traffic. Given this, the effects of the full development at this intersection are significant without mitigation occurring.
152. A series of models have been run to determine the scale of development that can be accommodated by this intersection. These models identified that a development of 310 dwellings plus 150 retirement dwellings would lead to LoS F for the right turn out of Threlkelds Road, with a delay of 51 seconds (see **Appendix 22**). The Threshold between LoS E and LoS F is 50 seconds, so we consider that this level of development is the point at which an upgrade is required. That said, we would not consider the effects of this operation to be significant, given it is only marginally worse than acceptable operation.
153. The Crash Prediction model for this existing intersection has also been updated. The resultant predictions for the existing intersection with the full development traffic added to the network is 1.1 injury crashes per five-year period, which remains within the *Medium-High* risk band.
154. We have considered the likely upgrade requirement for this intersection to accommodate the predicted traffic volumes. The most likely upgrade would be a roundabout and an indicative layout has been modelled in SDIRA (using the 2025 plus full development generated traffic volumes) with the results included in **Appendix 23**. This indicates that a roundabout could satisfactorily accommodate the



predicted traffic volumes. There is also ample scope in this arrangement to accommodate traffic growth on the Flaxton Road corridor associated with potential development to the west of Rangiora.

155. This modelling is based on the concept arrangement also included in **Appendix 23** and in **Figure 34**, which we understand can be accommodated within Council owned land.



Figure 34: Flaxton Rd / Threlkelds Rd – Concept Roundabout Arrangement

156. Overall, the proposed development can be satisfactorily accommodated at this intersection, subject to the timely delivery of a roundabout at this location.

Mill Road / Threlkelds Road Intersection

157. The operation of the Mill Road / Threlkelds Road intersection has been assessed in the SIDRA model of the existing intersection. Results are also provided (in **Appendix 24**) for a realigned intersection arrangement, as alterations to priorities are anticipated to promote the use of an upgraded Flaxton Road / Threlkelds Road intersection. This would encourage drivers from Ōhoka to access the Flaxton Road / Skewbridge Road corridor at this location, rather than using the Ōhoka Road / Mill Road intersection that is already over-capacity. A concept arrangement of the reconfigured Mill Road / Threlkelds Road intersection is included in **Appendix 24** and in **Figure 35**.



Figure 35: Mill Rd / Threlkelds Rd – Concept Arrangement

158. The model results contained in **Appendix 24** indicate that this intersection is predicted to operate satisfactorily with the development generated traffic added to the network in both its current and realigned arrangements. As with the Mill Road / Bradleys Road intersection, no safety assessment is considered necessary at this location.

Tram Road Interchange

159. Traffic modelling has been undertaken on the Tram Road interchange, as included in **Appendix 11**. That modelling provides results of a range of scenarios, including with traffic growth and with the development plus traffic growth. The growth accounted for includes development that was anticipated to proceed through the preparation of the Joint Witness Statement for the Proposed District Plan Stream 12C & D Transport Conferencing. This growth includes:

- i. Traffic associated with the 200 residential dwellings proposed at 144/168 Main North Road (primarily as through traffic on Main North Road);
- ii. Tram Road growth based on (see also **Figure 36**):
 - (a) 14 dwellings accommodated by the Swannanoa Large Lot Residential rezoning;
 - (b) 24 dwellings accommodated by the Ōhoka Large Lot Residential rezoning;
 - (c) 95 dwellings accommodated by the Mandeville Large Lot Residential rezoning.



Figure 36: Surrounding Rezoning Sites

160. The Tram Road growth in particular has not been included elsewhere in this report as we are not aware of consents being sought for the subdivision of that land. However, the inclusion of growth at the Tram Road interchange provides a robust assessment of the interchange although this exceeds the requirements of a subdivision consent (see paragraph 135).
161. The model also assumes that the T2 left turn lane to the SH1 on-ramp will be adhered to in the future. A high proportion of existing traffic using that facility is single occupant vehicles that should currently be using the through / left turn lane at the traffic signals.
162. The modelling results indicates that the background traffic can be accommodated by the existing interchange. The inclusion of the development traffic leads to the right turn from the off-ramp to the over-bridge being over-capacity (LoS F) in the AM peak hour only, although queues are not predicted to extend back to the SH1 main line. Whilst not ideal, we consider this operation is tolerable at peak times.

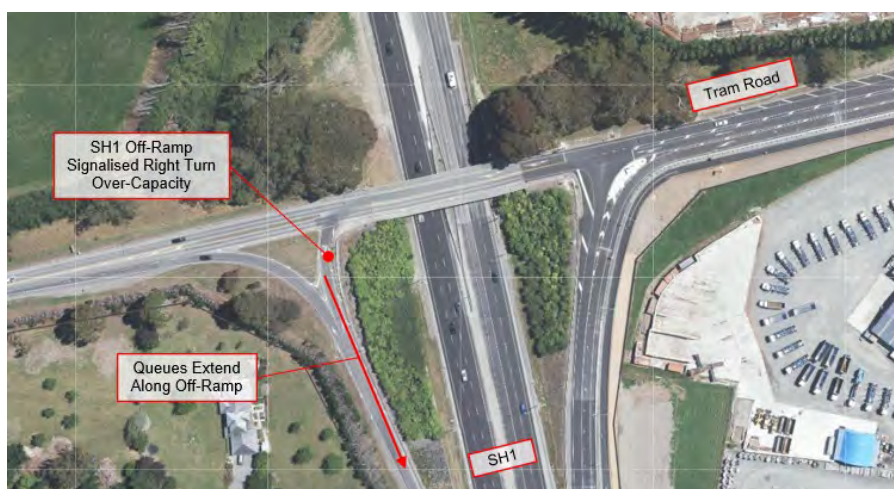


Figure 37: SH1 / Tram Road Interchange – AM Peak Capacity Effects

163. A mitigation option has been run, that alters the traffic signal phasing to match that discussed during the Transport Conferencing for the Proposed District Plan Streams 12C & D. Under this scenario the right



turn movement from the off ramp and the westbound through movement from Tram Road East are permitted to operate within the same signal phase (each movement “running on” to a red signal at the downstream intersection). The tests of this scenario indicate that the traffic generated by the proposed development plus traffic growth can be satisfactorily accommodated by the Tram Road interchange without requiring physical works.

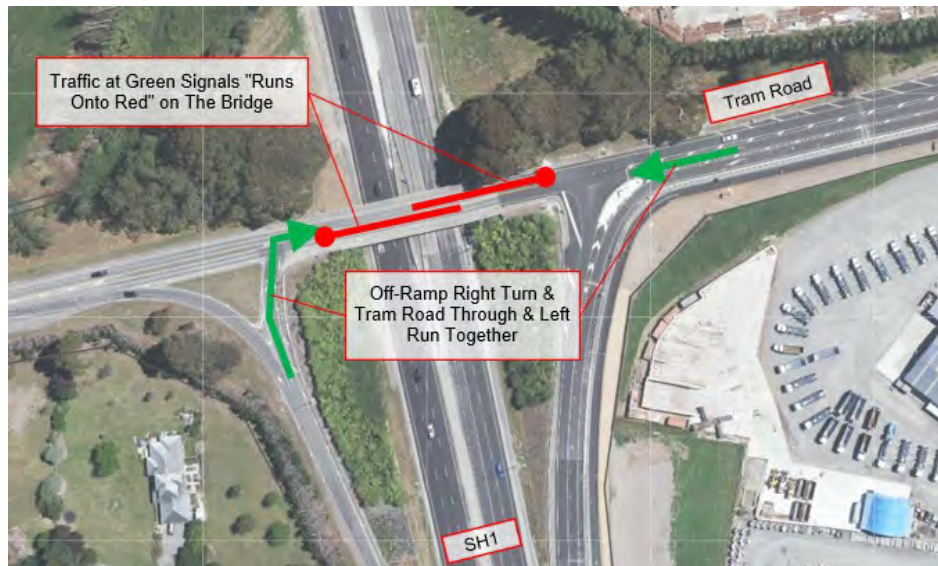


Figure 38: SH1 / Tram Road Interchange – Signal Phasing Mitigation

164. Wider discussions with the NZ Transport Agency indicated that it only plans for upgrades where there is confirmed growth and that it is responsive to growth. If subdivision of this Site were approved, it would feed into that confirmed growth and presumably into the NZ Transport Agency’s funding plans. The NZ Transport Agency also indicated that it has a priority focus on the Roads of National Significance compared to other parts of the network, which encompasses this interchange (as part of SH1).

Link Road Safety

Tram Road Corridor

165. As identified in paragraph 41, Council has already undertaken a review of safety along the Tram Road corridor and is planning on upgrades. It is expected that development contributions levied in respect of the proposal would assist in bringing forward those upgrades and mitigate the identified safety concerns.

166. As noted in paragraph 41, the Tram Road corridor study was undertaken on the assumption there would be 30% traffic growth on the corridor over a ten-year period. We undertook traffic counts in 2021 and again in 2025 and identified there was negligible change in Tram Road volumes. The proposed development will generate an estimated 6,046 vehicle movements per day and an average of 38.5% of this traffic (2,328 vehicles per day). Adding this traffic to Tram Road would increase the volumes by 30% at Whites Road, although this percentage would reduce as traffic heads east on Tram Road as the existing volumes increase toward SH1. As such, the effects of the additional traffic generated by the proposed development on the safety of the Tram Road corridor are broadly within the range of that already being planned and funded by the Council.

Local Network Safety Improvements

167. It is anticipated that minor safety works to Bradleys Road, Whites Road, Mill Road (between Bradleys Road and Threlkelds Road) and Threlkelds Road will be required to accommodate the proposed



development traffic. These works would be limited to minor works such as improved line-marking, signage and warning of roadside hazards. This (plus the recommended speed limit reductions on Whites Road and Bradleys Road) are considered to sufficiently mitigate the adverse effects of the proposed development in respect of these roads.

Pedestrian & Cycle Provision

168. The proposed site layout includes internal walking and cycling routes to link the residential activities to the proposed commercial and retirement village. The provision of the commercial area is also intended to reduce the need to drive to meet day-to-day retail needs, not only for future residents, but also the existing residents in Ōhoka. As such, there will be pedestrian and walkability benefits to the existing Ōhoka residents through the provision of this commercial area.
169. The proposal also provides for the shared path on Bradleys Road, Whites Road and Mill Road that will link to the wider shared path routes being planned by the Council. It is also recommended that the shared path on Mill Road and Jacksons Road to Ōhoka school be upgraded to better accommodate active travel to / from that location, although this is a matter outside the Applicant's control.
170. The centre of Rangiora is 10.5km from the centre of the Site, which is approximately 30 minutes cycle ride. We consider this to be a comfortable cycling distance for many people. Furthermore, the uptake in e-bikes is anticipated to increase the distance that cyclists will be willing to travel through the increased ease with which they cycle.
171. Kaiapoi is approximately 9km from the centre of the Site via the Main Drain Road route. This is an achievable cycling distance and would become more attractive if the Skewbridge Road bridge accommodated safe cycle crossing facilities.
172. There is also the potential that the identified Threlkelds Road / Flaxton Road roundabout (along with alterations to the Mill Road / Threlkelds Road intersection) could reduce traffic volumes on Mill Road east of Threlkelds Road. This may make this an attractive cycle route through to the Mill Road / Ōhoka Road intersection. We understand that the Council is investigating cycle crossing opportunities at that location that would enable a link to an existing cycle facility on the eastern side of Ōhoka Road, which would then provide an alternate option to access Kaiapoi.
173. The retail area at Mandeville (approximately 2km south of the Site) is within a comfortable cycling distance and cyclists would be able to use the shared path along Bradleys Road (when completed by the Council).
174. Overall, it is considered that the existing, planned and proposed pedestrian and cycle provision in relation to the proposed development is acceptable.

Passenger Transport

175. Although the Plan Change does not have access to passenger transport services, drivers are able to travel to / from the Park & Ride facility at Kaiapoi south. Residents could also cycle on Mill Road to the northern Kaiapoi Park & Ride site (approximately 25 to 30 minutes cycle). These in turn provide access to a direct bus service to / from Christchurch City centre. As such, residents of the Plan Change site will be able to make use of the wider public transport as part of their travel patterns.
176. The Greater Christchurch Public Transport Futures interim report (June 2021) indicates that Kaiapoi and Southbrook could be a heavy rail passenger transport route. Kaiapoi is indicated as potentially being on a 'street running corridor focussed' route, with Ōhoka Road and Tram Road stops illustrated on a



'street running limited stops' route. These stop locations are likely to become the focus for park and ride sites and the residents of the Plan Change site would be able to make use of these.

177. Passenger transport services could be routed through the site in the future, should ECan choose to do so. This could include routes that are to / from Oxford linking to the Park & Ride site at Kaiapoi (or other destinations as ECan chooses). There is also a requirement to provide a bus shelter in the commercial area, should bus serves be provided through the site.

Infrastructure Timing Summary

178. Given the above assessment, **Table 21** sets out the recommended transport infrastructure upgrades, whether they are required regardless of the proposed development, and when they are recommended to be completed in relation to the staging of the development.

Table 20: Infrastructure Timing & Funding

Upgrade	Existing Requirement	Recommended Timing (in relation to development staging)	Funding Mechanism
Speed limits and threshold treatments for Whites and Bradleys Roads.	Within Waimakariri Speed Management Plan	When the proposed development accesses these roads.	-
Shared paths on Whites, Bradleys and Mill Road frontages.	Planned, but not funded.	When the proposed development accesses these roads.	Part of the development.
Shared path upgrades on Mill Road from Whites Road to Ōhoka School.	Planned, but not funded.	-	Through Development Contributions.
Pedestrian crossings to / from the Ōhoka Domain.	No	When development occurs on that boundary.	Developer Funded.
Minor safety works to Bradleys, Whites, Mill and Threlkelds Roads.	No	When development accesses these roads (or when development commences for Threlkelds Road).	Development Contributions.
Tram Road / Bradleys Road / McHughes Road roundabout.	Yes, for safety reasons. This is already planned and funded.	N/A	Already funded in 2026 / 2027.
Tram Road / Whites Road intersection safety improvements.	Yes, but not planned or funded.	From occupation of houses at the development.	Development Contributions.
Flaxton Road / Threlkelds Road roundabout, plus changes to the Mill Road / Threlkelds Road intersection.	Imminent, but not planned for.	After 310 dwellings plus 150 retirement dwellings.	Development Contributions.

Summary & Conclusion

Summary

179. It is proposed to subdivide the site at 531 - 535 Mill Road and 347 Whites Road to facilitate 875 residential lots, 250 retirement dwellings, a commercial area and Polo grounds. The development is



predicted to generate up to 715 vehicle movements per hour in the weekday peak hours and 6,046 vehicle movements per day.

Internal Transport Network

180. The proposed road cross-sections and intersection arrangements have been reviewed and are considered acceptable. The cross-sections meet the requirements for urban roads, which is considered to be the appropriate standard given the nature of the proposed subdivision.
181. The internal intersection spacings do not comply with the requirements of the District Plan. However, the spacings are generally consistent with those elsewhere in the Waimakariri District and no adverse effects are anticipated.
182. The proposal provides a connected internal walking and cycling network. This includes shared paths on the main roads and off-road recreational paths. These are considered appropriate to link the residents to / from the proposed Commercial centre.
183. The proposed access arrangements are considered appropriate, noting these all incorporate turning bays to protect right turning vehicles on the main roads. The capacity of these intersections has been reviewed and they are predicted to operate satisfactorily.

Wider Network Effects

Traffic Effects

184. The operation of the Tram Road / Bradleys Road / McHughes Road intersection is predicted to be acceptable without the roundabout upgrade that the Council are planning to construct. The addition of development generated traffic to the network will worsen the safety performance of this intersection, but not significantly beyond the existing operation. The proposed roundabout will improve both the safety and capacity of this intersection.
185. Minor safety improvements at the Tram Road / Whites Road intersection are required to safely accommodate the traffic generated by the proposal. The addition of development traffic through this intersection leads to a similar level of performance as for the 'without development' scenario, although the operation as a whole does deteriorate. The required RAIWS signage at the intersection is predicted to improve the safety performance such that it will be better than the existing situation. Overall, the operation of this intersection is considered tolerable accounting for the proposed development traffic on the network.
186. The Flaxton Road / Threlkelds Road intersection is predicted to be over-capacity after construction of 310 dwellings plus 150 retirement dwellings. We have proposed a concept arrangement for a roundabout, which would accommodate the development traffic plus further growth. We consider that the Council should be planning on constructing this roundabout to safely accommodate future growth, although the traffic effects of the proposed development will be significant if this roundabout is not constructed in a timely manner.
187. The Flaxton Road / Threlkelds Road roundabout would logically lead to alterations to the Mill Road / Threlkelds Road intersection to promote use of that new intersection. A concept arrangement for this intersection has been provided and this could satisfactorily accommodate the predicted development volumes whilst still having capacity to also accommodate growth.



188. Modelling has also been undertaken of the Mill Road / Bradleys Road and Mill Road / Whites Road intersections. These are able to satisfactorily accommodate the predicted traffic volumes generated by the proposal.
189. The operation of the SH1 / Tram Road interchange will be tolerable with the inclusion of the development traffic and background growth. The right turn from the off-ramp will be over-capacity in the AM peak hour, although the queuing does not extend to the SH1 main line. This can be mitigated with a change to the signal phasing.
190. The safety of the Tram Road corridor is not anticipated to be notably different to that anticipated in the Council's safety study. Minor safety improvements are also recommended to be undertaken on Bradleys Road, Whites Road, Mill Road (between Bradleys Road and Threlkelds Road) and Threlkelds Road, as previously mentioned.

Pedestrian & Cycle Network

191. The proposed development provides shared paths along the Bradleys Road and Whites Road boundaries, as well as along Mill Road. Kaiapoi is approximately 9km from the centre of the Site via the Main Drain Road route, which is an achievable cycling distance and would become more attractive if the Skewbridge Road bridge accommodated safe cycle crossing facilities.
192. The centre of Rangiora is 10.5km from the centre of the Site, which is approximately 30 minutes cycle ride. We consider this to be a comfortable cycling distance for many people.

Conclusion

193. The transport effects of the proposed subdivision are considered to be acceptable subject to the upgrades identified in **Table 21** occurring in a timely manner and changes to the SH1 / Tram Road interchange signal phasing.



Appendix 1

Author's Experience



Nick Fuller

Nick Fuller is a Principal Transport Engineer with over two decades of experience in traffic and transportation engineering across New Zealand, the United Kingdom, Australia, and the Pacific Islands. He specialises in land development projects and has a strong background in providing transport advice to developers, as well as the New Zealand Transport Agency and local authorities in Christchurch and Auckland. Nick's expertise includes Integrated Transport Assessments, concept intersection layouts, and Road Safety Audits.

Throughout his career, Nick has worked on numerous significant Plan Change applications, providing expert transport advice and assessments. Some of the notable recent projects include:

- i. West of Rolleston Residential Plan Changes: Rural to Residential rezoning to permit 3,770 dwellings plus associated local commercial centres to the west of Rolleston;
- ii. Two Chain Road Industrial Plan Change: Rezoning of 98Ha of Rural land to permit Industrial purposes to the north-west of Rolleston;
- iii. Lincoln South Plan Change: 1,710 dwellings plus associated commercial centres to the south of Lincoln, Selwyn; and
- iv. iPort Extension Plan Change: Rezoning of 27Ha of Rural land to permit Industrial purposes to the north of Rolleston

Nick has provided Transport Assessments for a range of subdivisions, including industrial and residential developments. He has also completed training in Safe Systems Assessments and is a Road Safety Auditor and regularly undertakes Road Safety Audits for subdivisions.

Nick also has experience of providing Integrated Transport Assessments through the Fast Track process. Notably, he led the transport advice and prepared the Integrated Transport Assessments for the New Dunedin Hospital.

Rhys Chesterman

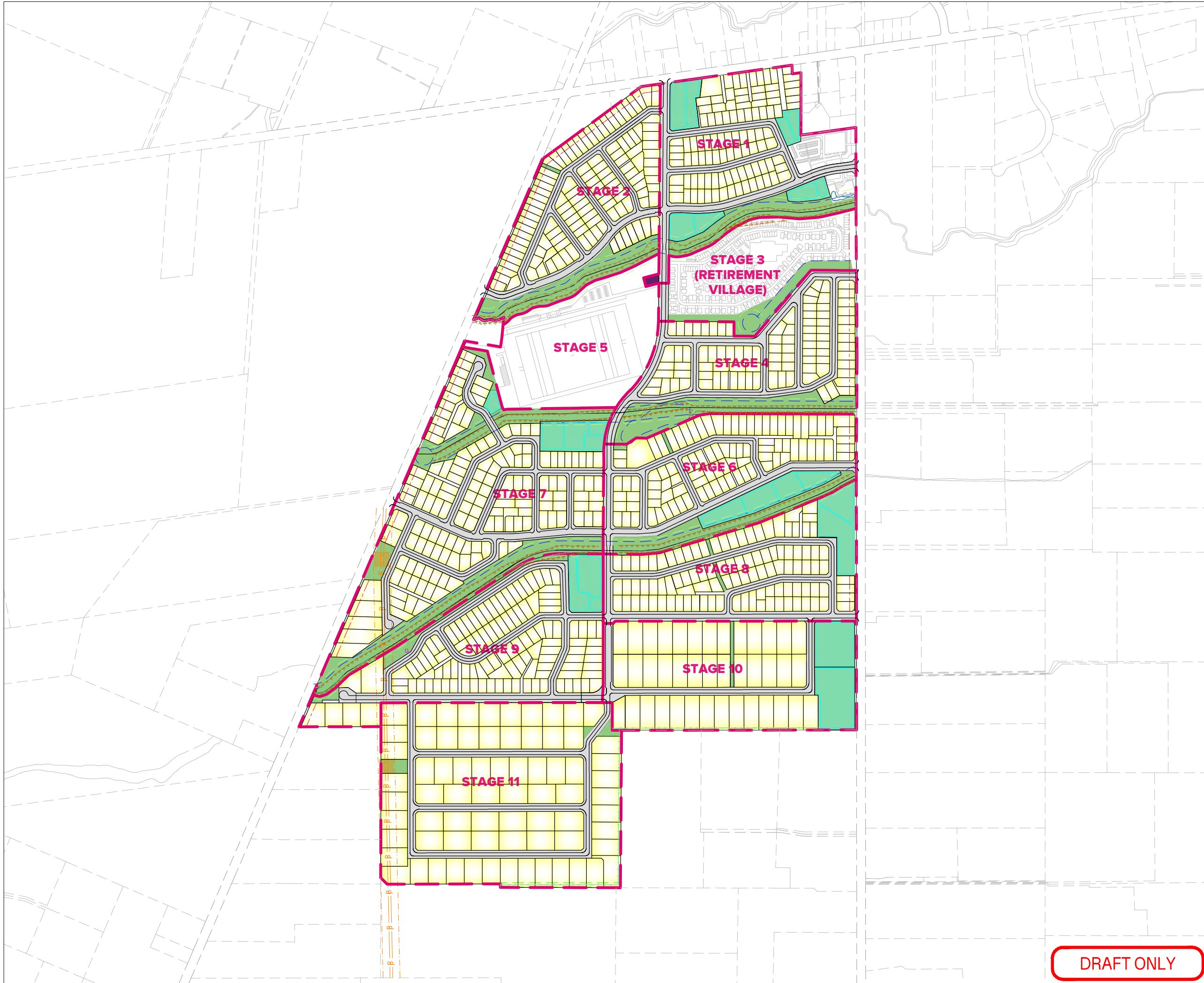
Rhys Chesterman is an experienced Director and Transport Engineer with over 20 years in the planning and traffic engineering field. His expertise is centred on land use development and subdivisions, where he provides design and technical advice, prepares traffic impact assessments, and offers expert evidence for Council and Environment Court.

His project experience is diverse, covering supermarkets, shopping malls, hotels, motels, retirement villages, hospitals, pre-schools, holiday parks, educational institutions, residential and business plan changes, residential show homes, quarry developments, wind farms, and various retail, commercial, and industrial developments.



Appendix 2

Subdivision Plans



LEGEND:

	STAGE BOUNDARY
	ABUTTAL BOUNDARY
	PROPOSED LOT BOUNDARY
	RESIDENTIAL LOTS
	PROPOSED ROAD
	BANK TOP
	WATER ALIGNMENT
	GROUND DISTURBANCE / IMPERVIOUS SURFACE SETBACK
	MINIMUM RIPARIAN ENHANCEMENT SETBACK
	CELLPHONE TOWER
	EXISTING OVERHEAD POWER LINE
	19m TRANSPOWER NATIONAL GRID YARD
	15m LANDSCAPING STRIP SETBACK
	STORMWATER MANAGEMENT AREA
	RESERVE / WALKWAYS

1	ISSUE FOR FAST TRACK APPLICATION	SS	02/07/2025
REVISION DETAILS		BY	DATE

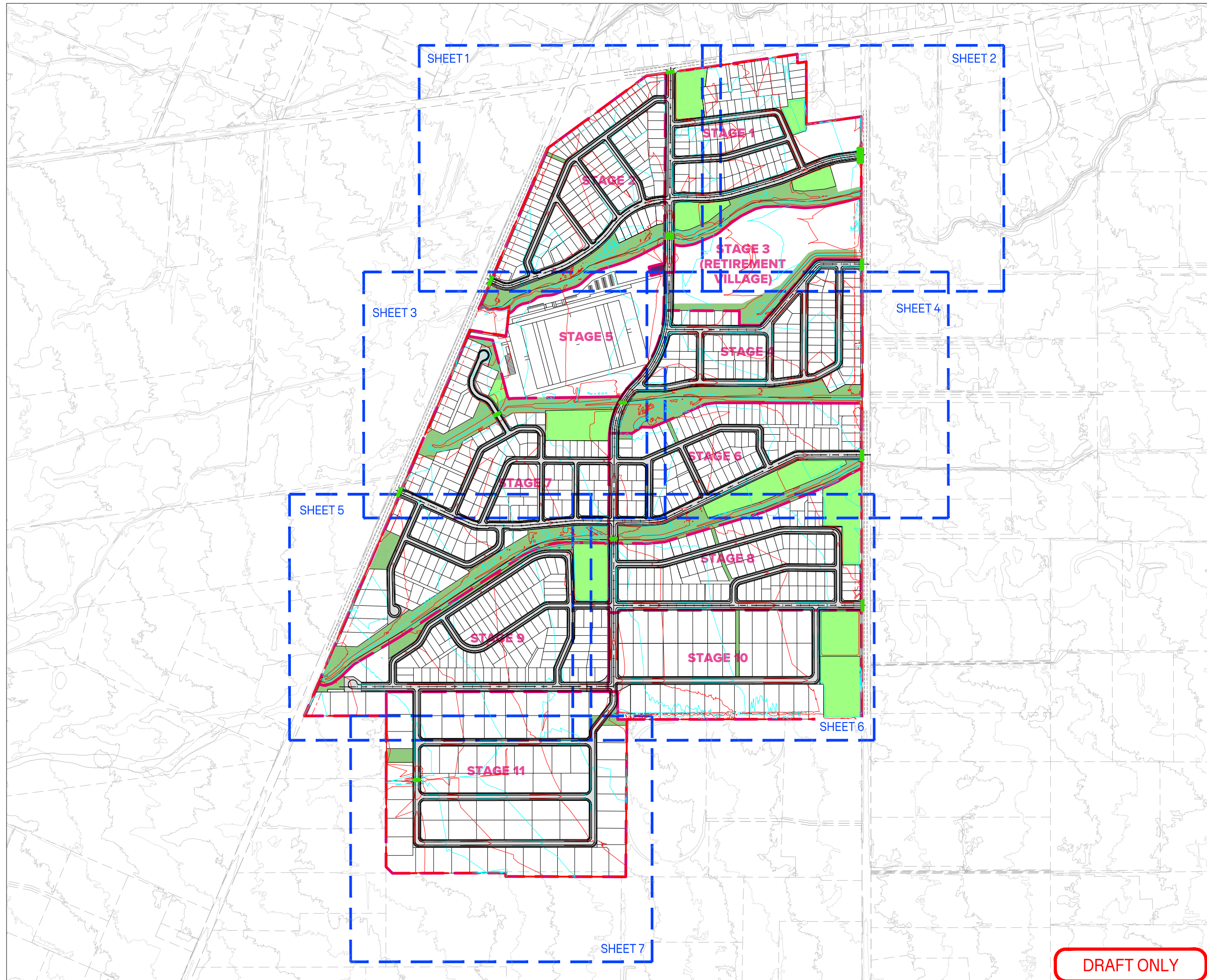
PROJECT: **OHOKA WAIMAKARIRI CATERBURY**

DESCRIPTION: **GENERAL LAYOUT PLAN**

	SURVEYED	-	-
	DESIGNED	SS	06/2025
	DRAWN	AA	06/2025
	CHECKED	SS	01/07/2025
	APPROVED	MP	-

SCALE	1:4,000 @A1	18,000 @A3	REVISION
STATUS	FOR RESOURCE CONSENT		A
PROJECT	16013		
DWG NO	16013-00-RC-1010		

DRAFT ONLY



NOTES:

1. EXISTING GROUND SURFACE DATA CREATED FROM WAIMAKARIRI DISTRICT LIDAR DATA.
2. HEIGHTS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM (NZVD) 2016.
3. PARKING BAYS AND OTHER ROADING DESIGN ELEMENTS TO BE DETERMINED AT DETAILED DESIGN PHASE.
4. REFER TO PLANS PREPARED BY DCM URBAN FOR ALL DETAILS REGARDING LANDSCAPING WORKS.
5. ALL WORKS SHALL COMPLY WITH THE REQUIREMENTS OF THE WAIMAKARIRI ENGINEERING CODE OF PRACTICE (ECOP) UNLESS OTHERWISE SPECIFIED.
6. ASPHALTIC CONCRETE SPECIFIED IN ACCORDANCE WITH NZTA M/10:2020 SPECIFICATION.
7. BENKELMAN BEAM TESTING TO COMPLY WITH WAIMAKARIRI DISTRICT COUNCIL ECOP SECTION 3.11.3 - RESULTS ARE TO BE SUBMITTED TO THE COUNCIL AS PER THE REQUIREMENTS OF ECOP 2.10.4. AND 3.11
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11. SOW GRASS ON BERMS IN ACCORDANCE WITH ECOP.
12. BERMS AND TREE PITS TO BE CONSTRUCTED AS PER ECOP PART 10.
13. CARRIAGEWAY CROSSFALLS TO COMPLY WITH ECOP SECTION 8.7.4.
14. MOUNTABLE KERB AS PER WDC ECOP 203A-B.
15. PEDESTRIAN CUT-DOWNS AS PER ECOP 213.

LEGEND:

- STAGE BOUNDARY
- ABUTTAL BOUNDARY
- PR LOT BOUNDARY
- PR KERBLINE
- PR ROAD
- SWALE
- GROUND DISTURBANCE / IMPERVIOUS SURFACE SETBACK
- MINIMUM RIPARIAN ENHANCEMENT SETBACK
- 15m LANDSCAPING STRIP SETBACK
- PROPOSED STORMWATER CULVERT
- STORMWATER MANAGEMENT AREA
- RESERVE / WALKWAYS
- EX CONTOURS AT 0.5m INTERVALS
- PR CONTOURS AT 0.5m INTERVALS

A	ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
REVISION DETAILS		BY	DATE

PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

DESCRIPTION: **ROADING PLAN OVERALL PLAN**

SURVEYED	-	-
DESIGNED	AO	06/2025
DRAWN	AA	06/2025
CHECKED	SS	01/07/2025
APPROVED	MP	-

SCALE	1:4,000 @A1	18,000 @A3	REVISION
STATUS	FOR RESOURCE CONSENT		A
PROJECT	16013		
DWG NO	16013-00-RC-3000		

DRAFT ONLY



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- PR CONTOURS AT 0.5m INTERVALS

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REVISION DETAILS		BY	DATE

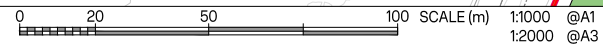
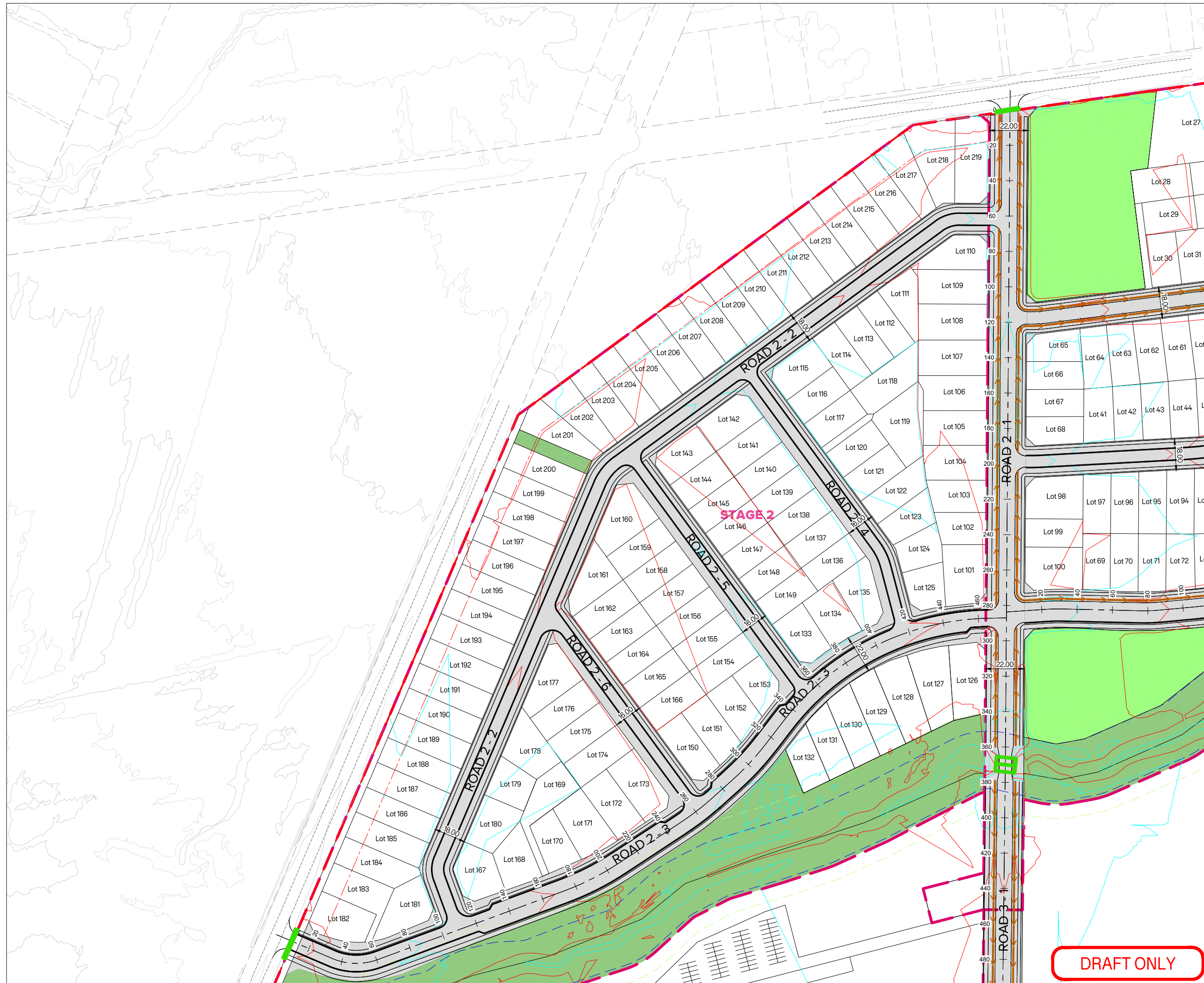
PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

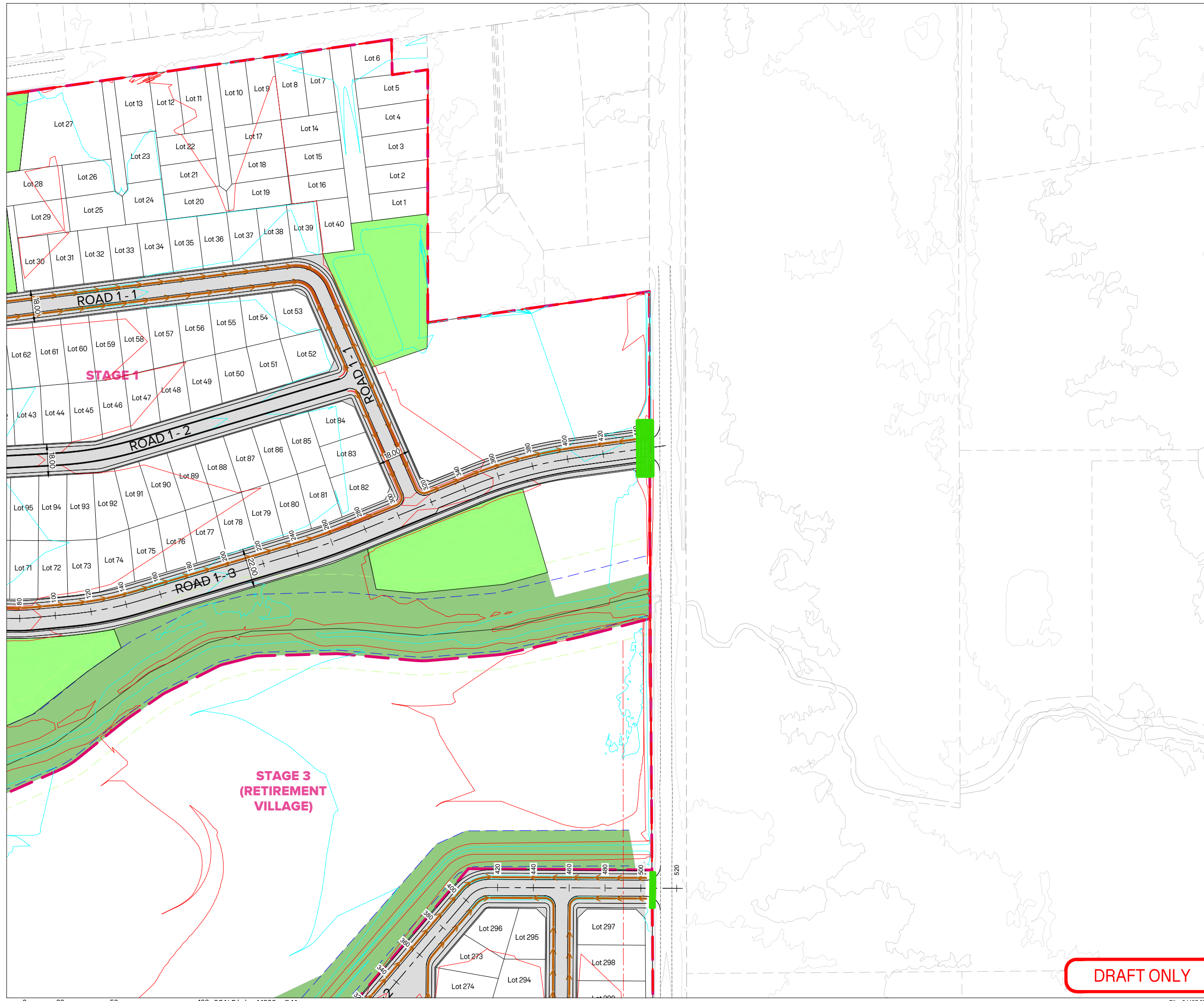
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DRAWN	AA	06/2025
CHECKED	SS	01/07/2025
APPROVED	MP	-

SCALE	1:1000 @A1	1:2000 @A3	REVISION
STATUS	FOR RESOURCE CONSENT		A
PROJECT	16013		
DWG NO	16013-00-RC-3001		

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A	ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
REVISION DETAILS		BY	DATE

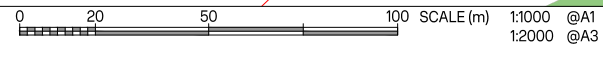
PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

DESCRIPTION: **ROADING PLAN SHEET 2 OF 7**

	SURVEYED	-	-
	DESIGNED	AO	06/2025
	DRAWN	AA	06/2025
	CHECKED	SS	01/07/2025
	APPROVED	MP	-

SCALE	1:1000 @A1	1:2000 @A3	REVISION
STATUS	FOR RESOURCE CONSENT		A
PROJECT	16013		
DWG NO	16013-00-RC-3002		

DRAFT ONLY





NOTES:

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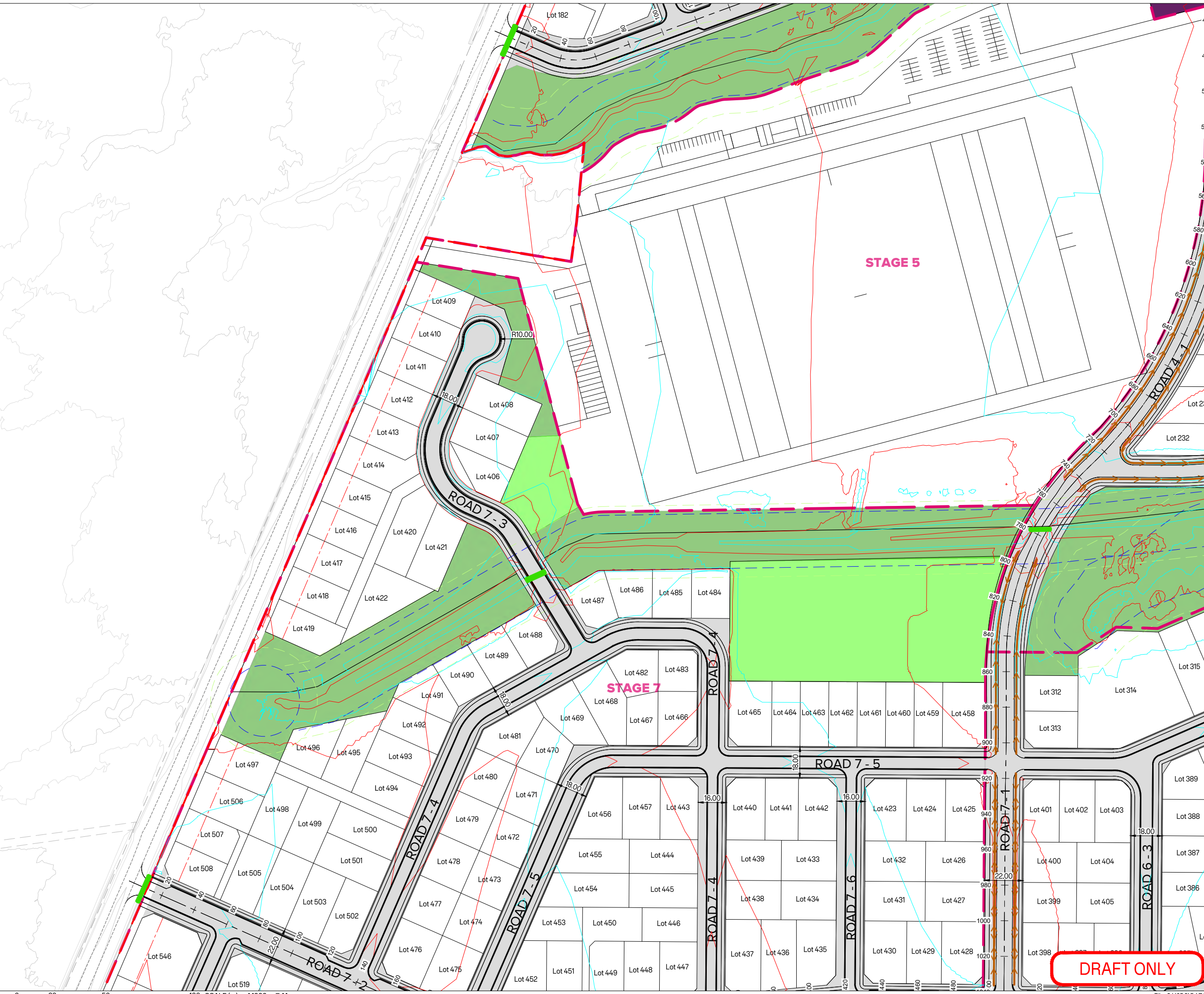
A	ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
REVISION DETAILS		BY	DATE

PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

DESCRIPTION: **ROADING PLAN SHEET 3 OF 7**

SURVEYED	-	-
DESIGNED	AO	06/2025
DRAWN	AA	06/2025
CHECKED	SS	01/07/2025
APPROVED	MP	-
SCALE	1:1000 @A1	1:2000 @A3
STATUS	FOR RESOURCE CONSENT	REVISION
PROJECT	16013	A
DWG NO	16013-00-RC-3003	

DRAFT ONLY



0 20 50 100 SCALE (m) 1:1000 @A1 1:2000 @A3



NOTES:

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LEGEND:

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- EX CONTOURS AT 0.5m INTERVALS
- PR CONTOURS AT 0.5m INTERVALS

A	ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
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REVISION DETAILS BY DATE

PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

DESCRIPTION: **ROADING PLAN SHEET 4 OF 7**

	SURVEYED	-	-
	DESIGNED	AO	06/2025
	DRAWN	AA	06/2025
	CHECKED	SS	01/07/2025
	APPROVED	MP	-

SCALE 1:1000 @A1 1:2000 @A3 REVISION

STATUS **FOR RESOURCE CONSENT** A

PROJECT **16013**

DWG NO **16013-00-RC-3004**



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NOTES:

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- PEDESTRIAN CUT-DOWNS AS PER ECOP 213.

LEGEND:

- STAGE BOUNDARY
- ABUTTAL BOUNDARY
- PR LOT BOUNDARY
- PR KERBLINE
- PR ROAD
- SWALE
- GROUND DISTURBANCE / IMPERVIOUS SURFACE SETBACK
- MINIMUM RIPARIAN ENHANCEMENT SETBACK
- 15m LANDSCAPING STRIP SETBACK
- PROPOSED STORMWATER CULVERT
- STORMWATER MANAGEMENT AREA
- RESERVE / WALKWAYS
- EX CONTOURS AT 0.5m INTERVALS
- PR CONTOURS AT 0.5m INTERVALS

A	ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
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REVISION DETAILS BY DATE

PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

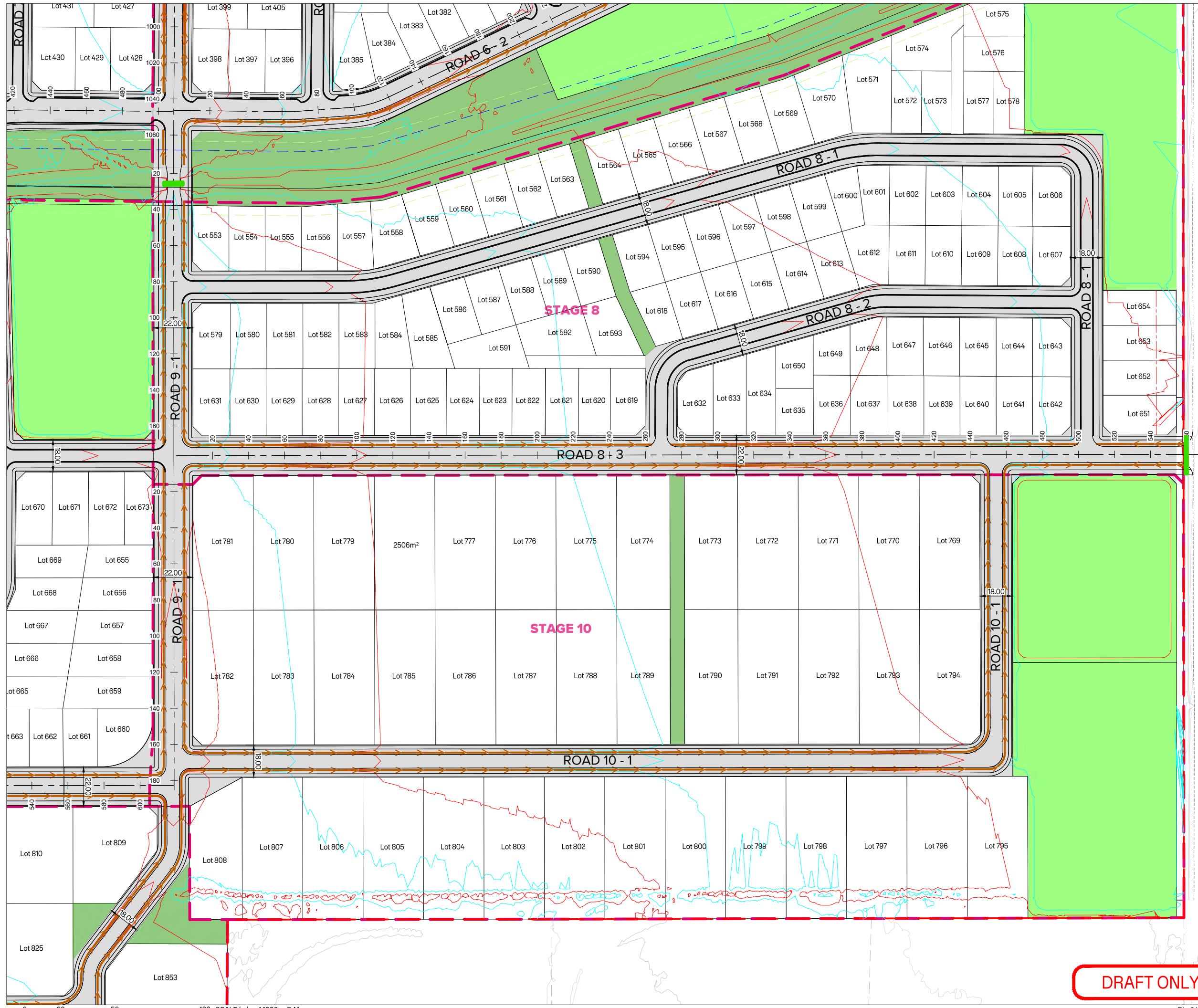
DESCRIPTION: **ROADING PLAN SHEET 5 OF 7**

SURVEYED	-	-
DESIGNED	AO	06/2025
DRAWN	AA	06/2025
CHECKED	SS	01/07/2025
APPROVED	MP	-

SCALE	1:1000 @A1	1:2000 @A3	REVISION
STATUS	FOR RESOURCE CONSENT		A
PROJECT	16013		
DWG NO	16013-00-RC-3005		

DRAFT ONLY





- NOTES:**
- EXISTING GROUND SURFACE DATA CREATED FROM WAIMAKARIRI DISTRICT LIDAR DATA.
 - HEIGHTS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM (NZVD) 2016.
 - PARKING BAYS AND OTHER ROADING DESIGN ELEMENTS TO BE DETERMINED AT DETAILED DESIGN PHASE.
 - REFER TO PLANS PREPARED BY DCM URBAN FOR ALL DETAILS REGARDING LANDSCAPING WORKS.
 - ALL WORKS SHALL COMPLY WITH THE REQUIREMENTS OF THE WAIMAKARIRI ENGINEERING CODE OF PRACTICE (ECOP) UNLESS OTHERWISE SPECIFIED.
 - ASPHALTIC CONCRETE SPECIFIED IN ACCORDANCE WITH NZTA M/10:2020 SPECIFICATION.
 - BENKELMAN BEAM TESTING TO COMPLY WITH WAIMAKARIRI DISTRICT COUNCIL ECOP SECTION 3.11.3 - RESULTS ARE TO BE SUBMITTED TO THE COUNCIL AS PER THE REQUIREMENTS OF ECOP 2.10.4. AND 3.11
 - METAL COURSE DESIGN DEPTHS TO BE CONFIRMED BY TESTING SUBGRADE PRIOR TO PLACING SUB-BASE MATERIAL AND APPROVAL BY THE ENGINEER.
 - KERB CUTDOWN REQUIRED FOR ALL PEDESTRIAN ROAD CROSSINGS. CROSSINGS TO BE CONSTRUCTED IN ACCORDANCE WITH ECOP 213.
 - KERB CUTDOWN REQUIRED FOR ALL RESIDENTIAL VEHICLE CROSSINGS. CROSSINGS TO BE CONSTRUCTED IN ACCORDANCE WITH ECOP 211 A-D, 212 A-C & 221A (AS RELEVANT) & 219, 616.
 - SOW GRASS ON BERMS IN ACCORDANCE WITH ECOP.
 - BERMS AND TREE PITS TO BE CONSTRUCTED AS PER ECOP PART 10.
 - CARRIAGEWAY CROSSFALLS TO COMPLY WITH ECOP SECTION 8.7.4.
 - MOUNTABLE KERBS AS PER WDC ECOP 203A-B.
 - PEDESTRIAN CUT-DOWNS AS PER ECOP 213.

- LEGEND:**
- STAGE BOUNDARY
 - ABUTTAL BOUNDARY
 - PR LOT BOUNDARY
 - PR KERBLINE
 - PR ROAD
 - SWALE
 - GROUND DISTURBANCE / IMPERVIOUS SURFACE SETBACK
 - MINIMUM RIPARIAN ENHANCEMENT SETBACK
 - 15m LANDSCAPING STRIP SETBACK
 - PROPOSED STORMWATER CULVERT
 - STORMWATER MANAGEMENT AREA
 - RESERVE / WALKWAYS
 - EX CONTOURS AT 0.5m INTERVALS
 - PR CONTOURS AT 0.5m INTERVALS

A	ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
REVISION DETAILS		BY	DATE

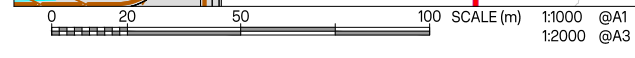
PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

DESCRIPTION: **ROADING PLAN SHEET 6 OF 7**

SURVEYED	-	-
DESIGNED	AO	06/2025
DRAWN	AA	06/2025
CHECKED	SS	01/07/2025
APPROVED	MP	-

SCALE	1:1000 @A1	1:2000 @A3	REVISION
STATUS	FOR RESOURCE CONSENT		A
PROJECT	16013		
DWG NO	16013-00-RC-3006		

DRAFT ONLY





NOTES:

- EXISTING GROUND SURFACE DATA CREATED FROM WAIMAKARIRI DISTRICT LIDAR DATA.
- HEIGHTS ARE IN TERMS OF NEW ZEALAND VERTICAL DATUM (NZVD) 2016.
- PARKING BAYS AND OTHER ROADING DESIGN ELEMENTS TO BE DETERMINED AT DETAILED DESIGN PHASE.
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- ALL WORKS SHALL COMPLY WITH THE REQUIREMENTS OF THE WAIMAKARIRI ENGINEERING CODE OF PRACTICE (ECOP) UNLESS OTHERWISE SPECIFIED.
- ASPHALTIC CONCRETE SPECIFIED IN ACCORDANCE WITH NZTA M/10:2020 SPECIFICATION.
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- SOW GRASS ON BERMS IN ACCORDANCE WITH ECOP.
- BERMS AND TREE PITS TO BE CONSTRUCTED AS PER ECOP PART 10.
- CARRIAGEWAY CROSSFALLS TO COMPLY WITH ECOP SECTION 8.7.4.
- MOUNTABLE KERB AS PER WDC ECOP 203A-B.
- PEDESTRIAN CUT-DOWNS AS PER ECOP 213.

LEGEND:

- STAGE BOUNDARY
- ABUTTAL BOUNDARY
- PR LOT BOUNDARY
- PR KERBLINE
- PR ROAD
- SWALE
- GROUND DISTURBANCE / IMPERVIOUS SURFACE SETBACK
- MINIMUM RIPARIAN ENHANCEMENT SETBACK
- 15m LANDSCAPING STRIP SETBACK
- PROPOSED STORMWATER CULVERT
- STORMWATER MANAGEMENT AREA
- RESERVE / WALKWAYS
- EX CONTOURS AT 0.5m INTERVALS
- PR CONTOURS AT 0.5m INTERVALS

A	ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
REVISION DETAILS		BY	DATE

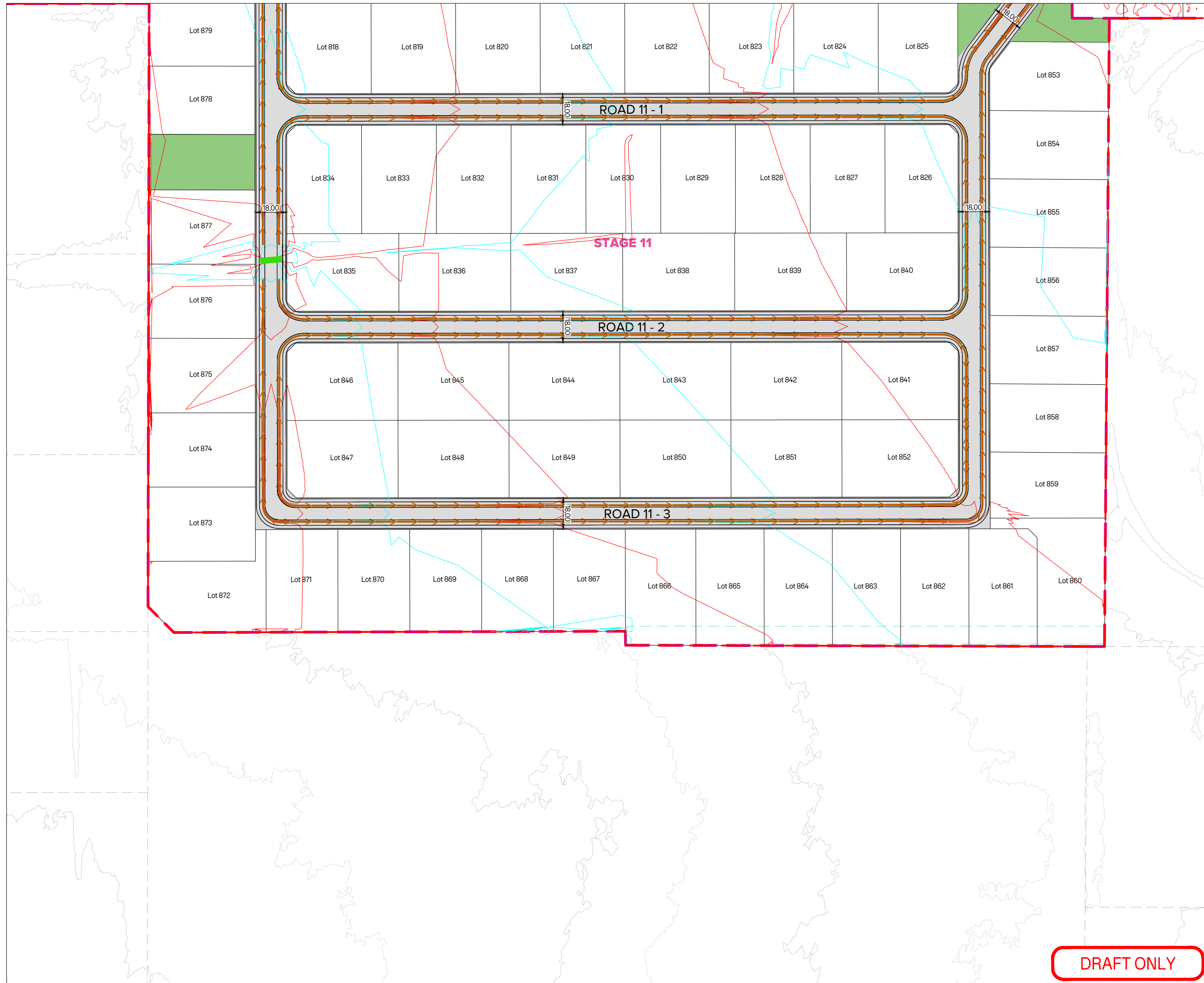
PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

DESCRIPTION: **ROADING PLAN SHEET 7 OF 7**

	SURVEYED	-	-
	DESIGNED	AO	06/2025
	DRAWN	AA	06/2025
	CHECKED	SS	01/07/2025
	APPROVED	MP	-

SCALE	1:1000 @A1	1:2000 @A3	REVISION
STATUS	FOR RESOURCE CONSENT		A
PROJECT	16013		
DWG NO	16013-00-RC-3007		

DRAFT ONLY



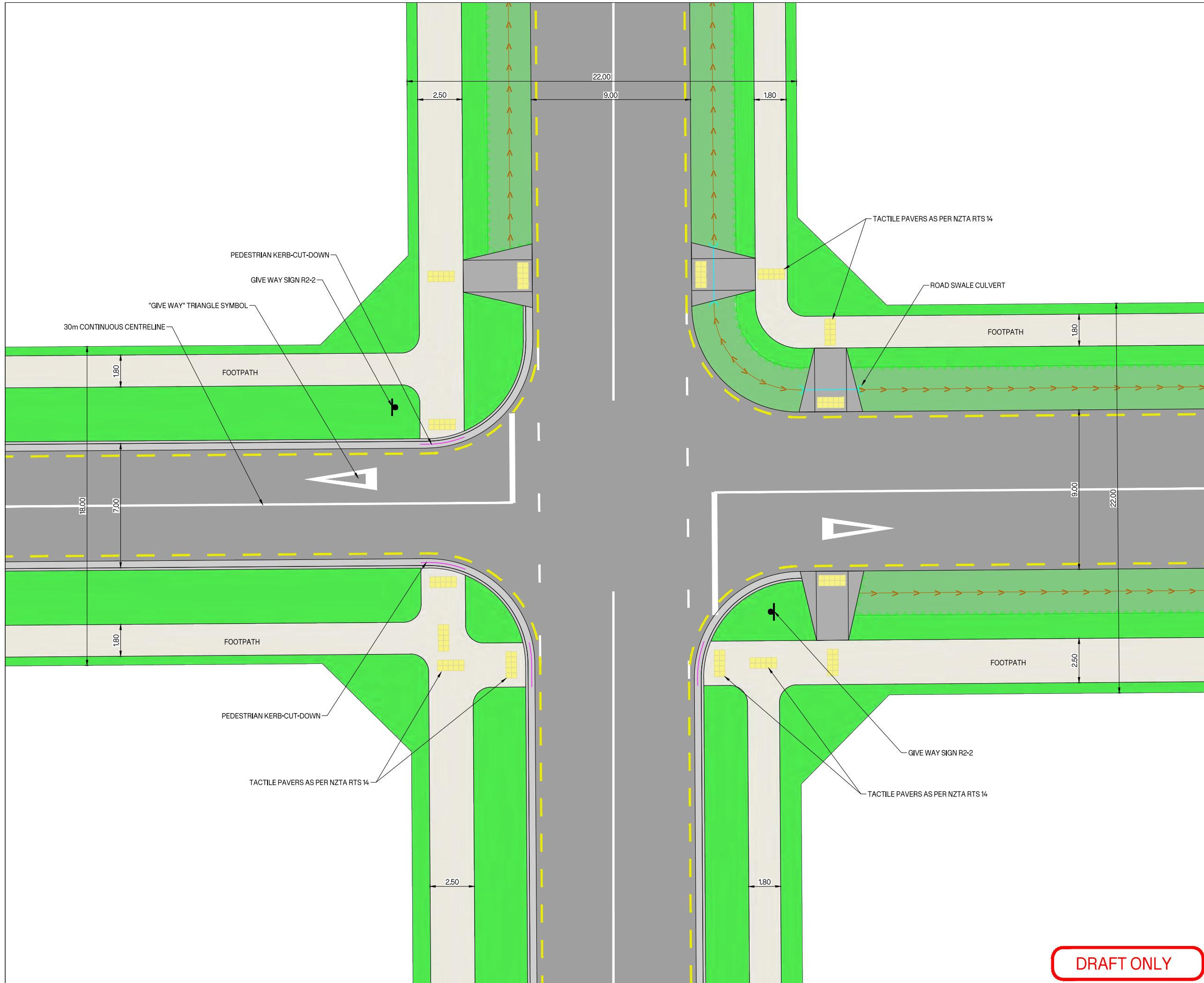
0 20 50 100 SCALE (m) 1:1000 @A1 1:2000 @A3

NOTES:

1. ALL WORKS SHALL COMPLY WITH THE WDC ENGINEERING CODE OF PRACTICE (ECOP) UNLESS OTHERWISE SPECIFIED.
2. ASPHALTIC CONCRETE SPECIFIED IN ACCORDANCE WITH NZTA M/10:2020 SPECIFICATION.
3. BENKELMAN BEAM TESTING TO COMPLY WITH WDC ECOP SECTION 3.11.3 RESULTS ARE TO BE SUBMITTED TO THE WDC AS PER THE REQUIREMENTS OF ECOP 2.10.4 AND 3.1.1.
4. METAL COURSE DESIGN DEPTHS TO BE CONFIRMED BY TESTING SUBGRADE PRIOR TO PLACING SUB-BASE MATERIAL AND APPROVAL BY THE ENGINEER.
5. KERB CUTDOWN REQUIRED FOR ALL PEDESTRIAN ROAD CROSSINGS. CROSSINGS TO BE CONSTRUCTED IN ACCORDANCE WITH ECOP 213.
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7. SOW GRASS ON BERMS IN ACCORDANCE WITH WDC ECOP.
8. BERMS AND TREE PITS TO BE CONSTRUCTED AS PER WDC ECOP PART 10.
9. CARRIAGEWAY CROSSFALLS TO COMPLY WITH WDC ECOP SECTION 8.7.4.
10. MOUNTABLE KERB AS PER WDC ECOP 203A-B.
11. PEDESTRIAN CUT DOWN AS PER WDC ECOP 213.

LEGEND:

- CARRIAGEWAY
- KERB & CHANNEL
- ROAD SWALE
- BERM
- FOOTPATH
- SWALE TOP
- WATER ALIGNMENT
- TACTILE PAVERS
- PRAM CROSSINGS
- ROAD SIGNS
- ROAD SWALE CULVERT



ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
REVISION DETAILS	BY	DATE

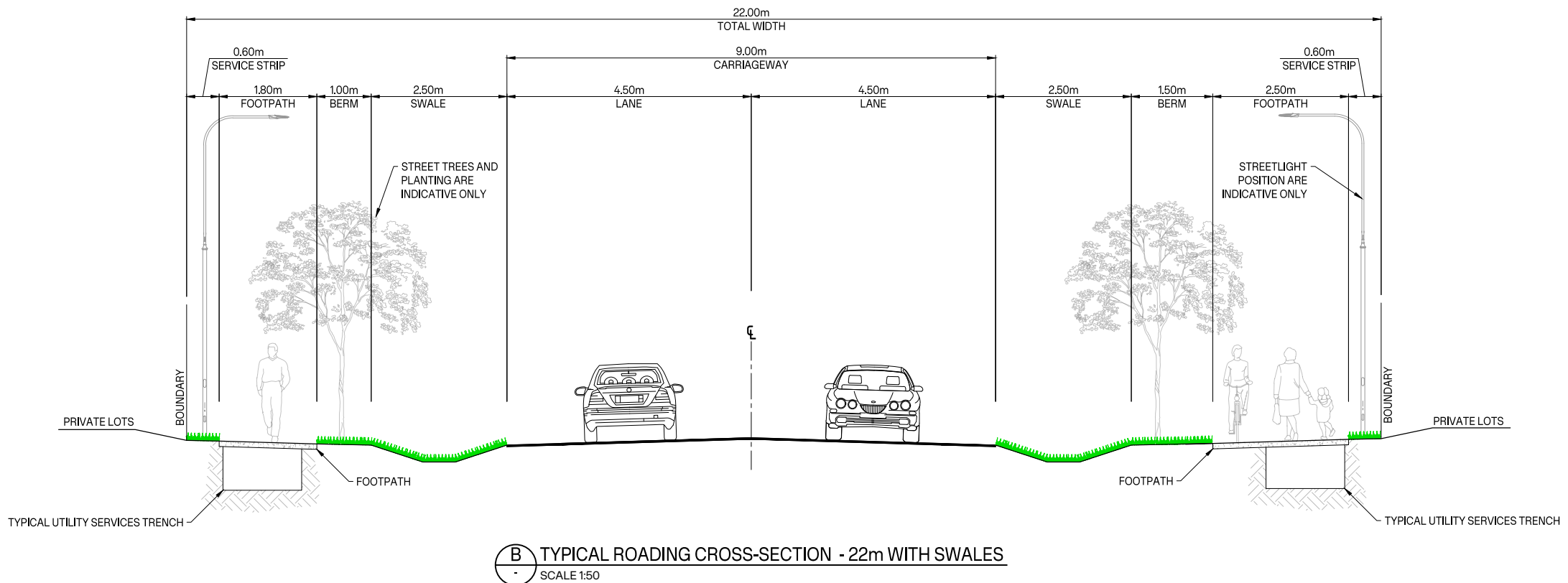
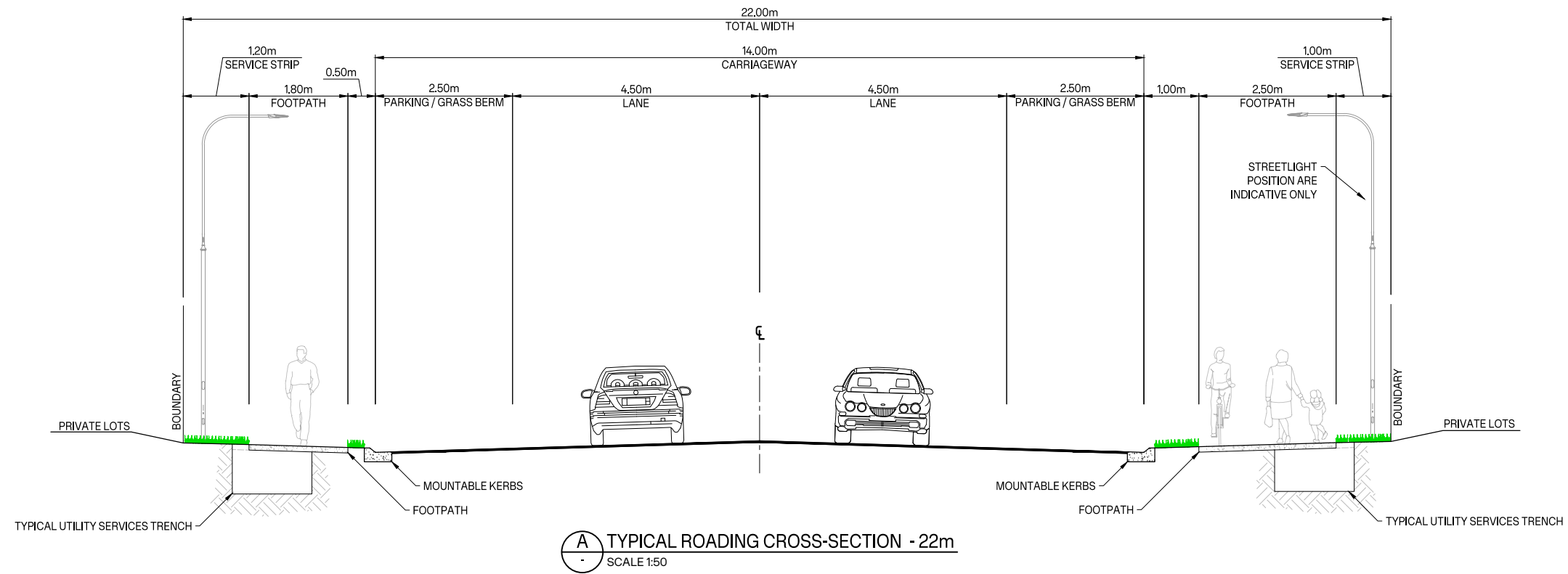
PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

DESCRIPTION: **TYPICAL INTERSECTION DETAIL**

SURVEYED	-	-
DESIGNED	KC	06/2025
DRAWN	KC	06/2025
CHECKED	SS	01/07/2025
APPROVED	MP	-

SCALE	1:100 @A1	1:200 @A3	REVISION
STATUS	FOR RESOURCE CONSENT		A
PROJECT	16013		
DWG NO	16013-00-RC-3100		

DRAFT ONLY



NOTES:

1. ALL WORKS SHALL COMPLY WITH THE WDC ENGINEERING CODE OF PRACTICE (ECOP) UNLESS OTHERWISE SPECIFIED.
2. ASPHALTIC CONCRETE SPECIFIED IN ACCORDANCE WITH NZTA M/10:2020 SPECIFICATION.
3. BENKELMAN BEAM TESTING TO COMPLY WITH WDC ECOP SECTION 3.11.3 RESULTS ARE TO BE SUBMITTED TO THE WDC AS PER THE REQUIREMENTS OF ECOP 2.10.4 AND 3.11.
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8. BERMS AND TREE PITS TO BE CONSTRUCTED AS PER WDC ECOP PART 10.
9. CARRIAGEWAY CROSSFALLS TO COMPLY WITH WDC ECOP SECTION 8.7.4.

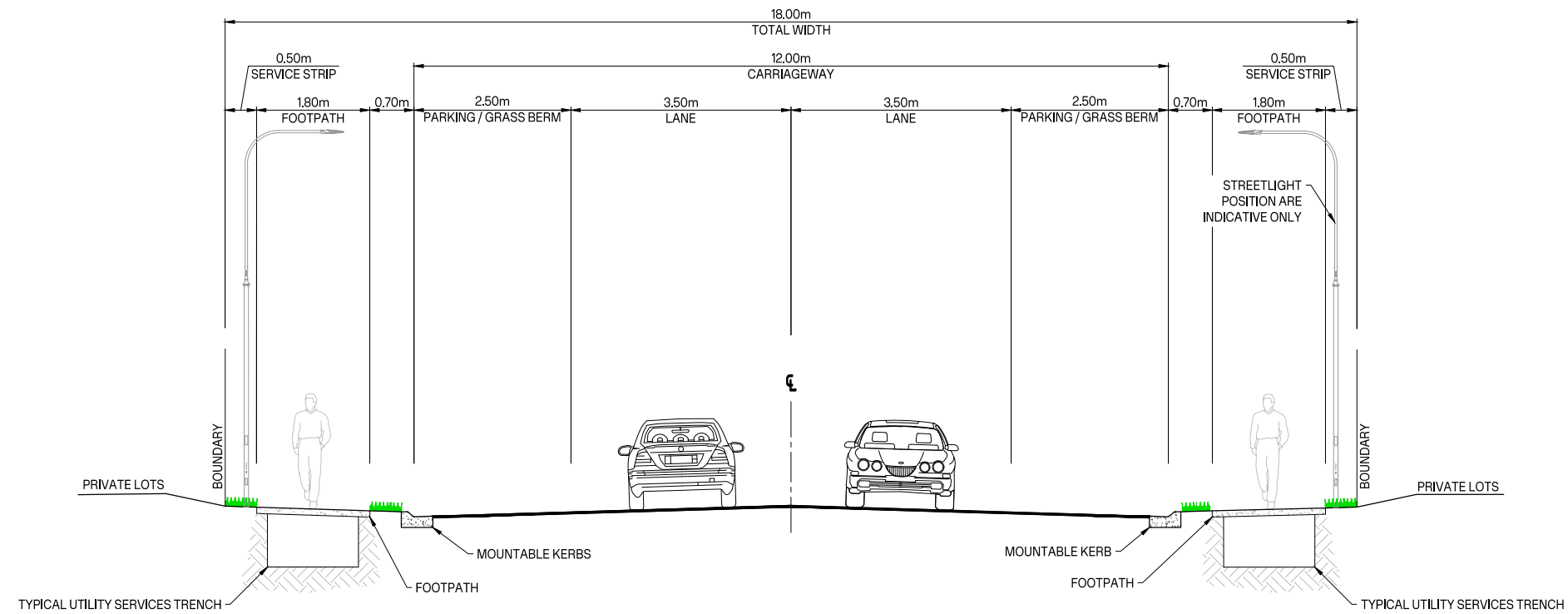
A	ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
REVISION DETAILS		BY	DATE

PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

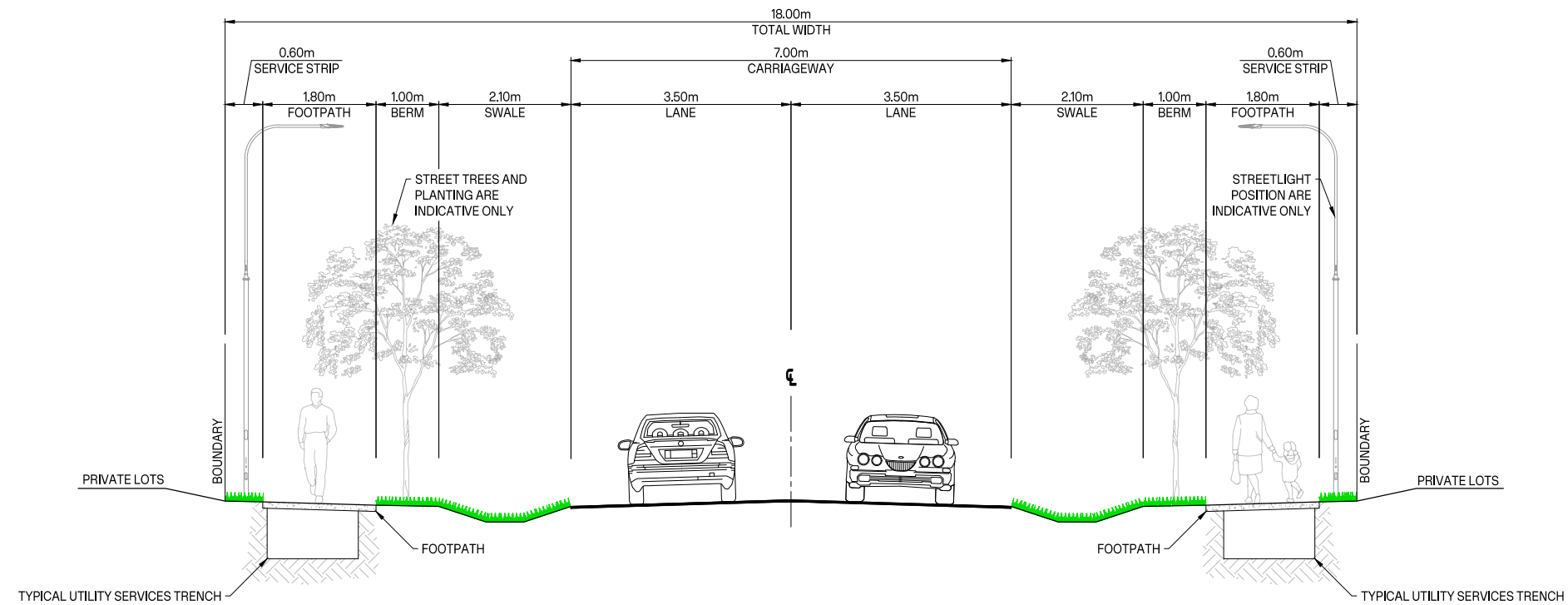
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SURVEYED	-	-
DESIGNED	AO	18/06/2025
DRAWN	AA	18/06/2025
CHECKED	SS	01/07/2025
APPROVED	MP	-
SCALE	AS SHOWN	REVISION
STATUS	FOR RESOURCE CONSENT	A
PROJECT	16013	
DWG NO	16013-00-RC-3300	

DRAFT ONLY



C TYPICAL ROADING CROSS-SECTION - 18m
SCALE 1:50



D TYPICAL ROADING CROSS-SECTION - 18m WITH SWALES
SCALE 1:50

NOTES:

1. ALL WORKS SHALL COMPLY WITH THE WDC ENGINEERING CODE OF PRACTICE (ECOP) UNLESS OTHERWISE SPECIFIED.
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3. BENKELMAN BEAM TESTING TO COMPLY WITH WDC ECOP SECTION 3.11.3 RESULTS ARE TO BE SUBMITTED TO THE WDC AS PER THE REQUIREMENTS OF ECOP 2.10.4 AND 3.11.
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8. BERMS AND TREE PITS TO BE CONSTRUCTED AS PER WDC ECOP PART 10.
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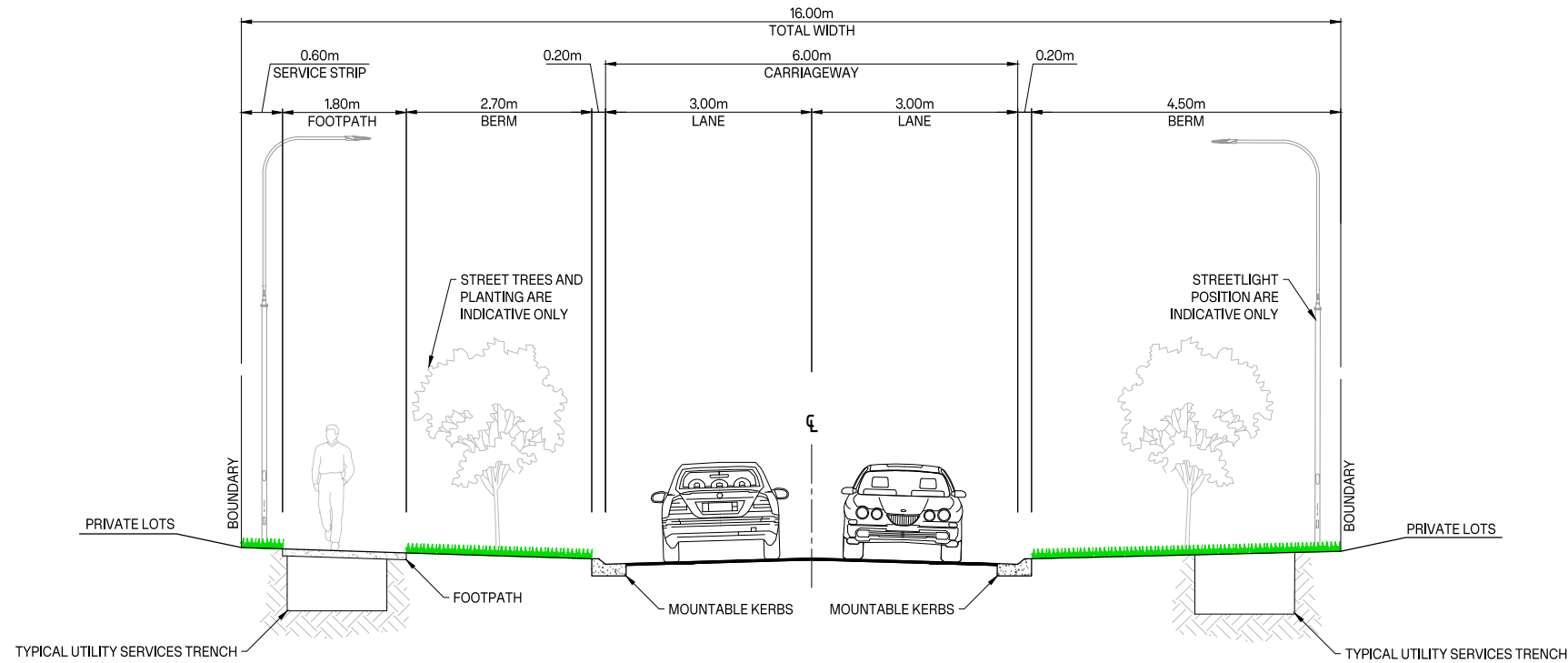
A	ISSUED FOR FAST TRACK CONSENT	SS 02/07/2025
REVISION DETAILS	BY	DATE

PROJECT: **OHOKA WAIMAKARIRI CANTERBURY**

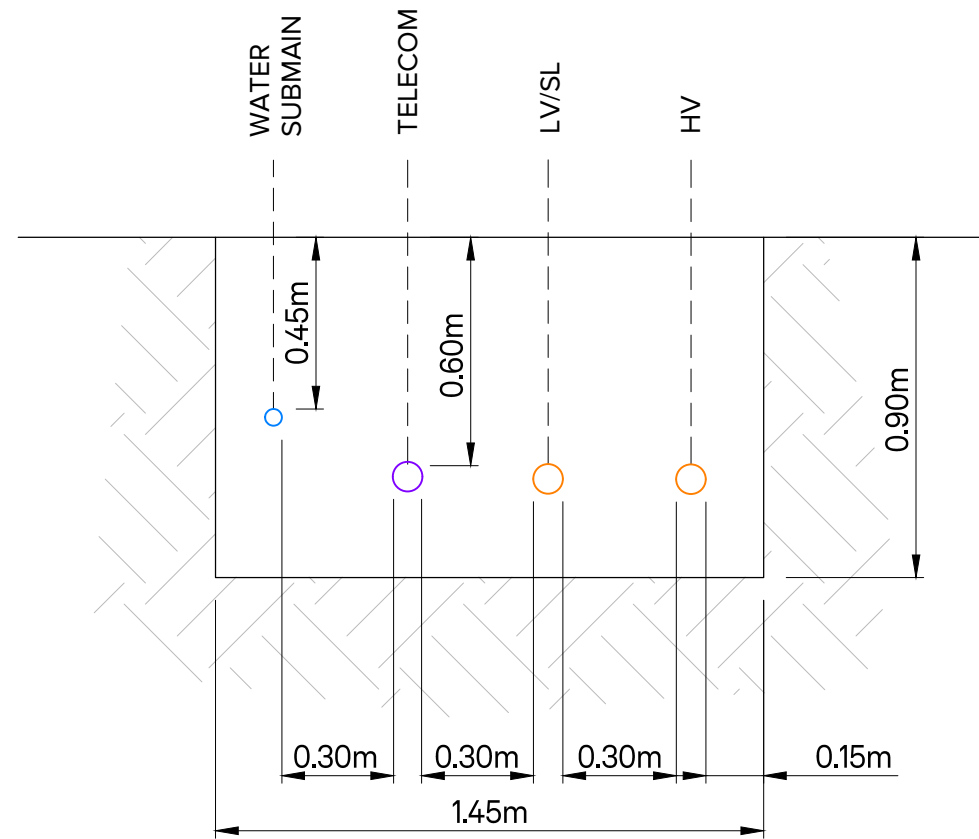
DESCRIPTION: **ROADING CROSS SECTION PLAN SHEET 2 OF 3**

SURVEYED	-	-
DESIGNED	AO	18/06/2025
DRAWN	AA	18/06/2025
CHECKED	SS	01/07/2025
APPROVED	MP	-
SCALE	AS SHOWN	REVISION
STATUS	FOR RESOURCE CONSENT	A
PROJECT	16013	
DWG NO	16013-00-RC-3301	

DRAFT ONLY



E TYPICAL ROADING CROSS-SECTION - 16m FORMATION
SCALE 1:50



F TYPICAL UTILITIES SERVICES TRENCH IN ROAD RESERVE
SCALE NTS

NOTES:

1. ALL WORKS SHALL COMPLY WITH THE WDC ENGINEERING CODE OF PRACTICE (ECOP) UNLESS OTHERWISE SPECIFIED.
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8. BERMS AND TREE PITS TO BE CONSTRUCTED AS PER WDC ECOP PART 10.
9. CARRIAGEWAY CROSSFALLS TO COMPLY WITH WDC ECOP SECTION 8.7.4.

A		ISSUED FOR FAST TRACK CONSENT	SS	02/07/2025
REVISION DETAILS			BY	DATE
PROJECT: OHOKA WAIMAKARIRI CANTERBURY				
DESCRIPTION: ROADING CROSS SECTION PLAN SHEET 3 OF 3				
SURVEYED	-			
DESIGNED	AO		18/06/2025	
DRAWN	AA		18/06/2025	
CHECKED	SS		01/07/2025	
APPROVED	MP			
SCALE	AS SHOWN			REVISION
STATUS	FOR RESOURCE CONSENT			A
PROJECT	16013			
DWG NO	16013-00-RC-3302			

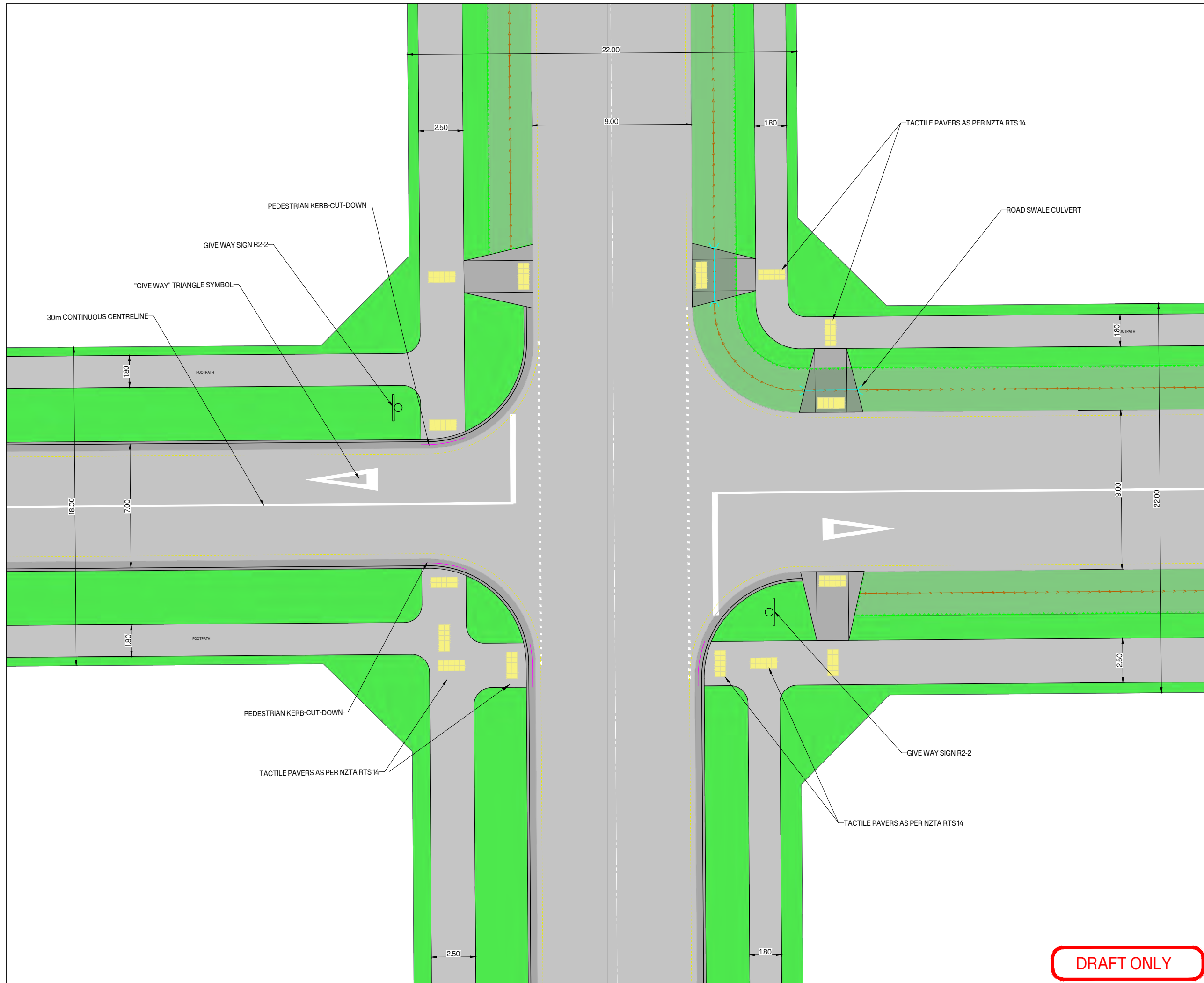
DRAFT ONLY

NOTES:

1. ALL WORKS SHALL COMPLY WITH THE WDC ENGINEERING CODE OF PRACTICE (ECOP) UNLESS OTHERWISE SPECIFIED.
2. ASPHALTIC CONCRETE SPECIFIED IN ACCORDANCE WITH NZTA M/10:2020 SPECIFICATION.
3. BENKELMAN BEAM TESTING TO COMPLY WITH WDC ECOP SECTION 3.11.3 RESULTS ARE TO BE SUBMITTED TO THE WDC AS PER THE REQUIREMENTS OF ECOP 2.10.4 AND 3.1.1.
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10. MOUNTABLE KERB AS PER WDC ECOP 203A-B.
11. PEDESTRIAN CUT DOWN AS PER WDC ECOP 213.

LEGEND:

- PR LOT BOUNDARY
- CARRIAGEWAY
- KERB & CHANNEL
- ROAD SWALE
- BERM
- FOOTPATH
- SWALE TOP
- WATER ALIGNMENT
- TACTILE PAVERS
- PRAM CROSSINGS
- ROAD SIGNS
- ROAD SWALE CULVERT

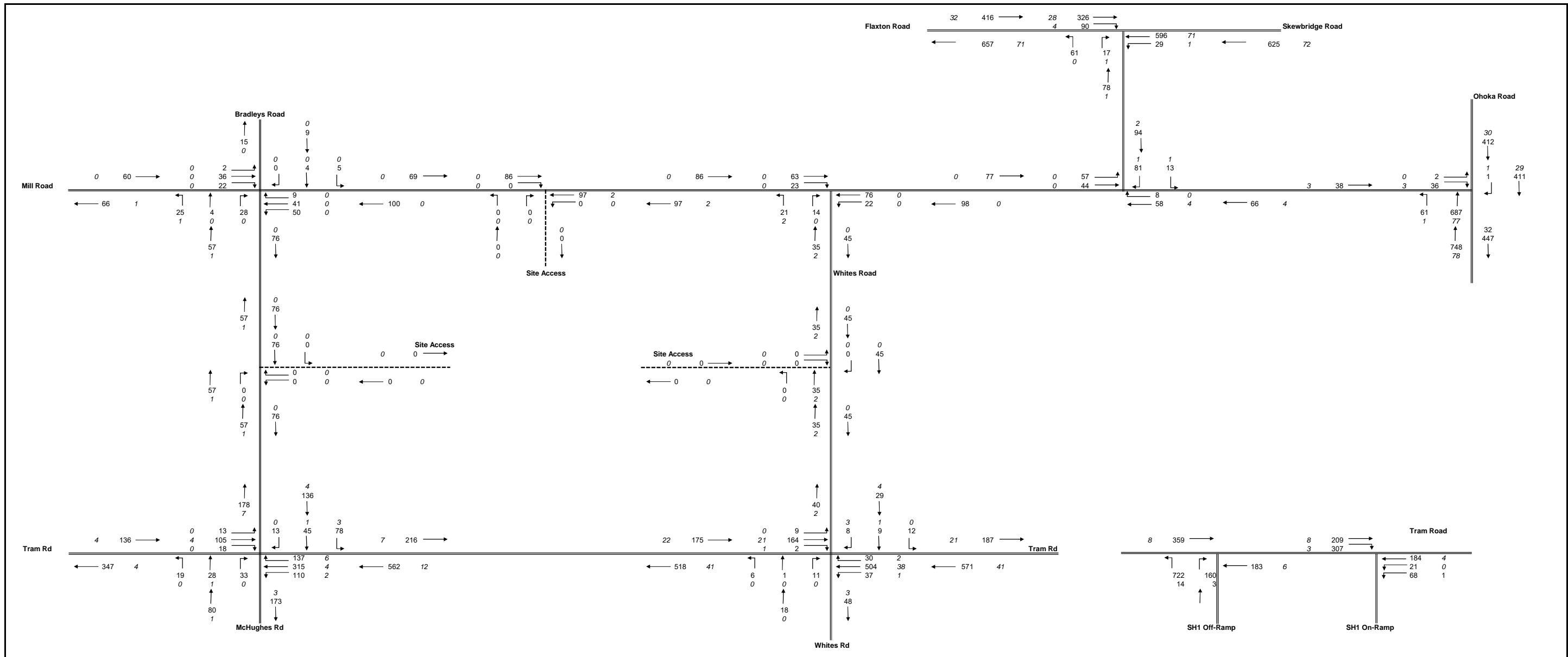


A	ISSUED FOR FAST TRACK CONSENT	SS	-
REVISION DETAILS		BY	DATE
PROJECT: OHOKA WAIMAKARIRI CHRISTCHURCH			
DESCRIPTION: TYPICAL INTERSECTION DETAIL			
SURVEYED	-	-	-
DESIGNED	KC	06/2025	-
DRAWN	KC	06/2025	-
CHECKED	SS	-	-
APPROVED	MP	-	-
SCALE	1:100 @A1	1:200 @A3	REVISION
STATUS	FOR RESOURCE CONSENT		A
PROJECT	16013		
DWG NO	16013-00-RC-3500		

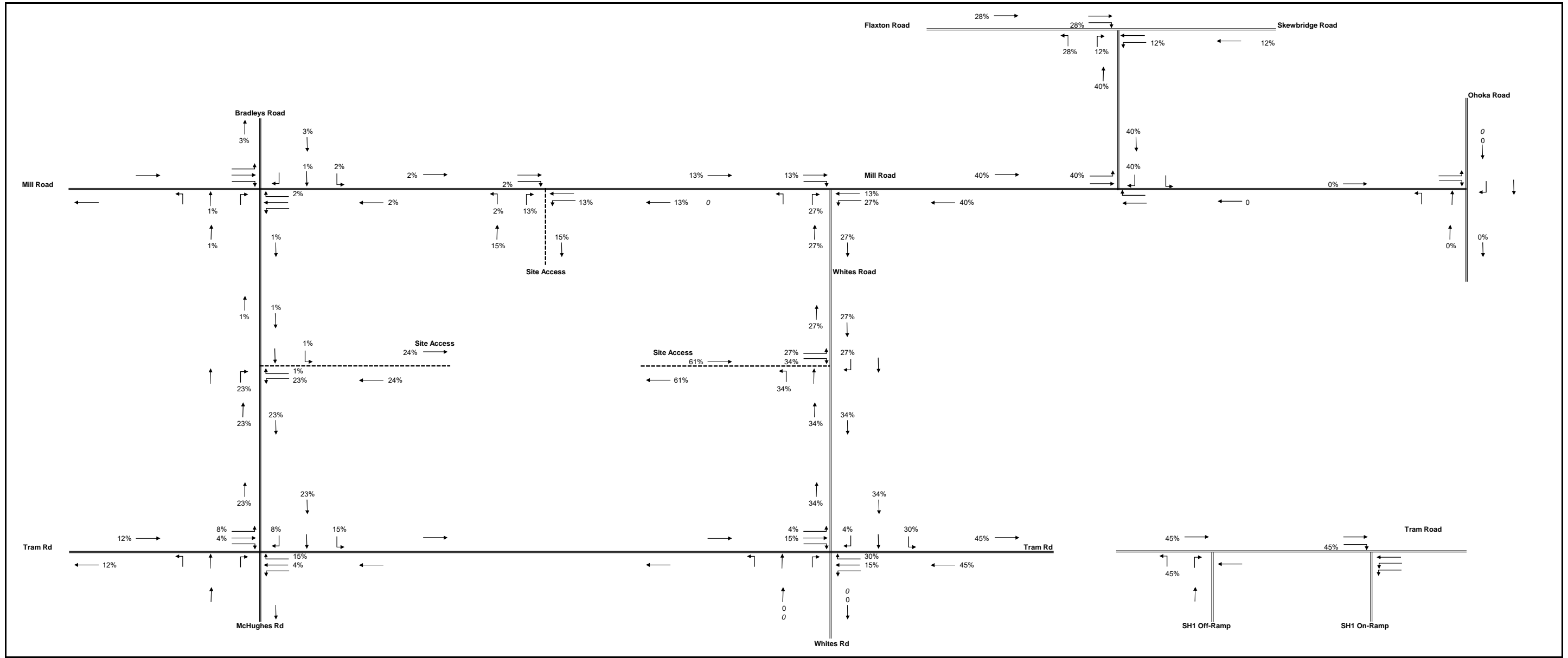
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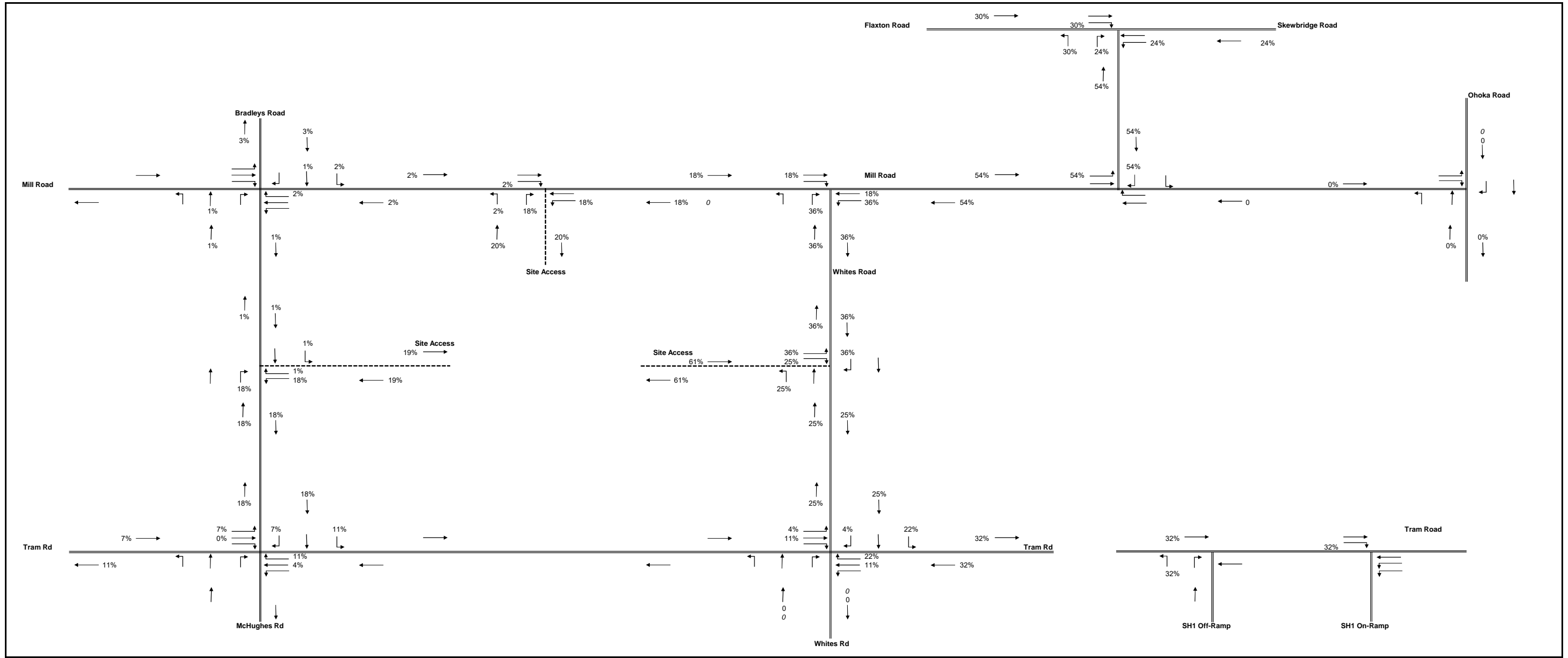
Appendix 3
Traffic Diagrams



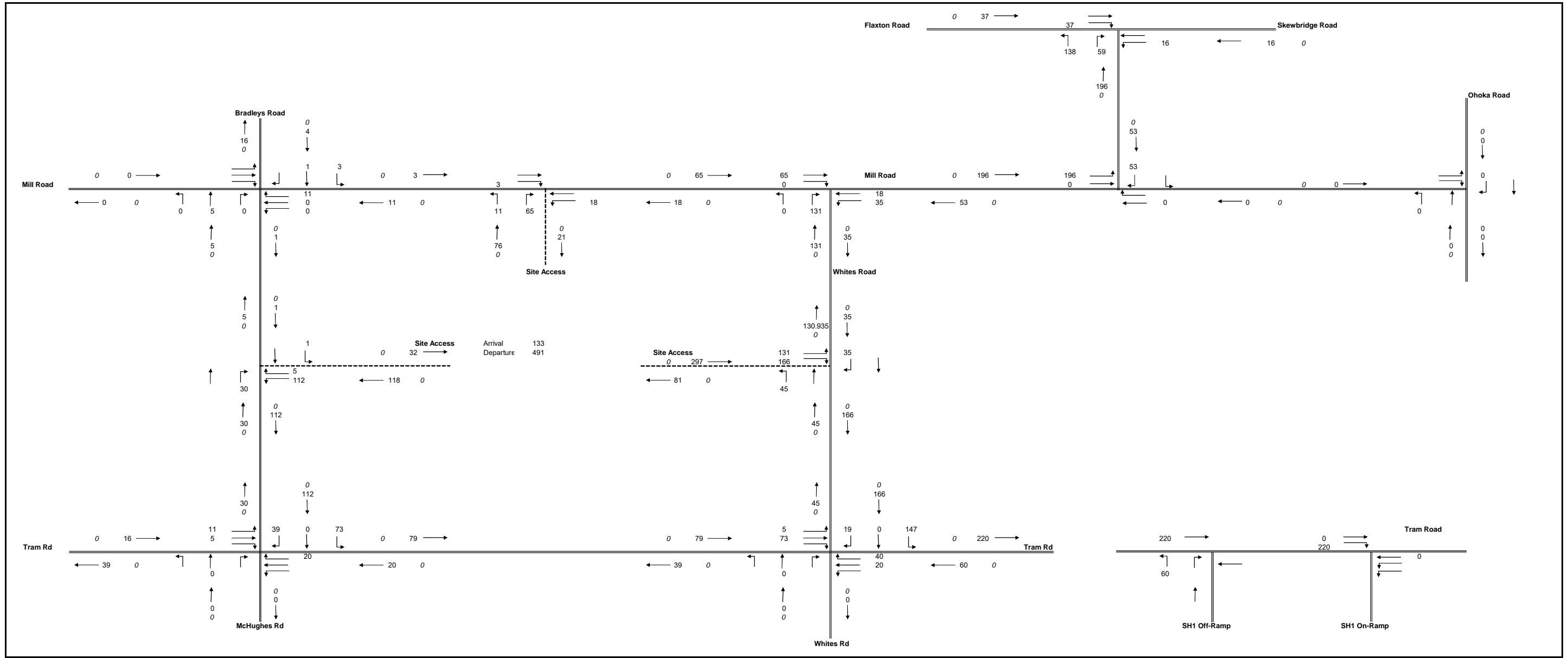
**021-051: Ohoka Fast Track Subdivision
2025 Existing Volumes - PM Peak
Diagram 2**



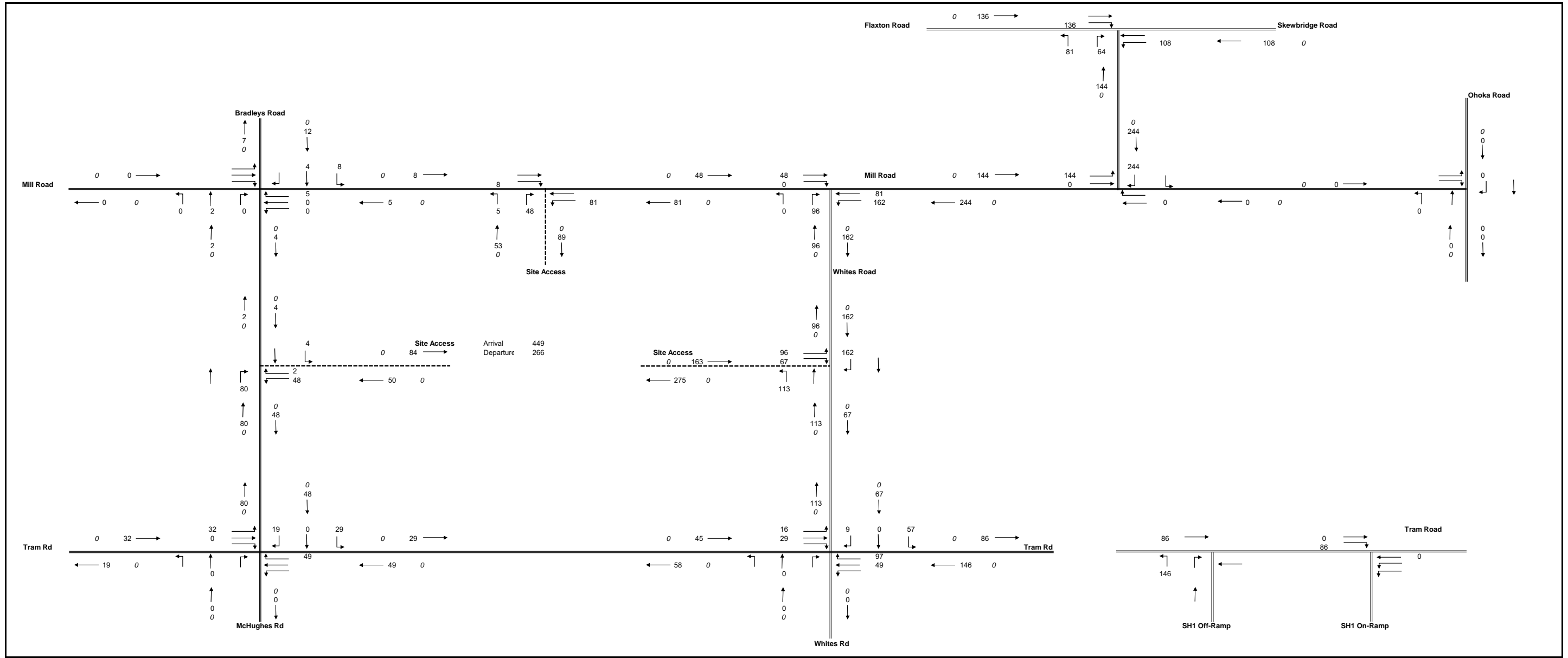
**021-051: Ohoka Fast Track Subdivision
Distribution - AM Peak
Diagram 3**



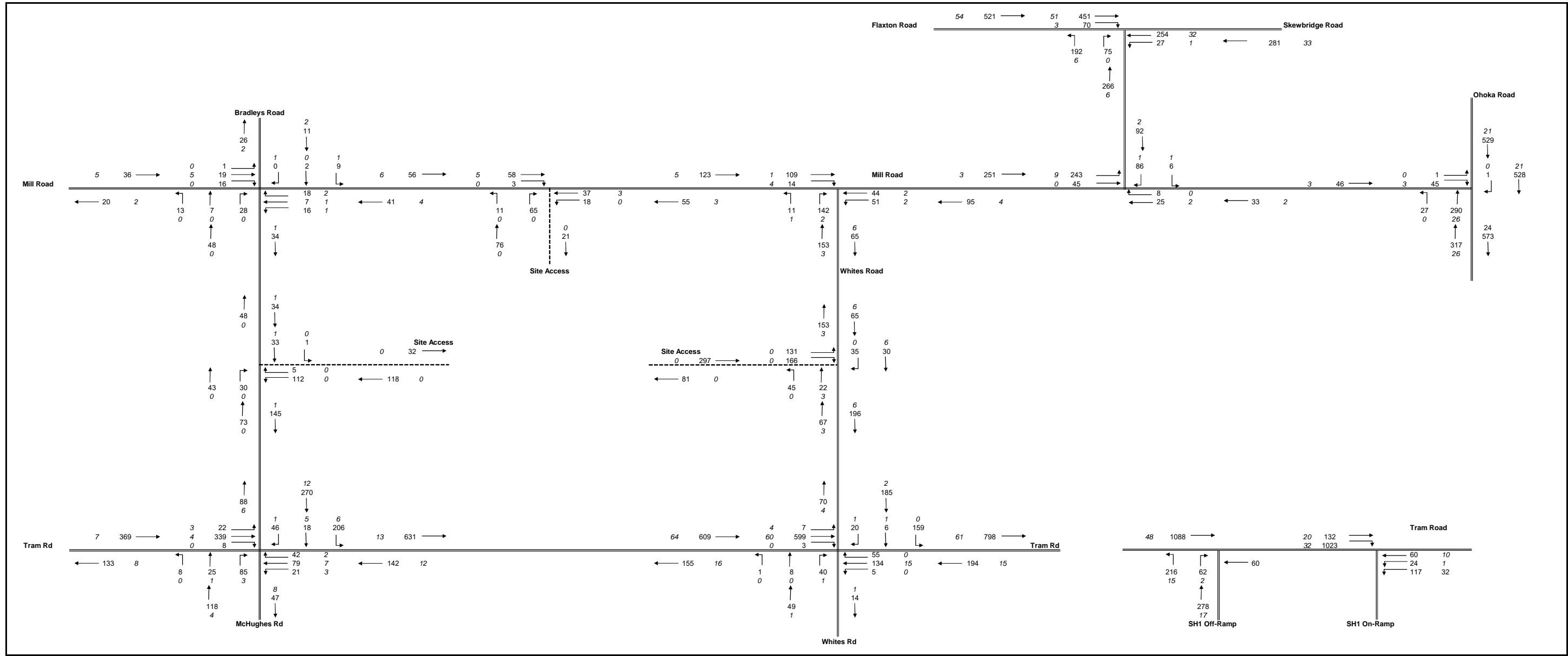
**021-051: Ohoka Fast Track Subdivision
Distribution - PM Peak
Diagram 4**



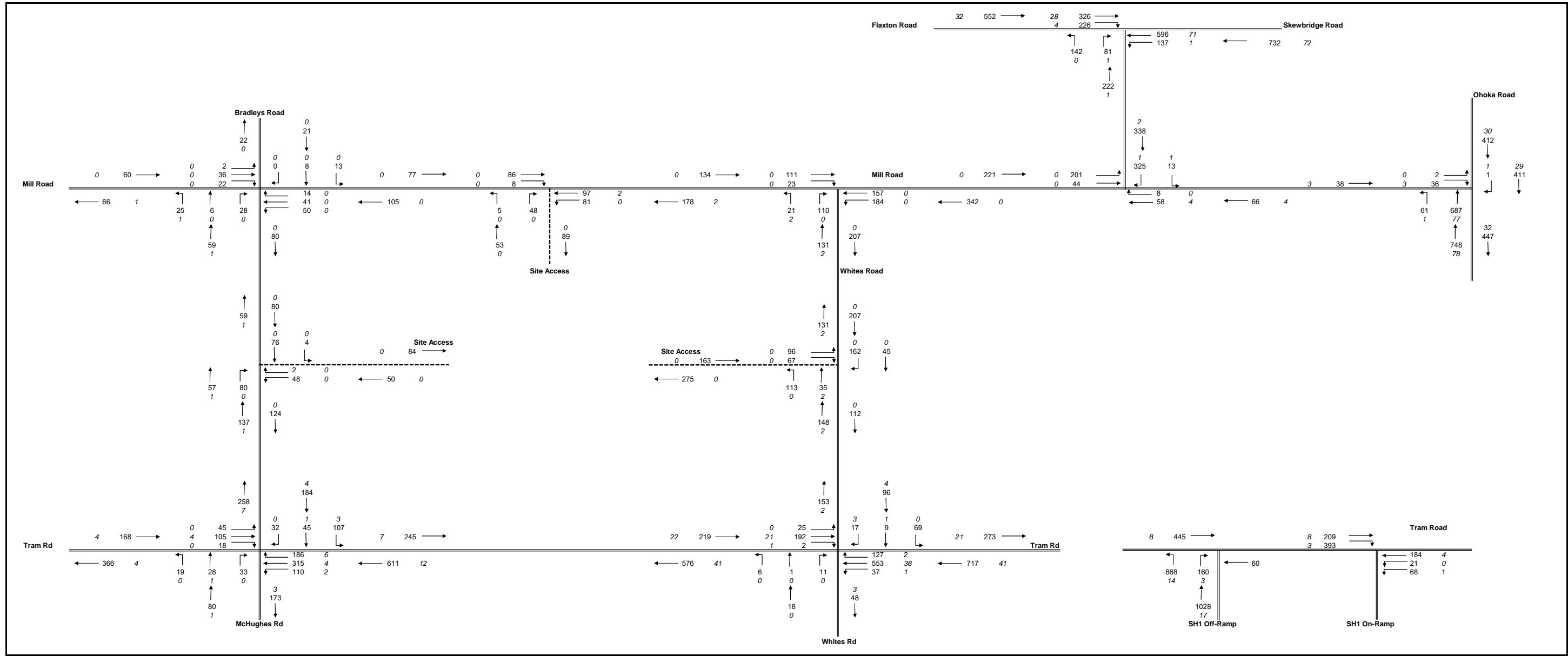
**021-051: Ohoka Fast Track Subdivision
Assignment - AM Peak
Diagram 5**



021-051: Ohoka Fast Track Subdivision
Assignment - PM Peak
Diagram 6



**021-051: Ohoka Fast Track Subdivision
2025 plus Development Traffic - AM Peak
Diagram 7**



**021-051: Ohoka Fast Track Subdivision
2025 plus Development Traffic - PM Peak
Diagram 8**



Appendix 4

Tram Rd / Bradleys Rd Intersection - Existing Operation

MOVEMENT SUMMARY

**Site: 101 [Tram Rd & Bradleys Rd - 2021 AM Peak - Calibrate
(Site Folder: Tram Rd & Bradleys Rd)]**

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue	Dist	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: McHughes Rd															
1	L2	All MCs	8	0.0	8	0.0	0.008	9.2	LOS A	0.0	0.2	0.19	0.88	0.19	62.5
2	T1	All MCs	27	3.8	27	3.8	0.401	20.8	LOS C	1.7	12.1	0.74	1.06	1.01	51.0
3	R2	All MCs	93	3.4	93	3.4	0.401	23.4	LOS C	1.7	12.1	0.74	1.06	1.01	51.1
Approach			128	3.3	128	3.3	0.401	21.9	LOS C	1.7	12.1	0.71	1.05	0.95	51.7
East: Tram Rd															
4	L2	All MCs	24	8.7	24	8.7	0.014	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	61.8
5	T1	All MCs	91	8.1	91	8.1	0.049	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
6	R2	All MCs	26	12.0	26	12.0	0.030	9.0	LOS A	0.1	0.9	0.43	0.66	0.43	58.9
Approach			141	9.0	141	9.0	0.049	2.9	NA	0.1	0.9	0.08	0.23	0.08	71.6
North: Bradleys Rd															
7	L2	All MCs	146	4.3	146	4.3	0.190	11.5	LOS B	0.7	5.2	0.47	0.93	0.47	59.7
8	T1	All MCs	24	21.7	24	21.7	0.128	21.6	LOS C	0.4	3.3	0.66	1.01	0.66	48.5
9	R2	All MCs	8	12.5	8	12.5	0.128	21.8	LOS C	0.4	3.3	0.66	1.01	0.66	50.3
Approach			179	7.1	179	7.1	0.190	13.4	LOS B	0.7	5.2	0.50	0.94	0.50	57.4
West: Tram Rd															
10	L2	All MCs	15	21.4	15	21.4	0.009	7.3	LOS A	0.0	0.0	0.00	0.63	0.00	58.1
11	T1	All MCs	356	1.2	356	1.2	0.182	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	All MCs	8	0.0	8	0.0	0.007	7.5	LOS A	0.0	0.2	0.22	0.57	0.22	63.5
Approach			379	1.9	379	1.9	0.182	0.5	NA	0.0	0.2	0.00	0.04	0.00	78.3
All Vehicles			827	4.5	827	4.5	0.401	7.0	NA	1.7	12.1	0.23	0.42	0.27	66.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

**Site: 101 [Tram Rd & Bradleys Rd - 2021 PM Peak - Calibrate
(Site Folder: Tram Rd & Bradleys Rd)]**

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist]				km/h
											m				
South: McHughes Rd															
1	L2	All MCs	20	0.0	20	0.0	0.024	10.7	LOS B	0.1	0.6	0.40	0.87	0.40	61.5
2	T1	All MCs	31	3.4	31	3.4	0.264	24.3	LOS C	1.0	6.7	0.77	1.02	0.88	50.3
3	R2	All MCs	35	0.0	35	0.0	0.264	23.3	LOS C	1.0	6.7	0.77	1.02	0.88	51.1
Approach			85	1.2	85	1.2	0.264	20.7	LOS C	1.0	6.7	0.68	0.99	0.76	52.9
East: Tram Rd															
4	L2	All MCs	118	1.8	118	1.8	0.066	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	64.0
5	T1	All MCs	336	1.3	336	1.3	0.173	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	All MCs	151	4.2	151	4.2	0.121	7.5	LOS A	0.5	3.7	0.25	0.61	0.25	62.2
Approach			604	2.1	604	2.1	0.173	3.2	NA	0.5	3.7	0.06	0.27	0.06	71.4
North: Bradleys Rd															
7	L2	All MCs	85	3.7	85	3.7	0.082	9.6	LOS A	0.3	2.2	0.23	0.89	0.23	61.2
8	T1	All MCs	48	2.2	48	2.2	0.281	26.3	LOS D	1.0	7.3	0.78	1.03	0.91	49.0
9	R2	All MCs	14	0.0	14	0.0	0.281	25.0	LOS D	1.0	7.3	0.78	1.03	0.91	49.4
Approach			147	2.9	147	2.9	0.281	16.5	LOS C	1.0	7.3	0.46	0.95	0.52	55.5
West: Tram Rd															
10	L2	All MCs	14	0.0	14	0.0	0.008	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	64.6
11	T1	All MCs	115	3.7	115	3.7	0.060	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
12	R2	All MCs	19	0.0	19	0.0	0.021	9.1	LOS A	0.1	0.6	0.46	0.66	0.46	62.3
Approach			147	2.9	147	2.9	0.060	1.8	NA	0.1	0.6	0.06	0.14	0.06	75.5
All Vehicles			984	2.2	984	2.2	0.281	6.5	NA	1.0	7.3	0.18	0.42	0.19	67.0

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Traffic Model - 2025-01.sjp9



Appendix 5

Tram Rd / Whites Rd Intersection - Existing Operation

MOVEMENT SUMMARY

**Site: 101 [Tram Rd & Whites Rd - 2021 AM Existing Calibrate
(Site Folder: Tram Rd & Whites Rd)]**

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Whites Rd															
1	L2	All MCs	1	0.0	1	0.0	0.165	10.0	LOS A	0.6	3.9	0.72	1.00	0.72	60.8
2	T1	All MCs	8	0.0	8	0.0	0.165	20.9	LOS C	0.6	3.9	0.72	1.00	0.72	60.8
3	R2	All MCs	43	2.4	43	2.4	0.165	19.9	LOS C	0.6	3.9	0.72	1.00	0.72	60.1
Approach			53	2.0	53	2.0	0.165	19.8	LOS C	0.6	3.9	0.72	1.00	0.72	60.3
East: Tram Rd															
4	L2	All MCs	5	0.0	5	0.0	0.065	7.8	LOS A	0.0	0.0	0.00	0.03	0.00	86.7
5	T1	All MCs	117	7.2	117	7.2	0.065	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	99.0
6	R2	All MCs	16	0.0	16	0.0	0.018	10.3	LOS B	0.1	0.5	0.56	0.72	0.56	70.7
Approach			138	6.1	138	6.1	0.065	1.5	NA	0.1	0.5	0.06	0.11	0.06	94.2
North: Whites Rd															
7	L2	All MCs	13	0.0	13	0.0	0.020	13.1	LOS B	0.1	0.5	0.53	0.91	0.53	68.6
8	T1	All MCs	7	14.3	7	14.3	0.052	25.3	LOS D	0.1	1.2	0.77	1.01	0.77	51.0
9	R2	All MCs	2	50.0	2	50.0	0.052	42.6	LOS E	0.1	1.2	0.77	1.01	0.77	45.1
Approach			22	9.5	22	9.5	0.052	20.0	LOS C	0.1	1.2	0.63	0.95	0.63	58.9
West: Tram Rd															
10	L2	All MCs	6	66.7	6	66.7	0.328	9.6	LOS A	0.0	0.0	0.00	0.01	0.00	62.3
11	T1	All MCs	629	1.7	629	1.7	0.328	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	99.7
12	R2	All MCs	3	0.0	3	0.0	0.002	7.7	LOS A	0.0	0.1	0.23	0.59	0.23	73.6
Approach			639	2.3	639	2.3	0.328	0.2	NA	0.0	0.1	0.00	0.01	0.00	99.0
All Vehicles			852	3.1	852	3.1	0.328	2.1	NA	0.6	3.9	0.07	0.11	0.07	92.9

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Traffic Model - 2025-01.sip9

MOVEMENT SUMMARY

**Site: 101 [Tram Rd & Whites Rd - 2021 PM Existing - Calibrate
(Site Folder: Tram Rd & Whites Rd)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed	
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. Dist]				km/h	
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	6	0.0	6	0.0	0.052	13.0	LOS B	0.2	1.2	0.69	1.00	0.69	63.4
2	T1	All MCs	1	0.0	1	0.0	0.052	22.8	LOS C	0.2	1.2	0.69	1.00	0.69	63.4
3	R2	All MCs	12	0.0	12	0.0	0.052	19.9	LOS C	0.2	1.2	0.69	1.00	0.69	63.3
Approach			19	0.0	19	0.0	0.052	17.8	LOS C	0.2	1.2	0.69	1.00	0.69	63.4
East: Tram Rd															
4	L2	All MCs	40	2.6	40	2.6	0.339	7.9	LOS A	0.0	0.0	0.00	0.04	0.00	85.0
5	T1	All MCs	612	3.3	612	3.3	0.339	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	98.5
6	R2	All MCs	34	6.3	34	6.3	0.023	8.4	LOS A	0.1	0.8	0.31	0.61	0.31	70.0
Approach			685	3.4	685	3.4	0.339	0.9	NA	0.1	0.8	0.02	0.07	0.02	95.7
North: Whites Rd															
7	L2	All MCs	13	0.0	13	0.0	0.011	10.2	LOS B	0.0	0.3	0.27	0.86	0.27	71.8
8	T1	All MCs	11	10.0	11	10.0	0.138	29.1	LOS D	0.3	2.8	0.80	1.01	0.80	49.4
9	R2	All MCs	12	27.3	12	27.3	0.138	35.4	LOS E	0.3	2.8	0.80	1.01	0.80	46.5
Approach			35	12.1	35	12.1	0.138	24.3	LOS C	0.3	2.8	0.61	0.95	0.61	54.4
West: Tram Rd															
10	L2	All MCs	9	0.0	9	0.0	0.103	7.8	LOS A	0.0	0.0	0.00	0.03	0.00	86.6
11	T1	All MCs	189	2.8	189	2.8	0.103	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	98.9
12	R2	All MCs	3	33.3	3	33.3	0.005	12.8	LOS B	0.0	0.2	0.60	0.70	0.60	58.3
Approach			202	3.1	202	3.1	0.103	0.6	NA	0.0	0.2	0.01	0.04	0.01	97.2
All Vehicles			941	3.6	941	3.6	0.339	2.0	NA	0.3	2.8	0.05	0.12	0.05	92.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Tram Rd & Whites Rd - 2025 AM (Site Folder: Tram Rd & Whites Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Whites Rd															
1	L2	All MCs	1	0.0	1	0.0	0.177	10.1	LOS B	0.6	4.2	0.74	1.00	0.74	59.8
2	T1	All MCs	8	0.0	8	0.0	0.177	22.1	LOS C	0.6	4.2	0.74	1.00	0.74	59.8
3	R2	All MCs	43	2.4	43	2.4	0.177	20.9	LOS C	0.6	4.2	0.74	1.00	0.74	59.2
Approach			53	2.0	53	2.0	0.177	20.9	LOS C	0.6	4.2	0.74	1.00	0.74	59.3
East: Tram Rd															
4	L2	All MCs	5	0.0	5	0.0	0.077	7.8	LOS A	0.0	0.0	0.00	0.03	0.00	86.7
5	T1	All MCs	136	11.6	136	11.6	0.077	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	99.1
6	R2	All MCs	16	0.0	16	0.0	0.018	10.4	LOS B	0.1	0.5	0.56	0.72	0.56	70.6
Approach			157	10.1	157	10.1	0.077	1.3	NA	0.1	0.5	0.06	0.10	0.06	94.8
North: Whites Rd															
7	L2	All MCs	13	0.0	13	0.0	0.020	13.2	LOS B	0.1	0.5	0.54	0.92	0.54	68.5
8	T1	All MCs	7	14.3	7	14.3	0.057	27.0	LOS D	0.2	1.3	0.79	1.01	0.79	49.5
9	R2	All MCs	2	50.0	2	50.0	0.057	46.6	LOS E	0.2	1.3	0.79	1.01	0.79	44.0
Approach			22	9.5	22	9.5	0.057	21.0	LOS C	0.2	1.3	0.65	0.95	0.65	58.0
West: Tram Rd															
10	L2	All MCs	6	66.7	6	66.7	0.339	9.6	LOS A	0.0	0.0	0.00	0.01	0.00	62.2
11	T1	All MCs	617	10.2	617	10.2	0.339	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	99.7
12	R2	All MCs	3	0.0	3	0.0	0.002	7.8	LOS A	0.0	0.1	0.25	0.59	0.25	73.5
Approach			626	10.8	626	10.8	0.339	0.2	NA	0.0	0.1	0.00	0.01	0.00	98.9
All Vehicles			858	10.1	858	10.1	0.339	2.2	NA	0.6	4.2	0.07	0.11	0.07	92.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Tram Rd & Whites Rd - 2025 PM (Site Folder: Tram Rd & Whites Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	6	0.0	6	0.0	0.050	12.7	LOS B	0.2	1.2	0.68	0.99	0.68	63.9
2	T1	All MCs	1	0.0	1	0.0	0.050	22.1	LOS C	0.2	1.2	0.68	0.99	0.68	63.9
3	R2	All MCs	12	0.0	12	0.0	0.050	19.3	LOS C	0.2	1.2	0.68	0.99	0.68	63.8
Approach			19	0.0	19	0.0	0.050	17.3	LOS C	0.2	1.2	0.68	0.99	0.68	63.8
East: Tram Rd															
4	L2	All MCs	40	2.6	40	2.6	0.324	7.9	LOS A	0.0	0.0	0.00	0.04	0.00	84.9
5	T1	All MCs	571	7.0	571	7.0	0.324	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	98.4
6	R2	All MCs	34	6.3	34	6.3	0.024	8.4	LOS A	0.1	0.8	0.32	0.61	0.32	70.0
Approach			644	6.7	644	6.7	0.324	1.0	NA	0.1	0.8	0.02	0.07	0.02	95.4
North: Whites Rd															
7	L2	All MCs	13	0.0	13	0.0	0.012	10.3	LOS B	0.0	0.3	0.28	0.86	0.28	71.7
8	T1	All MCs	11	10.0	11	10.0	0.129	28.0	LOS D	0.3	2.7	0.79	1.01	0.79	50.3
9	R2	All MCs	12	27.3	12	27.3	0.129	33.7	LOS D	0.3	2.7	0.79	1.01	0.79	47.4
Approach			35	12.1	35	12.1	0.129	23.4	LOS C	0.3	2.7	0.61	0.95	0.61	55.2
West: Tram Rd															
10	L2	All MCs	9	0.0	9	0.0	0.111	7.8	LOS A	0.0	0.0	0.00	0.03	0.00	86.6
11	T1	All MCs	195	11.4	195	11.4	0.111	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	98.8
12	R2	All MCs	3	33.3	3	33.3	0.005	12.4	LOS B	0.0	0.2	0.58	0.69	0.58	58.6
Approach			207	11.2	207	11.2	0.111	0.6	NA	0.0	0.2	0.01	0.04	0.01	97.2
All Vehicles			905	7.8	905	7.8	0.324	2.1	NA	0.3	2.7	0.05	0.12	0.05	92.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 6

Mill Rd / Bradleys Rd Intersection - Existing Operation

MOVEMENT SUMMARY

Site: 101 [Mill Rd & Bradleys Rd - 2021 AM Existing (Site Folder: Mill Rd & Bradleys Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Bradleys Rd															
1	L2	All MCs	14	0.0	14	0.0	0.043	8.0	LOS A	0.1	1.0	0.09	0.94	0.09	51.2
2	T1	All MCs	2	0.0	2	0.0	0.043	8.0	LOS A	0.1	1.0	0.09	0.94	0.09	51.2
3	R2	All MCs	29	0.0	29	0.0	0.043	7.9	LOS A	0.1	1.0	0.09	0.94	0.09	50.9
Approach			45	0.0	45	0.0	0.043	7.9	LOS A	0.1	1.0	0.09	0.94	0.09	51.0
East: Mill Rd															
4	L2	All MCs	18	5.9	18	5.9	0.021	5.6	LOS A	0.1	0.5	0.07	0.44	0.07	53.4
5	T1	All MCs	8	12.5	8	12.5	0.021	0.1	LOS A	0.1	0.5	0.07	0.44	0.07	55.9
6	R2	All MCs	9	22.2	9	22.2	0.021	5.8	LOS A	0.1	0.5	0.07	0.44	0.07	52.4
Approach			36	11.8	36	11.8	0.021	4.4	NA	0.1	0.5	0.07	0.44	0.07	53.7
North: Bradleys Rd															
7	L2	All MCs	7	14.3	7	14.3	0.008	8.7	LOS A	0.0	0.3	0.11	0.96	0.11	50.3
8	T1	All MCs	1	0.0	1	0.0	0.008	8.0	LOS A	0.0	0.3	0.11	0.96	0.11	50.8
9	R2	All MCs	1	100.0	1	100.0	0.008	12.4	LOS B	0.0	0.3	0.11	0.96	0.11	46.7
Approach			9	22.2	9	22.2	0.008	9.0	LOS A	0.0	0.3	0.11	0.96	0.11	49.9
West: Mill Rd															
10	L2	All MCs	1	0.0	1	0.0	0.024	5.6	LOS A	0.1	0.6	0.07	0.25	0.07	55.0
11	T1	All MCs	25	20.8	25	20.8	0.024	0.0	LOS A	0.1	0.6	0.07	0.25	0.07	57.3
12	R2	All MCs	17	0.0	17	0.0	0.024	5.6	LOS A	0.1	0.6	0.07	0.25	0.07	54.7
Approach			43	12.2	43	12.2	0.024	2.3	NA	0.1	0.6	0.07	0.25	0.07	56.2
All Vehicles			134	8.7	134	8.7	0.043	5.2	NA	0.1	1.0	0.08	0.58	0.08	53.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Mill Rd & Bradleys Rd - 2021 PM Existing (Site Folder: Mill Rd & Bradleys Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Bradleys Rd															
1	L2	All MCs	27	3.8	27	3.8	0.058	8.3	LOSA	0.2	1.5	0.17	0.90	0.17	51.0
2	T1	All MCs	4	0.0	4	0.0	0.058	8.3	LOSA	0.2	1.5	0.17	0.90	0.17	51.1
3	R2	All MCs	29	0.0	29	0.0	0.058	8.3	LOSA	0.2	1.5	0.17	0.90	0.17	50.8
Approach			61	1.7	61	1.7	0.058	8.3	LOSA	0.2	1.5	0.17	0.90	0.17	50.9
East: Mill Rd															
4	L2	All MCs	53	0.0	53	0.0	0.056	5.6	LOSA	0.1	0.5	0.03	0.34	0.03	54.6
5	T1	All MCs	43	0.0	43	0.0	0.056	0.0	LOSA	0.1	0.5	0.03	0.34	0.03	56.8
6	R2	All MCs	9	0.0	9	0.0	0.056	5.5	LOSA	0.1	0.5	0.03	0.34	0.03	54.3
Approach			105	0.0	105	0.0	0.056	3.3	NA	0.1	0.5	0.03	0.34	0.03	55.5
North: Bradleys Rd															
7	L2	All MCs	5	0.0	5	0.0	0.009	8.1	LOSA	0.0	0.2	0.15	0.92	0.15	51.1
8	T1	All MCs	4	0.0	4	0.0	0.009	8.4	LOSA	0.0	0.2	0.15	0.92	0.15	51.1
9	R2	All MCs	1	0.0	1	0.0	0.009	8.2	LOSA	0.0	0.2	0.15	0.92	0.15	50.8
Approach			11	0.0	11	0.0	0.009	8.2	LOSA	0.0	0.2	0.15	0.92	0.15	51.1
West: Mill Rd															
10	L2	All MCs	2	0.0	2	0.0	0.035	5.8	LOSA	0.1	0.9	0.15	0.26	0.15	55.1
11	T1	All MCs	38	0.0	38	0.0	0.035	0.2	LOSA	0.1	0.9	0.15	0.26	0.15	57.4
12	R2	All MCs	23	0.0	23	0.0	0.035	5.8	LOSA	0.1	0.9	0.15	0.26	0.15	54.7
Approach			63	0.0	63	0.0	0.035	2.4	NA	0.1	0.9	0.15	0.26	0.15	56.3
All Vehicles			240	0.4	240	0.4	0.058	4.5	NA	0.2	1.5	0.10	0.49	0.10	54.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 7

Mill Rd / Whites Rd Intersection - Existing Operation

MOVEMENT SUMMARY

 **Site: 101 [Mill Rd & Whites Rd - 2021 AM Existing (Site Folder: Mill Rd & Whites Rd)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	13	8.3	13	8.3	0.009	8.5	LOS A	0.0	0.3	0.10	0.94	0.10	50.7
3	R2	All MCs	14	15.4	14	15.4	0.014	8.5	LOS A	0.0	0.4	0.20	0.91	0.20	50.4
Approach			26	12.0	26	12.0	0.014	8.5	LOS A	0.0	0.4	0.15	0.92	0.15	50.6
East: Mill Rd															
4	L2	All MCs	19	11.1	19	11.1	0.027	5.7	LOS A	0.0	0.0	0.00	0.23	0.00	55.1
5	T1	All MCs	29	7.1	29	7.1	0.027	0.0	LOS A	0.0	0.0	0.00	0.23	0.00	58.0
Approach			48	8.7	48	8.7	0.027	2.2	NA	0.0	0.0	0.00	0.23	0.00	56.8
West: Mill Rd															
11	T1	All MCs	47	2.2	47	2.2	0.038	0.1	LOS A	0.1	0.9	0.09	0.18	0.09	58.4
12	R2	All MCs	19	22.2	19	22.2	0.038	5.9	LOS A	0.1	0.9	0.09	0.18	0.09	54.7
Approach			66	7.9	66	7.9	0.038	1.8	NA	0.1	0.9	0.09	0.18	0.09	57.3
All Vehicles			141	9.0	141	9.0	0.038	3.2	NA	0.1	0.9	0.07	0.34	0.07	55.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Mill Rd & Whites Rd - 2021 PM Existing (Site Folder: Mill Rd & Whites Rd)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	24	8.7	24	8.7	0.019	8.7	LOSA	0.1	0.6	0.18	0.90	0.18	50.7
3	R2	All MCs	15	0.0	15	0.0	0.015	8.2	LOSA	0.0	0.3	0.26	0.87	0.26	51.0
Approach			39	5.4	39	5.4	0.019	8.5	LOSA	0.1	0.6	0.21	0.89	0.21	50.8
East: Mill Rd															
4	L2	All MCs	23	0.0	23	0.0	0.054	5.6	LOSA	0.0	0.0	0.00	0.13	0.00	56.4
5	T1	All MCs	80	0.0	80	0.0	0.054	0.0	LOSA	0.0	0.0	0.00	0.13	0.00	58.8
Approach			103	0.0	103	0.0	0.054	1.3	NA	0.0	0.0	0.00	0.13	0.00	58.2
West: Mill Rd															
11	T1	All MCs	66	0.0	66	0.0	0.049	0.1	LOSA	0.1	1.0	0.12	0.18	0.12	58.1
12	R2	All MCs	24	0.0	24	0.0	0.049	5.8	LOSA	0.1	1.0	0.12	0.18	0.12	55.6
Approach			91	0.0	91	0.0	0.049	1.6	NA	0.1	1.0	0.12	0.18	0.12	57.4
All Vehicles			233	0.9	233	0.9	0.054	2.6	NA	0.1	1.0	0.08	0.28	0.08	56.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 8

Mill Rd / Threlkelds Rd Intersection – Existing Operation

MOVEMENT SUMMARY

Site: 101 [Mill & Threlkelds - 2023 AM (Site Folder: Mill & Threlkelds)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
East: Mill Rd															
5	T1	All MCs	28	7.4	28	7.4	0.020	0.1	LOS A	0.0	0.4	0.10	0.16	0.10	58.3
6	R2	All MCs	8	0.0	8	0.0	0.020	5.8	LOS A	0.0	0.4	0.10	0.16	0.10	55.6
Approach			37	5.7	37	5.7	0.020	1.4	NA	0.0	0.4	0.10	0.16	0.10	57.7
North: Threlkelds Rd															
7	L2	All MCs	7	14.3	7	14.3	0.041	8.8	LOS A	0.1	1.0	0.19	0.90	0.19	50.7
9	R2	All MCs	36	2.9	36	2.9	0.041	8.1	LOS A	0.1	1.0	0.19	0.90	0.19	50.9
Approach			43	4.9	43	4.9	0.041	8.2	LOS A	0.1	1.0	0.19	0.90	0.19	50.9
West: Mill Rd															
10	L2	All MCs	59	16.1	59	16.1	0.059	5.7	LOS A	0.0	0.0	0.00	0.32	0.00	54.3
11	T1	All MCs	47	0.0	47	0.0	0.059	0.0	LOS A	0.0	0.0	0.00	0.32	0.00	57.3
Approach			106	8.9	106	8.9	0.059	3.2	NA	0.0	0.0	0.00	0.32	0.00	55.6
All Vehicles			186	7.3	186	7.3	0.059	4.0	NA	0.1	1.0	0.06	0.43	0.06	54.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Mill & Threlkelds - 2023 PM (Site Folder: Mill & Threlkelds)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
East: Mill Rd															
5	T1	All MCs	65	6.5	65	6.5	0.040	0.0	LOS A	0.1	0.4	0.05	0.08	0.05	59.1
6	R2	All MCs	8	0.0	8	0.0	0.040	5.8	LOS A	0.1	0.4	0.05	0.08	0.05	56.4
Approach			74	5.7	74	5.7	0.040	0.7	NA	0.1	0.4	0.05	0.08	0.05	58.8
North: Threlkelds Rd															
7	L2	All MCs	15	7.1	15	7.1	0.098	8.5	LOS A	0.3	2.4	0.22	0.90	0.22	50.9
9	R2	All MCs	86	1.2	86	1.2	0.098	8.2	LOS A	0.3	2.4	0.22	0.90	0.22	50.9
Approach			101	2.1	101	2.1	0.098	8.2	LOS A	0.3	2.4	0.22	0.90	0.22	50.9
West: Mill Rd															
10	L2	All MCs	60	0.0	60	0.0	0.055	5.6	LOS A	0.0	0.0	0.00	0.33	0.00	54.8
11	T1	All MCs	46	0.0	46	0.0	0.055	0.0	LOS A	0.0	0.0	0.00	0.33	0.00	57.0
Approach			106	0.0	106	0.0	0.055	3.1	NA	0.0	0.0	0.00	0.33	0.00	55.7
All Vehicles			281	2.2	281	2.2	0.098	4.3	NA	0.3	2.4	0.09	0.47	0.09	54.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 9

Flaxton Rd / Threlkelds Rd Intersection – Existing Operation

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2025 AM (Site Folder: Threlkelds & Flaxton)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Threlkelds Rd															
1	L2	All MCs	63	10.0	63	10.0	0.131	8.8	LOS A	0.5	3.5	0.52	0.73	0.52	57.4
3	R2	All MCs	17	0.0	17	0.0	0.131	20.2	LOS C	0.5	3.5	0.52	0.73	0.52	60.3
Approach			80	7.9	80	7.9	0.131	11.2	LOS B	0.5	3.5	0.52	0.73	0.52	58.0
East: Skewbridge Rd															
4	L2	All MCs	13	8.3	13	8.3	0.007	7.1	LOS A	0.0	0.0	0.00	0.63	0.00	61.9
5	T1	All MCs	301	11.2	301	11.2	0.166	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach			314	11.1	314	11.1	0.166	0.3	NA	0.0	0.0	0.00	0.03	0.00	79.0
West: Flaxton Rd															
11	T1	All MCs	528	10.2	528	10.2	0.286	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
12	R2	All MCs	38	8.3	38	8.3	0.039	8.5	LOS A	0.1	1.1	0.41	0.65	0.41	60.3
Approach			566	10.0	566	10.0	0.286	0.6	NA	0.1	1.1	0.03	0.04	0.03	78.1
All Vehicles			960	10.2	960	10.2	0.286	1.4	NA	0.5	3.5	0.06	0.10	0.06	76.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2025 PM (Site Folder: Threlkelds & Flaxton)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Threlkelds Rd															
1	L2	All MCs	64	0.0	64	0.0	0.280	13.4	LOS B	1.0	6.8	0.78	0.95	0.92	52.7
3	R2	All MCs	19	5.6	19	5.6	0.280	41.3	LOS E	1.0	6.8	0.78	0.95	0.92	51.6
Approach			83	1.3	83	1.3	0.280	19.7	LOS C	1.0	6.8	0.78	0.95	0.92	52.4
East: Skewbridge Rd															
4	L2	All MCs	32	3.3	32	3.3	0.017	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	63.5
5	T1	All MCs	702	10.6	702	10.6	0.385	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
Approach			734	10.3	734	10.3	0.385	0.4	NA	0.0	0.0	0.00	0.03	0.00	78.8
West: Flaxton Rd															
11	T1	All MCs	373	7.9	373	7.9	0.199	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	All MCs	99	4.3	99	4.3	0.190	12.8	LOS B	0.7	4.9	0.67	0.88	0.67	57.2
Approach			472	7.1	472	7.1	0.199	2.7	NA	0.7	4.9	0.14	0.19	0.14	73.8
All Vehicles			1288	8.6	1288	8.6	0.385	2.5	NA	1.0	6.8	0.10	0.14	0.11	74.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 10

Mill Rd / Ohoka Rd Intersection – Existing Operation

MOVEMENT SUMMARY

 Site: 101 [Mill Rd & Ohoka Rd - 2025 AM (Site Folder: Mill Rd & Ohoka Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Ohoka Rd															
1	L2	All MCs	28	0.0	28	0.0	0.192	7.0	LOS A	0.0	0.0	0.00	0.05	0.00	72.6
2	T1	All MCs	333	8.2	333	8.2	0.192	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	78.9
Approach			361	7.6	361	7.6	0.192	0.6	NA	0.0	0.0	0.00	0.05	0.00	78.3
North: Skewbridge Rd															
8	T1	All MCs	578	3.8	578	3.8	0.304	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
9	R2	All MCs	1	0.0	1	0.0	0.001	7.8	LOS A	0.0	0.0	0.42	0.56	0.42	63.0
Approach			579	3.8	579	3.8	0.304	0.1	NA	0.0	0.0	0.00	0.00	0.00	79.7
West: Mill Rd															
10	L2	All MCs	1	0.0	1	0.0	0.218	11.1	LOS B	0.7	5.4	0.80	1.02	0.87	50.6
12	R2	All MCs	51	6.3	51	6.3	0.218	25.9	LOS D	0.7	5.4	0.80	1.02	0.87	49.2
Approach			52	6.1	52	6.1	0.218	25.6	LOS D	0.7	5.4	0.80	1.02	0.87	49.2
All Vehicles			992	5.3	992	5.3	0.304	1.6	NA	0.7	5.4	0.04	0.07	0.05	76.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Mill Rd & Ohoka Rd - 2025 PM (Site Folder: Mill Rd & Ohoka Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Ohoka Rd															
1	L2	All MCs	65	1.6	65	1.6	0.468	7.1	LOS A	0.0	0.0	0.00	0.05	0.00	71.7
2	T1	All MCs	804	10.1	804	10.1	0.468	0.1	LOS A	0.0	0.0	0.00	0.05	0.00	78.6
Approach			869	9.4	869	9.4	0.468	0.6	NA	0.0	0.0	0.00	0.05	0.00	78.0
North: Skewbridge Rd															
8	T1	All MCs	463	6.6	463	6.6	0.248	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
9	R2	All MCs	250	0.0	250	0.0	0.007	19.0	LOS C	0.0	0.2	0.77	0.81	0.77	43.8
Approach			465	6.8	465	6.8	0.248	0.1	NA	0.0	0.2	0.00	0.00	0.00	79.5
West: Mill Rd															
10	L2	All MCs	2	0.0	2	0.0	0.501	27.4	LOS D	1.4	10.5	0.95	1.06	1.24	32.8
12	R2	All MCs	41	7.7	41	7.7	0.501	66.3	LOS F	1.4	10.5	0.95	1.06	1.24	32.1
Approach			43	7.3	43	7.3	0.501	64.4	LOS F	1.4	10.5	0.95	1.06	1.24	32.1
All Vehicles			1378	8.5	1378	8.5	0.501	2.5	NA	1.4	10.5	0.03	0.07	0.04	75.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 11

Tram Road Interchange Modelling Report



Ōhoka Development

Traffic Modelling Assessment

October 2025

flow

TRANSPORTATION SPECIALISTS



TRANSPORTATION SPECIALISTS

Project: Ōhoka Development
Title: Traffic Modelling Assessment (Draft)
Document Reference: P:\CAGR\001 Transport Modelling for Tram Road interchange\4.0 Reporting\R1A251010_Draft.docx
Prepared by: Qing Li / Jerry Qian Yang
Project Manager: Ian Clark
Reviewed by: Michael Jongeneel

Revisions:

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EXECUTIVE SUMMARY

Flow Transportation Specialists Limited (Flow) has been requested by Novo Group to provide traffic modelling assistance regarding the proposed Ōhoka Development, in Ōhoka, Waimakariri. We have developed an Aimsun micro-simulation model to investigate the potential traffic impacts of the proposed development. The model was calibrated and validated against existing traffic conditions, and subsequently used to assess the operation of Tram Road near the SH1 interchange, using traffic growth assumptions from the Integrated Transport Assessment (ITA) prepared by Novo Group.

We have compared the following forecast scenarios:

- ◆ **Future Do Minimum (2035):** This assumes the SH1/Tram Road interchange operates with the existing layout. This scenario includes existing traffic volumes, plus anticipated background traffic growth
- ◆ **Future with Development (2035):** As above, but additionally with the anticipated vehicle traffic generated by the Ōhoka Development
- ◆ **Future with Development, with mitigation (2035):** Similar to the above scenario, but with refined traffic signal phasing at the SH1/Tram Road interchange. Under this arrangement, the right turn movement from the off ramp and the westbound through movement from Tram Road East are permitted to operate within the same signal phase.

Our traffic modelling assessment has concluded:

- ◆ Under the Future with Development scenario, the additional development traffic is predicted to result in longer travel times and Level of Service (LOS) F at the SH1/Tram Road interchange during the morning peak hour (7:00–8:00 am). Impacts outside the morning peak are expected to be less pronounced.
- ◆ With the proposed signal phasing changes, delays are expected to reduce and congestion identified in the Future With Development scenario would be alleviated. The interchange is predicted to operate at LOS C in the morning peak and LOS A in the evening peak.

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APPENDICES

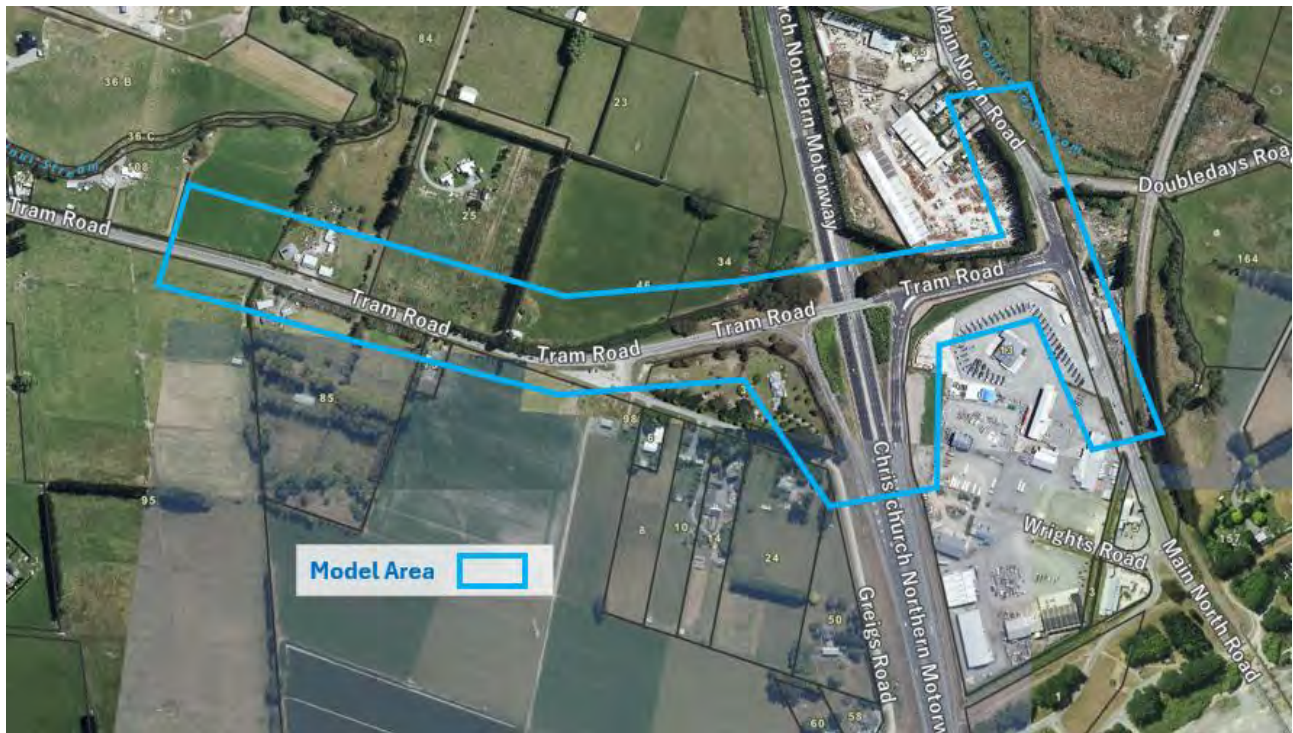
APPENDIX A BASE MODEL VALIDATION

APPENDIX B FORECAST ASSUMPTION AND DETAILED INTERSECTION RESULTS

1 INTRODUCTION

This report provides a summary of the traffic modelling completed to assist the Integrated Transport Assessment (ITA) of the proposed Ōhoka development along Tram Road and Main North Road in Waimakariri. The purpose of the modelling is to assess the potential traffic effects of the development on the operation of the Tram Road/State Highway 1 (SH1) interchange. The extent of the modelled road network is shown in Figure 1 below:

Figure 1: Modelled Network



We have developed an Aimsun micro-simulation model to assess the road network within the highlighted area. Aimsun is a traffic simulation package widely used in New Zealand to assess traffic operations at a range of scales and levels of detail. It enables the evaluation of existing or planned systems and the comparison of alternative solutions to potential traffic issues.

For the SH1/Tram Road interchange, we consider Aimsun's micro-simulation capacities to be the best tool available to assess the operation of the closely spaced traffic signals along the Tram Road corridor.

We have assessed the following traffic/land use scenarios:

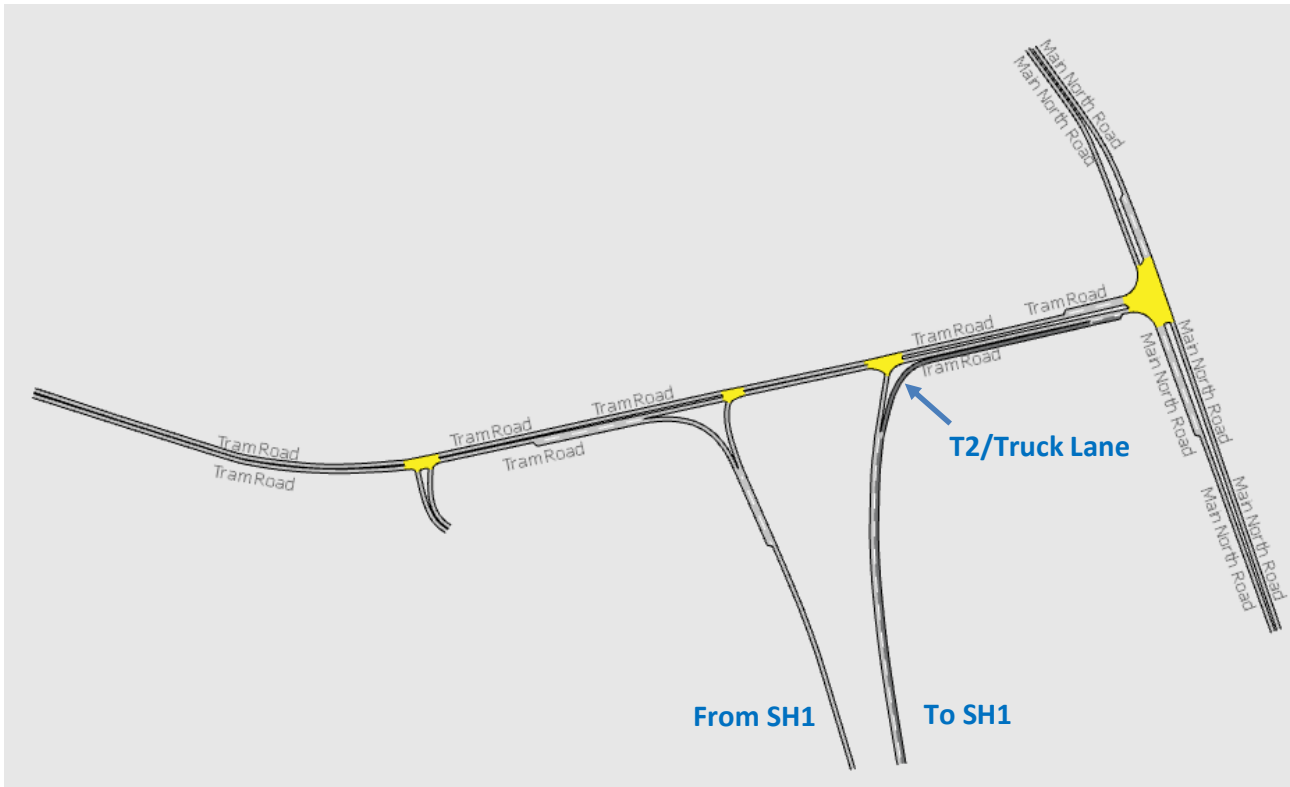
- ◆ **Base Case:** This reflects the existing layout and observed traffic operations along the Tram Road corridor (ie the operation today)
- ◆ **Future Do Minimum:** Uses the same layout as the Base Case model and reflects estimated future traffic volumes without the Ōhoka development
- ◆ **Future Do Something:** Uses the same layout as the Future Do Minimum scenario but incorporates estimated future traffic volumes including the proposed Ōhoka development.

2 MODEL DEVELOPMENT

2.1 Modelled Network

A screenshot of the Aimsun model is provided in Figure 2 below. The model includes the Tram Road/State Highway 1 interchange and the Tram Road/Main North Road intersection. Both intersections are signalised.

Figure 2: Aimsun Model Layout



2.2 Traffic Surveys

Traffic survey data was provided by Team Traffic for our assessment. This included vehicle movement counts and vehicle queue counts. The survey was undertaken on Thursday 4th September 2025 at the following intersections along Tram Road:

- ◆ Tram Road/SH1 On Ramp intersection
- ◆ Tram Road/SH1 Off Ramp intersection
- ◆ Tram Road/Main North Road intersection

Table 1: Traffic Survey Periods

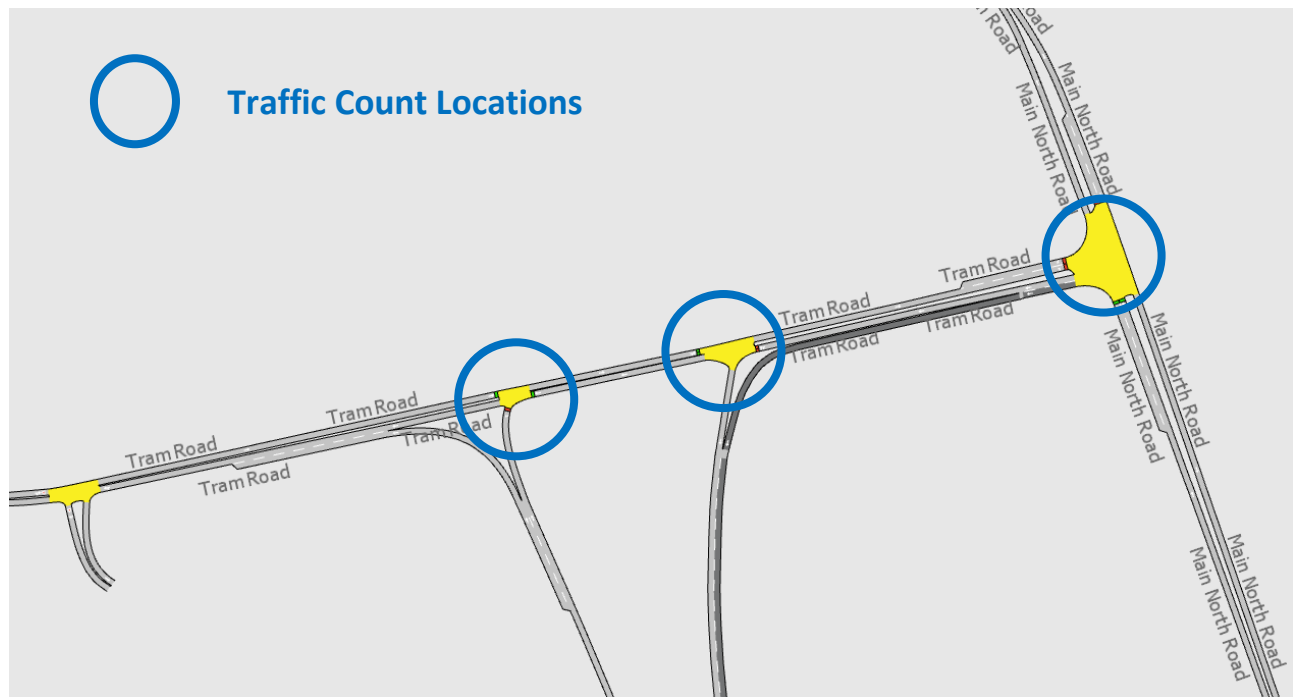
	Survey Time	Peak Hour
Morning Peak Period	7:00 am to 9:00 am	7:00 am to 8:00 am
Afternoon Peak Period	4:00 pm to 6:00 pm	4:00 pm to 5:00 pm

The surveyed traffic volumes of both peak periods are provided in Appendix A.

2.3 Our Base Model Development

We have developed a “base” network model to represent the existing operation of the corridor. The modelled layout for the existing corridor is shown in Figure 3.

Figure 3: Modelled Intersection Layout - Existing



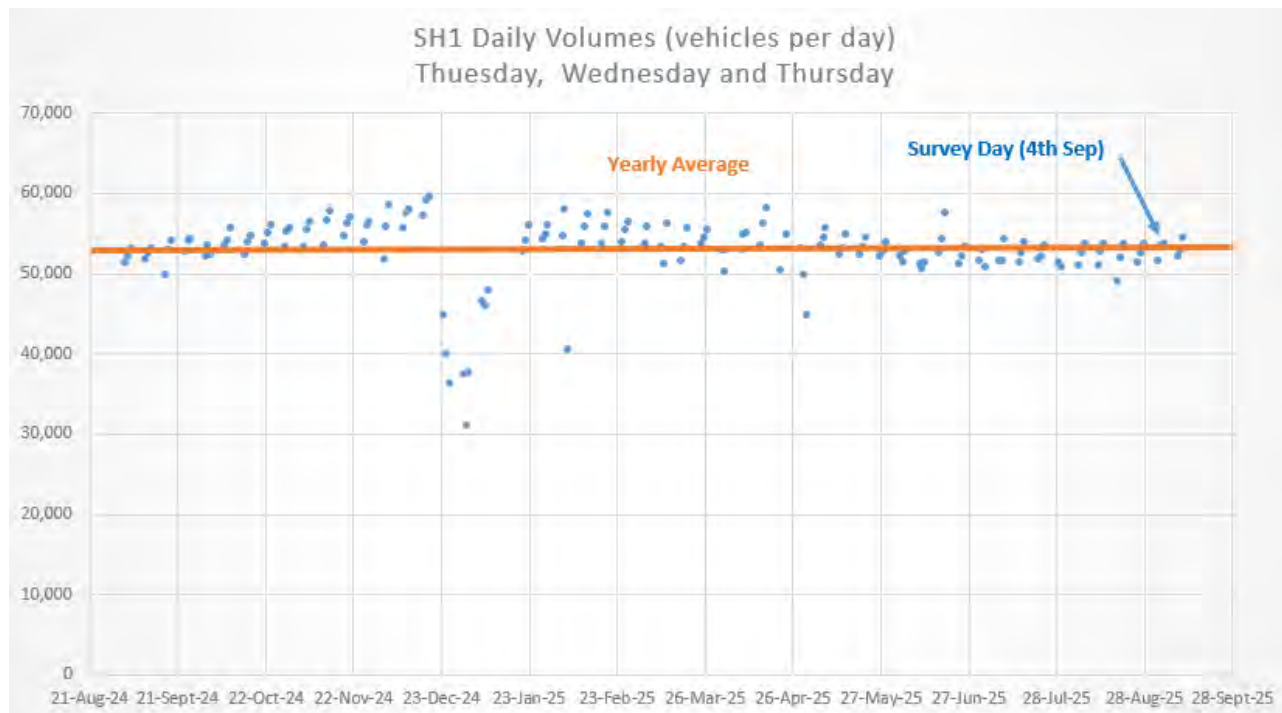
We have used the following sources of data for the build of the base model:

- ◆ The model network was developed using extracts from OpenStreetMap. Default road widths, road types and give-way parameters were initially based on those used in Auckland Transport’s Auckland Dynamic Traffic Assignment (ADTA) model. These parameters were further refined during model development to better reflect localised traffic patterns observed in the survey data
- ◆ We note that a T2/Truck lane is currently provided on Tram Road for westbound vehicles between Main North Road and the SH1 on ramp. The survey videos collected at the interchange indicates that the majority (>90%) of left turn vehicles used the T2/Truck lane to access the on ramp. This is significantly greater than the T2 vehicle percentage observed elsewhere in the country and may be attributable to a lack of enforcement
- ◆ SCATS data for the SH1 Ramps/Tram Road and Tram Road/Main North Road intersections were obtained from New Zealand Transport Agency (NZTA) to inform signal phasing for both vehicular and active mode movements
- ◆ Two bus routes currently use the Main North Road corridor: Route 1 and Route 92, based on timetables sourced from the Metro Christchurch website.

2.4 Traffic Demands

To understand the existing traffic pattern around the site, we refer to the automatic traffic data collected by the Traffic Management System (TMS), managed by NZTA. Figure 3 below shows the reported traffic volumes along SH1 close to the site, between January 2023 and July 2024:

Figure 4: Daily Traffic Volumes – August 2024 to September 2025 (vehicles per day)



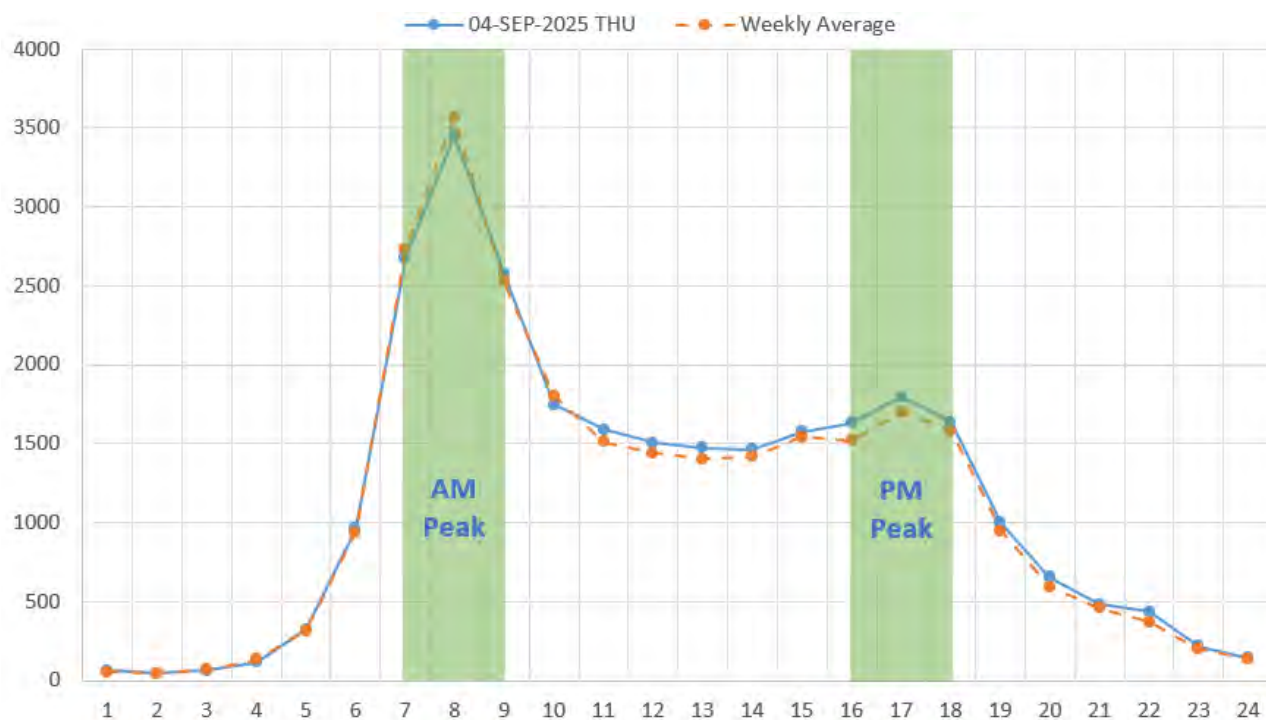
The following points are noted:

- ◆ The TMS data indicates that during the 2024/25 period, the highest traffic volumes were observed in December 2024. This is expected, as SH1 is the main state highway connecting central Christchurch and North Canterbury, and it is typically busier during the Christmas holiday period
- ◆ For non-holiday periods, November 2024 had the highest traffic volumes during the 2024/25 period. The daily traffic volumes in September 2025 (up to 11th September) were reported to be very similar to the annual average traffic volumes measured between August 2024 and September 2025 (around 53,000 vehicles per day)
- ◆ A daily traffic flow profile is provided in Figure 5 overleaf, based on the volumes between 2nd and 4th of September 2025 (Tuesday, Wednesday, and Thursday only)
- ◆ The intersection traffic data collected along Tram Road at the SH1 ramps and Main North Road intersections also identifies 7 am to 8 am and 4 pm to 5 pm as the morning and evening peak hours, respectively.

Based on the flow profiles, we have modelled the morning peak over 7 am to 9 am and the evening peak over 4 pm to 6 pm. Each peak period model includes a 30-minute 'Warm-up' period to capture any potential queuing that occurs prior to the peak hour. Traffic demands for the 2025 base model were developed using manual traffic survey data collected in 15 minutes intervals along the Tram Road

corridor. The model incorporates two vehicle types: Light Vehicles (LV) and Heavy Vehicles (HV), with separate demand matrices specified for each vehicle type and each modelled time period.

Figure 5: Weekday Flow Profile – September 2025



2.5 Model Calibration and Validation

We have calibrated and validated the base models in accordance with NZTA’s Transport Model Development Guidelines (“The Guidelines”). The model has been compared to the criteria outlined for model category F, which represents a model covering a single intersection or a short corridor.

The average outputs of five separate model runs have been compared to observed data, with comparisons provided based on peak hour flows for all vehicle types combined.

Table 2 below provides a summary of the validation results achieved by the base model. While the model development guidelines recommend using journey times to validate network performance, the existing Tram Road/Main North Road corridor currently operates with very low levels of congestion, meaning travel times are generally just above one minute. This makes the standard travel time validation criteria (within one minute or 15% of observed, whichever is higher) less meaningful. Instead, we validated the model by comparing queue data on each approach to ensure it reflects both signal operation and vehicle arrival/departure patterns during each signal cycle. Given the variable nature of observed queues, traffic survey videos were also used to verify queue behaviour and intersection operation.

We note that all model validation criteria have been met, and we consider the base model to be fit for option testing. The detailed validation results have been included in the appendix of this technical note.

Table 2: Transport Modelling Validation Criteria, Category F

Criteria	Sub criteria	Description	Criteria Satisfied	
			Morning Peak	Evening Peak
Turning Flows	Coefficient of determination (R ²)	A minimum of 95%	✓	✓
	Line of best fit	Y = 0.97x to 1.03x	✓	✓
	GEH statistic (Turn Counts)	95% GEH less than 5	✓	✓
		100% GEH less than 7.5 100% GEH less than 10	✓ ✓	✓ ✓
Queue Lengths	Modelled vs Observed maximum queues in each 15 minutes interval	90% of queues within 2 vehicles, 95% of queues within 3 vehicles	✓	✓

2.6 Forecast Model Development

To assess the potential impacts of the proposed Ōhoka Development at the SH1/Tram Road interchange, we have developed the following forecast scenarios:

- ◆ **Future Do Minimum (2035):** This assumes the SH1/Tram Road interchange operates with the existing layout. This scenario includes existing traffic volumes, plus anticipated background traffic growth
- ◆ **Future with Development (2035):** As above, but additionally with the anticipated vehicle traffic generated by the Ōhoka Development
- ◆ **Future with Development, with mitigation (2035):** Similar to the above scenario, but with refined traffic signal phasing at the SH1/Tram Road interchange. Under this arrangement, the right turn movement from the off ramp and the westbound through movement from Tram Road East are permitted to operate within the same signal phase (each movement “running on” to a red signal at the downstream intersection).

Both background traffic growth and development traffic have been based on information provided in the ITA prepared by Novo Group. A signal phasing diagram showing the signal phasing implemented in the Future with Development with and without mitigation is provided in Appendix B.

The following forecast demand assumptions have been provided by Novo Group:

- ◆ The background traffic growth has been based on the Joint Witness Statements discussions¹, which concluded that growth through the interchange would only occur as a result of district development

¹ JWS transport 12C Ōhoka rezoning v2.docx, Hearing Stream 12C (Large Lot Residential) and Stream 12D (Ōhoka) of the proposed Waimakariri District Plan review (10 October 2024)

- ◆ The background traffic growth for the Main North Road through movements accounts for the anticipated traffic associated with the 200 residential dwellings proposed at 144/168 Main North Road
- ◆ The forecast traffic demand at the SH1/Tram Road interchange (for the With Development scenario) has been calculated to reflect the following proposed residential rezoning, with trip distribution informed by CTM forecasts:
 - 14 dwellings accommodated by the Swannanoa Large Lot Residential rezoning;
 - 24 dwellings accommodated by the Ōhoka Large Lot Residential rezoning;
 - 95 dwellings accommodated by the Mandeville Large Lot Residential rezoning.

A summary of the anticipated traffic growth with both the Do Minimum and with Development scenarios is provided in Appendix B of this report.

For both the Future Do Minimum and Future with Development scenarios, we have assumed that the existing layout of Tram Road and Main North Road will remain unchanged. We have however assumed that in future, enforcement measures will be in place for the current westbound T2 lane on Tram Road. Accordingly, we have assumed that 20% of total traffic (light and heavy vehicles) from Main North Road will use the T2 lane to turn left onto the on-ramp in the forecast scenarios. This has ensured that our assessment is conservative, as it effectively reduces the capacity of the interchange, relative to today.

3 MODEL RESULTS

3.1 Delays and Level of Service

For each modelled scenario (Base, Future Do Minimum, and Future with Development), we have obtained results from five individual runs, with the average reported. To understand the intersection performance, we have used the following criteria, based on observations and outputs from the model.

- ◆ **Delays for each movement:** Delays for each individual movement at the intersection have been directly obtained from the model.
- ◆ **Level of Service (LOS):** The LOS for each movement has been assessed against Highway Capacity Manual (HCM) LOS criteria for priority intersections. A quick explanation of the LOS is provided in the tables below

Table 3: Highway Capacity Manual LOS Criteria - Intersections

Level of Service	Guidance on the LOS criteria
A	LOS A to C would be considered relatively uncongested and vehicles can pass through the intersection with only minor delay
B	
C	
D	LOS D is approaching congested conditions as delays for individual vehicles are more noticeable
E	LOS E is congested and approaching the capacity of the intersection
F	LOS F is operating over-capacity with significant delays

Table 4: Highway Capacity Manual LOS Criteria – Intersection delay ranges

Level of Service	Control Delay per vehicle in seconds (d)	
	Stop and Give-Way Signs	Traffic Signals
A	$d \leq 10$	$d \leq 10$
B	$10 < d \leq 15$	$10 < d \leq 20$
C	$15 < d \leq 25$	$20 < d \leq 35$
D	$25 < d \leq 35$	$35 < d \leq 55$
E	$35 < d \leq 50$	$55 < d \leq 80$
F	$50 < d$	$80 < d$

LOS D to E are typically considered acceptable within urban environments, during the commuter peak periods.

A summary of the model’s predicted performance under each proposed land use scenario, for the SH1 Ramps/Tram Road and Tram Road/Main North Road intersections, is provided in the tables on pages 10-12 overleaf. Appendix B provides more detailed model outputs (volumes, delay and LOS) for each individual movement at the intersections.

We note the following from these model outputs:

Tram Road/SH1 Ramps Interchange (Table 5 and Table 6)

- ◆ The SH1 interchange is predicted to operate satisfactorily in the evening peak hour, for all modelled scenarios, with LOS C or better predicted for all movements
- ◆ In the morning peak, the forecast Do Minimum scenario is predicted to operate with a worst LOS E, similar to the operation observed under existing conditions. Due to the increased left turn demand from Tram Road east to SH1 (within the general traffic lane, and in turn due to the assumed T2 lane enforcement), additional green time will need to be allocated to this movement, resulting in slightly higher delays for traffic from Tram Road west
- ◆ Under the With Development scenario, additional traffic is anticipated from Tram Road west towards the SH1 on ramp in the AM peak. This requires additional green time allocation to the

Tram Road eastbound movement, which is predicted to increase delays for Tram Road westbound traffic and the SH1 northbound off-ramp traffic. Consequently, LOS F is predicted for the SH1 northbound off ramp movement. We however note that the queues on the north off ramp are unlikely to extend back to the SH1 mainline

- ◆ We note that traffic operations after the morning peak hour (8–9 am) experience significantly less delay compared with the peak hour (7–8 am). This indicates that congestion is not expected to persist for an extended duration, for the With Development scenario
- ◆ We have assessed an additional With Development scenario, that additionally reoptimizes the signal phasing at the SH1 Tram Road interchange, in response to the predicted changes in travel demands. The model results for this scenario indicate that the proposed signal phasing can effectively reduce delays on both Tram Road and SH1 off ramp, resulting a satisfactory performance during the morning peak hour (LOS D or better).

Tram Road/Main North Road Intersection (Table 7 and Table 8)

- ◆ The model results indicate that the Tram Road/Main North Road intersection is predicted to operate satisfactorily in both forecast scenarios, with LOS C or better predicted in the AM peak hour, and LOS D or better in the PM peak hour.

Table 5: Movement summary – Morning Peak Hour, SH1 Ramps/Tram Road Interchange

Approach	Movement	Base			Future Do Minimum			Future with Development			Future with Development and Refined Signal Phasing		
		Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service
SH1 Off Ramp/Tram Road Intersection													
SH1 Off Ramp (South)	Left Turn	204	0	A	211	0	A	262	0	A	262	0	A
	Right Turn	85	58	E	85	73	E	82	123	F	83	40	D
Tram Road West	Through	934	7	A	977	14	B	1,184	55	E	1,185	36	D
Tram Road East	Through	74	1	A	78	1	A	78	1	A	77	6	A
Full Intersection	ALL	1,296	9	A	1,351	15	B	1,606	47	D	1,608	29	C
SH1 On Ramp/Tram Road Intersection													
Tram Road West	Through	177	8	A	181	10	A	176	12	B	181	15	B
	Right Turn	842	5	A	884	9	A	1,091	9	A	1,089	9	A
Tram Road East	Left Turn (T2)	148	1	A	53	1	A	53	1	A	53	1	A
	Left Turn	11	73	E	154	63	E	154	65	E	153	60	E
	Through	76	72	E	79	64	E	79	65	E	77	60	E
Full Intersection	ALL	1,254	9	A	1,352	18	B	1,553	17	B	1,553	17	B

Table 6: Movement summary – Evening Peak Hour, SH1 Ramps/Tram Road Interchange

Approach	Movement	Base			Future Do Minimum			Future with Development			Future with Development and Refined Signal Phasing		
		Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service
SH1 Off Ramp/Tram Road Intersection													
SH1 Off Ramp (South)	Left Turn	713	1	A	730	1	A	867	1	A	867	1	A
	Right Turn	176	20	B	252	23	C	253	23	C	250	19	B
Tram Road West	Through	379	9	A	389	9	A	480	11	B	483	6	A
Tram Road East	Through	167	1	A	176	1	A	176	1	A	176	3	A
Full Intersection	ALL	1,435	5	A	1,547	6	A	1,776	7	A	1,777	5	A
SH1 On Ramp/Tram Road Intersection													
Tram Road West	Through	268	4	A	346	6	A	346	7	A	346	12	B
	Right Turn	288	5	A	300	9	A	390	9	A	390	6	A
Tram Road East	Left Turn (T2)	107	1	A	26	1	A	26	1	A	26	1	A
	Left Turn	7	31	C	91	28	C	91	28	C	91	27	C
	Through	165	27	C	175	27	C	175	27	C	175	28	C
Full Intersection	ALL	837	9	A	937	13	B	1,027	13	B	1,028	14	B

Table 7: Movement summary – Morning Peak Hour, Main North Road/Tram Road Intersection

Approach	Movement	Base			Future Do Minimum			Future with Development			Future with Development and Refined Signal Phasing		
		Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service
Main North Road South	Left Turn	97	9	A	90	10	A	90	10	A	90	10	B
	Through	147	20	C	166	23	C	166	23	C	166	22	C
Tram Road West	Left Turn	60	4	A	62	6	A	60	8	A	62	7	A
	Right Turn	116	23	C	119	33	C	117	33	C	118	29	C
Main North Road North	Through	233	4	A	573	7	A	573	7	A	573	7	A
	Right Turn	142	12	B	199	13	B	199	13	B	199	13	B
Full Intersection	ALL	796	12	B	1,208	13	B	1,204	13	B	1,207	12	B

Table 8: Movement summary – Evening Peak Hour, Main North Road/Tram Road Intersection

Approach	Movement	Base			Future Do Minimum			Future with Development			Future with Development and Refined Signal Phasing		
		Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service	Volume (vph)	Delay (s)	Level of Service
Main North Road South	Left Turn	177	7	A	184	11	B	184	11	B	184	10	B
	Through	407	15	B	565	20	B	565	20	B	568	21	C
Tram Road West	Left Turn	177	10	B	254	15	B	254	15	B	254	18	B
	Right Turn	90	24	C	91	39	D	90	36	D	90	37	D
Main North Road North	Through	192	4	A	304	4	A	304	4	A	305	4	A
	Right Turn	105	21	C	109	20	C	109	20	C	108	27	C
Full Intersection	ALL	1,149	13	B	1,508	16	B	1,507	16	B	1,508	17	B

3.2 Model Predicted Travel Times

To further assess traffic operations along the Tram Road corridor, we obtained predicted travel times along Tram Road for each option modelled. These are presented in Figure 7 and Figure 8 below. The following routes have been included in this comparison:

- ◆ Route 1: Tram Road west eastbound to SH1
- ◆ Route 2: Tram Road westbound between Main North Road and Tram Road west
- ◆ Route 3: SH1 Off Ramp to Main North Road

Figure 6: Travel Time Routes

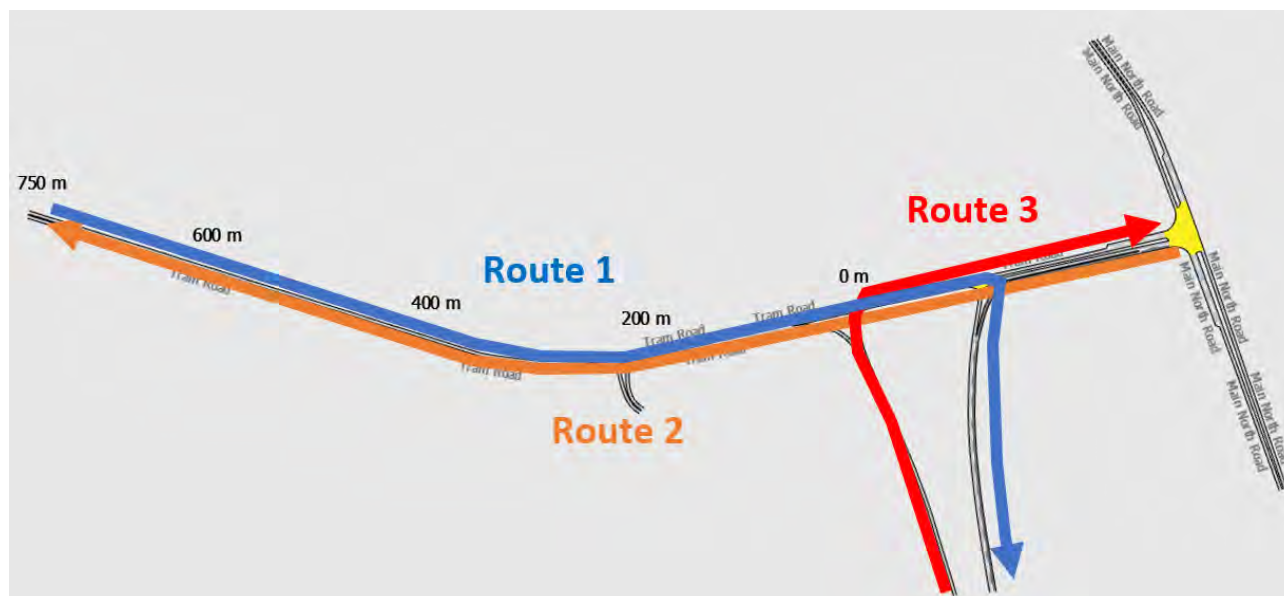


Figure 7: Travel Time Comparisons – AM Peak

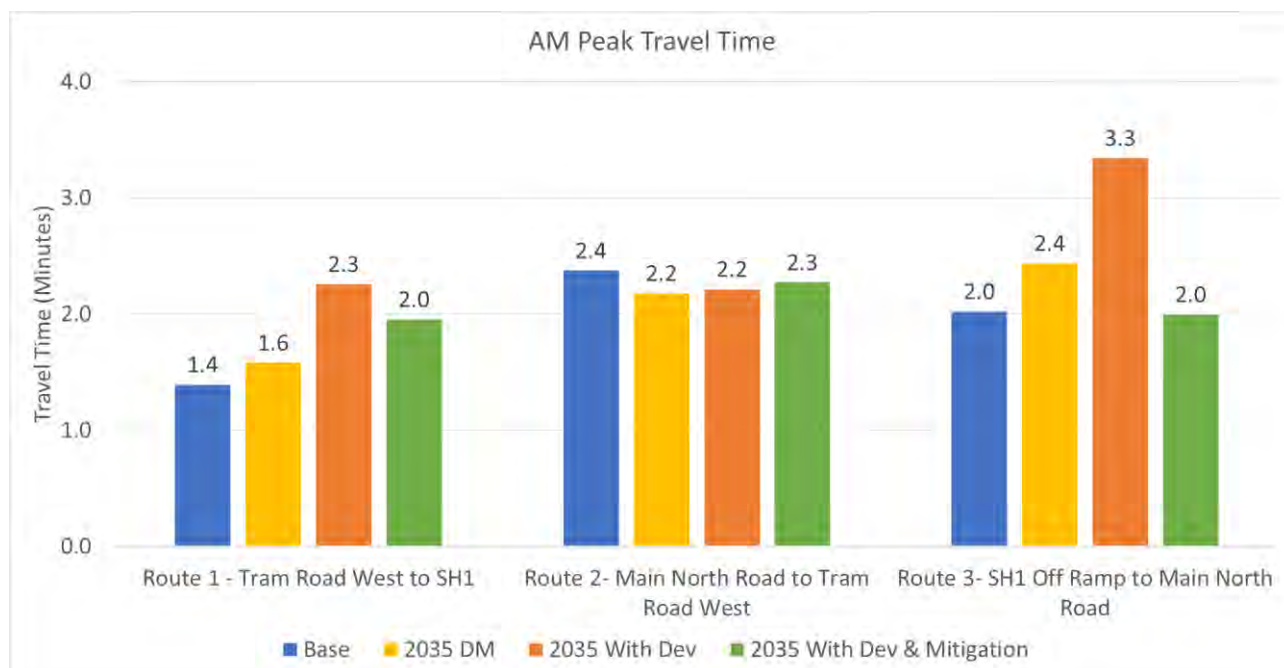
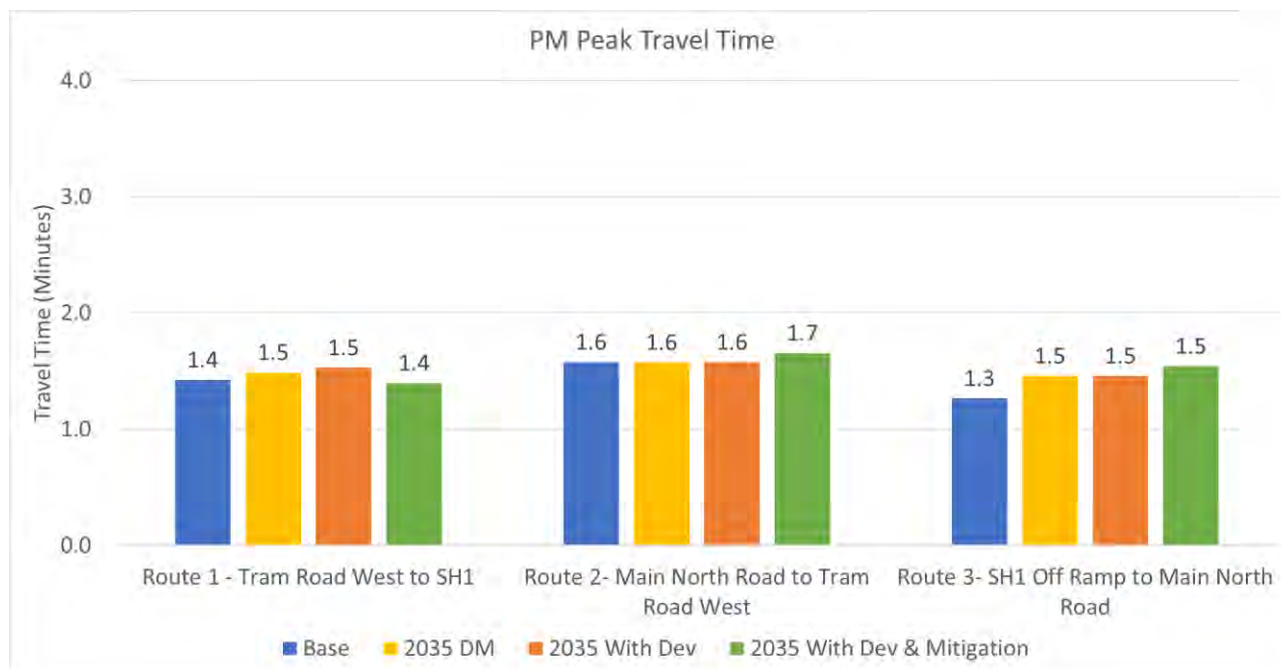


Figure 8: Travel Time Comparisons – PM Peak



We note the following from the travel time comparisons:

- ◆ Intersection performance outputs indicate that, under the With Development scenario, the anticipated increase in traffic volumes are expected to increase travel times between Tram Road west and SH1 (Route 1), as well as from the SH1 off ramp to Main North Road (Route 3) during the AM peak hour.
- ◆ The evening peak travel times are predicted to remain similar between scenarios
- ◆ The proposed signal phasing changes at the SH1/Tram Road interchange are expected to help mitigate these travel time increases associated with the additional traffic demand on Tram Road in the AM peak, while maintaining a travel time pattern similar to the existing operation during the PM peak.

4 CONCLUSIONS

We have developed an Aimsun micro-simulation model to investigate the potential traffic impacts of the anticipated traffic demands associated with the proposed Ōhoka Development, in Ōhoka, Waimakariri. The model was calibrated and validated against existing traffic conditions, and subsequently applied to assess the operation of Tram Road near the SH1 interchange, using traffic growth assumptions from the ITA prepared by Novo Group.

The modelling identified that:

- ◆ Under the existing traffic signal phasing, the additional development traffic is predicted to adversely affect the operation of the SH1/Tram Road interchange during the morning peak hour (7:00–8:00 am). Impacts outside the morning peak are expected to be less pronounced.
- ◆ We have proposed and tested signal phasing changes at the SH1/Tram Road interchange, to mitigate effects of the development’s increased traffic. This revised phasing is predicted to

effectively reduce delays and accommodate the additional traffic demands associated with the development.

APPENDIX A

Base Model Validation

GEH Statistic

Table 9 and Table 10 below provide comparison of the modelled and observed turning volumes, for the morning and evening peak hour respectively:

Table 9: Turn Count GEH Summary Statistics – Morning Peak Hour

Movement	7.00 - 8.00 AM (Peak Hour)					8.00 - 9.00 AM				
	Observed	Modelled	Diff	Diff%	GEH	Observed	Modelled	Diff	Diff%	GEH
Tram Road - Main N Road Intersection Main N Road S (South) LT	95	97	2	2%	0.2	96	96	0	0%	0.0
Tram Road - Main N Road Intersection Main N Road S (South) TH	145	147	2	1%	0.1	196	195	-1	-1%	0.1
Tram Road - Main N Road Intersection Main N Road N (North) TH	233	233	0	0%	0.0	180	187	7	4%	0.5
Tram Road - Main N Road Intersection Main N Road N (North) RT	135	142	7	5%	0.6	120	120	0	0%	0.0
Tram Road - Main N Road Intersection Tram Road (West) LT	51	60	9	18%	1.2	82	73	-9	-11%	1.0
Tram Road - Main N Road Intersection Tram Road (West) RT	97	116	19	20%	1.9	62	63	1	1%	0.1
Tram Road - On Ramp Intersection Tram Road East (East) LT	156	159	3	2%	0.3	126	124	-2	-1%	0.2
Tram Road - On Ramp Intersection Tram Road East (East) TH	72	76	4	6%	0.5	91	97	6	6%	0.6
Tram Road - On Ramp Intersection Tram Road West (West) TH	148	177	29	19%	2.2	144	137	-7	-5%	0.6
Tram Road - On Ramp Intersection Tram Road West (West) RT	855	842	-13	-1%	0.4	649	633	-16	-3%	0.6
Tram Road - Off Ramp Intersection Off Ramp (South) LT	200	204	4	2%	0.3	262	261	-1	0%	0.1
Tram Road - Off Ramp Intersection Off Ramp (South) RT	82	85	3	3%	0.3	99	89	-10	-10%	1.1
Tram Road - Off Ramp Intersection Tram Road East (East) TH	72	74	2	3%	0.2	91	98	7	8%	0.7
Tram Road - Off Ramp Intersection Tram Road West (West) TH	922	934	12	1%	0.4	701	681	-20	-3%	0.7
	3,263	3,347	84	3%		2,899	2,853	-46	-2%	
	Category F: Single Intersection/Small Corridor					Category F: Single Intersection/Small Corridor				
	Results Summary	Total	%	TARGET	MET	Results Summary	Total	%	TARGET	MET
	GEH <5	14	100.0%	95.0%	Y	GEH <5	14	100.0%	95.0%	Y
	GEH <7.5	14	100.0%	100.0%	Y	GEH <7.5	14	100.0%	100.0%	Y
	GEH >10	0	100.0%	100.0%	Y	GEH >10	0	100.0%	100.0%	Y
	Total	14				Total	14			
	Average Count	233				Average Count	207			
	Sum Count	1019809				Sum Count	514462			
	Sum Diff	1677				Sum Diff	1033			
	R Squared	1.00		0.95	Y	R Squared	1.00		0.95	Y
	Total no. of Counts	14				Total no. of Counts	14			
	Summation Observed	3063				Summation Observed	2637			
	Summation Modelled	1677				Summation Modelled	1033			
	% RMSE	5%		25.0%	Y	% RMSE	5%		25.0%	Y

Table 10: Turn Count GEH Summary Statistics – Evening Peak Hour

Movement	4.00 - 5.00 PM (Peak Hour)					5.00 - 6.00 PM				
	Observed	Modelled	Diff	Diff%	GEH	Observed	Modelled	Diff	Diff%	GEH
Tram Road - Main N Road Intersection Main N Road S (South) LT	176	177	1	0%	0.0	170	173	3	2%	0.2
Tram Road - Main N Road Intersection Main N Road S (South) TH	378	407	29	8%	1.5	386	398	12	3%	0.6
Tram Road - Main N Road Intersection Main N Road N (North) TH	198	192	-6	-3%	0.4	130	138	8	6%	0.7
Tram Road - Main N Road Intersection Main N Road N (North) RT	105	105	0	0%	0.0	100	95	-5	-5%	0.5
Tram Road - Main N Road Intersection Tram Road (West) LT	160	177	17	11%	1.3	130	134	4	3%	0.3
Tram Road - Main N Road Intersection Tram Road (West) RT	83	90	7	8%	0.8	46	53	7	15%	1.0
Tram Road - On Ramp Intersection Tram Road East (East) LT	109	115	6	5%	0.5	87	85	-2	-2%	0.2
Tram Road - On Ramp Intersection Tram Road East (East) TH	170	165	-5	-3%	0.4	182	184	2	1%	0.1
Tram Road - On Ramp Intersection Tram Road West (West) TH	244	268	24	10%	1.5	179	186	7	4%	0.5
Tram Road - On Ramp Intersection Tram Road West (West) RT	288	288	0	0%	0.0	294	299	5	2%	0.3
Tram Road - Off Ramp Intersection Off Ramp (South) LT	724	713	-11	-1%	0.4	736	736	0	0%	0.0
Tram Road - Off Ramp Intersection Off Ramp (South) RT	179	176	-4	-2%	0.3	150	153	3	2%	0.2
Tram Road - Off Ramp Intersection Tram Road East (East) TH	169	167	-2	-1%	0.2	182	182	0	0%	0.0
Tram Road - Off Ramp Intersection Tram Road West (West) TH	357	379	22	6%	1.1	323	334	11	3%	0.6
	3,340	3,420	80	2%		3,095	3,148	53	2%	
			Category F: Single Intersection/Small Corridor					Category F: Single Intersection/Small Corridor		
	Results Summary	Total	%	TARGET	MET	Results Summary	Total	%	TARGET	MET
	GEH <5	14	100.0%	95.0%	Y	GEH <5	14	100.0%	95.0%	Y
	GEH <7.5	14	100.0%	100.0%	Y	GEH <7.5	14	100.0%	100.0%	Y
	GEH >10	0	100.0%	100.0%	Y	GEH >10	0	100.0%	100.0%	Y
	Total	14				Total	14			
	Average Count	239				Average Count	221			
	Sum Count	119497				Sum Count	122216			
	Sum Diff	2371				Sum Diff	505			
	R Squared	0.98		0.95	Y	R Squared	1.00		0.95	Y
	Total no. of Cou	14				Total no. of Cou	14			
	Summation Obs	2616				Summation Obs	2359			
	Summation (Mo	2371				Summation (Mo	505			
	% RMSE	7%		25.0%	Y	% RMSE	4%		25.0%	Y

It is noted that all GEH values for turn counts are reported to be less than 2, which indicates that the criteria for GEH are met for both morning and evening peak models.

Coefficients of Determination

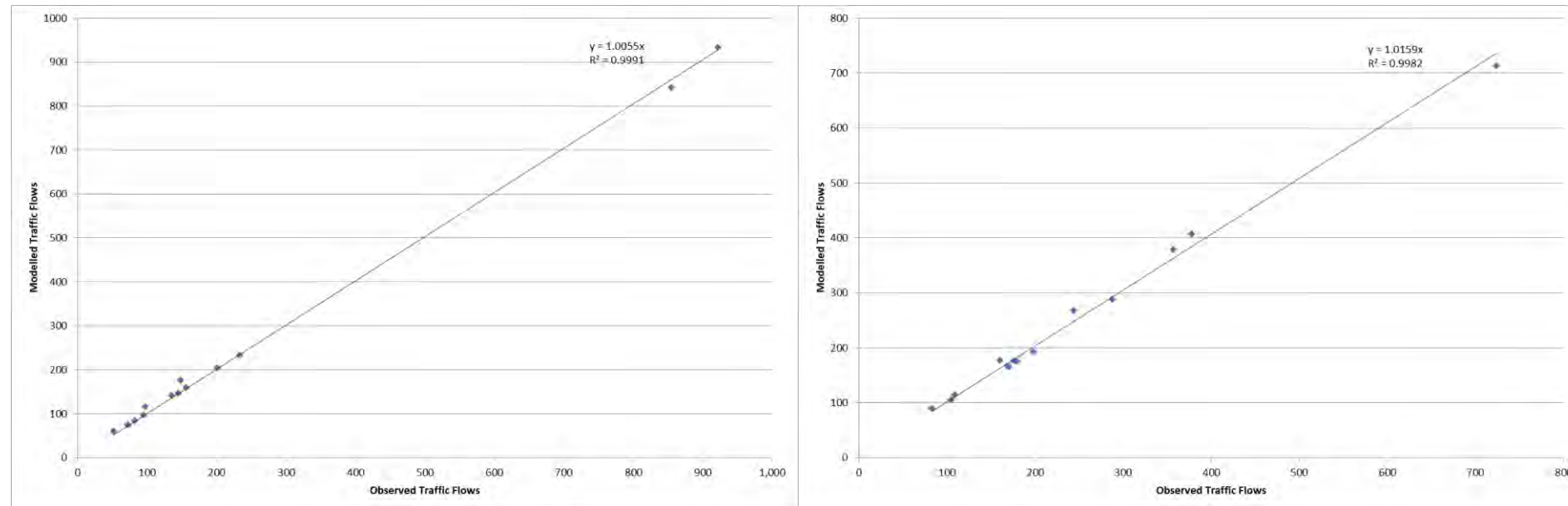
The coefficient of determination (R-squared) values for turn and link flows are provided in Table 11 below. The coefficients for each period should satisfy an R-squared value of 95%, for model type F.

Table 11: Coefficient of Determination (R²) Results for Validation Counts

Flow Type	Number of Counts	R ²	Line of Best Fit
Target	n/a	95%	$y=0.97x - 1.03x$
AM Peak Turn Flows	14	100%	1.01
PM Peak Turn Flows	14	100%	1.02

The results indicate that all R-squared values are over the 95% requirement, which indicates that the criteria for R-squared are met for all flows.

Figure 9: Observed vs Modelled Volumes – AM and PM Peak hour



Queue Comparisons

To verify the model has captured signal operations at all three intersections, we compared modelled maximum queues with observed queues at 15-minute intervals. While the model development guidelines recommend using journey times to validate performance, the existing Tram Road/Main North Road corridor currently operates with very low levels of congestion, meaning travel times are generally within one minute. This makes the standard travel time validation criteria (within one minute or 15% of observed, whichever is higher) less meaningful. Instead, we validated the model by comparing queue data on each approach to ensure it reflects both signal operation and vehicle arrival/departure patterns during each signal cycle. Given the variable nature of observed queues, traffic survey videos were also used to verify queue behaviour and intersection operation.

Table below provides a summary of the queue length comparisons and plots showing the difference between modelled and observed queues at each intersection, in the morning and evening peak, are provided in Figure 10 to Figure 11 below. We note the following from the comparisons:

- ◆ In both the AM and PM peaks, the vast majority of modelled queues are consistent with observed queues, with almost all within 3 vehicles and around 90% within 2 vehicles.
- ◆ The model appears to have underpredicted queues on the Main North Road south approach in the evening peak between 4:00 to 4:15 pm and 4:45 to 5:00 pm. However, a closer review of the observed queues (confirmed via survey video) indicates that these spikes were caused by vehicle platooning from Main North Road south, resulting in temporary surges during the red phase that cleared in the subsequent green phase. The survey video shows that queues on this approach were generally moderate during this period, with platoons of traffic arriving during the red phase at 4:10 pm and 4:56 pm. Such short term surges are challenging for the model to replicate and do not materially affect the overall intersection performance.
- ◆ On this basis, the comparison between the model results and the observed data is considered acceptable.

Table 12: Queue Length Comparison Summary

	Number of Queues	Within 3 vehicles	Within 2 vehicles	Within 1 vehicle
AM Peak	56	100%	95%	69%
PM Peak	56	97%	88%	69%

Figure 10: Observed vs Modelled Queues – AM Peak Period (7 – 9 am)

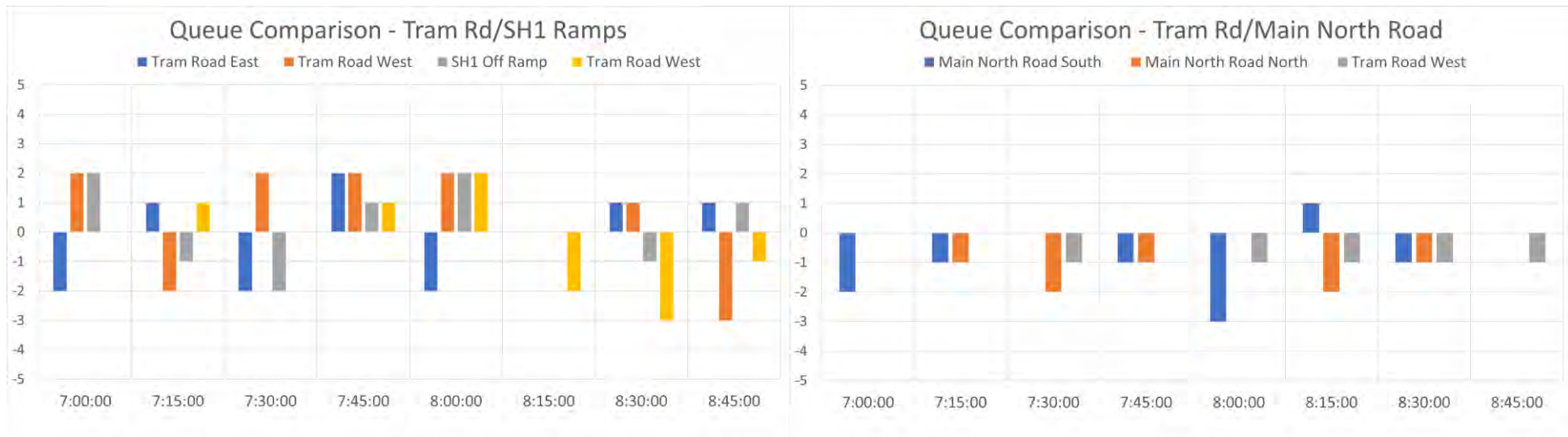
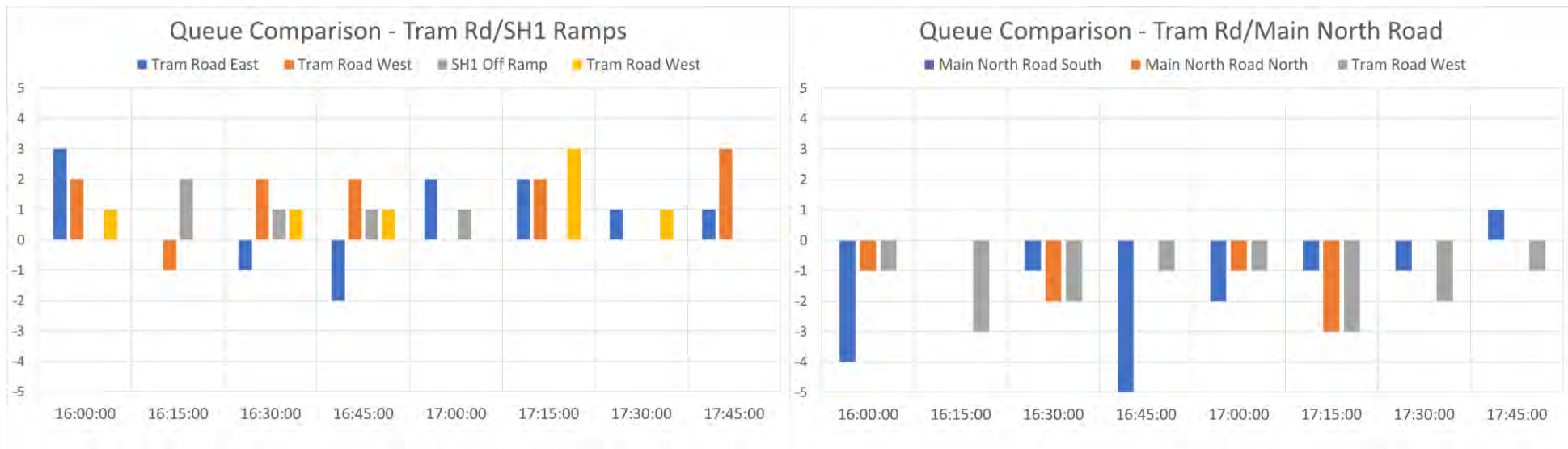


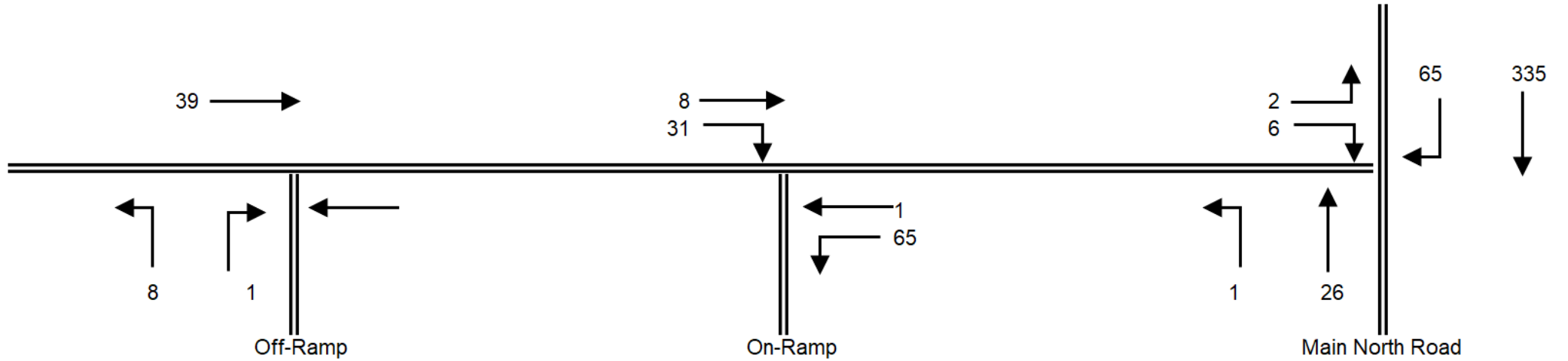
Figure 11: Observed vs Modelled Queues – PM Peak Period (4 – 6 pm)



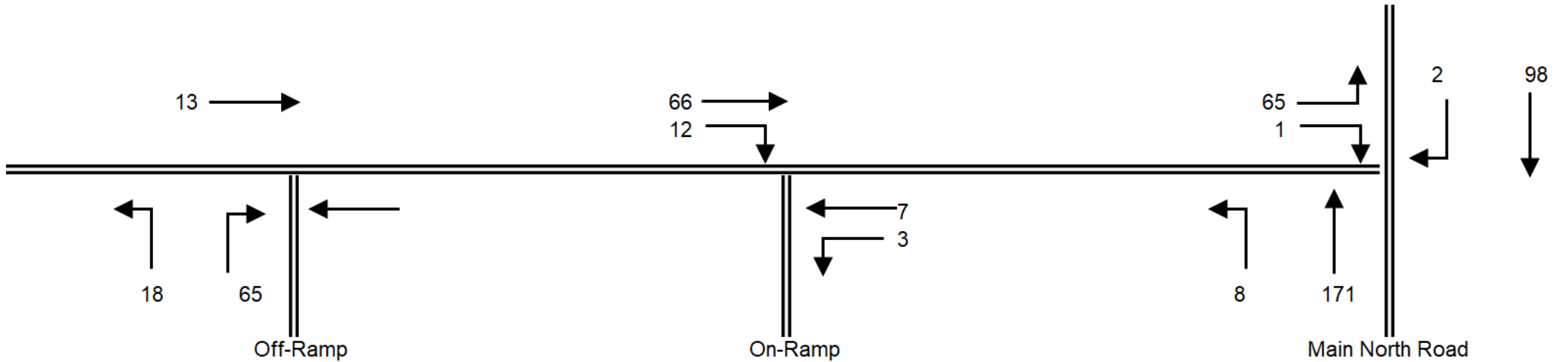
APPENDIX B Forecast Assumption and Detailed Intersection Results

Forecast 2035 Traffic Demand – Background Growth

AM Peak

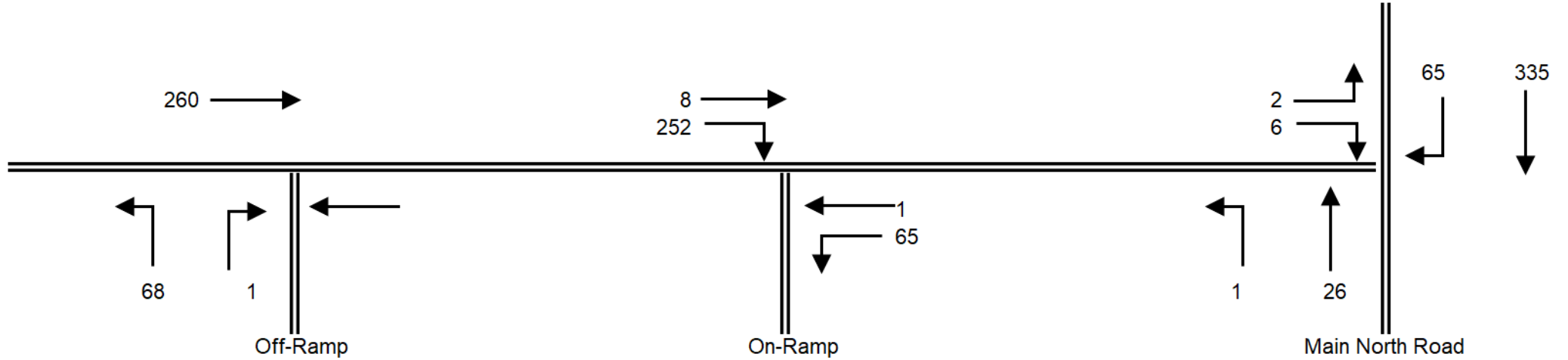


PM Peak

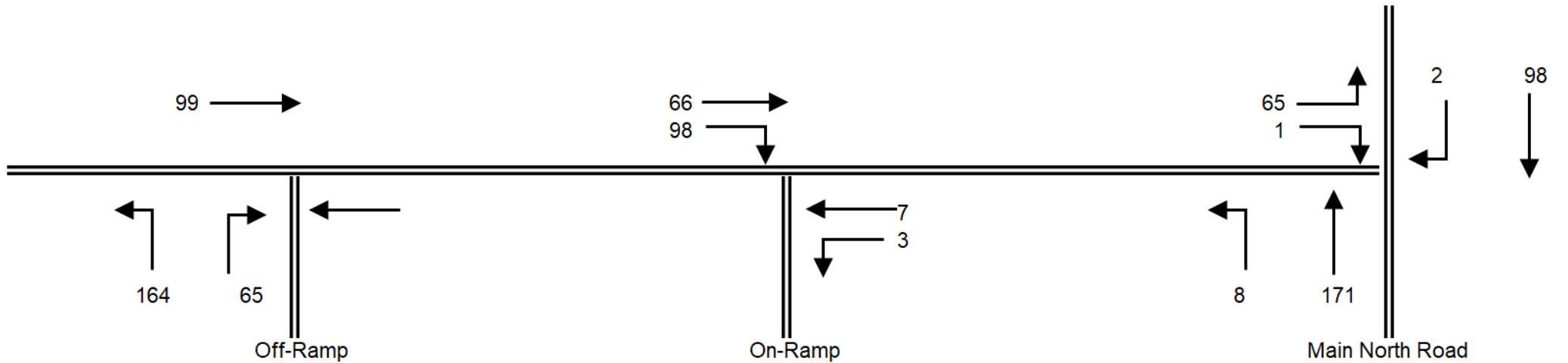


Forecast 2035 Traffic Demand – Background Growth, plus Development

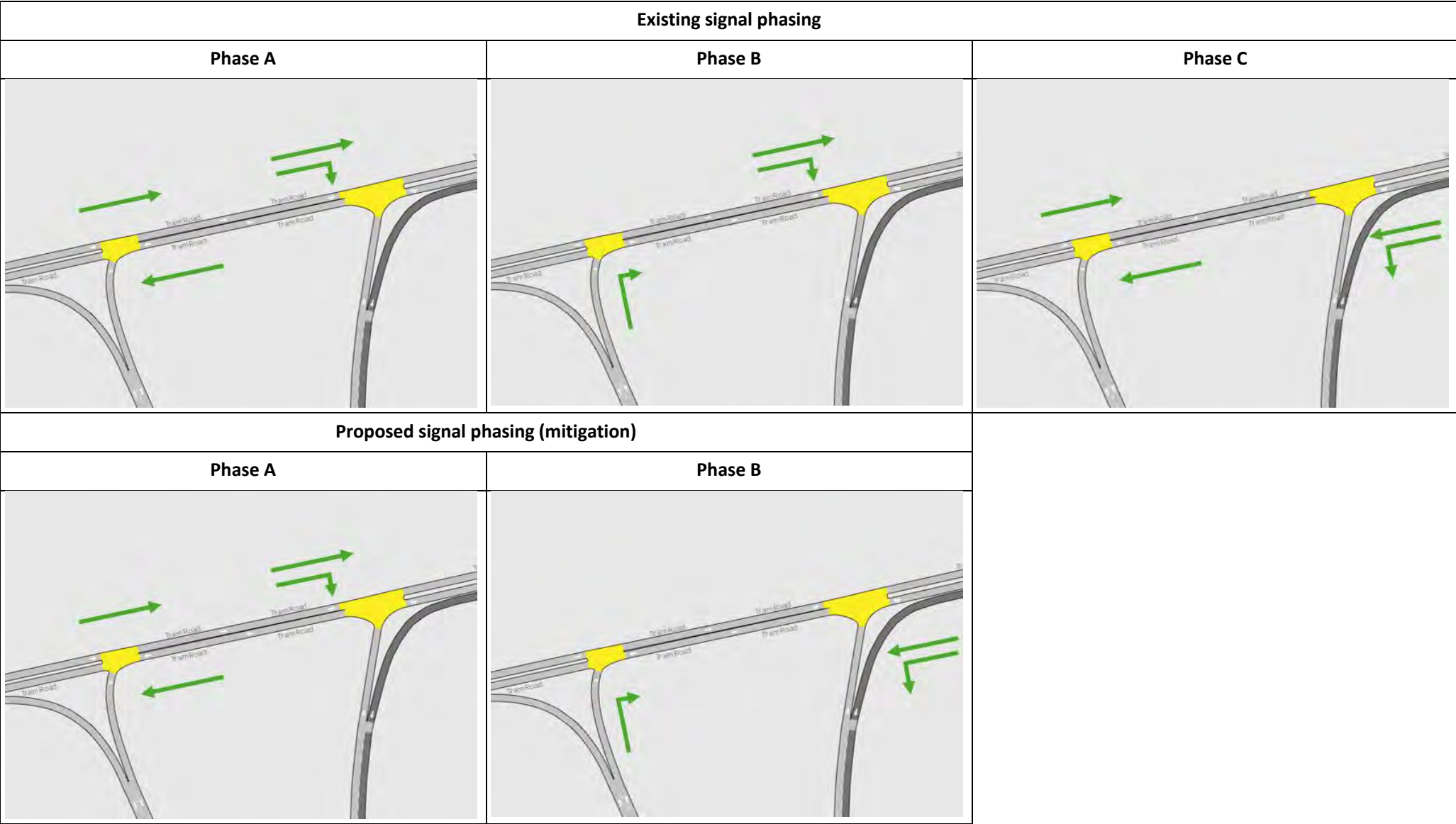
AM Peak



PM Peak



Existing and Proposed Signal Phasing at SH1/Tram Road Interchange



Level of Service Table Base

AM Peak Hour

Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
Tram Road/Main N Road	796	12	B	Main N Road S	244	16	B	Left	97	9	A
				Through				147	20	C	
				Tram Road W	176	17	B	Left	60	4	A
				Right				116	23	C	
				Main N Road N	376	7	A	Through	233	4	A
				Right				142	12	B	
Tram Road/Off Ramp	1296	9	A	Off Ramp S	288	17	B	Left	204	0	A
				Right				85	58	E	
				Tram Road (Off Ramp) W	934	7	A	Through	934	7	A
				Tram Road (Off Ramp) E				74	1	A	
Tram Road/On Ramp	1254	9	A	Tram Road (On Ramp) W	1019	5	A	Through	177	8	A
				Right				842	5	A	
				Tram Road (On Ramp) E	236	27	C	Left T2	148	1	A
								Left	11	73	E
								Through	76	72	E

Level of Service Table Base

PM Peak Hour

Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
Tram Road/Main N Road	1149	13	B	Main N Road S	584	13	B	Left	177	7	A
				Through				407	15	B	
				Tram Road W	267	15	B	Left	177	10	B
				Right				90	24	C	
				Main N Road N	297	10	B	Through	192	4	A
				Right				105	21	C	
Tram Road/Off Ramp	1435	5	A	Off Ramp S	889	4	A	Left	713	1	A
				Right				176	20	B	
				Tram Road (Off Ramp) W	379	9	A	Through	379	9	A
				Tram Road (Off Ramp) E	167	1	A	Through	167	1	A
Tram Road/On Ramp	837	9	A	Tram Road (On Ramp) W	557	5	A	Through	268	4	A
				Right				288	5	A	
				Tram Road (On Ramp) E	280	17	B	Left T2	107	1	A
								Left	7	31	C
								Through	165	27	C

Level of Service Table Future Do Minimum

AM Peak Hour

Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
Tram Road/Main N Road	1208	13	B	Main N Road S	256	18	B	Left	90	10	A
				Through				166	23	C	
				Tram Road W	181	24	C	Left	62	6	A
				Right				119	33	C	
				Main N Road N	772	9	A	Through	573	7	A
				Right				199	13	B	
Tram Road/Off Ramp	1351	15	B	Off Ramp S	295	21	C	Left	211	0	A
				Right				85	73	E	
				Tram Road (Off Ramp) W	977	14	B	Through	977	14	B
				Tram Road (Off Ramp) E				78	1	A	
Tram Road/On Ramp	1352	18	B	Tram Road (On Ramp) W	1066	9	A	Through	181	10	A
				Right				884	9	A	
				Tram Road (On Ramp) E	286	52	D	Left T2	53	1	A
				Left				154	63	E	
				Through				79	64	E	

Level of Service Table Future Do Minimum

PM Peak Hour

Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
Tram Road/Main N Road	1508	16	B	Main N Road S	749	18	B	Left	184	11	B
				Through				565	20	C	
				Tram Road W	346	21	C	Left	254	15	B
				Right				91	39	D	
				Main N Road N	413	8	A	Through	304	4	A
				Right				109	20	C	
Tram Road/Off Ramp	1547	6	A	Off Ramp S	982	6	A	Left	730	1	A
				Right				252	23	C	
				Tram Road (Off Ramp) W	389	9	A	Through	389	9	A
				Tram Road (Off Ramp) E	176	1	A	Through	176	1	A
Tram Road/On Ramp	937	13	B	Tram Road (On Ramp) W	646	7	A	Through	346	6	A
				Right				300	9	A	
				Tram Road (On Ramp) E	291	25	C	Left T2	26	1	A
				Left				91	28	C	
				Through				175	27	C	

Level of Service Table Future with Development

AM Peak Hour

Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
Tram Road/Main N Road	1204	13	B	Main N Road S	256	18	B	Left	90	10	A
				Through				166	23	C	
				Tram Road W	176	24	C	Left	60	8	A
				Right				117	33	C	
				Main N Road N	772	9	A	Through	573	7	A
				Right				199	13	B	
Tram Road/Off Ramp	1606	47	D	Off Ramp S	344	30	C	Left	262	0	A
				Right				82	123	F	
				Tram Road (Off Ramp) W	1184	55	E	Through	1184	55	D
				Tram Road (Off Ramp) E	78	1	A	Through	78	1	A
Tram Road/On Ramp	1553	17	B	Tram Road (On Ramp) W	1267	9	A	Through	176	12	B
				Right				1091	9	A	
				Tram Road (On Ramp) E	286	53	D	Left T2	53	1	A
				Left				154	65	E	
				Through				79	65	E	

Level of Service Table Future with Development

PM Peak Hour

Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
Tram Road/Main N Road	1507	16	B	Main N Road S	749	18	B	Left	184	11	B
				Through				565	20	C	
				Tram Road W	344	21	C	Left	254	15	B
				Right				90	36	D	
				Main N Road N	413	8	A	Through	304	4	A
				Right				109	20	C	
Tram Road/Off Ramp	1776	7	A	Off Ramp S	1120	6	A	Left	867	1	A
				Right				253	23	C	
				Tram Road (Off Ramp) W	480	11	B	Through	480	11	B
				Tram Road (Off Ramp) E				176	1	A	Through
Tram Road/On Ramp	1027	13	B	Tram Road (On Ramp) W	736	8	A	Through	346	7	A
				Right				390	9	A	
				Tram Road (On Ramp) E	291	25	C	Left T2	26	1	A
								Left	91	28	C
								Through	175	27	C

Level of Service Table Future with Development and Refined Signal Phasing

AM Peak Hour

Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
Tram Road/Main N Road	1206	12	B	Main N Road S	256	18	B	Left	90	10	B
				Through				166	22	C	
				Tram Road W	179	21	C	Left	62	7	A
				Right				117	29	C	
				Main N Road N	772	9	A	Through	573	7	A
				Right				199	13	B	
Tram Road/Off Ramp	1608	29	C	Off Ramp S	346	10	B	Left	262	0	A
				Right				83	40	D	
				Tram Road (Off Ramp) W	1185	36	D	Through	1185	36	D
				Tram Road (Off Ramp) E				77	6	A	
Tram Road/On Ramp	1553	17	B	Tram Road (On Ramp) W	1270	10	B	Through	181	15	B
				Right				1089	9	A	
				Tram Road (On Ramp) E	283	49	D	Left T2	53	1	A
								Left	153	60	E
								Through	77	60	E

Level of Service Table Future with Development and Refined Signal Phasing

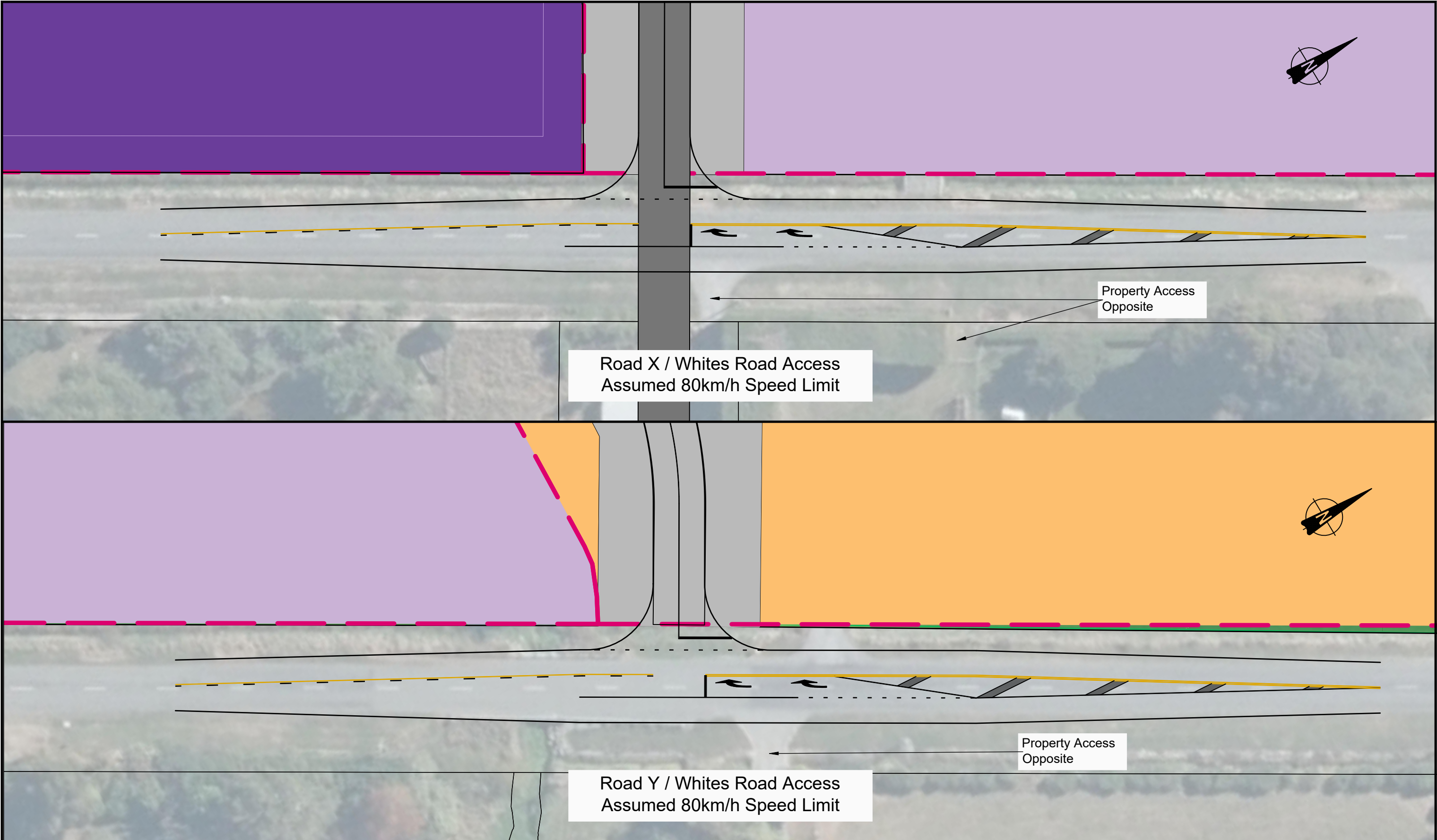
PM Peak Hour

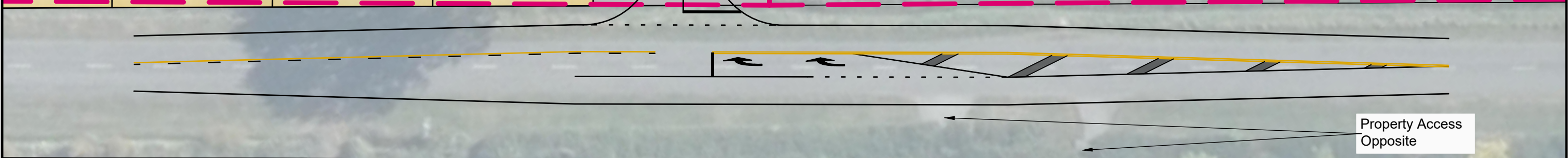
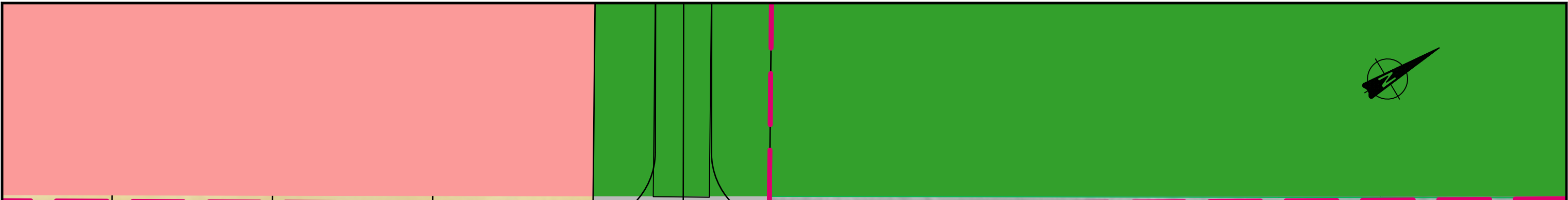
Intersection	Intersection			Approach	Approach			Mvt	Movement		
	Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS		Flow (veh)	Average Delay (s/veh)	LOS
Tram Road/Main N Road	1508	17	B	Main N Road S	752	18	B	Left	184	10	B
				Through				568	21	C	
				Tram Road W	343	23	C	Left	254	18	B
				Right				90	37	D	
				Main N Road N	413	10	B	Through	305	4	A
				Right				108	27	C	
Tram Road/Off Ramp	1777	5	A	Off Ramp S	1117	5	A	Left	867	1	A
				Right				250	19	B	
				Tram Road (Off Ramp) W	483	6	A	Through	483	6	A
				Tram Road (Off Ramp) E				176	3	A	
Tram Road/On Ramp	1028	14	B	Tram Road (On Ramp) W	736	9	A	Through	346	12	B
				Right				390	6	A	
				Tram Road (On Ramp) E	292	26	C	Left T2	26	1	A
								Left	91	27	C
								Through	175	28	C



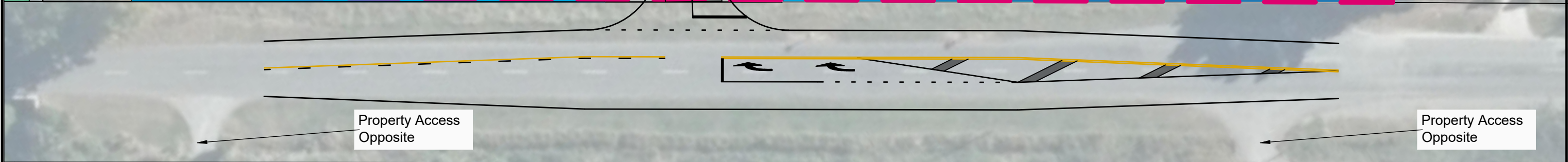
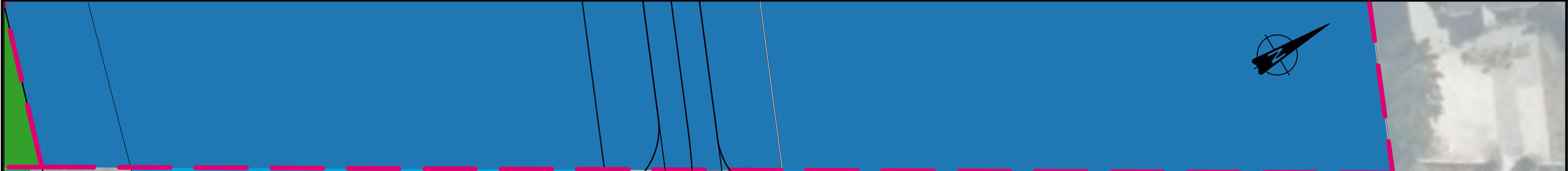
Appendix 12

Concept Site Access Intersections





Road Z / Whites Road Access
Assumed 80km/h Speed Limit



Road A / Whites Road Access
Assumed 80km/h Speed Limit

Novo Group Limited
PO Box 365
Christchurch 8014
NovoGroup.co.nz

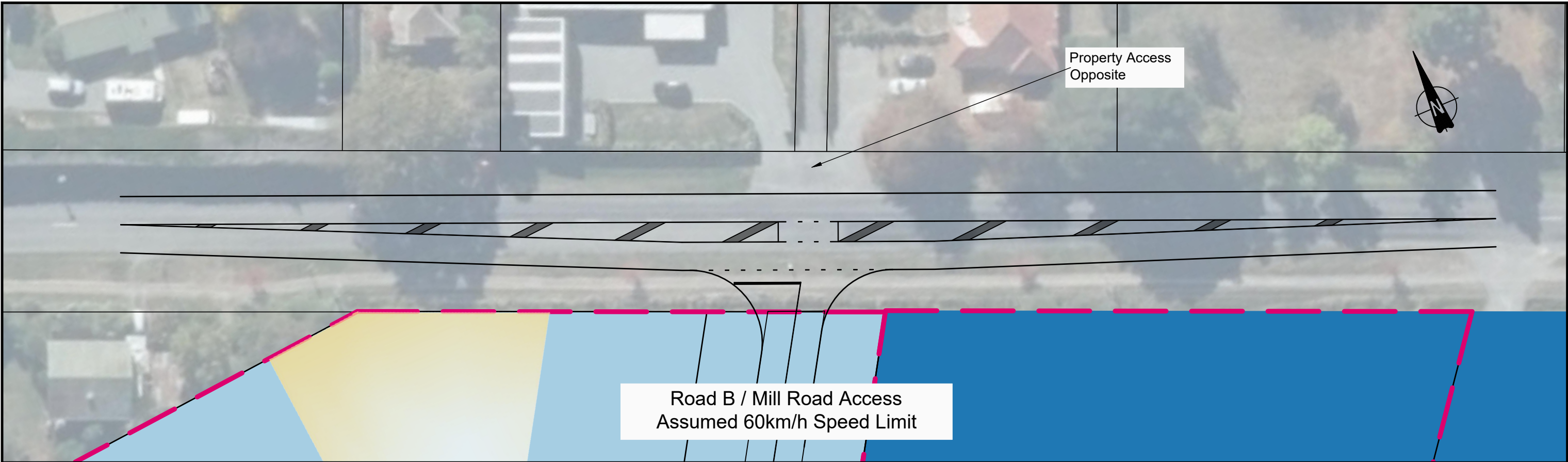
535 Mill Road, Ohoka
Carter Group Ltd

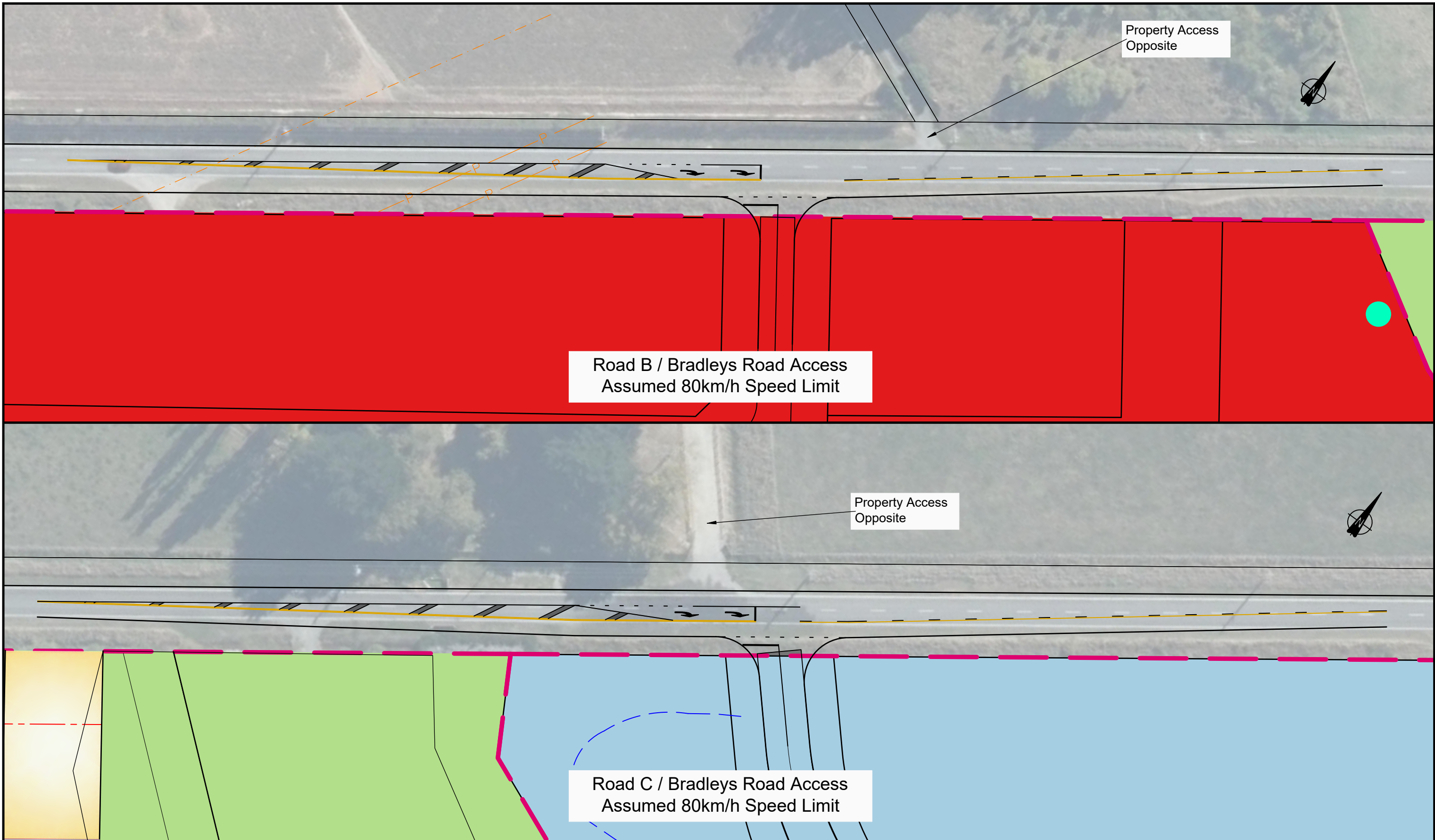
Concept Intersection Arrangements - Whites Road North

For Information

Drawing: 0021-051 - Ohoka FT - DWD100X-B

Sheet	0021-051- DWD1002-A
Scale @A3	1/500
Date	14/01/2025
By	N Fuller
Project #	0021-051






novo group
Planning, Traffic, Development
 Novo Group Limited
 PO Box 365
 Christchurch 8014
NovoGroup.co.nz

535 Mill Road, Ohoka
Carter Group Ltd
Concept Intersection Arrangements - Whites Road North
For Information

Drawing: 0021-051 - Ohoka FT - DWD100X-B

Sheet	0021-051- DWD1004-A
Scale @A3 1/750	
Date 14/01/2025	
By N Fuller	
Project # 0021-051	



Appendix 13

Operative District Plan Compliance



Rule / Standard	Comments	Complies?
Utilities : 30.1.1 Conditions		
30.1.1.9 Roads constructed after 20 June 1998 shall comply with Table 30.1 (except for roads constructed in the Residential 6, 6A and Business 1 Zones at Pegasus, or in the Pegasus Rural Zone, which shall comply with Rule 32.1.1.32d, or in the Residential 7 Zone or in the Residential 4A Zone at Bradleys Road, Ōhoka).	The proposed Site will remain zoned Rural, which requires a minimum road corridor width of 20m. Corridor widths of 18m and 16m are proposed in some instances. The 16m corridor road does not include parking lanes, where the District Plan requires at least one parking lane.	No
Traffic Management : 30.6.1 Conditions		
Access to Roads		
30.6.1.1 All land uses in any Residential Zone or Business Zone, and any dwellinghouse in any Rural Zone, shall be located on a site that has access to a road which complies with the design attributes of Table 30.1, Table 30.2 for the Residential 7 Zone, other than land uses in the Residential 6, 6A and Business 1 Zones at Pegasus which shall be located on a site that has access to a road which complies with the design attributes of Table 32.2.	The proposed Site will remain zoned Rural, which requires a minimum road corridor width of 20m. Corridor widths of 18m and 16m are proposed in some instances. The 16m corridor road does not include parking lanes, where the District Plan requires at least one parking lane.	No
30.6.1.2 Except where part of a cluster housing development under Rule 31.34.1 access to seven or more sites shall only be provided by way of a road which complies with the design attributes of Table 30.1, or Table 30.2 for the Residential 7 Zone.	Lots 334 to 341, 328 to 335, 536 to 542 and 1 to 5 plus 14 to 16 and 40 are all via shared Right of Ways serving seven or greater Lots rather than being served by a road.	No
30.6.1.3 All sites in the Residential 1 Zone, immediately south of the railway line on Williams Street, Kaiapoi, shall be limited to one access point for that zone.	Not Applicable	N/A
30.6.1.4 Where a site has frontage to a State Highway and any other road in the road hierarchy, access shall not be to the State Highway.	Not Applicable	N/A
30.6.1.5 Where a site in the Southbrook Business 2 Zone has frontage to Fernside Road and another road in the road hierarchy or an accessway, access shall not be to Fernside Road.	Not Applicable	N/A



Rule / Standard	Comments	Complies?
30.6.1.6 Access to State Highway 1 from Mapleham Rural 4B Zone shall be limited to the two locations as shown on the Mapleham Concept Plan (District Plan Map 147), provided that: a: one access located near the northern boundary of the zone shall serve a maximum of four sites; and b: the access road located near the southern boundary of the zone shall serve all other sites in the zone and shall adjoin the common boundary of the adjacent property to the south for a minimum distance of 30m from State Highway 1 into the zone.	Not Applicable	N/A
30.6.1.7 Vehicle crossings to Tram Road from the Residential 4A Zone (Wards Road, Mandeville North), shown on District Plan Map 162, shall be limited to the crossings and number of users as identified in Figure 30.1.	Not Applicable	N/A
30.6.1.8 Within the Todds Road Business 2 Zone identified on District Plan Map 175 no vehicle crossing shall access directly onto Fernside Road.	Not Applicable	N/A
30.6.1.9 Within the Southbrook Business 6 Zone no vehicle crossing shall directly access Flaxton Road.	Not Applicable	N/A
30.6.1.10 Within the Kaiapoi Business 5 Zone Outline Development Plan area shown on District Plan Map 170: a: any vehicle crossing shall not directly access Smith Street; and b: vehicle access shall not be to Bridge Street south of Smith Street unless and until Bridge Street is constructed to an urban local road formation in accordance with Table 30.1, or otherwise developed for public open space purposes.	Not Applicable	N/A
30.6.1.11 Vehicle crossings to Tram Road from the Residential 4A Zone Mandeville Road – Tram Road Mandeville North, shown on District Plan Map 182, shall be limited to the crossings and number of users as identified in Figure 30.2.	Not Applicable	N/A
Accessways		
30.6.1.12 Within the Residential 7 Zone no access from the new Urban Collector Roads west of Island Road shall be provided to Butchers Road or Giles Road until the Arterial Road shown on District Plan Map 164 is constructed and completed. This road access shall be limited to the two locations shown.	Not Applicable	N/A
30.6.1.13 Any accessway, except on a State Highway where the posted speed limit is 70km/hr or greater, shall comply with the minimum standards of Table 30.3.	Rural zones are required to have minimum accessway widths of 10m and a minimum formation width of 4m. All but one of the accessways have a width of less than 10m.	No



Rule / Standard	Comments	Complies?
30.6.1.14 All accessways within Residential 1 and 2, Residential 6 and 6A Zones, and Business 1 and 2 Zones, shall: a: where serving more than one site, be formed and sealed for their full length; or b: where serving only one site, be formed to an all weather standard.	Not Applicable	N/A
30.6.1.15 a All accessways within the Residential 3, 4A, 4B Zones and the Rural Zone shall be formed to an all weather standard. b In the Residential 6 and 6A Zones, all accessways shall be held in the same ownership or by tenancy-in-common in the same ownership as the lots or sites to which the accessway provides access. c All sites in the Residential 6A Zone shall be provided with access by way of an accessway.	Proposed to comply	Yes
30.6.1.16 All accessways within the Residential 7 Zone (Area A) shall: a be formed and sealed for their full length; b be held in the same ownership or by tenancy-in-common in the same ownership as the lots or sites to which the accessway provides access; and c all sites shall be provided with access by way of an accessway.	Not Applicable	N/A
30.6.1.17 All accessways within the Kaiapoi Business 5 Zone shall be formed and sealed for their full length.	Not Applicable	N/A
30.6.1.18 Within the Mandeville North Business 4 Zone one left turn exit onto Tram Road shall be provided. The exit location shall be located no closer than 125 metres from the intersection of McHughs Road and Tram Road, measured from the centre of McHughs Road) and shall be constructed to avoid the ability for vehicles to turn right from this exit.	Not Applicable	N/A
Vehicle Crossings		
30.6.1.19 The maximum number, spacing and width of vehicle crossings for all roads, other than State Highways where the posted speed limit is 70km/hr or greater, shall comply with Table 30.4.	The proposed access to the Polo grounds will be approximately 32m south-west of the access to the existing dwelling at 290 Bradleys Road.	No



Rule / Standard	Comments	Complies?
30.6.1.20 The minimum distance between crossings for any vehicle crossing accessing a State Highway where the posted speed limit is 70km/hr or greater shall be: 70km/hr - 40m; 80km/hr - 100m; 100km/hr - 200m provided that there shall be no more than five individual crossings along any 1km section of State Highway (on both sides) measured 500m on either side of a proposed crossing, on a State Highway with a posted speed limit of 100km/hr.	Not Applicable	N/A
30.6.1.21 Any accessway on a road adjacent to a footpath shall achieve the minimum sight distances for pedestrian safety as depicted in Figure 30.3.	The proposed subdivision layout does not preclude compliance with this requirement. Covenants will be provided at the ends of Right of Ways and Accessways to provide this splay.	Yes
30.6.1.22 The width of any vehicle crossing shall be the distance measured from side to side, across the flat part of the crossing at the kerb line; or, where there is no kerb and channel, the same measurement at the throat of the entrance way.	Noted	-
30.6.1.23 The distance between vehicle crossings shall be the distance measured parallel to the road centreline between the nearest edge of each respective vehicle crossing.	Noted	-
30.6.1.24 Vehicle crossings on arterial, strategic and collector roads shall have minimum unobstructed sight distances that comply with Table 30.5 and there shall be no obstruction to visibility inside the area bounded by the sight lines as depicted in Figure 30.4.	Accesses to Mill Road are anticipated to comply with sight distance requirements.	Yes
30.6.1.25 The sight distances and sight lines shall be measured as depicted in Figure 30.4. The sight distances shall be measured from a height of 1.15m above: a the existing road surface; and b the proposed surface level of the vehicle crossing.	Noted	-
30.6.1.26 Distances of vehicle crossings to intersections shall comply with Table 30.6.	This requires a separation of 10m between vehicle accesses and intersections (as the internal network will be 50km/h Local Roads). The proposed subdivision layout does not preclude compliance with this requirement. Accesses to Mill Road will comply.	Yes
30.6.1.27 The distance between vehicle crossings and road intersections shall be measured from the centreline of the vehicle crossing to the nearest point of the formed road at the intersection on the same side as the vehicle crossing and shall be measured parallel to the road centreline.	Noted	-



Rule / Standard	Comments	Complies?
30.6.1.28 Within the Mandeville North Business 4 Zone any site access from Tram Road shall be constructed to include a deceleration lane with a minimum width of 2.5 metres, over a minimum length of 88 metres and allowing for a 1 in 10 taper to be provided.	Not Applicable.	N/A
30.6.1.29 For any retail activity on a site, acceleration and deceleration tapers shall be constructed as part of the road carriageway and in accordance with Figure 30.5 where any vehicle crossing from the site connects to any road, other than a State Highway, and that road is shown in the District Plan Maps as a strategic, arterial or collector road with a posted speed limit of more than 70km/hr in the Rural Zone and Residential 4A and 4B Zones.	Not Applicable.	N/A
30.6.1.30 For vehicle crossings accessing a State Highway with a posted speed limit of 70km/hr or greater, and with 30 or fewer equivalent car movements per day, the crossing shall be constructed in accordance with Figure 30.6.	Not Applicable.	N/A
30.6.1.31 For vehicle crossings accessing a State Highway with a posted speed limit of 70km/hr or greater and with between 31 and 100 equivalent car movements per day, acceleration and deceleration tapers shall be constructed as part of the road carriageway in accordance with Figure 30.7.	Not Applicable.	N/A
Road Intersection Spacing		
30.6.1.32 The minimum spacing between road intersections shall comply with Table 30.7.	Requires 125m separation in 50km/h zones, 55m in 80km/h zones and 800m in 100km/h zones. The spacing of intersections to the existing road network and within the subdivision site do not meet these separation requirements.	No
30.6.1.33 Distances between intersections shall be measured parallel to the boundaries of the site of the respective road intersection along the road centreline, except where any corner splay has been taken the distance shall be measured as though the corner splay had not been taken.	Noted	-
Parking, Loading and Manoeuvring		



Rule / Standard	Comments	Complies?
30.6.1.34 Except as provided for by Rule 30.6.1.40, all parking spaces shall: a be provided on-site for the activity and in accordance with Table 30.8 and explanatory Figure 30.8, and Tables 30.9, 30.10. and 30.11, except for sites excluded or exempted by Rules 30.6.2.8 and 30.6.2.9, where a financial contribution applies for the provision of off-site parking and loading; and b loading dimensions in Table 30.10 apply based on the largest vehicle expected to use the loading space. For business zoned sites where on-site waste collection occurs, the loading and manoeuvring space shall accommodate a medium rigid truck.	The proposed subdivision layout does not preclude compliance with this requirement. To be assessed further at the time of seeking Resource Consent.	Yes
30.6.1.35 Where the parking requirement requires a fractional space, any fraction under one half shall be disregarded. Any fraction of one half or more should be counted as one space.	Noted	-
30.6.1.36 The total number of parking and loading spaces required shall be the sum of car parking, loading and cycle parking spaces identified in Table 30.8, provided: a where different activities are undertaken on the same site, the parking requirement shall be the sum of those spaces required for each activity; b where a single activity falls within two or more categories in Table 30.8, the category that yields the greater number of parking spaces shall apply.	Noted	-
30.6.1.37 Sufficient loading and manoeuvring space shall be provided on-site to ensure that no vehicle is required to reverse either onto or off a site where access is to a collector, strategic or arterial road or where the site gains access by a right of way or shared accessway.	The proposed subdivision layout does not preclude compliance with this requirement. To be assessed further at the time of seeking Resource Consent.	Yes
30.6.1.38 Access for loading and manoeuvring on any site identified by Figure 31.2 Rangiora and Kaiapoi Principal Shopping Street Frontages shall not occur across that road frontage.	Not Applicable	N/A
30.6.1.39 Accessible parking spaces for disabled persons and accessible routes from parking spaces to the associated activity or road shall be provided in accordance with NZS:4121:2001: Design for Access and Use of Buildings and Facilities for Disabled Persons. Accessible parking is included within the spaces required by Rule 30.6.1.34.	The development can comply with this requirement. To be assessed further at the time of seeking Resource Consent.	Yes
30.6.1.40 Within Sub-Areas A to D of the Rangiora Central Outline Development Plan area, shown on District Plan Map 178, car parking for activities specified by Rule 30.6.1.34, Table 30.8, shall only be provided for in a public car parking building within Sub-Area C.	Not Applicable	N/A



Rule / Standard	Comments	Complies?
30.6.1.41 Within the Mandeville North Business 4 Zone shown on District Plan Map 182 no parking space or manoeuvring space shall be located within 3 metres of the Tram Road boundary.	Not Applicable	N/A
30.6.1.42 In the Residential 6A Zone: a access to all garages and parking spaces must be from an accessway and not from a road; and b on any site, there shall be no vehicle parking between a dwellinghouse and a road.	Not Applicable	N/A
30.6.1.43 In the Business 5 Zone: a where several activities are established on any one site, or on several sites in any area, joint off-street parking and loading areas may be provided for common use by such activities. In such circumstances, the number of parking spaces required shall be the sum of the requirements for each activity as set out in Table 30.8. b Where a joint parking and loading area is provided for common use under (a), there shall be a minimum of one tree provided per five parking spaces within the joint parking and loading area, except where parking is contained within a building.	Not Applicable	N/A
30.6.1.44 Where more than five car parking spaces are required on a site under Rules 30.6.1.34 to 30.6.1.39, a minimum of one tree shall be planted and maintained per 5 parking spaces , or per 5 facing pairs of parking spaces, within, or immediately adjacent to, the parking area. Trees shall: a be planted at 8m to 10m spacing within a planting bed for which the minimum dimension shall be a circle with a 1.5m radius; b be protected from damage by vehicles; c be a minimum of 1.5m tall and be in a healthy state at planting; d be capable of attaining a minimum height of 4 m at maturity; e be planted no closer than 2 m from an underground service or 1 metre from a footpath or kerb; and f not impede the passage of pedestrians or vehicles.	The development can comply with this requirement. To be assessed further at the time of seeking Resource Consent.	Yes



Rule / Standard	Comments	Complies?
<p>30.6.1.45 Cycle parking required by Rule 30.6.1.34 shall be constructed:</p> <ul style="list-style-type: none"> a to support the cycle frame and not the wheel only; b of durable materials and securely anchored to ground or building; c to allow at least 1m between parking rails where more than one park is provided; d for short term parking, be located: <ul style="list-style-type: none"> i within 15 m of the entrance to the activity; ii to be easily seen when approaching or leaving the activity; iii under shelter (where this is available); e where cycles will be protected from motor vehicles; f under lighting if designed to be used at night; and g where use will not create a hazard for pedestrians, including visually impaired pedestrians; and h for long term parking, to provide bicycle parking space within a secure, covered facility. 	<p>The development can comply with this requirement. To be assessed further at the time of seeking Resource Consent.</p>	<p>Yes</p>
Traffic Sight Lines at Railway Crossings		
<p>30.6.1.46 Any use of land (including structures or vegetation) on a site abutting a railway shall comply with traffic sight lines at road rail crossings in accordance with Figure 30.13.</p>	<p>Not Applicable</p>	<p>N/A</p>
30.6.2 Exemptions	<p>Not Applicable</p>	<p>N/A</p>
30.7 Controlled Activity	<p>Not Applicable</p>	<p>N/A</p>
30.8 Discretionary Activity (Restricted)		
<p>30.8.1 Any land use that does not comply with one or more of the conditions under Rules 30.6.1.34 to 30.6.1.45 is a discretionary activity (restricted) except where it is a non-complying activity under Rule 30.9 or it is exempted by Rule 30.6.2.</p>	<p>Noted</p>	<p>-</p>
<p>30.8.2 The provision of 20 or more new car parking spaces on any site other than within the Rural Zone, excluding:</p> <ul style="list-style-type: none"> a sites subject to Rules 30.6.2.8, 30.6.2.9 and 30.6.2.10, or b any extension to an existing car parking facility where no more than nine parking spaces are added within any five year period. <p>is a discretionary activity (restricted).</p>	<p>Noted</p>	<p>-</p>
<p>30.8.3 Within the Business 5 Zone, any joint off-street parking and loading area which does not comply with one or more of the standards and terms under Rule 30.6.1.43 is a discretionary activity (restricted).</p>	<p>Not Applicable</p>	<p>N/A</p>



Rule / Standard	Comments	Complies?
30.8.4 Within the Kaiapoi Business 5 Zone, where the combined total gross floor area of all buildings exceeds 23,000m ² , vehicle access to Smith Street via the proposed road shown in District Plan Map 170 is a discretionary activity (restricted).	Not Applicable	N/A
30.8.5 Within the North Woodend (Ravenswood) Business 1 Zone, any land use that does not comply with one or more of the conditions under Rules 30.6.1.13, 30.6.1.19, 30.6.1.24, 30.6.1.26, or 30.6.1.32, is a discretionary activity (restricted).	Not Applicable	N/A
30.9 Discretionary Activity		
30.9.1 Except as provided for by Rule 30.7 or Rule 30.8.5, any land use that does not comply with one or more of the conditions under Rule 30.6.1.1 to 30.6.1.32 or 30.7.1 is a discretionary activity except where it is a non-complying activity under Rule 30.10 or it is exempted by Rule 30.6.2.	This is the applicable status to this Application because of the non-compliances with 30.6.1.1, 30.6.1.2, 30.6.1.13, 30.6.1.19 and 30.6.1.32.	No
Subdivision Traffic Management		
32.1.1.29 Any road, accessway, or vehicle crossing shall comply with Rules 30.6.1.1 to 30.6.1.33 as though any allotment was a site.	Does not comply (as per the above)	No
32.1.1.30 All allotments in the Residential 6A Zone shall have a road frontage and also be provided with access by way of an accessway.	Not Applicable	N/A
32.1.1.31 Subdivision of any certificate of title into three, four, five or six allotments within a Rural Zone, where access from one or more allotments is to a strategic or arterial road, must be served by a common vehicle crossing.	Not Applicable	N/A
32.1.1.32 In the case of subdivision in the Pegasus Residential 6, 6A or Business 1 or Pegasus Rural Zones:	Not Applicable	N/A
32.1.1.33 Conditions shall be imposed on the subdivision consent for the first allotment within the West Kaiapoi Outline Development Plan area	Not Applicable	N/A
32.1.1.34 Prior to the issuing of any subdivision consent within the West Kaiapoi Outline Development Plan area	Not Applicable	N/A
32.1.1.35 Subdivision consent shall not be granted within the West Kaiapoi Outline Development Plan area	Not Applicable	N/A



Rule / Standard	Comments	Complies?
32.1.1.36 Subdivision consent shall not be granted within the West Kaiapoi Outline Development Plan area	Not Applicable	N/A
32.1.1.37 Conditions shall be imposed on the resource consent for the subdivision creating all new allotments within the West Kaiapoi Outline Development Plan area	Not Applicable	N/A
32.1.1.38 Subdivision consent in the Residential 7 Zone to the east of Island Road	Not Applicable	N/A
32.1.1.39 Prior to the approval of the 551st allotment within the West Kaiapoi Outline Development Plan area	Not Applicable	N/A
32.1.1.40 Subdivision consent within the West Kaiapoi Outline Development Plan area	Not Applicable	N/A
32.1.1.41 Within the West Kaiapoi Outline Development Plan area	Not Applicable	N/A
32.1.1.42 Within the East Kaiapoi Outline Development Plan area	Not Applicable	N/A
32.1.1.43 Conditions shall be imposed on the resource consent for the subdivision creating the first residential allotment within the East Kaiapoi Outline Development Plan area	Not Applicable	N/A
32.1.1.44 Conditions shall be imposed on the resource consent creating any lot in the Outline Development Plan area	Not Applicable	N/A
32.1.1.45 Within the Mill Road, Ohoka Outline Development Plan shown on District Plan Map 160 there shall be no increase in the number of allotments with vehicle access onto Kintyre Lane unless and until it is vested as a public road.	Not Applicable	N/A
32.1.1.46 Within the Mill Road, Ohoka Outline Development Plan shown on District Plan Map 160: a. there shall be only one public road connecting to Mill Road; and b. provision shall be made for a road connection to the land to the north in the location shown on District Plan Map 160.	Not Applicable	N/A
32.1.1.47 Within the Kaiapoi Business 5 Zone Outline Development Plan area	Not Applicable	N/A



Rule / Standard	Comments	Complies?
Splays		
32.1.1.48 The corner of any allotment at any road intersection in any subdivision of Residential 1, 2 or 3 or Business Zone land shall be either: a splayed with a diagonal line reducing each boundary by a minimum of 6m; or b rounded to a radius of a minimum of 6m.	Not Applicable	N/A
32.1.1.49 The corner of any allotment at any road intersection in any subdivision of Residential 4A, 4B or any Rural Zone land shall be splayed with a diagonal line reducing each boundary by: a a minimum of 6m on local, collector or urban collector roads; and b a minimum of 15m on any strategic or arterial roads.	It is proposed to provide splays of 5m at the intersections.	No
32.2 Discretionary Activities (Restricted)		
32.2.1 Except as provided for by Rules 32.3 or 32.4, or where exempted under Rule 32.1.2, any new allotment that does not comply with the corner splay standards and terms of Rules 32.1.1.48 to 32.1.1.49 is a discretionary activity (restricted).	Noted	-
32.3 Discretionary Activities		
32.3.1 Except as provided for by Rule 32.4 any new allotment in any zone that does not comply with Rules 32.1.1.29 to 32.1.1.32 (traffic management) and 32.1.1.47 is a discretionary activity.	Noted	-



Appendix 14

Partially Operative District Plan Transport Compliance



TRAN - Ranga waka - Transport

Activity Rules

TRAN-R2 Provision of new, and additions or upgrades to existing, land transport infrastructure

All Zones

Activity status: PER

Where:

1. the activity complies with the following, as applicable:
 - a. TRAN-R3 to TRAN-R17 and TRAN-R20;
 - b. TRAN-R18 and TRAN-R19.

TRAN-R3 Formation of a new road

All Zones

Activity status: PER

Where:

- | | | |
|---|------------------|---|
| <ol style="list-style-type: none">1. any activity that includes the formation of a new road shall comply with the design standards for new roads in TRAN-S1 Table TRAN-3 or Table TRAN-4 (as applicable). | Infringes | Does not comply with the requirements of TRAN-S1 Table TRAN-3 as set out below. |
|---|------------------|---|

TRAN-R4 Formation of a new road intersection

All Zones

Activity status: PER

Where:

- | | | |
|---|------------------|---|
| <ol style="list-style-type: none">1. any activity that includes the formation of a new road intersection shall comply with the minimum road intersection separation distances in TRAN-S2 below. | Infringes | Intersection separation distances do not comply with the requirements of TRAN-S2, as set out below. |
|---|------------------|---|

TRAN-R5 Formation of a new vehicle crossing

All Zones

Activity status: PER

Where:

- | | | |
|--|------------------|--|
| <ol style="list-style-type: none">1. any activity that includes the formation of a new vehicle crossing shall comply with the design standards for new vehicle crossings in TRAN-S3 below. | Infringes | Does not comply with access separation to intersections, maximum formed width of access and minimum sight distance requirements (see below). |
|--|------------------|--|



TRAN-R6 Formation of a new vehicle accessway

All Zones

Activity status: PER

Where:

- | | | | |
|----|--|------------------|---|
| 1. | any activity that includes the formation of a new vehicle accessway shall comply with the design standards for new vehicle accessways in TRAN-S4 below; | Infringes | Does not comply, as set out below. |
| 2. | any new vehicle accessway that serves three or more sites shall achieve the minimum sight lines for pedestrian safety by way of a visibility splay as shown in Figure TRAN-4; and | Complies | This will be achieved through covenants at the ends of these accessways. |
| 3. | in the circumstances specified in (a) to (c) below, a new vehicle accessway shall be designed to the standard of a new road as per Table TRAN-3 or Table TRAN-4, with the applicable standard based on the posted speed limit of the road with which the accessway will connect: | | |
| a. | where any new vehicle accessway in a Rural Zone will serve six or more sites; or | Infringes | The accesses to six or more sites will not be designed as roads. |
| b. | where any new vehicle accessway in a Residential Zone will serve 11 or more sites; or | N/A | The site is not in a Residential zone. However, if applying those standards the proposal would comply as there are fewer than eleven sites accessed via a single accessway. |
| c. | where equivalent car movements on any new accessway will exceed 100 per day. | Complies | |

TRAN-R7 Formation of a new vehicle crossing on a sealed road where the posted speed limit is 60km/hr or above

All Zones

Activity status: PER

Where:

- | | | | |
|----|--|------------------|--|
| 1. | any activity that includes the formation of a new vehicle crossing on a sealed road where the posted speed limit is 60km/hr or above, shall comply with the design standards in TRAN-S5 below; except that where the new vehicle crossing is expected to carry more than 100 equivalent car movements per day or have peak hour flows of more than 20 equivalent car movements, the new vehicle crossing shall be treated as an intersection and meet the intersection design standards set out in the Austroads Guide to Road Design. | Infringes | The proposal includes accesses to Mill Road, which is in a 60km/h zone. This requires accesses to be designed to comply with Diagram C (for four Lots or less) and Diagram D (for five to nine Lots). The proposed accesses will not comply with these requirements. |
|----|--|------------------|--|



TRAN-R8 Formation of a new vehicle crossing on a site with frontage to more than one road

All Zones

Activity status: PER

Where:

- | | | | |
|----|---|-----------------|--|
| 1. | for any activity that includes a new vehicle crossing to be formed on a site that has frontage to both a State Highway and any other road in the District Plan road hierarchy, the new vehicle crossing shall not be to the State Highway; | N/A | The site does not front a State highway. |
| 2. | other than in (1) above, for any activity that includes a new vehicle crossing to be formed on a site that has frontage to more than one road, the new vehicle crossing shall be to the road that has the lower classification in the District Plan road hierarchy; and | Complies | Can comply. Two Lots (218 & 219) have frontage to Mill Road (a Collector Road) and an internal Road (a Local Road). No access has been sought at this stage, although these would logically occur from the internal Local Roads to maximise north facing outdoor living. |
| 3. | the new vehicle crossing complies with TRAN-R5 and TRAN-R7 (as applicable). | Complies | Sites with access to more than one road comply with these Standards. |

TRAN-R9 Provision of accessible car parking space

All Zones

Activity status: PER

Where:

- | | | | |
|----|---|-----------------|---|
| 1. | except in the circumstance specified in (3)(a) below, any activity (excluding residential activity) shall provide accessible car parking spaces on site; | Complies | This would apply to the Polo Grounds and Commercial development and these can comply. |
| 2. | where on site car parking is provided, the required number of accessible car parking spaces to be provided shall be in accordance with the minimum requirements in TRAN-S6 below; and | Complies | As above. |
| 3. | where on site car parking is not provided, the required number of accessible car parking spaces to be provided shall be in accordance with the following: <ul style="list-style-type: none"> a. where GFA is less than 200m², no accessible car parking spaces are required; b. where GFA is 200-500m², one accessible car parking space is required; and c. where GFA is more than 500m², one accessible car parking space is required, plus one | Complies | As above. |



additional accessible car parking space is required for every additional 2,500m² GFA thereafter.

TRAN-R10 Provision of car parking space and associated manoeuvring area

All Zones

Activity status: PER

Where:

1.	any activity that includes the provision of any on site car parking spaces, including accessible car parking spaces, shall comply with the dimensions for car parking spaces and associated manoeuvring area specified in TRAN-S7 below;	Complies	Can comply.
2.	for the location of parking spaces and associated manoeuvring area provided on sites with frontage to a Principal Shopping Street in: <ul style="list-style-type: none"> a. Oxford – see TRAN-R18 below; b. Rangiora or Kaiapoi – see TRAN-R19 below; 	N/A	The site is not in these areas.
3.	for any activity, on site manoeuvring area shall be provided to ensure that no vehicle is required to reverse onto or off a strategic road, State Highway, arterial road, or any road where there is a marked on-road cycle lane, separated cycle lane or a shared use path across the site road frontage;	Complies	There is a shared path on the Mill Road frontage and the sites can comply with this requirement.
4.	for any activity, on site manoeuvring area shall be provided for a 99 percentile design vehicle as shown in Appendix TRAN-APP3 to ensure that no such vehicle is required to reverse either onto or off any collector road; and	Complies	Mill Road is a Collector Road and the sites fronting this road can comply.
5.	for any activity, on site manoeuvring area shall be provided for a 99 percentile design vehicle as shown in Appendix TRAN-APP3 to ensure that no such vehicle is required to reverse either onto or off any local road where:		
a.	ten or more parking spaces are to be serviced by a single accessway; or	Complies	The proposal can comply.
b.	five or more residential units share a single accessway; or	Complies	The proposal can comply.
c.	the activity is on a rear site.	Complies	The proposal can comply.

TRAN-R11 Provision of loading space and associated manoeuvring area

All Zones

Activity status: PER



Where:

1.	for any activity (excluding a residential unit), loading space and associated manoeuvring area shall be provided that complies with the minimum loading space and associated manoeuvring area dimensions in TRAN-S8 below;	Complies	The Polo Grounds and Commercial development can comply.
2.	the dimensions that apply shall be based on the largest vehicle expected to visit the site, and shall as a minimum accommodate a medium rigid truck;	Complies	The proposal can comply.
3.	the loading space and associated manoeuvring area shall be provided on site;	Complies	The proposal can comply.
4.	for the location of loading spaces and associated manoeuvring area on sites with frontage to a Principal Shopping Street in: <ul style="list-style-type: none"> a. Oxford – see TRAN-R18 below; b. Rangiora or Kaiapoi – see TRAN-R19 below; and 	N/A	The site is not in these areas.
5.	the loading space and associated manoeuvring area provided shall ensure that no vehicle is required to reverse either onto or off a site where vehicle access is to a strategic road, arterial road or collector road, or to any road where there is a marked on-road cycle lane, separated cycle lane or a shared use path across the site frontage, or where the site gains access by a right of way or shared accessway.	Complies	The proposal can comply.

TRAN-R12 Formation of parking area, loading area, manoeuvring area, vehicle crossing or accessway

All Zones

Activity status: PER

Where:

1.	except where specified in (2) and (3) below, for all activities:		
a.	any vehicle crossing, accessway, and on site parking area, loading area, and manoeuvring area shall be formed, sealed and drained;	Complies	The proposal can comply.
b.	parking space and loading space shall be permanently marked;	Complies	The proposal can comply.
c.	where parking space and loading space are used at night these shall be illuminated	Complies	The proposal can comply.



and shall comply with the relevant provisions in the Light Chapter;

2. except where specified in (3) below, for all activities in Rural Zones, Special Purpose Zone (Kāinga Nohoanga), Special Purpose Zone (Pines Beach and Kairaki Regeneration) or Natural Open Space Zone:

a. any vehicle crossing shall be formed, sealed and drained; **Complies** The proposal can comply.

b. any accessway, and on site parking area, loading area, and manoeuvring area, shall be either:

i. formed, sealed and drained; or **Complies** The proposal can comply.

ii. formed to an all weather standard, and maintained to avoid: **Complies** The proposal can comply.

a. stormwater ponding on parking area, loading area, or manoeuvring area;

b. stormwater runoff onto an adjoining site or road;

c. adverse dust or noise effects being experienced beyond the boundaries of the site;

d. vehicle traffic spreading loose gravel onto an adjoining sealed road;

3. the requirements in (1) and (2) above shall not apply to the following: **N/A**

a. sites where vehicle access is obtained from an unsealed road; and

b. activities provided for as temporary activities under the provisions of the Temporary Activities Chapter of the District Plan.

TRAN-R13 Landscaping of a new car parking area

All Zones

Activity status: PER

Where:

1. for any activity (excluding residential activity) providing more than 5 new car parking spaces on a site, landscaping shall be provided within a landscaping strip(s) or within a planting protection area(s); **Complies** The proposal can comply.

2. landscaping strip(s) shall have a minimum width, and planting protection area(s) shall have a minimum diameter, of 1.5m; **Complies** The proposal can comply.

3. landscaping shall be within, or immediately adjacent to, the parking area; **Complies** The proposal can comply.



4.	landscaping shall consist of a combination of trees, shrubs and ground cover species;	Complies	The proposal can comply.
5.	trees shall: <ul style="list-style-type: none"> a. be placed at regular spacings along a road boundary or within a parking area; b. have a minimum height of 1.5m above ground level and be in a healthy state at the time of planting; c. be a species capable of attaining a minimum height above ground level at maturity of at least 4m; d. be planted no closer than 2m from an underground service or 1m from a footpath or kerb; 	Complies	The proposal can comply.
6.	landscaping shall be maintained so as to not obscure visibility or impede the movement of drivers or pedestrians;	Complies	The proposal can comply.
7.	landscaping placed within the vicinity of electricity lines shall be selected and maintained to ensure the Electricity (Hazards from Trees) Regulations 2003 are not breached; and	Complies	The proposal can comply.
8.	all landscaping shall be maintained and, if diseased, damaged or dead, shall be replaced during the next planting season.	Complies	The proposal can comply.

TRAN-R14 Provision of new footpaths

All Zones

Activity status: PER

Where:

1.	for any activity that includes the creation of a new road in Residential Zones, Special Purpose Zones, or Commercial and Mixed Use Zones, new footpaths (where none currently exist) shall be provided within the road corridor in accordance with the requirements for new footpaths in TRAN-S9 below.	N/A	Not applicable, as the activity is in a Rural Zone. That said, the footpaths within the Residential areas do not comply with the residential requirements as a footpath and a shared path are proposed (rather than two footpaths). There is also a Commercial Zone proposed and the proposal is for a 1.8m footpath rather than the 2.0m path required by the District Plan.
----	---	------------	---

TRAN-R15 Provision of new cycle parking

All Zones

Activity status: PER

Where:	Complies	The proposal can comply.
1.	for any activity, cycle parking shall be provided in accordance with the requirements in TRAN-S10	



below. Where the calculation of the required number of cycle parks results in a fraction of a space, any fraction that is less than one half shall be disregarded and any fraction of one half or more shall be counted as 1 space. The cycle parking requirements for each different type of user shown in TRAN-S10 shall be calculated and rounded separately; and

2. any required cycle parking shall be designed and constructed as follows:
 - a. short stay * cycle parking shall:
 - i. be located within 15m of the entrance to an activity or bus stops;
 - ii. be visible when approaching or leaving an activity or bus stops;
 - b. cycle parks shall:
 - i. be a "staple" type of cycle stand as shown in Appendix TRAN-APP5 and physically support the cycle frame and not the front wheel only;
 - ii. provide for cycle security where the cycle stand is constructed of durable material and is securely anchored to the ground or other immovable object, and allows the cycle frame to be secured to the cycle stand by a "D-lock" or "U-lock";
 - iii. not require lifting of the cycle for the cycle to be secured to the cycle stand;
 - iv. be under lighting when used at night;
 - v. be protected ** from motor vehicles;
 - vi. not create a safety hazard or impede pedestrian thoroughfares;
 - c. long stay *** cycle parking shall be in a secure covered facility with external access to the street;
 - d. cycle stands shall have the dimensions shown in Appendix TRAN-APP5.



TRAN-R16 Provision of cycling end-of-trip facilities for staff

All Zones

Activity status: PER

Where:

- | | | |
|--|-----------------|--------------------------|
| 1. in circumstances where staff cycle parks are required under TRAN-R15 above, cycling end-of-trip facilities for staff shall be provided in accordance with TRAN-S11 below. | Complies | The proposal can comply. |
|--|-----------------|--------------------------|

TRAN-R17 Installation of new charging facilities for electric vehicles

All Zones

Activity status: PER

Where:

- | | | |
|---|-----------------|-------------|
| 1. the new charging facility is installed immediately adjacent to an existing, permitted or consented vehicle parking space located in a road corridor, vehicle depot, garage, parking lot, parking area or parking building. | Complies | Can comply. |
|---|-----------------|-------------|

TRAN-R18 Provision of a parking area or loading area and associated manoeuvring area on a site with frontage to a Principal Shopping Street in Oxford

Local Centre Zone

Activity status: PER

Where:

- | | | |
|--|------------|-------------------------------|
| 1. for any activity, any new parking area or loading area and associated manoeuvring area provided on a site with frontage to a Principal Shopping Street in Oxford (see Figure TRAN-1 below) shall be located to the rear of the site or any building and not on the 'Principal Shopping Street' frontage (with the exception of access). | N/A | The site is not in this area. |
|--|------------|-------------------------------|

TRAN-R19 Provision of a parking area or loading area and associated manoeuvring area on a site with frontage to a Principal Shopping Street in Rangiora or Kaiapoi

Town Centre Zone

Activity status: RDIS

Where:

- | | | |
|--|------------|-------------------------------|
| 1. except as specified in (2) below, for any activity, any new parking area or loading area and associated | N/A | The site is not in this area. |
|--|------------|-------------------------------|



manoeuvring area provided on a site with frontage to a Principal Shopping Street in Rangiora (see Figure TRAN-2 below) or Kaiapoi (see Figure TRAN-3 below) shall be located to the rear of the site or any building and not on the 'Principal Shopping Street' frontage (with the exception of new pedestrian access);

2. loading space and associated manoeuvring area shall not be required to be located on site, where loading and manoeuvring for the largest vehicle expected to visit the site can be undertaken from a service lane, public loading space, or shared loading space, and this can as a minimum accommodate a medium rigid truck based on the minimum dimensions in TRAN-S8 below; and
3. a new vehicle crossing for an on site parking area, loading area and associated manoeuvring area shall not be located across the 'Principal Shopping Street' frontage.

TRAN-R20 High traffic generating activities

All Zones

Activity status: RDIS

Where:	-	Consent may be required when specific activities are sought.
1. any activity that requires a Basic ITA or Full ITA as indicated in Table TRAN-1 below; and		
2. for the activities in (1) above:		
a. either a Basic ITA or Full ITA shall be required as indicated in Table TRAN-1; and		
b. the ITA shall be prepared by an independent suitably qualified and experienced transport planner, transport engineer or other suitably qualified and experienced professional.		

Managing effects of activities on the road corridor, rail corridor, Rangiora Airfield

TRAN-R21 Activities adjacent to a road/rail level crossing

All Zones

Activity status: PER

Where:	N/A	The site is not near a road / rail crossing.
1. any activity adjacent to a road/rail level crossing, including a new		



building, other structure, road intersection, vehicle crossing or vegetation, shall comply with the road/rail level crossing 'approach' and 're-start' sight triangles in TRAN-APP6 below.

TRAN-R23 Rangiora Airfield

All Zones

Activity status: NC

Where:	N/A	The site is not near the Airfield.
1. any land use where any structure or vegetation penetrates the Rangiora Airfield Obstacle Limitation Surfaces as shown in TRAN-APP7 and described as:		
a. take-off climb/approach surface, commencing at ground level at the end of the runway and rising at a gradient of 1 in 20 for a horizontal distance of 1,200m, and splayed outwards at the rate of 1:20 from each side of the runway; and		
b. side surfaces, commencing at the edge of each runway and rising at a gradient of 1 in 4 until it reaches a height of 2m above the level of the runway.		

Transport Standards

TRAN-S1 Design standards for new roads

All Zones

Refer to Table TRAN-3 or Table TRAN-4 below, as applicable.

Infringes

Low Volume Local Roads (16m Corridor)

Three roads are proposed in this category and the following are noted:

- **Two of these roads are longer than the maximum permitted 150m (Road 2-4 is 176m and Road 2-5 is 170m);**
- Fewer than 20 Lots will access each road;
- **Footpaths of 1.8m width are required both sides of the road, whereas a footpath is proposed on one side only; and**
- **The carriageway is required to be 6.5m wide (a 4m traffic lane plus a 2.5m wide parking lane). The proposed carriageway is 6m, with two traffic lanes of 3m proposed.**

Local Road (18m corridor)



The remaining roads are proposed to be local roads and the following is noted:

- These roads are each anticipated to accommodate no more than 200 dwellings;
- Corridor widths of 18m to 22m are proposed. We assume that the required width of 18m is a minimum and therefore the proposal complies;
- **Footpaths of 1.8m width are required both sides of the road. Cross-sections C & D have footpaths both sides, but cross-sections A & B have a footpath one side and a shared path the other; and**
- **The carriageway is required to be 8m wide (4m traffic lane plus 2m parking lanes both sides). The carriageway for cross-section A is 9m with further space for 2.5m wide indented car parking both sides. The carriageway for cross-section B is 9m with no indented car parking. The carriageway for cross-section C is 7m with further space for 2.5m wide indented car parking both sides. The carriageway for cross-section D is 7m with no indented car parking.**

TRAN-S2 Minimum road intersection separation distances

All Zones

Refer to Table TRAN-5 below.

Infringes

Requires the following minimum separations:

- 800m for intersections to 100km/h roads (such as Bradleys Rd and Whites Rd existing speed limits);
- 550m for intersections to 80km/h roads (such as Bradleys Rd and Whites Rd suggested speed limits);
- 160m for intersections to 60km/h roads (Mill Road); and
- 75m for intersections between Local Roads in 50km/h speed limit areas (internal intersections).

The following intersection separations are proposed:

- **Bradleys Road - 485m to 517m;**
- **Whites Road - 246m to 430m south of Ōhoka Stream and 262m north of Ōhoka Stream;**
- Mill Road - At least 232m;
- **Internal intersections typically separated by at least 40m (centre to**



centre), although the typical spacing is in the range of 60m to 80m.

TRAN-S3 Design standards for new vehicle crossings

All Zones

Refer to Table TRAN-6 below.

Infringes

Vehicle crossings will be applied for at the time of seeking Resource Consent for each site (if required).

- A compliant number of crossings can be provided for each Lot.
- Compliant separation distances of crossings could be achieved for each access.
- **Some accesses will be located within the intersection (opposite the minor arm) and therefore within the intersection.**
- **The accesses to Lots 574 to 576 & 711 to 713 have a maximum formed width of 5.5m, compared to a maximum of 4.5m permitted by the District Plan.**
- **A minimum sight distance of 90m is required from all vehicle accesses, which will not be achieved.**
- Compliant separation from pedestrian crossing islands is anticipated.

TRAN-S4 Design standards for new vehicle accessways

All Zones

Refer to Table TRAN-7 below.

Infringes

Accesses in the Rural Zone are required to have a minimum legal width of 10m and minimum formed width of 4m, with passing bays provided. The accesses will not generally meet this standard.



Appendix 15

Access Intersection Operation

MOVEMENT SUMMARY

 Site: 101 [Whites Access - AM Peak (Site Folder: Whites Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	47	0.0	47	0.0	0.040	7.8	LOS A	0.0	0.0	0.00	0.43	0.00	77.7
2	T1	All MCs	26	12.0	26	12.0	0.040	0.0	LOS A	0.0	0.0	0.00	0.43	0.00	87.4
Approach			74	4.3	74	4.3	0.040	5.0	NA	0.0	0.0	0.00	0.43	0.00	80.9
North: Whites Rd															
8	T1	All MCs	38	16.7	38	16.7	0.021	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	All MCs	37	0.0	37	0.0	0.022	7.6	LOS A	0.1	0.7	0.17	0.61	0.17	56.3
Approach			75	8.5	75	8.5	0.022	3.7	NA	0.1	0.7	0.08	0.30	0.08	72.3
West: Access															
10	L2	All MCs	138	0.0	138	0.0	0.285	7.6	LOS A	1.4	10.0	0.19	0.88	0.19	54.2
12	R2	All MCs	175	0.0	175	0.0	0.285	8.3	LOS A	1.4	10.0	0.19	0.88	0.19	54.2
Approach			313	0.0	313	0.0	0.285	8.0	LOS A	1.4	10.0	0.19	0.88	0.19	54.2
All Vehicles			461	2.1	461	2.1	0.285	6.8	NA	1.4	10.0	0.14	0.72	0.14	59.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Whites Access - PM Peak (Site Folder: Whites Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	119	0.0	119	0.0	0.084	7.8	LOS A	0.0	0.0	0.00	0.51	0.00	76.5
2	T1	All MCs	39	5.4	39	5.4	0.084	0.0	LOS A	0.0	0.0	0.00	0.51	0.00	85.9
Approach			158	1.3	158	1.3	0.084	5.9	NA	0.0	0.0	0.00	0.51	0.00	78.6
North: Whites Rd															
8	T1	All MCs	47	0.0	47	0.0	0.024	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	All MCs	171	0.0	171	0.0	0.109	7.9	LOS A	0.5	3.6	0.28	0.63	0.28	56.0
Approach			218	0.0	218	0.0	0.109	6.2	NA	0.5	3.6	0.22	0.49	0.22	61.9
West: Access															
10	L2	All MCs	101	0.0	101	0.0	0.169	7.6	LOS A	0.7	5.2	0.21	0.88	0.21	53.8
12	R2	All MCs	71	0.0	71	0.0	0.169	9.9	LOS A	0.7	5.2	0.21	0.88	0.21	53.8
Approach			172	0.0	172	0.0	0.169	8.5	LOS A	0.7	5.2	0.21	0.88	0.21	53.8
All Vehicles			547	0.4	547	0.4	0.169	6.8	NA	0.7	5.2	0.15	0.62	0.15	62.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Bradleys Access - AM Peak (Site Folder: Bradleys Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Bradleys Rd															
2	T1	All MCs	45	0.0	45	0.0	0.023	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
3	R2	All MCs	32	0.0	32	0.0	0.018	7.5	LOS A	0.1	0.6	0.11	0.62	0.11	56.5
Approach			77	0.0	77	0.0	0.023	3.1	NA	0.1	0.6	0.05	0.26	0.05	76.0
East: Access															
4	L2	All MCs	118	0.0	118	0.0	0.090	7.6	LOS A	0.4	2.6	0.12	0.92	0.12	54.4
6	R2	All MCs	5	0.0	5	0.0	0.090	8.0	LOS A	0.4	2.6	0.12	0.92	0.12	54.3
Approach			123	0.0	123	0.0	0.090	7.6	LOS A	0.4	2.6	0.12	0.92	0.12	54.3
North: Bradleys Rd															
7	L2	All MCs	1	0.0	1	0.0	0.019	7.8	LOS A	0.0	0.0	0.00	0.02	0.00	86.9
8	T1	All MCs	36	2.9	36	2.9	0.019	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	99.4
Approach			37	2.9	37	2.9	0.019	0.2	NA	0.0	0.0	0.00	0.02	0.00	99.0
All Vehicles			237	0.4	237	0.4	0.090	5.0	NA	0.4	2.6	0.08	0.56	0.08	64.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Bradleys Access - PM Peak (Site Folder: Bradleys Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Bradleys Rd															
2	T1	All MCs	61	1.7	61	1.7	0.032	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
3	R2	All MCs	84	0.0	84	0.0	0.050	7.7	LOS A	0.2	1.6	0.18	0.61	0.18	56.3
Approach			145	0.7	145	0.7	0.050	4.4	NA	0.2	1.6	0.11	0.36	0.11	68.9
East: Access															
4	L2	All MCs	51	0.0	51	0.0	0.040	7.7	LOS A	0.2	1.1	0.18	0.89	0.18	54.3
6	R2	All MCs	2	0.0	2	0.0	0.040	8.7	LOS A	0.2	1.1	0.18	0.89	0.18	54.3
Approach			53	0.0	53	0.0	0.040	7.8	LOS A	0.2	1.1	0.18	0.89	0.18	54.3
North: Bradleys Rd															
7	L2	All MCs	4	0.0	4	0.0	0.044	7.8	LOS A	0.0	0.0	0.00	0.03	0.00	87.7
8	T1	All MCs	80	0.0	80	0.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	98.9
Approach			84	0.0	84	0.0	0.044	0.4	NA	0.0	0.0	0.00	0.03	0.00	98.3
All Vehicles			282	0.4	282	0.4	0.050	3.9	NA	0.2	1.6	0.09	0.36	0.09	71.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Mill Rd Access - AM Peak (Site Folder: Mill Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Site Access															
1	L2	All MCs	12	0.0	12	0.0	0.094	4.7	LOS A	0.4	2.6	0.25	0.54	0.25	48.5
2	T1	All MCs	1	0.0	1	0.0	0.094	8.5	LOS A	0.4	2.6	0.25	0.54	0.25	16.4
3	R2	All MCs	68	0.0	68	0.0	0.094	5.6	LOS A	0.4	2.6	0.25	0.54	0.25	48.4
Approach			81	0.0	81	0.0	0.094	5.5	LOS A	0.4	2.6	0.25	0.54	0.25	47.2
East: Mill Rd															
4	L2	All MCs	19	0.0	19	0.0	0.033	5.5	LOS A	0.0	0.0	0.00	0.18	0.00	55.9
5	T1	All MCs	42	7.5	42	7.5	0.033	0.0	LOS A	0.0	0.0	0.00	0.18	0.00	58.2
6	R2	All MCs	1	0.0	1	0.0	0.001	7.3	LOS A	0.0	0.0	0.16	0.67	0.16	16.7
Approach			62	5.1	62	5.1	0.033	1.8	NA	0.0	0.0	0.00	0.19	0.00	55.2
North: Existing Access															
7	L2	All MCs	1	0.0	1	0.0	0.003	0.2	LOS A	0.0	0.1	0.23	0.08	0.23	16.6
8	T1	All MCs	1	0.0	1	0.0	0.003	0.8	LOS A	0.0	0.1	0.23	0.08	0.23	16.2
9	R2	All MCs	1	0.0	1	0.0	0.003	0.9	LOS A	0.0	0.1	0.23	0.08	0.23	16.6
Approach			3	0.0	3	0.0	0.003	0.7	LOS A	0.0	0.1	0.23	0.08	0.23	16.5
West: Mill Rd															
10	L2	All MCs	1	0.0	1	0.0	0.036	8.9	LOS A	0.0	0.0	0.00	0.02	0.00	56.4
11	T1	All MCs	66	7.9	66	7.9	0.036	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
12	R2	All MCs	3	0.0	3	0.0	0.002	5.6	LOS A	0.0	0.1	0.15	0.54	0.15	48.6
Approach			71	7.5	71	7.5	0.036	0.4	NA	0.0	0.1	0.01	0.04	0.01	59.2
All Vehicles			217	3.9	217	3.9	0.094	2.7	NA	0.4	2.6	0.10	0.27	0.10	51.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Mill Rd Access - PM Peak (Site Folder: Mill Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Site Access															
1	L2	All MCs	5	0.0	5	0.0	0.079	5.0	LOSA	0.3	2.1	0.39	0.60	0.39	47.8
2	T1	All MCs	1	0.0	1	0.0	0.079	9.5	LOSA	0.3	2.1	0.39	0.60	0.39	16.3
3	R2	All MCs	51	0.0	51	0.0	0.079	6.8	LOSA	0.3	2.1	0.39	0.60	0.39	47.7
Approach			57	0.0	57	0.0	0.079	6.7	LOSA	0.3	2.1	0.39	0.60	0.39	46.1
East: Mill Rd															
4	L2	All MCs	85	0.0	85	0.0	0.099	5.6	LOSA	0.0	0.0	0.00	0.27	0.00	55.3
5	T1	All MCs	104	2.0	104	2.0	0.099	0.0	LOSA	0.0	0.0	0.00	0.27	0.00	57.6
6	R2	All MCs	1	0.0	1	0.0	0.001	7.4	LOSA	0.0	0.0	0.19	0.66	0.19	16.7
Approach			191	1.1	191	1.1	0.099	2.5	NA	0.0	0.0	0.00	0.27	0.00	55.8
North: Existing Access															
7	L2	All MCs	1	0.0	1	0.0	0.004	0.3	LOSA	0.0	0.1	0.30	0.13	0.30	16.6
8	T1	All MCs	1	0.0	1	0.0	0.004	2.0	LOSA	0.0	0.1	0.30	0.13	0.30	16.2
9	R2	All MCs	1	0.0	1	0.0	0.004	1.6	LOSA	0.0	0.1	0.30	0.13	0.30	16.6
Approach			3	0.0	3	0.0	0.004	1.3	LOSA	0.0	0.1	0.30	0.13	0.30	16.5
West: Mill Rd															
10	L2	All MCs	1	0.0	1	0.0	0.047	8.9	LOSA	0.0	0.0	0.00	0.01	0.00	56.5
11	T1	All MCs	91	0.0	91	0.0	0.047	0.0	LOSA	0.0	0.0	0.00	0.01	0.00	59.9
12	R2	All MCs	8	0.0	8	0.0	0.006	6.0	LOSA	0.0	0.2	0.29	0.54	0.29	48.3
Approach			100	0.0	100	0.0	0.047	0.6	NA	0.0	0.2	0.02	0.06	0.02	58.7
All Vehicles			351	0.6	351	0.6	0.099	2.7	NA	0.3	2.1	0.07	0.26	0.07	53.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 16

Access Intersection Operation – Sensitivity Testing

MOVEMENT SUMMARY

 Site: 101 [Whites Access - AM Peak - S Test (Site Folder: Whites Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	95	0.0	95	0.0	0.079	7.8	LOS A	0.0	0.0	0.00	0.43	0.00	77.6
2	T1	All MCs	53	12.0	53	12.0	0.079	0.0	LOS A	0.0	0.0	0.00	0.43	0.00	87.4
Approach			147	4.3	147	4.3	0.079	5.0	NA	0.0	0.0	0.00	0.43	0.00	80.9
North: Whites Rd															
8	T1	All MCs	76	16.7	76	16.7	0.043	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	All MCs	74	0.0	74	0.0	0.047	7.8	LOS A	0.2	1.5	0.26	0.62	0.26	56.1
Approach			149	8.5	149	8.5	0.047	3.9	NA	0.2	1.5	0.13	0.30	0.13	72.1
West: Access															
10	L2	All MCs	276	0.0	276	0.0	0.641	9.5	LOS A	8.7	60.6	0.49	0.82	0.60	52.0
12	R2	All MCs	349	0.0	349	0.0	0.641	13.0	LOS B	8.7	60.6	0.49	0.82	0.60	52.0
Approach			625	0.0	625	0.0	0.641	11.4	LOS B	8.7	60.6	0.49	0.82	0.60	52.0
All Vehicles			922	2.1	922	2.1	0.641	9.2	NA	8.7	60.6	0.35	0.67	0.43	57.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Whites Access - PM Peak - S Test (Site Folder: Whites Access)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Whites Rd															
1	L2	All MCs	238	0.0	238	0.0	0.168	7.8	LOS A	0.0	0.0	0.00	0.51	0.00	76.5
2	T1	All MCs	78	5.4	78	5.4	0.168	0.0	LOS A	0.0	0.0	0.00	0.51	0.00	85.9
Approach			316	1.3	316	1.3	0.168	5.9	NA	0.0	0.0	0.00	0.51	0.00	78.6
North: Whites Rd															
8	T1	All MCs	95	0.0	95	0.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
9	R2	All MCs	341	0.0	341	0.0	0.256	8.7	LOS A	1.3	9.0	0.45	0.69	0.45	55.5
Approach			436	0.0	436	0.0	0.256	6.8	NA	1.3	9.0	0.35	0.54	0.35	61.4
West: Access															
10	L2	All MCs	202	0.0	202	0.0	0.457	8.5	LOS A	3.3	22.8	0.49	0.80	0.55	51.4
12	R2	All MCs	141	0.0	141	0.0	0.457	17.7	LOS C	3.3	22.8	0.49	0.80	0.55	51.3
Approach			343	0.0	343	0.0	0.457	12.3	LOS B	3.3	22.8	0.49	0.80	0.55	51.4
All Vehicles			1095	0.4	1095	0.4	0.457	8.3	NA	3.3	22.8	0.29	0.61	0.31	61.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Bradleys Access - AM Peak - S Test (Site Folder: Bradleys Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Bradleys Rd															
2	T1	All MCs	91	0.0	91	0.0	0.047	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
3	R2	All MCs	63	0.0	63	0.0	0.037	7.6	LOS A	0.2	1.2	0.17	0.61	0.17	56.3
Approach			154	0.0	154	0.0	0.047	3.1	NA	0.2	1.2	0.07	0.25	0.07	75.8
East: Access															
4	L2	All MCs	236	0.0	236	0.0	0.188	7.8	LOS A	0.9	6.0	0.20	0.89	0.20	54.4
6	R2	All MCs	11	0.0	11	0.0	0.188	9.1	LOS A	0.9	6.0	0.20	0.89	0.20	54.3
Approach			246	0.0	246	0.0	0.188	7.8	LOS A	0.9	6.0	0.20	0.89	0.20	54.3
North: Bradleys Rd															
7	L2	All MCs	2	0.0	2	0.0	0.039	7.8	LOS A	0.0	0.0	0.00	0.02	0.00	86.9
8	T1	All MCs	72	2.9	72	2.9	0.039	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	99.4
Approach			74	2.9	74	2.9	0.039	0.2	NA	0.0	0.0	0.00	0.02	0.00	99.0
All Vehicles			474	0.4	474	0.4	0.188	5.1	NA	0.9	6.0	0.12	0.55	0.12	64.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Bradleys Access - PM Peak - S Test (Site Folder: Bradleys Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Bradleys Rd															
2	T1	All MCs	122	1.7	122	1.7	0.064	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
3	R2	All MCs	168	0.0	168	0.0	0.109	8.0	LOS A	0.5	3.6	0.29	0.63	0.29	56.0
Approach			291	0.7	291	0.7	0.109	4.6	NA	0.5	3.6	0.17	0.36	0.17	68.7
East: Access															
4	L2	All MCs	101	0.0	101	0.0	0.089	8.1	LOS A	0.4	2.5	0.28	0.87	0.28	54.2
6	R2	All MCs	4	0.0	4	0.0	0.089	11.0	LOS B	0.4	2.5	0.28	0.87	0.28	54.2
Approach			105	0.0	105	0.0	0.089	8.2	LOS A	0.4	2.5	0.28	0.87	0.28	54.2
North: Bradleys Rd															
7	L2	All MCs	8	0.0	8	0.0	0.087	7.8	LOS A	0.0	0.0	0.00	0.03	0.00	87.7
8	T1	All MCs	160	0.0	160	0.0	0.087	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	98.9
Approach			168	0.0	168	0.0	0.087	0.4	NA	0.0	0.0	0.00	0.03	0.00	98.3
All Vehicles			564	0.4	564	0.4	0.109	4.0	NA	0.5	3.6	0.14	0.36	0.14	71.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Mill Rd Access - AM Peak - S Test (Site Folder: Mill Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Site Access															
1	L2	All MCs	23	0.0	23	0.0	0.222	4.9	LOSA	1.0	6.7	0.42	0.61	0.42	47.6
2	T1	All MCs	2	0.0	2	0.0	0.222	9.9	LOSA	1.0	6.7	0.42	0.61	0.42	16.3
3	R2	All MCs	137	0.0	137	0.0	0.222	7.3	LOSA	1.0	6.7	0.42	0.61	0.42	47.5
Approach			162	0.0	162	0.0	0.222	7.0	LOSA	1.0	6.7	0.42	0.61	0.42	46.4
East: Mill Rd															
4	L2	All MCs	38	0.0	38	0.0	0.065	5.6	LOSA	0.0	0.0	0.00	0.18	0.00	55.9
5	T1	All MCs	84	7.5	84	7.5	0.065	0.0	LOSA	0.0	0.0	0.00	0.18	0.00	58.2
6	R2	All MCs	2	0.0	2	0.0	0.001	7.5	LOSA	0.0	0.0	0.24	0.65	0.24	16.7
Approach			124	5.1	124	5.1	0.065	1.8	NA	0.0	0.0	0.00	0.19	0.00	55.2
North: Existing Access															
7	L2	All MCs	2	0.0	2	0.0	0.008	0.5	LOSA	0.0	0.2	0.34	0.17	0.34	16.6
8	T1	All MCs	2	0.0	2	0.0	0.008	1.9	LOSA	0.0	0.2	0.34	0.17	0.34	16.2
9	R2	All MCs	2	0.0	2	0.0	0.008	2.1	LOSA	0.0	0.2	0.34	0.17	0.34	16.6
Approach			6	0.0	6	0.0	0.008	1.5	LOSA	0.0	0.2	0.34	0.17	0.34	16.4
West: Mill Rd															
10	L2	All MCs	2	0.0	2	0.0	0.072	8.9	LOSA	0.0	0.0	0.00	0.02	0.00	56.4
11	T1	All MCs	133	7.9	133	7.9	0.072	0.0	LOSA	0.0	0.0	0.00	0.02	0.00	59.8
12	R2	All MCs	6	0.0	6	0.0	0.004	5.8	LOSA	0.0	0.1	0.22	0.54	0.22	48.5
Approach			141	7.5	141	7.5	0.072	0.4	NA	0.0	0.1	0.01	0.04	0.01	59.1
All Vehicles			434	3.9	434	3.9	0.222	3.3	NA	1.0	6.7	0.17	0.30	0.17	50.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Mill Rd Access - PM Peak - S Test (Site Folder: Mill Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total HV]		Arrival Flows [Total HV]		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.]	Dist [m]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
			veh/h	%	veh/h	%	v/c	sec							
South: Site Access															
1	L2	All MCs	11	0.0	11	0.0	0.229	5.5	LOS A	0.9	6.4	0.59	0.77	0.59	45.7
2	T1	All MCs	1	0.0	1	0.0	0.229	12.7	LOS B	0.9	6.4	0.59	0.77	0.59	16.1
3	R2	All MCs	101	0.0	101	0.0	0.229	10.8	LOS B	0.9	6.4	0.59	0.77	0.59	45.6
Approach			113	0.0	113	0.0	0.229	10.3	LOS B	0.9	6.4	0.59	0.77	0.59	44.8
East: Mill Rd															
4	L2	All MCs	171	0.0	171	0.0	0.198	5.6	LOS A	0.0	0.0	0.00	0.27	0.00	55.2
5	T1	All MCs	208	2.0	208	2.0	0.198	0.1	LOS A	0.0	0.0	0.00	0.27	0.00	57.5
6	R2	All MCs	1	0.0	1	0.0	0.001	7.7	LOS A	0.0	0.0	0.28	0.64	0.28	16.6
Approach			380	1.1	380	1.1	0.198	2.6	NA	0.0	0.0	0.00	0.27	0.00	56.1
North: Existing Access															
7	L2	All MCs	1	0.0	1	0.0	0.005	0.6	LOS A	0.0	0.1	0.47	0.27	0.47	16.4
8	T1	All MCs	1	0.0	1	0.0	0.005	5.3	LOS A	0.0	0.1	0.47	0.27	0.47	16.0
9	R2	All MCs	1	0.0	1	0.0	0.005	3.9	LOS A	0.0	0.1	0.47	0.27	0.47	16.4
Approach			3	0.0	3	0.0	0.005	3.3	LOS A	0.0	0.1	0.47	0.27	0.47	16.3
West: Mill Rd															
10	L2	All MCs	1	0.0	1	0.0	0.092	8.9	LOS A	0.0	0.0	0.00	0.01	0.00	56.5
11	T1	All MCs	181	0.0	181	0.0	0.092	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.9
12	R2	All MCs	17	0.0	17	0.0	0.014	6.7	LOS A	0.1	0.4	0.43	0.59	0.43	48.0
Approach			199	0.0	199	0.0	0.092	0.6	NA	0.1	0.4	0.04	0.06	0.04	58.7
All Vehicles			695	0.6	695	0.6	0.229	3.3	NA	0.9	6.4	0.11	0.29	0.11	54.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 17

Tram Rd / Bradleys Rd Intersection Model Results

MOVEMENT SUMMARY

Site: 101 [Tram Rd & Bradleys Rd - 2025 AM + Dev (Site Folder: Tram Rd & Bradleys Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: McHughes Rd															
1	L2	All MCs	8	0.0	8	0.0	0.007	9.2	LOS A	0.0	0.2	0.18	0.88	0.18	62.5
2	T1	All MCs	27	3.8	27	3.8	0.463	23.1	LOS C	2.0	14.1	0.79	1.08	1.15	48.6
3	R2	All MCs	93	3.4	93	3.4	0.463	27.4	LOS D	2.0	14.1	0.79	1.08	1.15	48.8
Approach			128	3.3	128	3.3	0.463	25.3	LOS D	2.0	14.1	0.75	1.07	1.09	49.4
East: Tram Rd															
4	L2	All MCs	25	12.5	25	12.5	0.015	7.2	LOS A	0.0	0.0	0.00	0.63	0.00	60.6
5	T1	All MCs	91	8.1	91	8.1	0.049	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
6	R2	All MCs	46	4.5	46	4.5	0.050	8.8	LOS A	0.2	1.4	0.44	0.68	0.44	61.1
Approach			162	7.8	162	7.8	0.050	3.6	NA	0.2	1.4	0.13	0.29	0.13	70.3
North: Bradleys Rd															
7	L2	All MCs	223	2.8	223	2.8	0.251	11.1	LOS B	1.0	7.1	0.46	0.92	0.46	60.4
8	T1	All MCs	24	21.7	24	21.7	0.284	25.1	LOS D	1.1	8.0	0.71	1.03	0.83	47.5
9	R2	All MCs	49	2.1	49	2.1	0.284	21.8	LOS C	1.1	8.0	0.71	1.03	0.83	51.3
Approach			297	4.3	297	4.3	0.284	14.0	LOS B	1.1	8.0	0.53	0.95	0.56	57.5
West: Tram Rd															
10	L2	All MCs	26	12.0	26	12.0	0.016	7.2	LOS A	0.0	0.0	0.00	0.63	0.00	60.8
11	T1	All MCs	361	1.2	361	1.2	0.185	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	All MCs	8	0.0	8	0.0	0.007	7.5	LOS A	0.0	0.2	0.22	0.57	0.22	63.5
Approach			396	1.9	396	1.9	0.185	0.7	NA	0.0	0.2	0.00	0.05	0.00	77.8
All Vehicles			983	3.7	983	3.7	0.463	8.4	NA	2.0	14.1	0.28	0.50	0.33	64.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tram Rd & Bradleys Rd - 2025 PM + Dev (Site Folder: Tram Rd & Bradleys Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: McHughes Rd															
1	L2	All MCs	20	0.0	20	0.0	0.021	10.3	LOS B	0.1	0.5	0.38	0.87	0.38	61.8
2	T1	All MCs	31	3.4	31	3.4	0.307	28.7	LOS D	1.1	7.9	0.81	1.03	0.97	47.9
3	R2	All MCs	35	0.0	35	0.0	0.307	26.4	LOS D	1.1	7.9	0.81	1.03	0.97	48.6
Approach			85	1.2	85	1.2	0.307	23.4	LOS C	1.1	7.9	0.71	0.99	0.83	50.9
East: Tram Rd															
4	L2	All MCs	118	1.8	118	1.8	0.066	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	64.0
5	T1	All MCs	336	1.3	336	1.3	0.173	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
6	R2	All MCs	202	3.1	202	3.1	0.167	7.6	LOS A	0.7	5.3	0.30	0.62	0.30	62.3
Approach			656	1.9	656	1.9	0.173	3.6	NA	0.7	5.3	0.09	0.30	0.09	70.6
North: Bradleys Rd															
7	L2	All MCs	116	2.7	116	2.7	0.099	9.5	LOS A	0.4	2.6	0.22	0.89	0.22	61.6
8	T1	All MCs	48	2.2	48	2.2	0.425	32.6	LOS D	1.7	12.0	0.84	1.06	1.13	45.5
9	R2	All MCs	34	0.0	34	0.0	0.425	31.1	LOS D	1.7	12.0	0.84	1.06	1.13	45.8
Approach			198	2.1	198	2.1	0.425	18.8	LOS C	1.7	12.0	0.48	0.96	0.60	53.8
West: Tram Rd															
10	L2	All MCs	47	0.0	47	0.0	0.026	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	64.6
11	T1	All MCs	115	3.7	115	3.7	0.060	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
12	R2	All MCs	19	0.0	19	0.0	0.021	9.1	LOS A	0.1	0.6	0.46	0.66	0.46	62.3
Approach			181	2.3	181	2.3	0.060	2.8	NA	0.1	0.6	0.05	0.23	0.05	73.2
All Vehicles			1120	2.0	1120	2.0	0.425	7.7	NA	1.7	12.0	0.20	0.46	0.23	65.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Tram Rd & Bradleys Rd - 2025 + Dev AM (Site Folder: Tram Rd & Bradleys Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: McHughes Rd															
1	L2	All MCs	8	0.0	8	0.0	0.115	6.4	LOS A	0.6	4.6	0.39	0.62	0.39	61.5
2	T1	All MCs	26	4.0	26	4.0	0.115	6.9	LOS A	0.6	4.6	0.39	0.62	0.39	61.1
3	R2	All MCs	89	3.5	89	3.5	0.115	12.6	LOS B	0.6	4.6	0.39	0.62	0.39	59.7
Approach			124	3.4	124	3.4	0.115	11.0	LOS B	0.6	4.6	0.39	0.62	0.39	60.1
East: Tram Rd															
4	L2	All MCs	22	14.3	22	14.3	0.122	6.0	LOS A	0.8	5.8	0.28	0.53	0.28	60.4
5	T1	All MCs	83	8.9	83	8.9	0.122	6.3	LOS A	0.8	5.8	0.28	0.53	0.28	62.5
6	R2	All MCs	44	4.8	44	4.8	0.122	12.0	LOS B	0.8	5.8	0.28	0.53	0.28	61.8
Approach			149	8.5	149	8.5	0.122	8.0	LOS A	0.8	5.8	0.28	0.53	0.28	62.0
North: Bradleys Rd															
7	L2	All MCs	217	2.9	217	2.9	0.364	9.3	LOS A	2.4	17.5	0.72	0.69	0.72	61.4
8	T1	All MCs	19	27.8	19	27.8	0.364	11.2	LOS B	2.4	17.5	0.72	0.69	0.72	56.4
9	R2	All MCs	48	2.2	48	2.2	0.364	15.4	LOS B	2.4	17.5	0.72	0.69	0.72	60.6
Approach			284	4.4	284	4.4	0.364	10.5	LOS B	2.4	17.5	0.72	0.69	0.72	60.9
West: Tram Rd															
10	L2	All MCs	23	13.6	23	13.6	0.319	6.8	LOS A	2.2	15.7	0.44	0.51	0.44	60.8
11	T1	All MCs	357	1.2	357	1.2	0.319	6.9	LOS A	2.2	15.7	0.44	0.51	0.44	64.7
12	R2	All MCs	8	0.0	8	0.0	0.319	12.5	LOS B	2.2	15.7	0.44	0.51	0.44	63.5
Approach			388	1.9	388	1.9	0.319	7.0	LOS A	2.2	15.7	0.44	0.51	0.44	64.5
All Vehicles			946	3.9	946	3.9	0.364	8.7	LOS A	2.4	17.5	0.49	0.58	0.49	62.4

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

Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

Site: 101 [Tram Rd & Bradleys Rd - 2025 + Dev PM (Site Folder: Tram Rd & Bradleys Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: McHughes Rd															
1	L2	All MCs	20	0.0	20	0.0	0.110	9.0	LOS A	0.7	4.7	0.67	0.70	0.67	60.9
2	T1	All MCs	29	3.6	29	3.6	0.110	9.7	LOS A	0.7	4.7	0.67	0.70	0.67	60.6
3	R2	All MCs	35	0.0	35	0.0	0.110	15.1	LOS B	0.7	4.7	0.67	0.70	0.67	60.1
Approach			84	1.3	84	1.3	0.110	11.8	LOS B	0.7	4.7	0.67	0.70	0.67	60.5
East: Tram Rd															
4	L2	All MCs	116	1.8	116	1.8	0.482	6.2	LOS A	4.2	30.0	0.42	0.53	0.42	63.0
5	T1	All MCs	332	1.3	332	1.3	0.482	6.6	LOS A	4.2	30.0	0.42	0.53	0.42	63.7
6	R2	All MCs	196	3.2	196	3.2	0.482	12.3	LOS B	4.2	30.0	0.42	0.53	0.42	61.6
Approach			643	2.0	643	2.0	0.482	8.3	LOS A	4.2	30.0	0.42	0.53	0.42	62.9
North: Bradleys Rd															
7	L2	All MCs	113	2.8	113	2.8	0.184	6.5	LOS A	1.1	8.0	0.42	0.56	0.42	63.6
8	T1	All MCs	47	2.2	47	2.2	0.184	7.0	LOS A	1.1	8.0	0.42	0.56	0.42	64.5
9	R2	All MCs	34	0.0	34	0.0	0.184	12.6	LOS B	1.1	8.0	0.42	0.56	0.42	63.4
Approach			194	2.2	194	2.2	0.184	7.7	LOS A	1.1	8.0	0.42	0.56	0.42	63.8
West: Tram Rd															
10	L2	All MCs	47	0.0	47	0.0	0.166	6.9	LOS A	1.0	7.1	0.49	0.57	0.49	64.0
11	T1	All MCs	111	3.8	111	3.8	0.166	7.4	LOS A	1.0	7.1	0.49	0.57	0.49	63.6
12	R2	All MCs	19	0.0	19	0.0	0.166	13.0	LOS B	1.0	7.1	0.49	0.57	0.49	63.0
Approach			177	2.4	177	2.4	0.166	7.9	LOS A	1.0	7.1	0.49	0.57	0.49	63.6
All Vehicles			1098	2.0	1098	2.0	0.482	8.4	LOS A	4.2	30.0	0.45	0.56	0.45	63.0

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

Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on average delay per movement.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Appendix 18

Tram Rd / Whites Rd Intersection Model Results

MOVEMENT SUMMARY

Site: 101 [Tram Rd & Whites Rd - 2025 AM + Dev (Site Folder: Tram Rd & Whites Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	1	0.0	1	0.0	0.304	12.6	LOS B	1.0	7.0	0.86	1.03	1.02	49.9
2	T1	All MCs	8	0.0	8	0.0	0.304	30.0	LOS D	1.0	7.0	0.86	1.03	1.02	49.9
3	R2	All MCs	43	2.4	43	2.4	0.304	34.3	LOS D	1.0	7.0	0.86	1.03	1.02	49.5
Approach			53	2.0	53	2.0	0.304	33.2	LOS D	1.0	7.0	0.86	1.03	1.02	49.6
East: Tram Rd															
4	L2	All MCs	5	0.0	5	0.0	0.088	7.8	LOS A	0.0	0.0	0.00	0.02	0.00	86.8
5	T1	All MCs	157	10.1	157	10.1	0.088	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	99.2
6	R2	All MCs	58	0.0	58	0.0	0.075	11.3	LOS B	0.3	2.0	0.60	0.82	0.60	69.4
Approach			220	7.2	220	7.2	0.088	3.2	NA	0.3	2.0	0.16	0.23	0.16	88.9
North: Whites Rd															
7	L2	All MCs	167	0.0	167	0.0	0.306	15.7	LOS C	1.2	8.6	0.68	1.03	0.81	65.8
8	T1	All MCs	7	14.3	7	14.3	0.143	36.5	LOS E	0.4	2.8	0.80	1.00	0.80	52.2
9	R2	All MCs	22	4.8	22	4.8	0.143	23.3	LOS C	0.4	2.8	0.80	1.00	0.80	54.0
Approach			197	1.1	197	1.1	0.306	17.3	LOS C	1.2	8.6	0.69	1.02	0.81	63.6
West: Tram Rd															
10	L2	All MCs	12	36.4	12	36.4	0.381	8.8	LOS A	0.0	0.0	0.00	0.01	0.00	71.5
11	T1	All MCs	694	9.1	694	9.1	0.381	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	99.5
12	R2	All MCs	3	0.0	3	0.0	0.002	7.8	LOS A	0.0	0.1	0.27	0.59	0.27	73.4
Approach			708	9.5	708	9.5	0.381	0.2	NA	0.0	0.1	0.00	0.01	0.00	98.7
All Vehicles			1178	7.3	1178	7.3	0.381	5.1	NA	1.2	8.6	0.18	0.27	0.21	85.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Tram Rd & Whites Rd - 2025 PM + Dev (Site Folder: Tram Rd & Whites Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	6	0.0	6	0.0	0.072	13.3	LOS B	0.2	1.6	0.77	1.00	0.77	59.3
2	T1	All MCs	1	0.0	1	0.0	0.072	29.2	LOS D	0.2	1.6	0.77	1.00	0.77	59.3
3	R2	All MCs	12	0.0	12	0.0	0.072	26.0	LOS D	0.2	1.6	0.77	1.00	0.77	59.2
Approach			19	0.0	19	0.0	0.072	21.9	LOS C	0.2	1.6	0.77	1.00	0.77	59.3
East: Tram Rd															
4	L2	All MCs	40	2.6	40	2.6	0.351	7.9	LOS A	0.0	0.0	0.00	0.04	0.00	85.0
5	T1	All MCs	622	6.4	622	6.4	0.351	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	98.5
6	R2	All MCs	136	1.6	136	1.6	0.097	8.5	LOS A	0.4	3.1	0.37	0.65	0.37	71.4
Approach			798	5.4	798	5.4	0.351	1.9	NA	0.4	3.1	0.06	0.14	0.06	91.8
North: Whites Rd															
7	L2	All MCs	73	0.0	73	0.0	0.068	10.5	LOS B	0.2	1.7	0.32	0.88	0.32	71.5
8	T1	All MCs	11	10.0	11	10.0	0.245	41.6	LOS E	0.6	4.5	0.86	1.02	0.98	44.6
9	R2	All MCs	21	15.0	21	15.0	0.245	39.3	LOS E	0.6	4.5	0.86	1.02	0.98	43.9
Approach			104	4.0	104	4.0	0.245	19.5	LOS C	0.6	4.5	0.48	0.93	0.52	60.2
West: Tram Rd															
10	L2	All MCs	26	0.0	26	0.0	0.135	7.8	LOS A	0.0	0.0	0.00	0.07	0.00	85.6
11	T1	All MCs	224	9.9	224	9.9	0.135	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	97.5
12	R2	All MCs	3	33.3	3	33.3	0.005	13.1	LOS B	0.0	0.2	0.60	0.71	0.60	58.0
Approach			254	9.1	254	9.1	0.135	1.0	NA	0.0	0.2	0.01	0.08	0.01	95.3
All Vehicles			1175	6.0	1175	6.0	0.351	3.6	NA	0.6	4.5	0.10	0.21	0.10	87.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 19

Mill Rd / Bradleys Rd Intersection Model Results

MOVEMENT SUMMARY

 Site: 101 [Mill Rd & Bradleys Rd - 2025 AM + Dev (Site Folder: Mill Rd & Bradleys Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed	
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. Dist]				km/h	
			veh/h		veh/h					veh	m				
South: Bradleys Rd															
1	L2	All MCs	14	0.0	14	0.0	0.048	8.0	LOS A	0.2	1.2	0.10	0.94	0.10	51.2
2	T1	All MCs	7	0.0	7	0.0	0.048	8.1	LOS A	0.2	1.2	0.10	0.94	0.10	51.2
3	R2	All MCs	29	0.0	29	0.0	0.048	7.9	LOS A	0.2	1.2	0.10	0.94	0.10	50.9
Approach			51	0.0	51	0.0	0.048	8.0	LOS A	0.2	1.2	0.10	0.94	0.10	51.0
East: Mill Rd															
4	L2	All MCs	18	5.9	18	5.9	0.028	5.7	LOS A	0.1	0.8	0.09	0.47	0.09	53.1
5	T1	All MCs	8	12.5	8	12.5	0.028	0.1	LOS A	0.1	0.8	0.09	0.47	0.09	55.5
6	R2	All MCs	21	10.0	21	10.0	0.028	5.7	LOS A	0.1	0.8	0.09	0.47	0.09	52.6
Approach			47	8.9	47	8.9	0.028	4.7	NA	0.1	0.8	0.09	0.47	0.09	53.3
North: Bradleys Rd															
7	L2	All MCs	11	10.0	11	10.0	0.012	8.5	LOS A	0.0	0.3	0.11	0.95	0.11	50.5
8	T1	All MCs	2	0.0	2	0.0	0.012	8.1	LOS A	0.0	0.3	0.11	0.95	0.11	50.9
9	R2	All MCs	100		100		0.012	12.6	LOS B	0.0	0.3	0.11	0.95	0.11	46.8
Approach			14	15.4	14	15.4	0.012	8.8	LOS A	0.0	0.3	0.11	0.95	0.11	50.3
West: Mill Rd															
10	L2	All MCs	1	0.0	1	0.0	0.024	5.6	LOS A	0.1	0.6	0.07	0.25	0.07	55.0
11	T1	All MCs	25	20.8	25	20.8	0.024	0.0	LOS A	0.1	0.6	0.07	0.25	0.07	57.3
12	R2	All MCs	17	0.0	17	0.0	0.024	5.6	LOS A	0.1	0.6	0.07	0.25	0.07	54.7
Approach			43	12.2	43	12.2	0.024	2.3	NA	0.1	0.6	0.07	0.25	0.07	56.2
All Vehicles			155	7.5	155	7.5	0.048	5.5	NA	0.2	1.2	0.09	0.60	0.09	53.0

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

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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MOVEMENT SUMMARY

 Site: 101 [Mill Rd & Bradleys Rd - 2025 PM + Dev (Site Folder: Mill Rd & Bradleys Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Bradleys Rd															
1	L2	All MCs	27	3.8	27	3.8	0.061	8.3	LOS A	0.2	1.6	0.18	0.90	0.18	51.0
2	T1	All MCs	6	0.0	6	0.0	0.061	8.4	LOS A	0.2	1.6	0.18	0.90	0.18	51.1
3	R2	All MCs	29	0.0	29	0.0	0.061	8.4	LOS A	0.2	1.6	0.18	0.90	0.18	50.8
Approach			63	1.7	63	1.7	0.061	8.4	LOS A	0.2	1.6	0.18	0.90	0.18	50.9
East: Mill Rd															
4	L2	All MCs	53	0.0	53	0.0	0.059	5.6	LOS A	0.1	0.8	0.05	0.36	0.05	54.5
5	T1	All MCs	43	0.0	43	0.0	0.059	0.0	LOS A	0.1	0.8	0.05	0.36	0.05	56.7
6	R2	All MCs	15	0.0	15	0.0	0.059	5.5	LOS A	0.1	0.8	0.05	0.36	0.05	54.1
Approach			111	0.0	111	0.0	0.059	3.4	NA	0.1	0.8	0.05	0.36	0.05	55.3
North: Bradleys Rd															
7	L2	All MCs	14	0.0	14	0.0	0.019	8.1	LOS A	0.1	0.5	0.15	0.93	0.15	51.1
8	T1	All MCs	8	0.0	8	0.0	0.019	8.4	LOS A	0.1	0.5	0.15	0.93	0.15	51.1
9	R2	All MCs	1	0.0	1	0.0	0.019	8.2	LOS A	0.1	0.5	0.15	0.93	0.15	50.8
Approach			23	0.0	23	0.0	0.019	8.3	LOS A	0.1	0.5	0.15	0.93	0.15	51.1
West: Mill Rd															
10	L2	All MCs	2	0.0	2	0.0	0.035	5.8	LOS A	0.1	0.9	0.15	0.26	0.15	55.1
11	T1	All MCs	38	0.0	38	0.0	0.035	0.2	LOS A	0.1	0.9	0.15	0.26	0.15	57.4
12	R2	All MCs	23	0.0	23	0.0	0.035	5.8	LOS A	0.1	0.9	0.15	0.26	0.15	54.7
Approach			63	0.0	63	0.0	0.035	2.4	NA	0.1	0.9	0.15	0.26	0.15	56.3
All Vehicles			260	0.4	260	0.4	0.061	4.8	NA	0.2	1.6	0.11	0.52	0.11	54.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major HCM road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 20

Mill Rd / Whites Rd Intersection Model Results

MOVEMENT SUMMARY

 Site: 101 [Mill Rd & Whites Rd - 2025 AM + Dev (Site Folder: Mill Rd & Whites Rd)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Whites Rd															
1	L2	All MCs	13	8.3	13	8.3	0.010	8.5	LOS A	0.0	0.3	0.13	0.92	0.13	50.7
3	R2	All MCs	152	1.4	152	1.4	0.162	8.6	LOS A	0.6	4.1	0.32	0.90	0.32	50.7
Approach			164	1.9	164	1.9	0.162	8.6	LOS A	0.6	4.1	0.31	0.90	0.31	50.7
East: Mill Rd															
4	L2	All MCs	56	3.8	56	3.8	0.057	5.6	LOS A	0.0	0.0	0.00	0.32	0.00	54.7
5	T1	All MCs	48	4.3	48	4.3	0.057	0.0	LOS A	0.0	0.0	0.00	0.32	0.00	57.2
Approach			104	4.0	104	4.0	0.057	3.0	NA	0.0	0.0	0.00	0.32	0.00	55.8
West: Mill Rd															
11	T1	All MCs	116	0.9	116	0.9	0.075	0.1	LOS A	0.1	1.0	0.08	0.11	0.08	59.1
12	R2	All MCs	19	22.2	19	22.2	0.075	6.2	LOS A	0.1	1.0	0.08	0.11	0.08	55.3
Approach			135	3.9	135	3.9	0.075	0.9	NA	0.1	1.0	0.08	0.11	0.08	58.5
All Vehicles			403	3.1	403	3.1	0.162	4.6	NA	0.6	4.1	0.15	0.48	0.15	54.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Mill Rd & Whites Rd - 2025 PM + Dev (Site Folder: Mill Rd & Whites Rd)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	24	8.7	24	8.7	0.021	9.1	LOS A	0.1	0.6	0.27	0.87	0.27	50.7
3	R2	All MCs	116	0.0	116	0.0	0.151	9.7	LOS A	0.5	3.6	0.44	0.94	0.44	50.1
Approach			140	1.5	140	1.5	0.151	9.6	LOS A	0.5	3.6	0.41	0.93	0.41	50.2
East: Mill Rd															
4	L2	All MCs	194	0.0	194	0.0	0.190	5.6	LOS A	0.0	0.0	0.00	0.32	0.00	54.8
5	T1	All MCs	165	0.0	165	0.0	0.190	0.1	LOS A	0.0	0.0	0.00	0.32	0.00	57.1
Approach			359	0.0	359	0.0	0.190	3.0	NA	0.0	0.0	0.00	0.32	0.00	55.9
West: Mill Rd															
11	T1	All MCs	117	0.0	117	0.0	0.080	0.4	LOS A	0.2	1.4	0.18	0.20	0.18	58.4
12	R2	All MCs	24	0.0	24	0.0	0.080	6.8	LOS A	0.2	1.4	0.18	0.20	0.18	55.8
Approach			141	0.0	141	0.0	0.080	1.5	NA	0.2	1.4	0.18	0.20	0.18	57.9
All Vehicles			640	0.3	640	0.3	0.190	4.1	NA	0.5	3.6	0.13	0.43	0.13	54.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Mill Rd & Whites Rd - 2025 AM + Dev - S Test (Site Folder: Mill Rd & Whites Rd)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	25	8.3	25	8.3	0.020	8.7	LOS A	0.1	0.6	0.20	0.89	0.20	50.7
3	R2	All MCs	303	1.4	303	1.4	0.413	11.3	LOS B	2.1	15.0	0.55	1.00	0.70	49.1
Approach			328	1.9	328	1.9	0.413	11.1	LOS B	2.1	15.0	0.52	0.99	0.66	49.2
East: Mill Rd															
4	L2	All MCs	112	3.8	112	3.8	0.113	5.6	LOS A	0.0	0.0	0.00	0.32	0.00	54.7
5	T1	All MCs	97	4.3	97	4.3	0.113	0.0	LOS A	0.0	0.0	0.00	0.32	0.00	57.2
Approach			208	4.0	208	4.0	0.113	3.0	NA	0.0	0.0	0.00	0.32	0.00	55.8
West: Mill Rd															
11	T1	All MCs	232	0.9	232	0.9	0.153	0.2	LOS A	0.3	2.4	0.13	0.15	0.13	58.8
12	R2	All MCs	38	22.2	38	22.2	0.153	6.7	LOS A	0.3	2.4	0.13	0.15	0.13	55.2
Approach			269	3.9	269	3.9	0.153	1.1	NA	0.3	2.4	0.13	0.15	0.13	58.3
All Vehicles			806	3.1	806	3.1	0.413	5.7	NA	2.1	15.0	0.25	0.54	0.31	53.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 **Site: 101 [Mill Rd & Whites Rd - 2025 PM + Dev - S Test (Site Folder: Mill Rd & Whites Rd)]**

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Whites Rd															
1	L2	All MCs	48	8.7	48	8.7	0.051	10.0	LOS B	0.2	1.4	0.41	0.88	0.41	50.2
3	R2	All MCs	232	0.0	232	0.0	0.518	17.3	LOS C	2.5	17.6	0.77	1.12	1.18	45.7
Approach			280	1.5	280	1.5	0.518	16.0	LOS C	2.5	17.6	0.71	1.08	1.05	46.4
East: Mill Rd															
4	L2	All MCs	387	0.0	387	0.0	0.380	5.7	LOS A	0.0	0.0	0.00	0.32	0.00	54.7
5	T1	All MCs	331	0.0	331	0.0	0.380	0.1	LOS A	0.0	0.0	0.00	0.32	0.00	57.0
Approach			718	0.0	718	0.0	0.380	3.1	NA	0.0	0.0	0.00	0.32	0.00	55.7
West: Mill Rd															
11	T1	All MCs	234	0.0	234	0.0	0.182	1.3	LOS A	0.7	4.6	0.29	0.35	0.29	57.4
12	R2	All MCs	48	0.0	48	0.0	0.182	9.3	LOS A	0.7	4.6	0.29	0.35	0.29	55.0
Approach			282	0.0	282	0.0	0.182	2.7	NA	0.7	4.6	0.29	0.35	0.29	57.0
All Vehicles			1280	0.3	1280	0.3	0.518	5.8	NA	2.5	17.6	0.22	0.49	0.29	53.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 21

Flaxton Rd / Threlkelds Rd Intersection Model Results

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2025 AM + Dev (Site Folder: Threlkelds & Flaxton)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Threlkelds Rd															
1	L2	All MCs	208	3.0	208	3.0	0.529	11.5	LOS B	3.6	25.8	0.72	0.93	1.17	54.7
3	R2	All MCs	79	0.0	79	0.0	0.529	29.1	LOS D	3.6	25.8	0.72	0.93	1.17	55.5
Approach			287	2.2	287	2.2	0.529	16.3	LOS C	3.6	25.8	0.72	0.93	1.17	54.9
East: Skewbridge Rd															
4	L2	All MCs	29	3.6	29	3.6	0.016	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	63.4
5	T1	All MCs	301	11.2	301	11.2	0.166	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach			331	10.5	331	10.5	0.166	0.7	NA	0.0	0.0	0.00	0.06	0.00	78.1
West: Flaxton Rd															
11	T1	All MCs	528	10.2	528	10.2	0.286	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
12	R2	All MCs	77	4.1	77	4.1	0.079	8.5	LOS A	0.3	2.2	0.42	0.68	0.42	61.5
Approach			605	9.4	605	9.4	0.286	1.1	NA	0.3	2.2	0.05	0.09	0.05	76.9
All Vehicles			1223	8.0	1223	8.0	0.529	4.6	NA	3.6	25.8	0.20	0.28	0.30	70.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2025 PM +Dev (Site Folder: Threlkelds & Flaxton)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
South: Threlkelds Rd															
1	L2	All MCs	149	0.0	149	0.0	1.220	230.9	LOS F	32.3	226.8	1.00	2.81	9.37	12.3
3	R2	All MCs	86	1.2	86	1.2	1.220	275.3	LOS F	32.3	226.8	1.00	2.81	9.37	12.3
Approach			236	0.4	236	0.4	1.220	247.2	LOS F	32.3	226.8	1.00	2.81	9.37	12.3
East: Skewbridge Rd															
4	L2	All MCs	145	0.7	145	0.7	0.077	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	64.3
5	T1	All MCs	702	10.6	702	10.6	0.385	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
Approach			847	8.9	847	8.9	0.385	1.3	NA	0.0	0.0	0.00	0.11	0.00	76.5
West: Flaxton Rd															
11	T1	All MCs	373	7.9	373	7.9	0.199	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	All MCs	242	1.7	242	1.7	0.523	17.7	LOS C	2.7	19.3	0.81	1.04	1.26	53.7
Approach			615	5.5	615	5.5	0.523	7.0	NA	2.7	19.3	0.32	0.41	0.50	67.0
All Vehicles			1698	6.5	1698	6.5	1.220	37.5	NA	32.3	226.8	0.25	0.59	1.48	43.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 22

Flaxton Rd / Threlkelds Rd Intersection – Partial Development Model Results

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2025 AM + Partial Dev (Site Folder: Threlkelds & Flaxton)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Threlkelds Rd															
1	L2	All MCs	118	5.4	118	5.4	0.276	9.1	LOS A	1.2	8.4	0.60	0.77	0.65	57.4
3	R2	All MCs	40	0.0	40	0.0	0.276	22.6	LOS C	1.2	8.4	0.60	0.77	0.65	59.0
Approach			158	4.0	158	4.0	0.276	12.5	LOS B	1.2	8.4	0.60	0.77	0.65	57.8
East: Skewbridge Rd															
4	L2	All MCs	20	5.3	20	5.3	0.011	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	62.9
5	T1	All MCs	301	11.2	301	11.2	0.166	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach			321	10.8	321	10.8	0.166	0.5	NA	0.0	0.0	0.00	0.04	0.00	78.6
West: Flaxton Rd															
11	T1	All MCs	528	10.2	528	10.2	0.286	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
12	R2	All MCs	54	5.9	54	5.9	0.055	8.4	LOS A	0.2	1.6	0.41	0.66	0.41	61.0
Approach			582	9.8	582	9.8	0.286	0.8	NA	0.2	1.6	0.04	0.06	0.04	77.6
All Vehicles			1061	9.2	1061	9.2	0.286	2.5	NA	1.2	8.4	0.11	0.16	0.12	74.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2025 PM +Partial Dev (Site Folder: Threlkelds & Flaxton)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Give-Way (Two-Way)

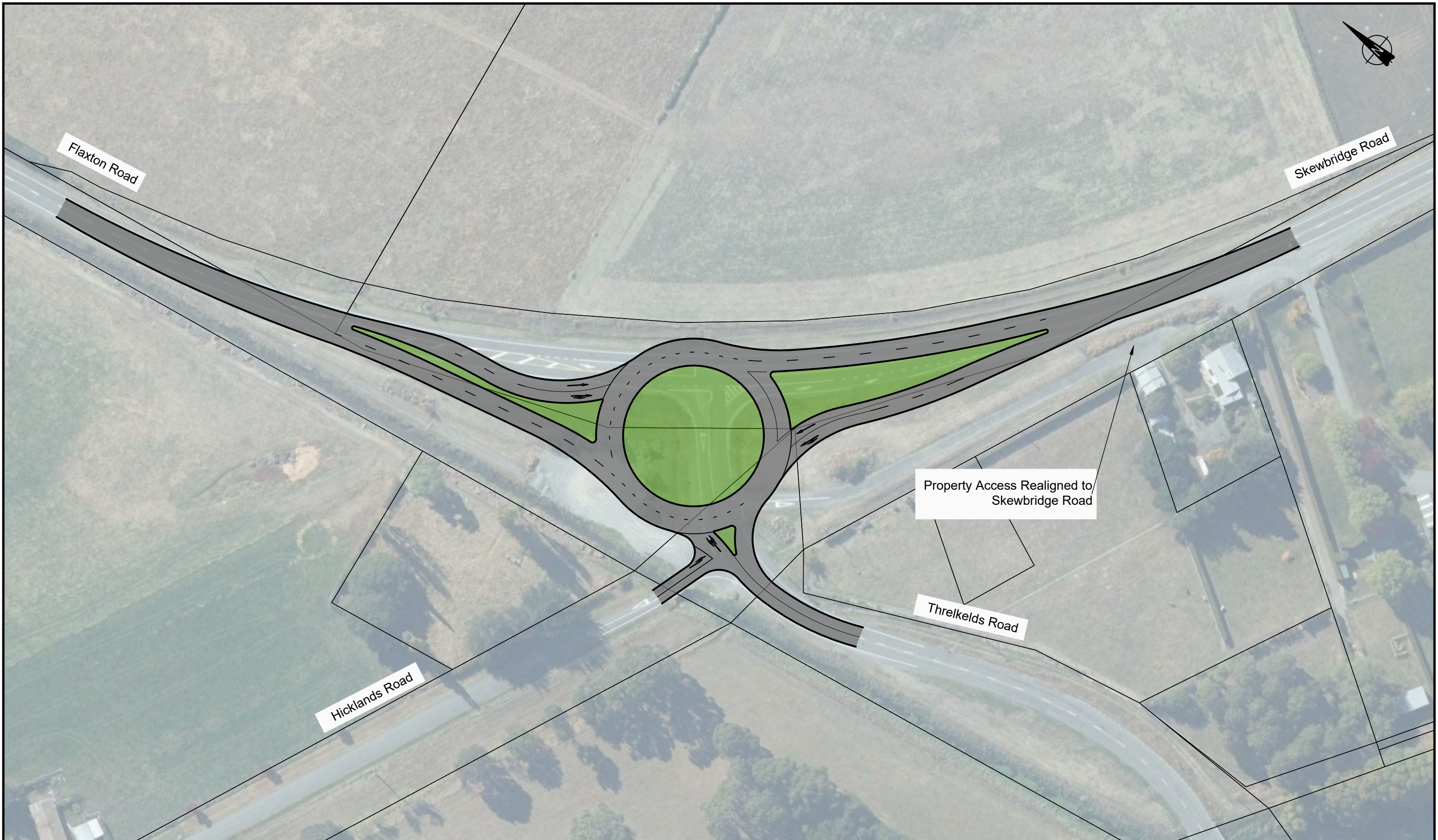
Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Threlkelds Rd															
1	L2	All MCs	97	0.0	97	0.0	0.584	18.8	LOS C	2.6	18.0	0.89	1.08	1.43	46.4
3	R2	All MCs	45	2.3	45	2.3	0.584	51.2	LOS F	2.6	18.0	0.89	1.08	1.43	46.1
Approach			142	0.7	142	0.7	0.584	29.1	LOS D	2.6	18.0	0.89	1.08	1.43	46.3
East: Skewbridge Rd															
4	L2	All MCs	75	1.4	75	1.4	0.040	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	64.1
5	T1	All MCs	702	10.6	702	10.6	0.385	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	79.7
Approach			777	9.8	777	9.8	0.385	0.8	NA	0.0	0.0	0.00	0.06	0.00	77.9
West: Flaxton Rd															
11	T1	All MCs	373	7.9	373	7.9	0.199	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
12	R2	All MCs	154	2.7	154	2.7	0.305	14.2	LOS B	1.3	9.1	0.72	0.93	0.86	56.4
Approach			526	6.4	526	6.4	0.305	4.2	NA	1.3	9.1	0.21	0.27	0.25	71.2
All Vehicles			1445	7.6	1445	7.6	0.584	4.8	NA	2.6	18.0	0.16	0.24	0.23	70.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 23

Flaxton Rd / Threlkelds Rd Roundabout & Model Results




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535 Mill Road, Ohoka
Carter Group Ltd
Concept Intersection Arrangement - Flaxton Rd / Threlkelds Rd Roundabout
For Information

Drawing: 0021-051 - Ohoka FT - DWD100X-B

Sheet	0021-051- DWD1005-A
Scale @A3 1/1,250	
Date 17/01/2025	
By N Fuller	
Project # 0021-051	

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2025 AM + Dev (Site Folder: Threlkelds & Flaxton)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	[Dist] m				km/h
South: Threlkelds Rd															
1	L2	All MCs	208	3.0	208	3.0	0.263	6.3	LOS A	1.3	9.3	0.46	0.61	0.46	63.9
3	R2	All MCs	79	0.0	79	0.0	0.263	14.2	LOS B	1.3	9.3	0.46	0.61	0.46	63.5
Approach			287	2.2	287	2.2	0.263	8.5	LOS A	1.3	9.3	0.46	0.61	0.46	63.8
East: Skewbridge Rd															
4	L2	All MCs	29	3.6	29	3.6	0.118	5.2	LOS A	0.7	5.3	0.22	0.40	0.22	66.6
5	T1	All MCs	301	11.2	301	11.2	0.118	5.5	LOS A	0.7	5.3	0.23	0.40	0.23	65.5
Approach			331	10.5	331	10.5	0.118	5.5	LOS A	0.7	5.3	0.23	0.40	0.23	65.6
West: Flaxton Rd															
11	T1	All MCs	528	10.2	528	10.2	0.226	5.5	LOS A	1.3	10.2	0.23	0.43	0.23	65.0
12	R2	All MCs	77	4.1	77	4.1	0.180	13.1	LOS B	1.0	7.5	0.24	0.50	0.24	63.0
Approach			605	9.4	605	9.4	0.226	6.5	LOS A	1.3	10.2	0.23	0.44	0.23	64.7
All Vehicles			1223	8.0	1223	8.0	0.263	6.7	LOS A	1.3	10.2	0.29	0.47	0.29	64.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Vehicle movement LOS values are based on average delay per movement.
 Intersection and Approach LOS values are based on average delay for all vehicle movements.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Threlkelds / Flaxton - 2025 PM + Dev (Site Folder: Threlkelds & Flaxton)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
South: Threlkelds Rd															
1	L2	All MCs	149	0.0	149	0.0	0.277	7.6	LOS A	1.4	9.6	0.64	0.75	0.64	63.0
3	R2	All MCs	86	1.2	86	1.2	0.277	15.6	LOS B	1.4	9.6	0.64	0.75	0.64	61.6
Approach			236	0.4	236	0.4	0.277	10.5	LOS B	1.4	9.6	0.64	0.75	0.64	62.5
East: Skewbridge Rd															
4	L2	All MCs	145	0.7	145	0.7	0.343	6.0	LOS A	2.5	18.7	0.48	0.49	0.48	65.4
5	T1	All MCs	702	10.6	702	10.6	0.343	6.6	LOS A	2.5	18.7	0.49	0.49	0.49	63.6
Approach			847	8.9	847	8.9	0.343	6.5	LOS A	2.5	18.7	0.49	0.49	0.49	63.9
West: Flaxton Rd															
11	T1	All MCs	373	7.9	373	7.9	0.228	5.4	LOS A	1.4	10.8	0.26	0.41	0.26	65.9
12	R2	All MCs	242	1.7	242	1.7	0.183	13.1	LOS B	1.1	7.6	0.26	0.62	0.26	59.2
Approach			615	5.5	615	5.5	0.228	8.5	LOS A	1.4	10.8	0.26	0.49	0.26	63.0
All Vehicles			1698	6.5	1698	6.5	0.343	7.8	LOS A	2.5	18.7	0.43	0.53	0.43	63.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Roundabout LOS Method: SIDRA Roundabout LOS.
 Vehicle movement LOS values are based on average delay per movement.
 Intersection and Approach LOS values are based on average delay for all vehicle movements.
 Roundabout Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.



Appendix 24

Mill Rd / Threlkelds Rd Intersection – Model Results



Novo Group Limited
 PO Box 365
 Christchurch 8014

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535 Mill Road, Ohoka Carter Group Ltd

Concept Intersection Arrangement - Flaxton Rd / Threlkelds Rd Roundabout

For Information

Drawing:

0021-051 - Ohoka FT - DWD100X-B

Sheet

**0021-051-
 DWD1006-A**

Scale @A3 1/750

Date 17/01/2025

By N Fuller

Project # 0021-051

MOVEMENT SUMMARY

 Site: 101 [Mill & Threlkelds - 2025 AM + Dev (Site Folder: Mill & Threlkelds)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
East: Mill Rd															
5	T1	All MCs	28	7.4	28	7.4	0.021	0.4	LOS A	0.1	0.4	0.20	0.22	0.20	57.9
6	R2	All MCs	8	0.0	8	0.0	0.021	6.5	LOS A	0.1	0.4	0.20	0.22	0.20	55.3
Approach			37	5.7	37	5.7	0.021	1.8	NA	0.1	0.4	0.20	0.22	0.20	57.3
North: Threlkelds Rd															
7	L2	All MCs	7	14.3	7	14.3	0.104	8.8	LOS A	0.4	2.6	0.28	0.89	0.28	50.5
9	R2	All MCs	92	1.1	92	1.1	0.104	8.6	LOS A	0.4	2.6	0.28	0.89	0.28	50.7
Approach			99	2.1	99	2.1	0.104	8.6	LOS A	0.4	2.6	0.28	0.89	0.28	50.7
West: Mill Rd															
10	L2	All MCs	265	3.6	265	3.6	0.169	5.6	LOS A	0.0	0.0	0.00	0.49	0.00	53.4
11	T1	All MCs	47	0.0	47	0.0	0.169	0.0	LOS A	0.0	0.0	0.00	0.49	0.00	55.7
Approach			313	3.0	313	3.0	0.169	4.8	NA	0.0	0.0	0.00	0.49	0.00	53.7
All Vehicles			448	3.1	448	3.1	0.169	5.4	NA	0.4	2.6	0.08	0.56	0.08	53.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

 Site: 101 [Mill & Threlkelds - 2025 PM + Dev (Site Folder: Mill & Threlkelds)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh.]	[Dist]				km/h
			veh/h		veh/h					veh	m				
East: Mill Rd															
5	T1	All MCs	65	6.5	65	6.5	0.040	0.1	LOS A	0.1	0.4	0.09	0.11	0.09	59.0
6	R2	All MCs	8	0.0	8	0.0	0.040	6.3	LOS A	0.1	0.4	0.09	0.11	0.09	56.2
Approach			74	5.7	74	5.7	0.040	0.8	NA	0.1	0.4	0.09	0.11	0.09	58.6
North: Threlkelds Rd															
7	L2	All MCs	15	7.1	15	7.1	0.381	8.6	LOS A	1.7	12.1	0.38	0.88	0.39	50.6
9	R2	All MCs	343	0.3	343	0.3	0.381	9.0	LOS A	1.7	12.1	0.38	0.88	0.39	50.6
Approach			358	0.6	358	0.6	0.381	9.0	LOS A	1.7	12.1	0.38	0.88	0.39	50.6
West: Mill Rd															
10	L2	All MCs	212	0.0	212	0.0	0.136	5.6	LOS A	0.0	0.0	0.00	0.48	0.00	53.6
11	T1	All MCs	46	0.0	46	0.0	0.136	0.0	LOS A	0.0	0.0	0.00	0.48	0.00	55.8
Approach			258	0.0	258	0.0	0.136	4.6	NA	0.0	0.0	0.00	0.48	0.00	54.0
All Vehicles			689	0.9	689	0.9	0.381	6.5	NA	1.7	12.1	0.21	0.65	0.21	52.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Mill & Threlkelds - 2034 AM + Dev Realigned (Site Folder: Mill & Threlkelds)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Mill Rd															
5	T1	All MCs	28	7.4	28	7.4	0.038	8.5	LOS A	0.1	1.0	0.23	0.95	0.23	50.8
6	R2	All MCs	8	0.0	8	0.0	0.038	9.6	LOS A	0.1	1.0	0.23	0.95	0.23	50.8
Approach			37	5.7	37	5.7	0.038	8.7	LOS A	0.1	1.0	0.23	0.95	0.23	50.8
North: Threlkelds Rd															
7	L2	All MCs	7	14.3	7	14.3	0.059	5.9	LOS A	0.3	1.9	0.13	0.56	0.13	52.0
9	R2	All MCs	92	1.1	92	1.1	0.059	5.6	LOS A	0.3	1.9	0.13	0.56	0.13	52.2
Approach			99	2.1	99	2.1	0.059	5.6	NA	0.3	1.9	0.13	0.56	0.13	52.2
West: Mill Rd															
10	L2	All MCs	265	3.6	265	3.6	0.169	5.6	LOS A	0.0	0.0	0.00	0.49	0.00	53.4
11	T1	All MCs	47	0.0	47	0.0	0.169	0.0	LOS A	0.0	0.0	0.00	0.49	0.00	55.7
Approach			313	3.0	313	3.0	0.169	4.8	NA	0.0	0.0	0.00	0.49	0.00	53.7
All Vehicles			448	3.1	448	3.1	0.169	5.3	NA	0.3	1.9	0.05	0.54	0.05	53.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
 Vehicle movement LOS values are based on average delay per movement.
 Minor Road Approach LOS values are based on average delay for all vehicle movements.
 NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
 Two-Way Sign Control Capacity Model: SIDRA Standard.
 Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
 Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
 Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
 Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: 101 [Mill & Threlkelds - 2034 PM + Dev Realigned (Site Folder: Mill & Threlkelds)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
 Site Category: (None)
 Stop (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
East: Mill Rd															
5	T1	All MCs	65	6.5	65	6.5	0.099	10.2	LOS B	0.4	2.6	0.45	0.97	0.45	50.0
6	R2	All MCs	8	0.0	8	0.0	0.099	11.3	LOS B	0.4	2.6	0.45	0.97	0.45	50.1
Approach			74	5.7	74	5.7	0.099	10.4	LOS B	0.4	2.6	0.45	0.97	0.45	50.0
North: Threlkelds Rd															
7	L2	All MCs	15	7.1	15	7.1	0.210	5.8	LOS A	1.1	7.9	0.15	0.56	0.15	52.2
9	R2	All MCs	343	0.3	343	0.3	0.210	5.6	LOS A	1.1	7.9	0.15	0.56	0.15	52.2
Approach			358	0.6	358	0.6	0.210	5.6	NA	1.1	7.9	0.15	0.56	0.15	52.2
West: Mill Rd															
10	L2	All MCs	212	0.0	212	0.0	0.136	5.6	LOS A	0.0	0.0	0.00	0.48	0.00	53.6
11	T1	All MCs	46	0.0	46	0.0	0.136	0.0	LOS A	0.0	0.0	0.00	0.48	0.00	55.8
Approach			258	0.0	258	0.0	0.136	4.6	NA	0.0	0.0	0.00	0.48	0.00	54.0
All Vehicles			689	0.9	689	0.9	0.210	5.7	NA	1.1	7.9	0.13	0.57	0.13	52.6

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