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Integrated Transport Assessment

Prepared for

LMM INVESTMENTS 2012 LTD

Whisper Creek, Spencerville
Christchurch

April 2025

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Prepared for

LMM Investments 2012 Ltd

Whisper Creek, Spencerville
Christchurch

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Document Date:	**16/04/2025**
Document Version/Status:	Revision B | FINAL
Project Reference:	1221-003 – Whisper Creek – ITA001
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Introduction

1. LMM Investments 2012 Ltd has commissioned Novo Group to prepare an Integrated Transport Assessment (ITA) for the rezoning of land from predominantly *Specific Purpose (Golf Resort) Zone* to *Residential New Neighbourhood* at land broadly bound by Turners Road, Spencerville Road and the Styx River in north-east Christchurch.

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 and effects of the proposal. It has been prepared broadly in accordance with the Integrated Transportation Assessment Guidelines specified in New Zealand Transport Agency Research report 422, November 2010 and other relevant best practice guides.

3. The Site location is illustrated in **Figure 1** and a copy of the Outline Development Plan (ODP) is included in **Appendix 1**.

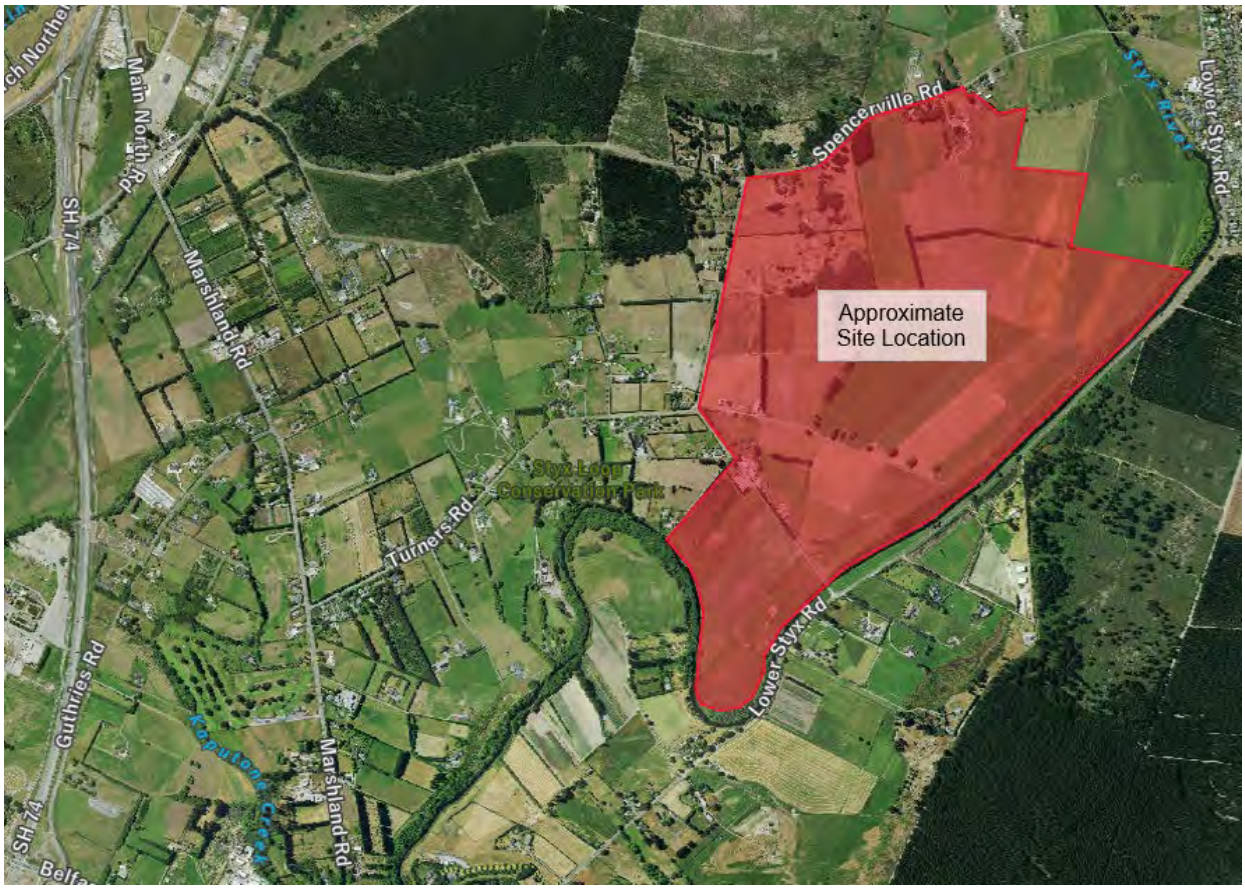


Figure 1: Site Location (source Canterbury Maps)

4. The sought zoning would enable approximately 800 dwellings, plus a small commercial and community area that would provide for the day-to-day needs of the residents. Three site accesses are proposed, with one to each of Spencerville Road, Turners Road and Teapes Road (as a continuation of the existing Teapes Road).

5. The traffic generation of the proposed rezoning is predicted to be 720 vehicles per hour in the AM and PM peak hours, with 6,560 vehicle movements per day.

Transport Environment

Transport Network

6. The following sections describe the transport network in the vicinity of the Site.

Road Links

7. The key transport characteristics of Teapes Road and Turners Road are set out in **Table 1**.

Table 1: Teapes Road & Turners Road

Key Feature or Characteristic	Teapes Road	Turners Road
Road Classification	Local Road	Local Road
Cross-Section Description	Approximately 4.3m wide carriageway. Wide grass verges, including a drainage channel on the northern side.	Approximately 5.0m to 6.3m wide carriageway. Wide grass verges with occasional swales.
Traffic Volumes	Average Daily Traffic: 20vpd[1] (Mobile Roads, 2024)	Average Daily Traffic: 220 – 815vpd (CCC counts, 2016-2024). AM Weekday Peak: 25 to 70vph[2] (CCC counts, 2016-2024). PM Weekday Peak: 17 to 72 (CCC counts, 2016-2024).
Speed	Speed limit: 60km/h	Speed limit: 60km/h
Pedestrian & Cycling Infrastructure	No footpath or cycle lanes	Footpaths and cycle facilities are generally not provided. There is a footpath for approximately 160m outside Ōuruhia Model School. There is also a footpath on the southern side of the road extending 260m north-east from Marshland Road.
Public Transport	None	None
Additional Notes	Cul-de-sac has a dead end.	Ōuruhia Model School is located toward the western end of this road.

8. **Figure 2** and **Figure 3** are typical views along Teapes Road and Turners Road respectively.

[1] vpd = Vehicles Per Day
[2] vph = Vehicles Per Hour.

Figure 2: Teapes Road – Looking South-East

Figure 3: Turners Road – Looking North-East

9. The key transport details of Spencerville Road and Lower Styx Road are set out in **Table 2**.

Table 2: Spencerville Rd & Lower Styx Rd Transport Details

Key Feature or Characteristic	Spencerville Road	Lower Styx Road
Road Classification	Collector	Collector
Cross-Section Description	Approximately 6m wide carriageway. Wide grass berms.	Approximately 7-8m wide carriageway, plus grass berms.
Traffic Volumes	Average Daily Traffic: 534 to 1,066vpd (CCC, 2018-2023). AM Weekday Peak: 40 to 76vph (CCC, 2018-2023). PM Weekday Peak: 45 to 90vph (CCC, 2018-2023).	Average Daily Traffic: 1,623 to 1,992vpd (CCC, 2016-2022). AM Weekday Peak: 104 to 151vph (CCC, 2016-2022). PM Weekday Peak: 150 to 178vph (CCC, 2016-2022).
Speed	Speed limit: 60km/h	Speed limit: 80km/h
Pedestrian & Cycling Infrastructure	No footpath or cycle lanes.	No footpath or cycle lanes.
Public Transport	None	None
Additional Notes	Road crosses a railway.	The Marshland Road / Lower Styx Road intersection has been signalised, which is a key staging trigger in the existing Specific Purpose (Golf Resort) zone for the existing ODP that includes a road bridge from the Site to Lower Styx Road as the main entrance..

10. **Figure 4** and **Figure 5** are typical views along Spencerville Road and Lower Styx Road respectively.

Figure 4: Spencerville Road – Looking East from Turners Road

Figure 5: Lower Styx Road

11. The key details of Marshland Road are set out in **Table 3**.

Table 3: Marshland Road Transport Details

Key Feature or Characteristic	Marshland Road
Road Classification	Minor Arterial
Cross-Section Description	Approximately 11m carriageway, including approximately 2m paved edge line either side. Grass berms.
Traffic Volumes	Average Daily Traffic: 8,345vpd (CCC, 2022). AM Weekday Peak: 542vph (CCC, 2022). PM Weekday Peak: 741vph (CCC, 2022).
Speed	Speed Limit: 60km/h
Pedestrian & Cycling Infrastructure	Approximately 2m paved edge line. No footpath or cycle lanes
Public Transport	None
Additional Notes	Road widens to support right turning bay onto Turners Road.

Intersections

Turners Road / Teapes Road

12. The Turners Road / Teapes Road intersection is a priority-controlled 'T' intersection, with Turners Road being the major road. The layout of this intersection is illustrated in **Figure 6**, which indicates that Teapes Road splits at the approach to the intersection, nominally accommodating traffic departing Teapes Road on the southern leg and traffic entering Teapes Road on the northern leg (although the use of these legs is unmarked).

Figure 6: Turners Rd / Teapes Rd Intersection
Image sourced from Canterbury Maps

Spencerville Road / Turners Road Intersection

13. The Spencerville Road / Turners Road intersection is 'stop' controlled (as illustrated in **Figure 7**), with Spencerville Road having the priority. There are also signs on the Turners Road approach restricting access for light vehicles in the evening / nighttime for Thursday to Monday other than for owners, occupiers and their visitors.

Figure 7: Spencerville Road / Turners Road Intersection
Image sourced from Canterbury Maps

14. Visibility to the east (along Spencerville Road) is currently limited by existing vegetation, when turning out of Turners Road. This is illustrated in **Figure 8**.

Figure 8: Visibility to the East Out of Turners Road

Marshland Road / Turners Road Intersection

15. The Marshland Road / Turners Road intersection is illustrated in **Figure 9**, which indicates that Marshland Road has the priority and Turners Road is 'stop' controlled. There is a right turn bay provided on Marshland Road, to safely accommodate traffic waiting to turn into Turners Road and this appears to have been constructed in mid to late 2022.

16. **Figure 10** illustrates the Turners Road approach to Marshland Road. This indicates there is a wide metalled area on the southern side of Turners Road that is currently used as a parking lane. There is also a footpath on the southern side of Turners Road that terminates at Marshland Road.

Figure 9: Marshland Road / Turners Road Intersection
Image sourced from LINZ

Figure 10: Turners Road approach to Marshland Road

Crash History

17. The NZ Transport Agency Crash Analysis System (CAS) has been reviewed to identify crashes that have been reported within the area highlighted in **Figure 11** in the most recent five-year period available at the time of drafting this report (01/01/2020 to 01/01/2025). The review identified 25 crashes had been reported, which includes five Minor Injury crashes.

Figure 11: CAS Review Output

18. The reported crashes are summarised as follows:

i. Spencerville Road Mid-block:

(a) Loss of Control: Four Minor Injury and four non-injury crashes. Two Minor Injury crashes related to a loss of control on ice. Two Minor Injury crashes related to a medical event. One non-injury crash related to speeding.

ii. Marshland Road / Spencerville Road Intersection:

(a) Failure to give-way turning out of Spencerville Road (east): One Minor Injury and two non-injury crash;

(b) Failure to give-way turning out of Main North Road (west): One Minor Injury and one non-injury crash;

(c) Failure to give-way turning out of Main North Road (north): One non-injury crash; and

(d) Loss of control turning left out of Main North Road (west): One non-injury crash.

iii. Lower Styx Road Mid-block:

(a) Loss of Control: One Minor Injury crash and four non-injury crashes. Alcohol was a factor in the Minor Injury crash. Two of the non-injury crashes related to avoiding animals on the road

and swerving to avoid an on-coming overtaking vehicle. One related to driver distraction (looking at a map); and

(b) Unknown: One non-injury crash related to a car found abandoned.

iv. Lower Styx Road / Te Korari Street Intersection:

(a) Failure to give-way turning right from Lower Styx Road: One non-injury crash;

(b) Loss of control turning left Lower Styx Road: One non-injury crash;

(c) Sideswipe on the Te Korari Street approach to Lower Styx Road: One non-injury crash; and

(d) Loss of control turning right out of Te Korari Street: One non-injury crash whilst evading police.

19. The above indicates a trend for loss of control crashes on Spencerville Road, which is most likely a reflection of the winding rural road environment. This is also indirectly linked to the signage that restricts nighttime use to residents and their visitors only suggesting that anti-social activity has been occurring in this area. There is also a trend in drivers failing to give-way at the Marshland Road / Main North Road / Spencerville Road intersection. We have reviewed the dates of the crashes at the Marshland Road / Spencerville Road intersection and note that six out of the seven crashes occurred prior to (or around the time of) the opening of the Christchurch Northern Corridor in December 2020. Only one crash has occurred since January 2021, indicating the reduction in traffic volumes through the intersection has alleviated the crash concern.

Alternative Transport Modes

Passenger Transport

20. There are currently no public transport routes that serve the Site. The closest stops are at the Marshland Road / Spencerville Road intersection and on Te Korari Street.

21. **Figure 12** illustrates the termination point of Route 135 within the Prestons subdivision. That service operates between New Bright and The Palms shopping centre (via Prestons) on an hourly frequency.

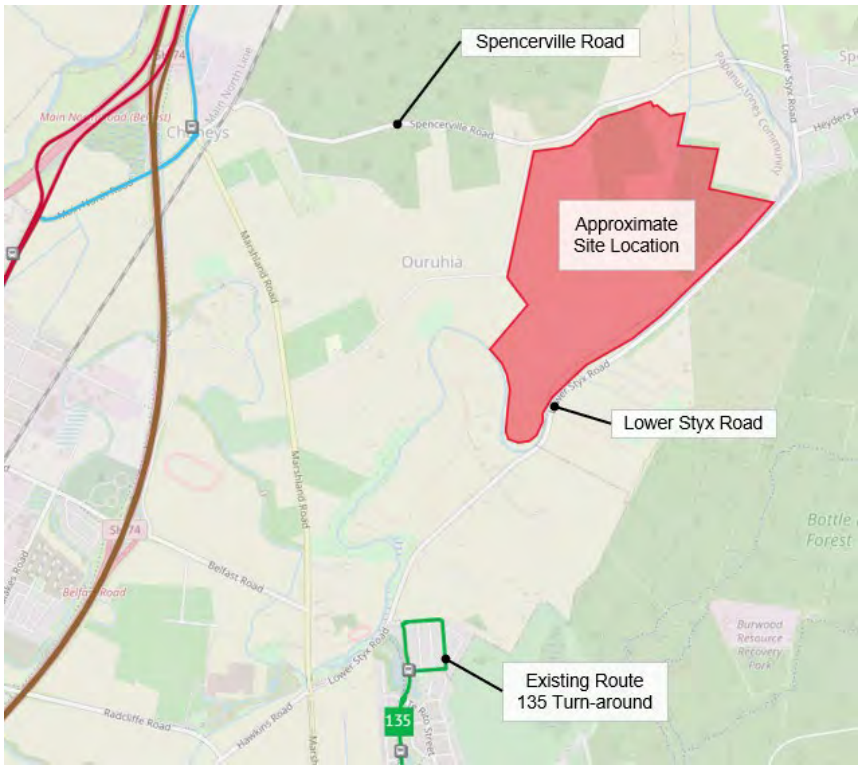


Figure 12: Existing Bus Services
Map sourced from https://go.metroinfo.co.nz

Cycling

22. There are currently no cycle facilities in the immediate vicinity of the Site. **Figure 13** illustrates the existing cycle network in the wider area surrounding the Site, which indicates there are on-road cycle lanes on Te Korari Street and a shared path running along State Highway 74 (the Northern Corridor).

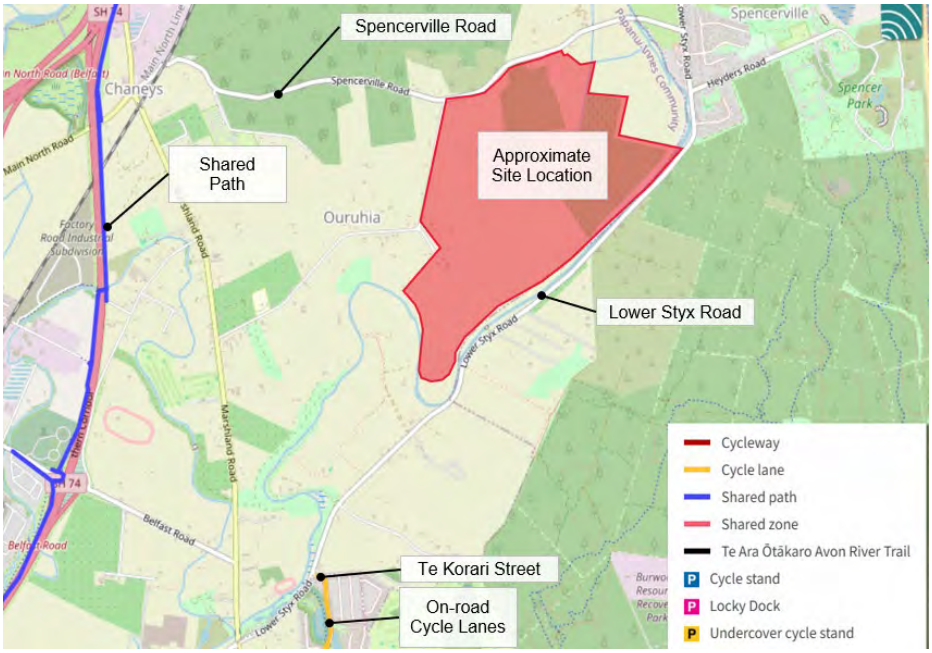


Figure 13: Existing Cycle Network
Image sourced from https://ccc.govt.nz/transport/getting-around/cycling/cycling-maps

23. There are existing recreational cycling facilities throughout Bottle Lake Forest (to the south-east of the Site). We also understand that the Council is considering opening Chaneys Plantation (to the north-west of the Site) to recreational cycling.

Future Transport Network

Christchurch Long Term Plan 2024-2034

24. We have reviewed the Christchurch City Council's Long Term Plan (LTP) 2024-2034 to understand whether there are any transport projects of relevance to this Plan Change application. None were identified.

Source to Sea

25. The Source to Sea is a project that is part of the 2000-2040 Styx Vision from CCC, a 40-year plan for the Styx (Pūharakekenui) River, associated tributaries and wetlands. There are five Visions in this plan, with Vision Two being to create a 'Source to Sea Experience', or to be able to travel from the source of the Styx River to the Sea.

26. Key actions of this vision involve developing walkway routes, cycleways, landscaping experiences, car parking, eating facilities and other service nodes to concentrate human activity in the area. A section linking the Northern Corridor shared path with Ōuruhia Reserve was prioritised for construction in 2023, so we understand this strategic link in the walkway has been completed.

Road Network Operation

27. Traffic modelling of the road network surrounding the application Site has been undertaken by QTP using the CAST model, with their report included in **Appendix 2**. That report adopts an assessment year of 2038 and includes results of the reasonably anticipated future network operation (without the development) and with the development.

28. Figures 3.10 to 3.13 of the QTP report set out the predicted approach delays at intersections near the Site during the 2038 AM and PM peak periods respectively (without the Site generated traffic). The road network is generally operating well in this area in 2038, with no significant or noteworthy delays identified.

Baseline Development

Baseline Development Content

29. At present, the Site is predominantly zoned *Specific Purpose (Golf Resort)* zoning, with the portion of land immediately adjacent to the Styx River having an *Open Space Water and Margins* zone. Furthermore, the Plan Change area also includes four 4ha lifestyle blocks located on the south-east corner of the Spencerville Road / Turners Road intersection and these currently have a *Rural Urban Fringe* zoning.

30. The *Specific Purpose (Golf Resort)* zoning allows for:

    i. 150 dwellings;

    ii. 160 dormitory bedrooms in a golf academy;

iii. 380 resort bedrooms (split between hotel and resort apartments);

iv. Golf course (and associated facilities such as a driving range clubhouse, food and beverage and retail); and

v. Single road accesses to both Lower Styx Road and Spencerville Road, with a service vehicle only access to Teapes Road.

31. The ODP for this current zoning is illustrated in **Figure 14**.

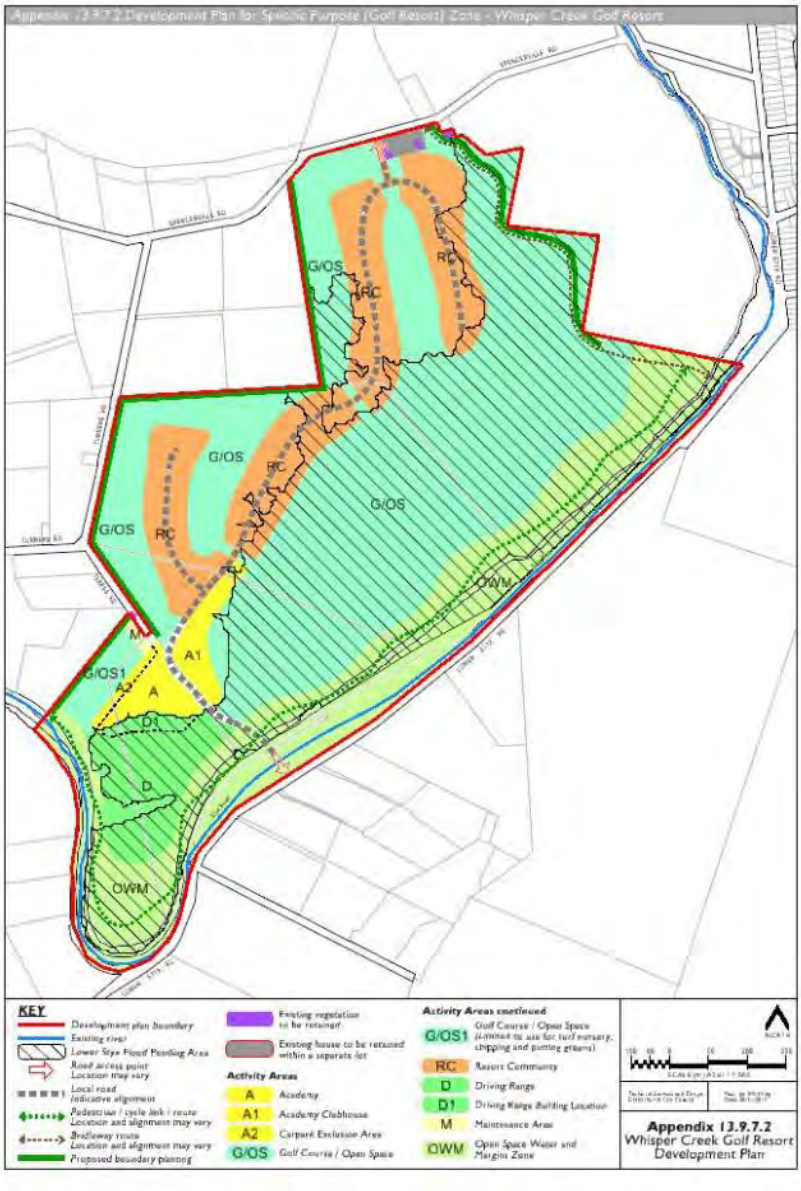


Figure 14: Current Specific Purpose (Golf Resort) ODP

Baseline Traffic Generation

Residential Traffic Generation

32. The traffic generation of the residential element of the Baseline scenario has been based on generic traffic generation rates of 0.9 vehicles per dwelling per hour in the peak hours and 8.2 vehicles per

dwelling per day. These are from the NZ Transport Agency Research Report 453 (Trips and Parking Related to Land Use) and represent the 85th percentile traffic generation rates for Outer Suburban dwellings.

33. The arrival / departure proportions have been taken from a survey held by Novo Group of a residential area in Rolleston, which had peak hour traffic generation rates similar to the 0.9 vehicles per hour adopted for this Site. The traffic generation rates and resultant traffic generation (based on 150 dwellings) is summarised in **Table 4**.

Table 4: Residential Traffic Generation Rates & Resultant Traffic Generation

		Arrivals	Departure	Total
Traffic Generation Rates (per dwelling)	AM Peak Hour	0.21	0.69	0.9
	PM Peak Hour	0.6	0.3	0.9
	Daily	4.1	4.1	8.2
Traffic Generation (150 du)	AM Peak Hour	31	104	135
	PM Peak Hour	90	45	135
	Daily	612	612	1,230

Resort Bedrooms

34. The traffic generation for the Resort Bedrooms has been based on *Resort Hotel* data from the Institute of Transportation Engineers Trip Generation guide book[3]. Resort Hotels are noted as including a range of recreational facilities, such as golf courses.

35. The traffic generation rates and resultant traffic generation (based on 380 bedrooms) is summarised in **Table 5**.

Table 5: Resort Bedrooms Traffic Generation Rates & Resultant Traffic Generation

		Arrivals	Departure	Total
Traffic Generation Rates (per bedroom)	AM Peak Hour	0.22	0.09	0.31
	PM Peak Hour	0.26	0.15	0.41
	Daily	2.38	2.38	4.75
Traffic Generation (380 Resort Bedrooms)	AM Peak Hour	85	33	118
	PM Peak Hour	69	91	160
	Daily	903	903	1,806

[3] 8th Edition.

Golf Course

36. The traffic generation for the Golf Course has been based on data from the Institute of Transportation Engineers Trip Generation guide book[4]. The data is based on the number of Holes at the golf-course and we have assumed that it would be an 18 Hole course.

37. The traffic generation rates and resultant traffic generation rates and resultant generation are summarised in **Table 6**[5].

Table 6: Golf Course Traffic Generation Rates & Resultant Traffic Generation

		Arrivals	Departure	Total
Traffic Generation Rates (per Hole)	AM Peak Hour	1.76	0.47	2.23
	PM Peak Hour	0.81	0.98	1.79
	Daily	17.87	17.87	35.74
Traffic Generation (18 hole golf course)	AM Peak Hour	32	8	40
	PM Peak Hour	14	18	32
	Daily	322	322	643

Golf Academy

38. The existing zoning permits a Golf Academy with up to 160 dormitory bedrooms. We are unable to source traffic generation for this activity, although we anticipate that there would be few peak hour vehicle movements as the majority of students would be living on-site. However, the inclusion of a Golf Course and the Resort Bedrooms may lead to a double counting of some traffic, given the Resort would include a Golf Course. As such, we consider the traffic associated with the Golf Academy would be satisfactorily captured through this double counting.

Resultant Traffic Generation

39. The resultant traffic generation predicted to occur with the existing zoning is summarised in **Table 7**[6].

Table 7: Baseline Traffic Generation

	Arrivals	Departure	Total
AM Peak Hour	148	145	293
PM Peak Hour	173	154	327
Daily	1,840	1,840	3,679

[4] 8th Edition.
[5] Some rounding errors occur.
[6] Some rounding errors occur.

The Proposal

40. It is proposed to rezone the Site from the existing predominantly *Special Purpose (Golf Resort)* zoning to *Residential New Neighbourhood*. An ODP for the Site is included **Figure 15** and is contained in **Appendix 1**.

41. The proposed zoning is understood to facilitate approximately 800 dwellings, plus a small commercial and community centre. Three accesses are proposed, with one to each of Turners Road, Spencerville Road and Teapes Road (through and extension of Teapes Road). No individual property access is proposed to the existing roads and no road access is proposed via a bridge to Lower Styx Road (although pedestrian/ cycle access will be provided over the river).

42. The following sections set out the transport components of the proposal.

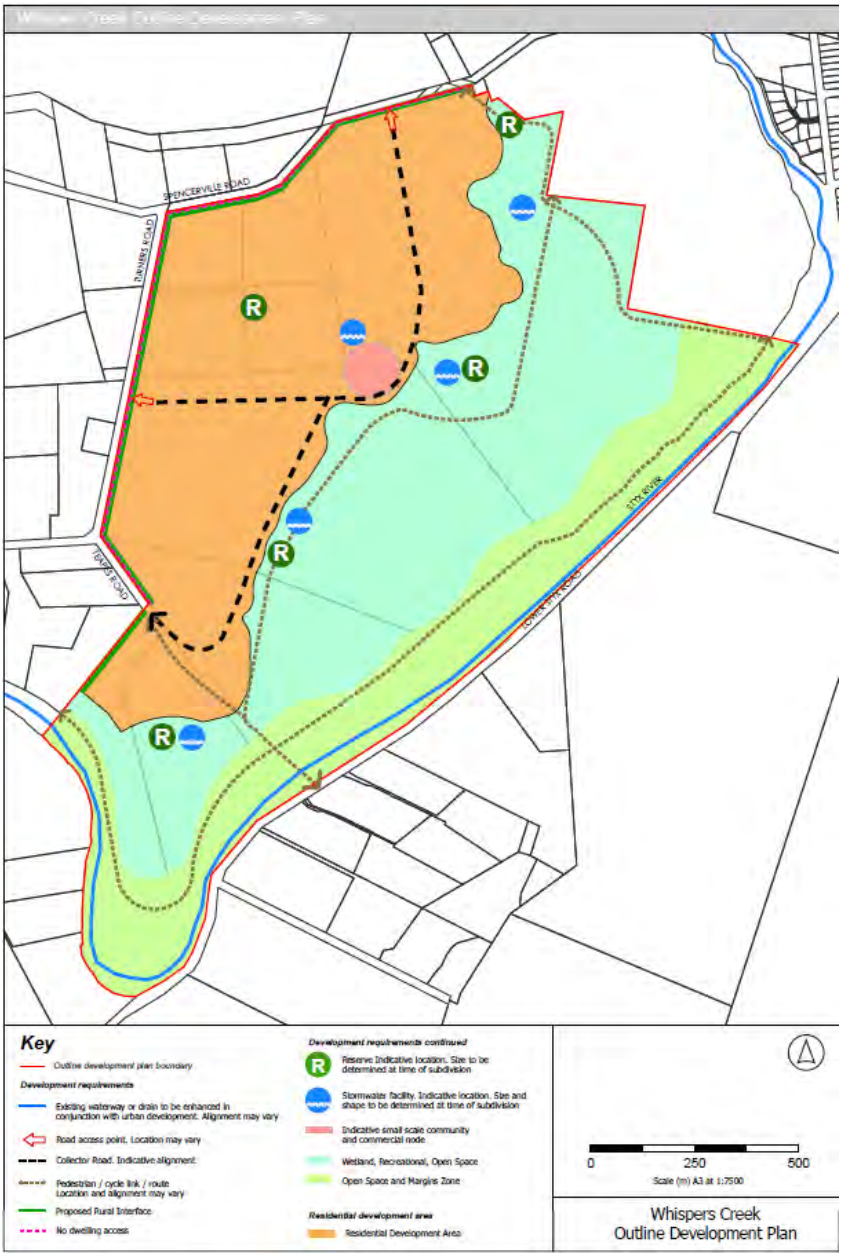


Figure 15: Proposed Outline Development Plan

Traffic Generation

43. The traffic generation rates set out in **Table 4** have been adopted for the anticipated 800 dwelling development yield at this Site. The resultant traffic generation is set out in **Table 8**.

Table 8: Traffic Generation Rates & Resultant Traffic Generation

	Arrivals	Departure	Total
AM Peak Hour	167	553	720
PM Peak Hour	480	240	720
Daily	3,280	3,280	6,560

44. No traffic generation has been included for the commercial and community area, as this is intended to provide for the day-to-day needs of the residents within the Plan Change area and not attract trips from the wider network.

Traffic Distribution

45. The distribution of Site generated traffic has been determined by the CAST model. Figures 5.1 to 5.4 plus Table 5.1 of the QTP report (in **Appendix 2**) set out the distribution, which is broadly as follows in the immediate vicinity of the Site:

    i. Spencerville Road (west of Turners Road) – 28%;

    ii. Turners Road, west of Teapes Road – 70%; and

    iii. Spencerville Road (east of the Site) – 3%.

Outline Development Plan Layout

Intersections & Access Arrangements

46. The ODP proposes access intersections to Turners Road and Spencerville Road. In addition, Teapes Road will be extended into the Site to provide a third connection to the existing transport network. No property access is proposed from the Site to either Turners Road or Spencerville Road.

47. Concept intersection arrangements for the Turners Road and Spencerville Road intersections are included in **Appendix 3** and in **Figure 16** and **Figure 17**. These are concept only, but indicate that access will be taken to straight segments of these roads and there is ample space to accommodate these intersections and the associated sight lines.

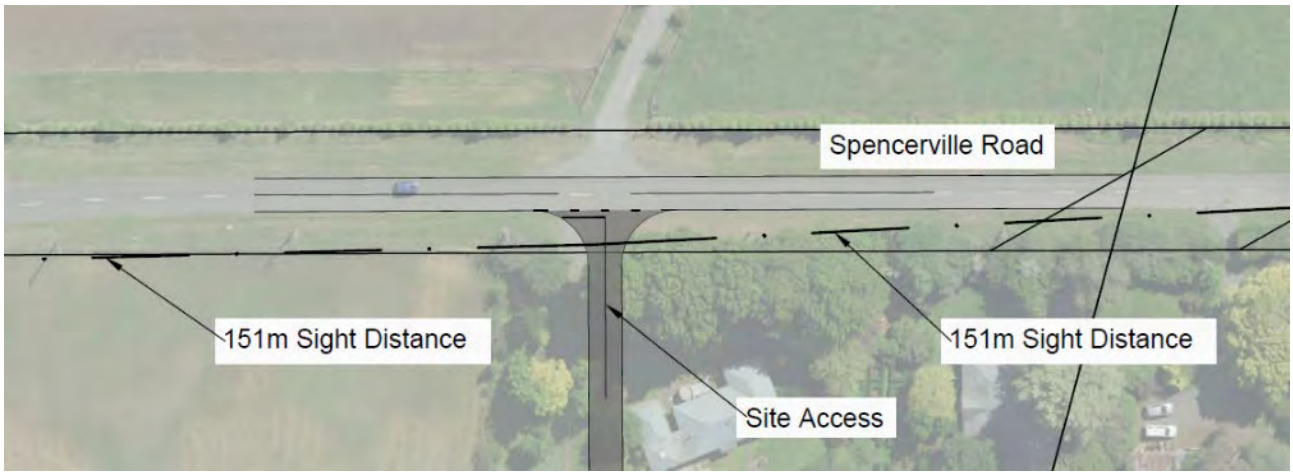


Figure 16: Concept Spencerville Road / Site Access Intersection

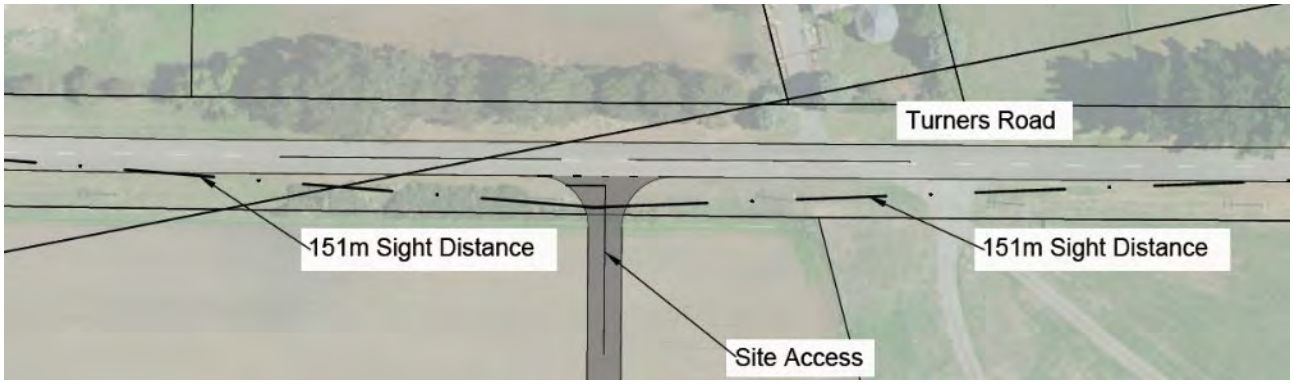


Figure 17: Concept Turners Road / Site Access Intersection

Road Cross-Sections & Internal Connectivity

48. The internal road network will be developed at a later stage and subject to Subdivision Consent and Road Safety Audit processes. At this stage, we note that the cross-sections of the internal road network are anticipated to comply with the District Plan requirements for urban roads. The internal road network also provides for an interconnected 'Primary Road' network that provides a choice of routes to the wider network for future residents.

49. Indicative cycle connections are also illustrated on the ODP. These include links along the Styx River that will assist in completing the Source to Sea route discussed in paragraph 25. These links also provide the opportunity to connect with the Styx Loop Conservation Park (to the south-west) and to Lower Styx Road (via the existing bridge across the Styx River) and on toward Bottle Lake Forest via a paper road. These wider links are discussed further in paragraph 55.

50. The Collector Roads within the Site will be designed to accommodate bus services, should these be proposed by Environment Canterbury (noting that the Applicant has no control over the provision of these services).

Off-Site Road Upgrades

51. It is proposed to upgrade Turners Road (from Spencerville Road to Marshland Road) to better accommodate the traffic generated by the proposed activity. The details of the upgrade will need to be agreed with the Council, although it is envisioned that a 6.0m carriageway with 0.5m sealed shoulders

(both sides) would be provided. Teapes Road would also be upgraded to accommodate the development traffic. It is anticipated this road would be 5.5m wide with 0.5m sealed shoulders (both sides) and it would occur when development commences that accesses this road.

52. The Teapes Road / Turners Road intersection would also be upgraded to provide a 'standard' arrangement, as illustrated in **Appendix 4** and **Figure 18**. Again, this arrangement is concept at present, although it is considered to be sufficiently detailed to confirm that a suitable arrangement can be agreed with the Council through the subdivision process. This is anticipated to occur when development commences that accesses Teapes Road.

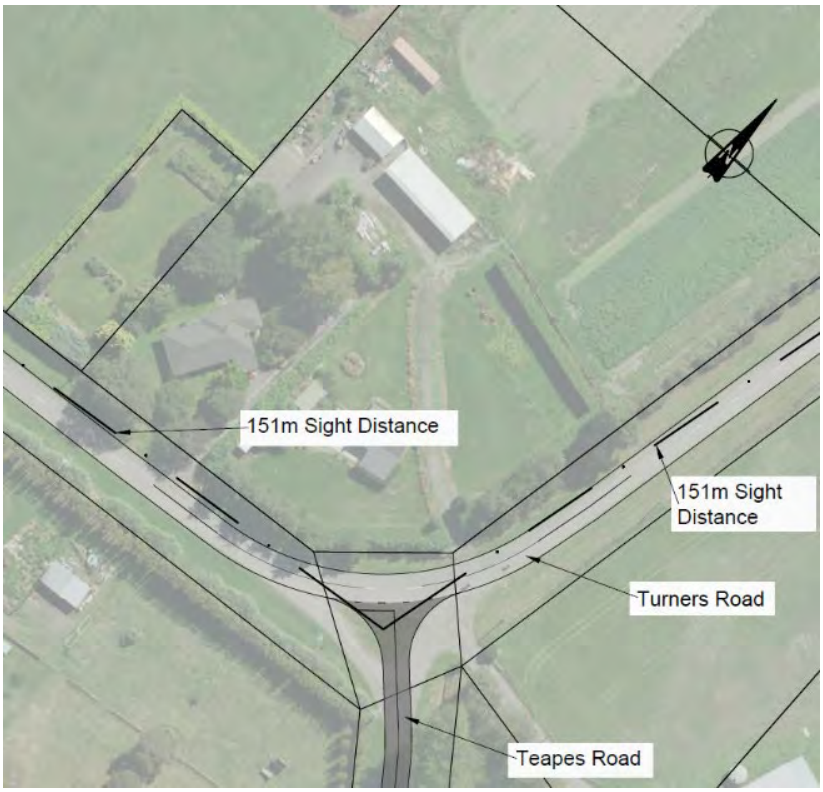


Figure 18: Concept Turners Road / Teapes Road Intersection

53. It is also proposed to undertake a minor upgrade to the Marshland Road / Turners Road intersection to address traffic capacity constraints (as discussed further in paragraph 64). This upgrade is illustrated in **Figure 19** and **Appendix 5**, which indicates an additional 30m left turn lane is proposed on Turners Road to separate left and right turning traffic. Dedicated right and left turning lanes can be readily accommodated within the existing legal road corridor.

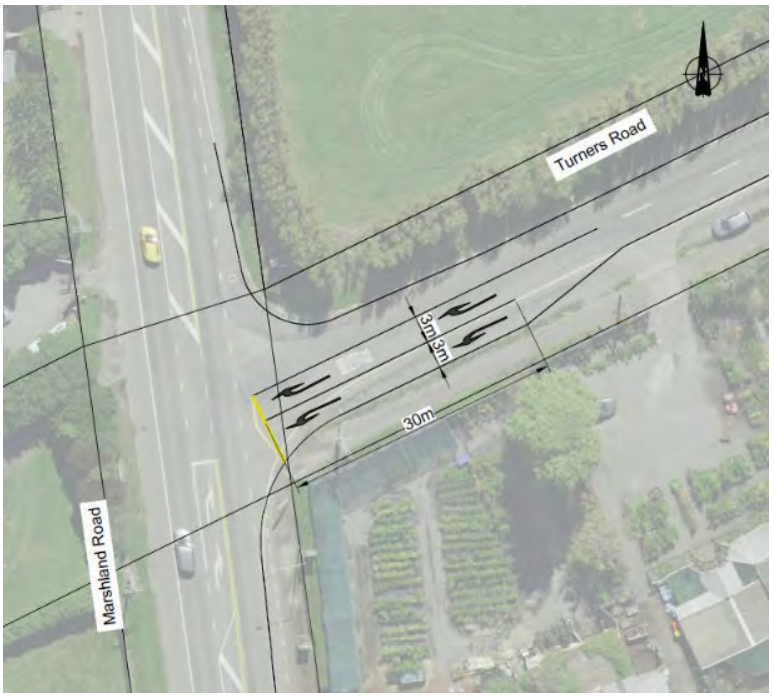


Figure 19: Concept Turners Road / Marshland Road Intersection

54. The existing sight distance out of Turners Road at the intersection with Spencerville Road is limited when looking toward the east. Part of the Site (as illustrated in **Figure 20**) will be provided to facilitate improved sight lines to the east and assist in achieving safe turning movements from this intersection, with the detailed design of such works confirmed through the subdivision consent process.

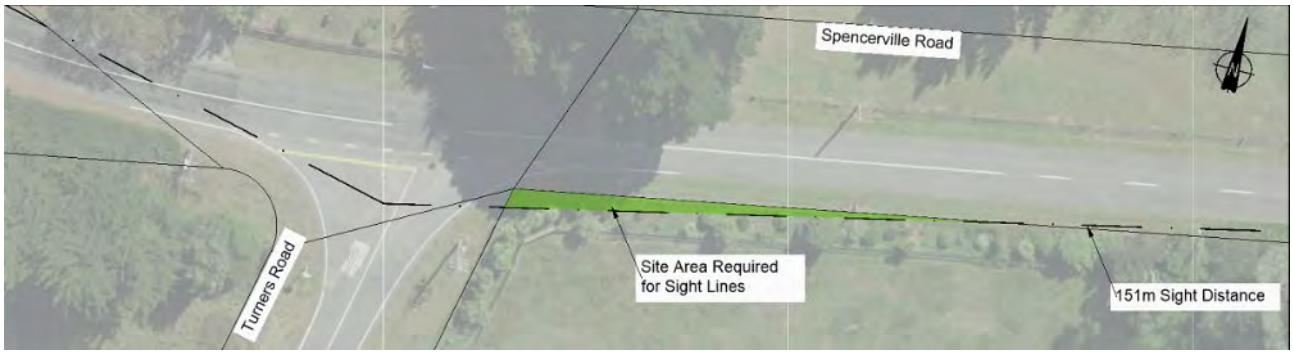


Figure 20: Turners Road / Spencerville Intersection Sight Line Requirement

Off-Site Walking & Cycling Provision

55. It is proposed to construct a shared path that links the Site to Ōuruhia Model School, with the alignment illustrated in **Figure 21**. This will follow the Styx River (therefore potentially forming part of the Source to Sea route) and travel through the Styx Loop Conservation Park to Turners Road. Approximately 400m of shared path will be constructed along Turners Road to link to the existing path outside the Ōuruhia Model School.

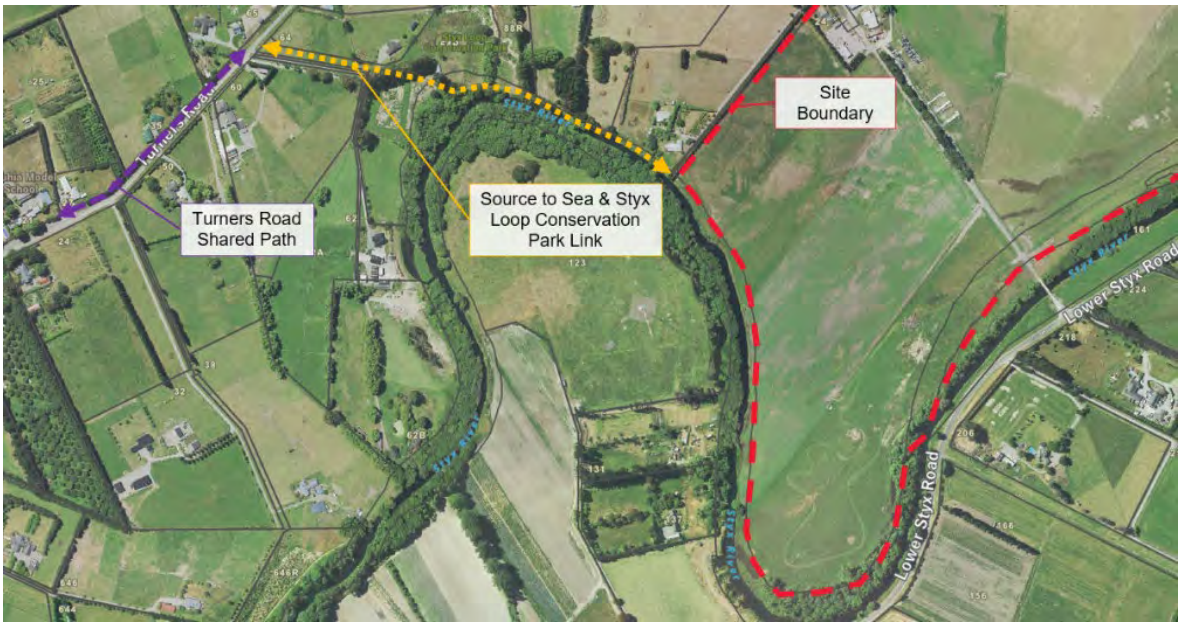


Figure 21: Proposed Ōuruhia Model School Shared Path Link
Image sourced from LINZ

56. A shared path is also proposed on Lower Styx Road to link with Te Korari Street, which is at the northern end of the Prestons subdivision. Te Korari Street has on-road cycle lanes and this Lower Styx Road shared path would link the site to the wider cycling network. The existing bridge across the Styx River would be retained to provide the shared path connection between Lower Styx Road and the Site.

57. This Lower Styx Road shared path can also connect with Bottle Lake Forest (via a Paper Road) for recreational cycling. That connection would assist in linking Bottle Lake Forest to Chaneys Plantation (via the proposed internal shared path network) should the Council open up Chaneys Plantation for recreational cycling. These links are illustrated in **Figure 22**.

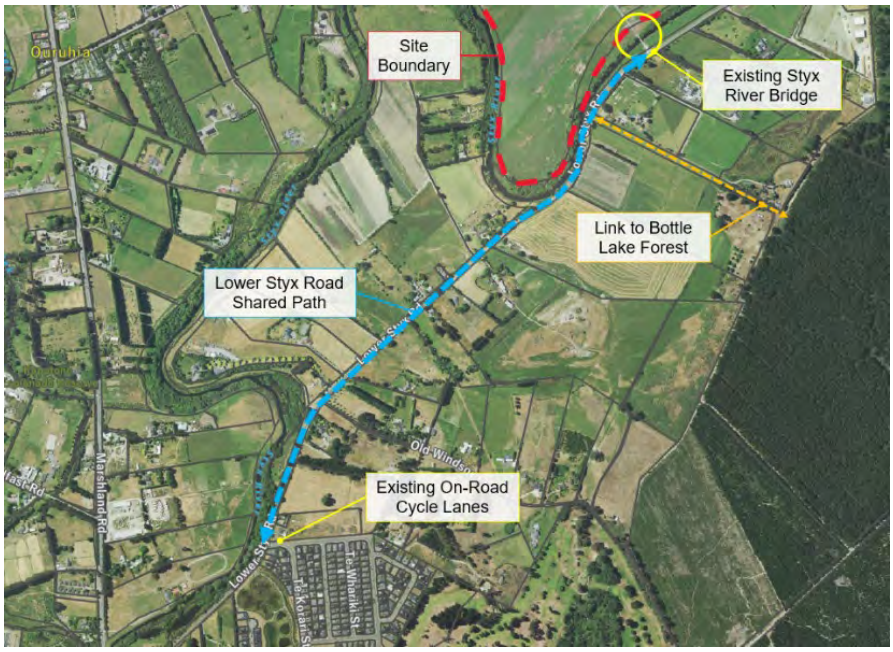


Figure 22: Lower Styx Shared Path & Bottle Lake Forest Links
Image sourced from LINZ

Assessment of Effects

Access Arrangements

Intersection Capacity & Layouts

58. Concept arrangements have been provided for the Site accesses and the reconfiguration of the Teapes Road / Turners Road intersection. These intersections are anticipated to have sufficient capacity to accommodate the predicted traffic volumes, noting that the delay plots in the QTP report[7] do not highlight any capacity concerns at these locations.

59. There is sufficient space along the Site frontage to construct access arrangements that meet relevant design standards, including sight distance requirements. These concept arrangements will also be subject to assessment at the Subdivision Consent stage and through Road Safety Audit processes.

60. Overall, we consider that safe and efficient site access intersections can be achieved.

Wider Network Transport Effects

Comparison With Baseline Traffic Effects

61. Although traffic modelling has been undertaken of the Baseline traffic scenario, the peak hour traffic generation of the proposed rezoning (720 vehicles per hour) is notably higher than that of the Baseline development (327 vehicles per hour). As such, the traffic effects of the proposed zoning are more significant than those of the Baseline and the focus of the following section is on the effects of the proposed zoning compared to the forecast 2038 background traffic (i.e. with no development at the Site beyond the existing use).

Traffic Effects - Capacity

62. The assessment of traffic effects is set out in sections 6 and 7 of the QTP report (refer to **Appendix 2**). Section 6.4 of that report (including Figures 6.8 and 6.9) discuss the predicted approach delays with traffic from the Site added to the road network in close proximity to the Site. Figures 6.12 and 6.13 of the QTP report illustrate the changes in delay due to development that would be enabled by the proposed Plan Change. These figures are reproduced in **Figure 23** to **Figure 26**.

63. The reporting is summarised and further discussed in the following sections.

[7] Figures 6.8 and 6.9 of the QTP report.

Figure 23: Modelled Average Link Delays with Plan Change – 2038 AM Peak Hour (Local Network)

Figure 24: Modelled Average Link Delays with Plan Change – 2038 PM Peak Hour (Local Network)

Figure 25: Modelled Changes in Link Delays with Plan Change – 2038 AM Peak Hour (Wider Network)

Figure 26: Modelled Changes in Link Delays with Plan Change – 2038 PM Peak Hour (Wider Network)

Marshland Road / Turners Road Intersection

64. The key traffic effect of the proposed Plan Change is the additional delay predicted at the existing Marshland Road / Turners Road intersection. As highlighted in **Figure 23** and discussed in the QTP

report[8], the proposed Plan Change traffic will lead to the Turners Road approach to this intersection being over-capacity with delays of approximately 57 seconds for right turning traffic.

65. As discussed in paragraph 53, it is proposed to construct an additional turning lane on the Turners Road approach to the intersection. This will separate left and right turning traffic on the Turners Road approach and mitigate the capacity concern, as outlined in paragraph 7.2.4 of the QTP report.

66. Additional traffic modelling (by QPT) has identified that this intersection upgrade would need to occur prior to 701 dwellings being constructed at the Site. The model Sidra model results in **Appendix 6** set out the operation of this intersection in the 2038 AM peak hour (this being the critical peak hour) with 700 dwellings at the Site. The right turn from Turners Road is predicted to operate at Level of Service E under this scenario and the Degree of Saturation is 0.86. These are both at (or in the case of the Degree of Saturation fractionally over[9]) the practical limits typically considered acceptable.

67. Subject to the above intersection upgrade and the proposed widening of Turners Road (outlined in paragraph 51, we consider there is no need to construct the road connection to Lower Styx Road that is a requirement of the current ODP for this site under the existing *Specific Purpose (Golf Resort)* zoning.

Marshland Road Operation

68. The QTP report highlights that travel times along the Marshland Road corridor (from Guthries Road to south of QEII Drive) will increase by approximately one minute (from 8.5 minutes to 9.5 minutes). This is the combination of several small increases in travel times along the corridor, rather than being attributed to a single location.

69. We consider the effects of these increases to be acceptable. Whilst the increase is one minute on the Marshland Road corridor, we anticipate that the majority of people driving this route in the AM peak would have come from further north (i.e. the Waimakariri District) and the increase of one minute is acceptable in the context of what would be a much longer wider journey.

Traffic Effects – Safety

70. The review of the crash record highlighted a potential concern regarding loss of control crashes on Spencerville Road. Two of the key factors involved in these crashes were speed and the presence of ice on the road. It is anticipated that development of the Plan Change site would lead to more regular gritting of the road during icy conditions. Additional traffic volumes on the road may also lead to better adherence to the posted speed limit, as there are currently "Heavy Vehicle Restrictions" signs (restricting access for vehicles under 3.5 tonnes at night) in the area, suggesting anti-social behaviour is currently occurring on the road network.

Active Modes

71. The proposed development includes internal and external pedestrian / cycle links that will connect it to wider destinations. Notably, an off-road link is proposed that will connect the Site to the Ōuruhia Model School, making cycling to school a safe option. The proposed Lower Styx Road link to Te Korari Street will accommodate cyclists travelling to / from further destinations. The link to Bottle Lake Forest provides

[8] Paragraphs 6.4.2 and in Section 7.
[9] An upper limit of 0.85 is typically considered to be the practical capacity of a priority-controlled intersection, as small changes in traffic above this level can lead to disproportionate adverse intersection operation.

an opportunity for connections to recreational cycling, as well as a potential link to Chaneys Plantation should recreational cycling be permitted there.

72. The internal shared paths that are proposed within the Reserves within the Site will facilitate ongoing development of the Source to Sea network. The Plan Change also provides for a small scale commercial and community area, which is intended to accommodate day to day shopping and community needs of the residents. This could place 'local retail' within walking and cycling distance of those residents.

73. Overall, it is considered that the proposal meets the alternate transport modes of the future residents (to the extent this is practical) whilst providing a positive contribution to connecting and completing recreational links in the area.

Passenger Transport Services

74. The Applicant is not able to propose passenger transport services to the Site, as this is controlled by Environment Canterbury. However, the internal Collector Roads will be designed to accommodate buses so the Site could be served by Passenger Transport in the future.

75. Options for the wider routing of passenger transport could be to travel through the Prestons subdivision (using the route currently taken by Route 135) then travelling to Spencerville via Lower Styx Road and into this Site via Spencerville Road and the proposed access intersection (see **Figure 27**). This service would then most likely return via the same route.

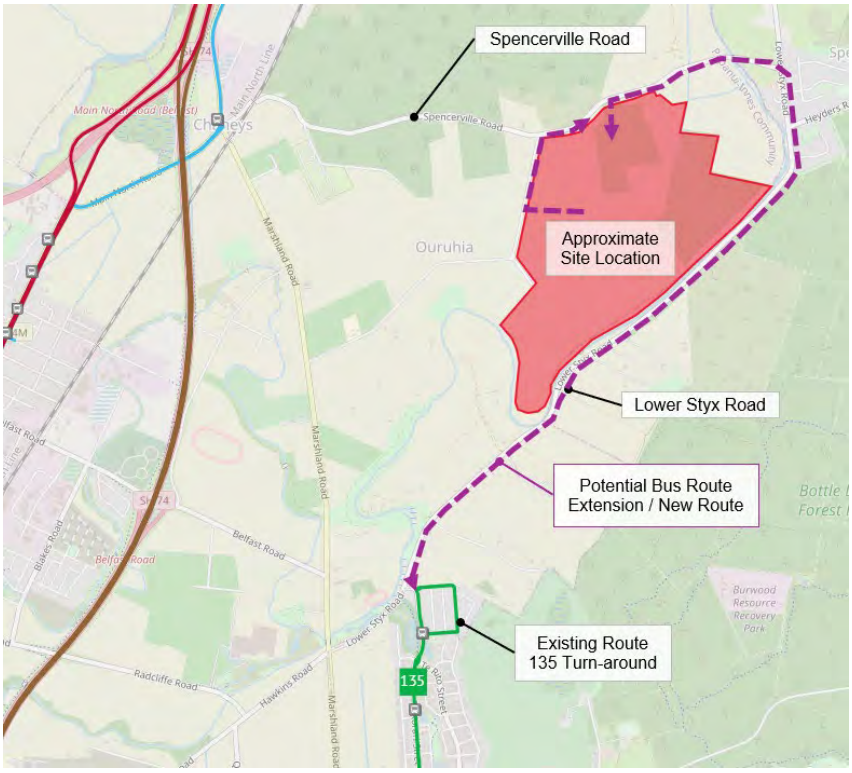


Figure 27: Potential Bus Route to Site
Map sourced from https://go.metroinfo.co.nz

76. The above indicates that the Site can be linked to passenger transport services, although this ultimately remains the responsibility of Environment Canterbury.

Summary & Conclusions

Summary

77. It is proposed to rezone land at Whisper Creek from the current predominantly *Specific Purpose (Golf Resort)* to be *Residential New Neighbourhood*. The proposed zone would facilitate the development of approximately 800 dwellings, along with a small commercial and community area intended to serve the daily needs of the residents.

78. The development is predicted to generate 720 vehicle movements in the AM and PM peak hours, with approximately 6,560 daily vehicle movements. This is an increase in traffic generation compared to what may have been anticipated under the existing *Specific Purpose* zoning.

79. The development will be served by three access points, with one onto Spencerville Road, one onto Turners Road and a third via the extension of the existing Teapes Road. No individual property access is proposed to the existing road network, and there will be no road access to Lower Styx Road. Concept intersection layouts have been prepared for the Spencerville Road and Turners Road access points.

80. Off-site road upgrades are proposed to mitigate the traffic effects of the development. These include widening Turners Road (between Spencerville Road and Marshland Road) to a 6.0m carriageway with 0.5m sealed shoulders on each side. Teapes Road will also be upgraded to a 5.5m wide carriageway with 0.5m sealed shoulders.

81. The existing Teapes Road / Turners Road intersection will be upgraded to a 'standard' layout. Furthermore, a minor upgrade is proposed for the Marshland Road / Turners Road intersection, which is the addition of a 30m left turn lane on the Turners Road approach to improve capacity by separating left and right turning traffic. This needs to occur prior to the 701st dwelling being completed at the Site.

82. The proposal includes provision for walking and cycling connections. A shared path will connect the Site to Ōuruhia Model School, via the Styx Mill Conservation Loop and a short segment of shared path on Turners Road. This will provide a safe route for walking and cycling to / from that school. Another shared path is proposed along Lower Styx Road, linking the Site to Te Korari Street and the wider cycling network.

83. These shared paths will also contribute to the ongoing development of the *Source to Sea* walkway / cycleway project. Additionally, the shared path network has the potential to connect to Bottle Lake Forest for recreational cycling and potentially to Chaneys Plantation in the future. Internal shared paths are also proposed within the development's reserves.

84. The Site will include Collector Roads that can accommodate bus services should these be provided in the future. The most logical option for the wider routing of these bus services would be via Prestons and Spencerville, although this is ultimately a matter for Environment Canterbury (as the regional passenger transport operator).

85. The inclusion of a small-scale commercial area within the development aims to provide daily needs within walking and cycling distance for residents.

86. Traffic modelling indicates that the primary traffic effect of the proposed Plan Change is an increase in delays at the existing Marshland Road / Turners Road intersection. However, the proposed addition of a left turn lane on Turners Road is predicted to mitigate this capacity concern.

87. The traffic modelling also indicates an increase of approximately one minute in travel times along the Marshland Road corridor (between Guthries Road and south of QEII Drive), which is considered acceptable given the context of the longer journeys that this route forms part of.

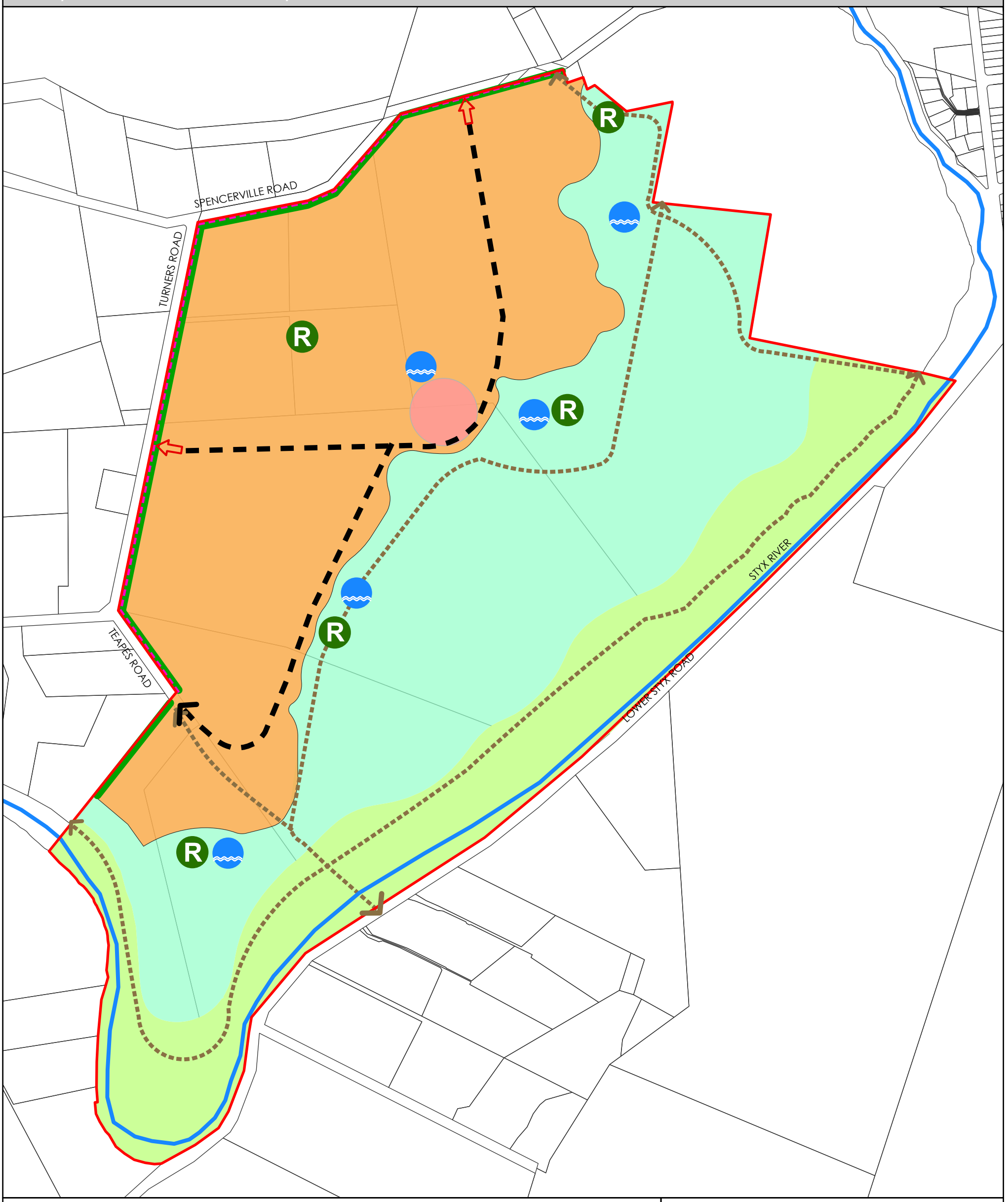
88. Overall, the proposal is considered to provide safe and efficient access arrangements, with the proposed off-site upgrades addressing the key traffic capacity constraints.

Conclusion

89. Based on the above, the proposed rezoning of land at Whisper Creek to *Residential New Neighbourhood* is supportable from a transportation perspective, subject to the implementation of the proposed access arrangements, off-site road upgrades, and alternate transport mode provisions identified.

Appendix 1

Outline Development Plan



Key

Outline development plan boundary

Development requirements

- Existing waterway or drain to be enhanced in conjunction with urban development. Alignment may vary
- Road access point. Location may vary
- Collector Road. Indicative alignment
- Pedestrian / cycle link / route Location and alignment may vary
- Proposed Rural Interface
- No dwelling access

Development requirements continued

- R — Reserve Indicative location. Size to be determined at time of subdivision
- Stormwater facility. Indicative location. Size and shape to be determined at time of subdivision
- Indicative small scale community and commercial node
- Wetland, Recreational, Open Space
- Open Space and Margins Zone

Residential development area

- Residential Development Area

0 250 500

Scale (m) A3 at 1:7500

Whispers Creek Outline Development Plan

Appendix 2

Traffic Modelling Report

Quality Transport Planning

Whisper Creek Proposed Plan Change

Traffic Network Effects Modelling Technical Report

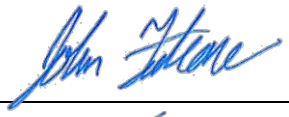
March 2025

Ref: 2025-001

Document Issue Record

Version No	Prepared By	Description	Date
00a	Tim Wright	First issue (Draft Pending Internal Review)	14 March 2025
01a	Tim Wright	First issue following internal review	18 March 2025
02a	Tim Wright	Reissue with minor change to Exec Summary	06 April 2025

Document Verification

Role	Name	Signature	Date
Preparation	Tim Wright		06 April 2025
Reviewer	John Falconer		17 March 2025
Approval	Tim Wright		06 April 2025

Contents

Appendices

1 Executive Summary

1.1 QTP Ltd has been appointed to undertake traffic modelling to inform the assessment of traffic effects of a proposed plan change (**PPC**) at 'Whisper Creek' for land approximately 2km north of Prestons in northern Christchurch, from its present Special Purpose (Golf Resort) zoning to Residential New Neighbourhood.

1.2 The new proposed development comprises 800 household and a relatively small area of commercial activity to service the proposed residential subdivision.

1.3 Traffic generation estimates associated with the new development have been provided by Novo Group.

1.4 Modelling has been undertaken using the latest version (v23) of the Christchurch Assignment and Simulation Traffic model (**CAST**). The model is owned and managed by the Model Management Group comprising members of the Christchurch, Selwyn and Waimakariri District Councils, Waka Kotaki and Ecan. The model covers Greater Christchurch, including all roads with a significant through-traffic function, whilst having strong simulation capabilities at an intersection turning level.

1.5 Network-wide simulation modelling undertaken in CAST has been supplemented with isolated intersection modelling undertaken in the industry-standard SIDRA Intersection software. This cross-check provides greater confidence in the CAST modelling of the intersection and more easily facilitates investigation of alternate phasing and timings.

1.6 The generic v23 model has been refined in the vicinity of the proposed development site to provide a project-specific model able to simulate the impacts of the proposed rezoning on the operation of the local and wider road network.

1.7 Model vs count comparisons of the v21 generic 2018 base model and the 2021 project models have been undertaken for the local network with reference to Waka Kotahi's Transport Model Development Guidelines (**TMDG**). The calibrated 2018 largely meet the criteria. The 2021 model has been subject to a round of further 'light' matrix estimation to bring modelled flows closer to observed values. Outliers have been investigated and addressed. Overall, the validation and calibration exercise indicates the model is reflecting count data with appropriate accuracy.

1.8 Traffic conditions were observed in the vicinity of the proposed rezoning during the AM peak period on Wednesday 26th February 2025. Observations were by way of 'sweeps' of the road network in the vicinity of the Whisper Creek PPC area, focusing on the Marshland Road corridor intersections between Spencerville Road and QEII Drive. Notwithstanding the roadworks at the Prestons Road intersection with Marshlands Road, the traffic network was observed to be operating within capacity and with minimal delays to traffic. Road sections and intersections on the minor roads nearer the site (Spencerville Road and Turners Road) were observed to be very lightly trafficked with no capacity issues observed.

1.9 Assessment of the impacts of the proposed rezoning has been undertaken for the 'medium-

term' CAST model horizon year of 2038. For the AM peak period, the 07:30-08:30 time-slice was adopted as a basis of more robust assessment than the traditional 08:00-09:00 peak hour modelled for central Christchurch due to higher counts and modelled flows on Marshland Road during this period.

1.10 The following points summarise the scenarios modelled and indicated network operation and effects:

a. The 2038 'no development' scenario assumes no new development at the PPC site, per the generic CAST model. Modelling suggests no significant capacity issues on the road network in the vicinity of the site

b. The 2038 'with PPC' scenario assumes 800hh per the subdivision plan and traffic generation assumptions supplied by Novo Group. Both CAST network modelling and a cross-check in the SIDRA Intersection software indicate capacity issues on the Turners Road approach to the Marshland Road intersection during the AM peak with delays of around 1 minute. SIDRA Intersection modelling indicates that localised widening to provide separate left and right turn lanes for a length of around 30m on approach to the intersection should provide satisfactory performance with the highest modelled delays occurring for the right-turn out movement reducing to less than 30s.

c. Wider network delay impacts (with PPC vs no development scenarios) are considered modest, with no delay impacts greater than around 10s at any one location. Cumulative impacts are noted on the Marshland Road corridor southbound in the AM peak hour between Guthries Road and south of QEII Drive of around 1 minute, increasing the total travel time for through-traffic from around 8.5 to 9.5 minutes.

d. A baseline scenario including a Golf Resort consistent with the District Plan has also been modelled, again with traffic generation assumptions supplied by Novo Group. Comparison instead of the 'with PPC' scenario to this baseline scenario has little bearing on the modelling of the relative impacts of the 'with PPC' scenario.

2 Introduction

2.1 QTP Ltd has been appointed to undertake traffic modelling to inform the assessment of traffic effects of a proposed plan change (**PPC**) at 'Whisper Creek' for land approximately 2km north of Prestons in northern Christchurch, from its present Special Purpose (Golf Resort) zoning to Residential New Neighbourhood.

2.2 The following diagram illustrates the approximate extent and location of the proposed plan change land.

Figure 2.1: Site Location

2.3 In essence, QTP's brief is to apply the latest version of the CAST traffic model (v23) to understand the likely operation of the traffic network for three scenarios:

1. With no changes to the level of traffic activity assumed in the generic model at Whisper Creek for the assessment year of 2038 (i.e. no significant development)
2. With traffic activity associated with the current zoning for the Golf Resort
3. With traffic activity associated with the proposed change in zoning to Residential New Neighbourhood

2.4 The modelling work is summarised as follows:

- Refine the zonal and network resolution of the current generic version of Council's CAST model for 2021 and 2038 in the immediate study area
- Field-check and compare the current network performance to that modelled for 2018 and 2021

- Calibrate the 2021 (and 2038) models to the count data as required
- Manipulate the CAST model demands to reflect ‘base’ and ‘with development’ scenarios for 2038
- Modify the 2038 CAST model networks to reflect ‘base’ and ‘with development’ road networks
- Produce outputs from the CAST models to indicate network operation and the effects of the proposed development under the different development scenarios
- Cross-check modelling of the operation of any key intersections for which the CAST model (implemented in the SATURN software) indicates marginal performance for the PPC scenario using SIDRA Intersection modelling software
- Provide summary reporting (this document) describing the methodology employed and the network operation and effects.

3 Base Models Review

3.1 CAST Model Version

3.1.1 The latest CAST model version (v23) has been used as the basis of the analysis. V23 is a minor update to the v21 model, undertaken in 2023 to address relatively minor issues noted in the application of the model between 2021 and 2023. The previous model update, v21, was completed in 2021, with the model base year being 2018. This was the last census year for which demographic data is presently available for. The initial estimate of travel demands for the CAST model come from the parent Christchurch Transportation Model (**CTM**) which uses demographic inputs as the basis of estimating travel demands in Greater Christchurch. The CAST model uses a refined zone system, network representation and simulation to better reflect the operation of the road network. The v23 2018 model is calibrated to over 4,000 individual turning counts in each model period, separately for light and heavy vehicles.

2018 Model vs Count Comparison

3.1.2 The following diagram illustrates the location of the five nearby intersection counts used in the calibration of the wider CAST model for consideration of the performance of the v23 2018 base model in the vicinity of the proposed rezoning. As noted above, the 2018 model is the base model, unlike the 2021 model that is a landuse forecast and includes significant network changes and is also affected by the Covid-19 lockdowns.

Figure 3.1: Location of v23 2018 Calibration Counts Local to Site

3.1.3 The following Table summarises the performance of the model against Waka Kotahi's Transport Model Development Guidance (**TMDG**) key criteria for turning counts for the Type E: Small Area / Corridor model category.

Criteria	Target Type E	AM	PM
R^2	>0.95	0.987	0.973
y = **M**x	0.95-1.05	0.967	1.002
GEH<5	>85%	90%	87%
GEH<7.5	>90%	100%	94%
GEH<10	>95%	100%	100%
<12	>100%	100%	100%
RMSE	<15%	14%	20%
Ave. Error	-	9%	11%
No. Counts	-	52	52

Table 3.1: 2018 Model Local Performance Against TMDG Criteria

3.1.4 The 2018 AM and PM peak base model meets all of the TMDG overall correlation criteria, except for the PM peak model narrowly missing the Root of the Mean Suare of the Error (**RMSE**) criteria. The RMSE value is not a particularly intuitive measure of error in the model. A more intuitive value of error is presented, being the average (absolute) error, or difference between counts and flows, being the sum of the absolute differences compared to the sum of the counts, indicating an 'average' error of around 10%.

3.2 2021 CAST Model

3.2.1 The v21 model update included development of a (then) present-day model, for 2021. This included comprehensive updates to traffic signals across Christchurch to reflect signal phasing and timings extracted from the SCATS system that manages traffic signals in Christchurch. Furthermore, the 2021 model included the (then) recently completed major infrastructure motorway projects, including the Christchurch Northern Corridor, that has significantly altered traffic volumes in the study area, notably on Marshland Road.

3.2.2 Unlike the 2018 base model, the 2021 model flows and network operation is very much a forecast, projected forwards from 2018, with forecast changes in demographics and changes to the traffic network. Accordingly, for this study, the 2021 CAST model has been considered against local count data available subsequent to the 2021 v21 update. First, however, further modifications to the v23 2021 (and 2038) generic models have been made to refine them specifically for this assessment, to form project models. This model refinement is briefly outlined next.

3.3 Network and Zonal Refinement

3.3.1 The 2021 and 2038 generic models have been modified to better reflect traffic demands and access to/from the PPC area and also to refine demands in the area west of the site to provide a better representation of traffic demands on the roads in this area.

3.3.2 CAST model zone 831 encompassing the PPC area has been split to 8 sub-zones: 6 zones (834-839) representing the PC area (refer section 4.3) and 2 zones (832&833) reflecting the remnant areas of the original zone southwest and northeast of the site. In the 2021 and 2038

base model (the without development scenarios) the 6 zones allocated for future development have zero demands and are notionally attached to the existing road network. CAST zone 831 comprises a single Statistics New Zealand (SNZ) Meshblock, and as such, the splitting of the original demands to the two remnant zones has been based on the approximate number of properties in these two areas as demographic data is limited to the resolution of the single Meshblock.

3.3.3 CAST model zone 931, west of the PPC area, has been spit to sub-zones 932-935 based on the SNZ demographic data (population, jobs, school roll) for the component Meshblocks. The standard CAST model regressed trip generation equations have then been applied to estimate trip generation for each sub-zone, applied as proportions of the original zone (total) trip generation.

3.3.4 The relationship between the generic CAST model zones, the SNZ Meshblocks (coloured areas) and the project model zoning is illustrated in the following diagram.

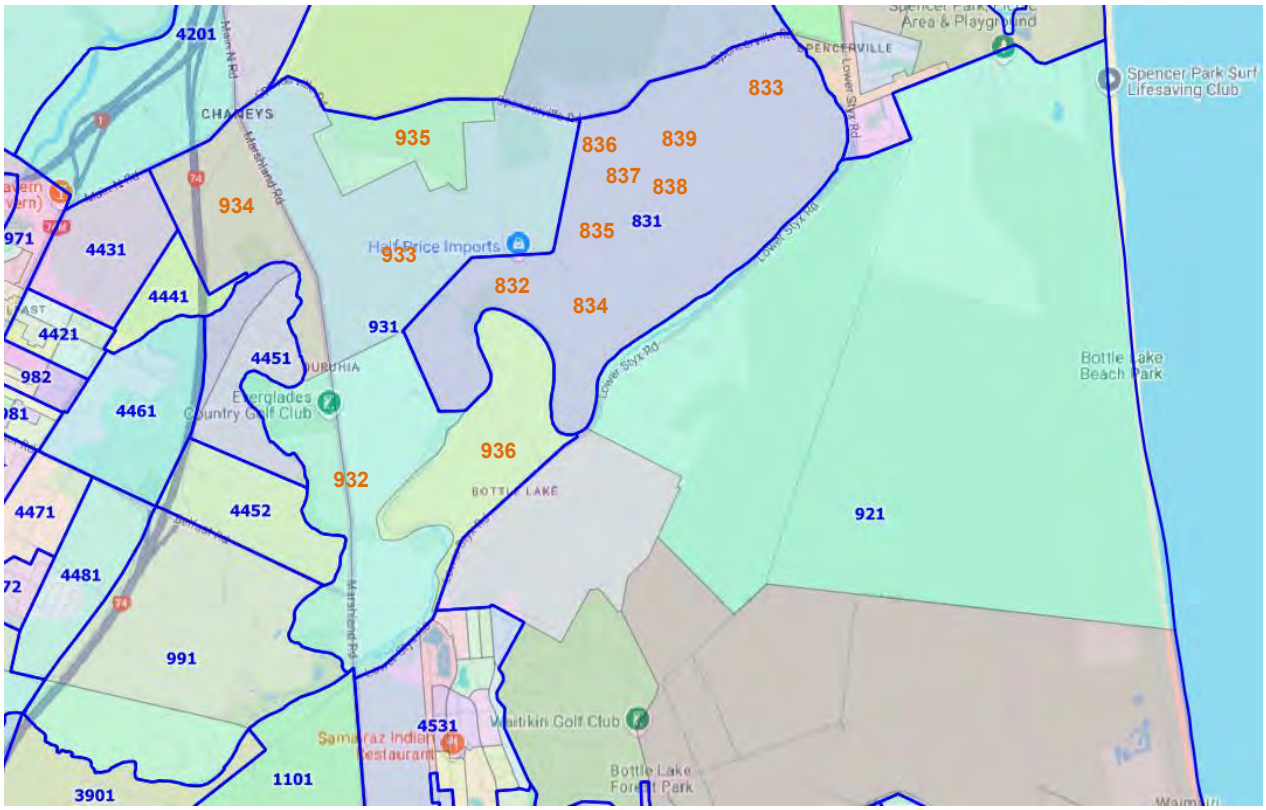


Figure 3.2: Generic Model Zones (Blue), SNZ Meshblocks (Coloured Areas) and Project Model Zones (Orange)

3.3.5 The resulting refined base year network and zone loading implemented within the traffic model is illustrated within the following diagram output from the traffic model.

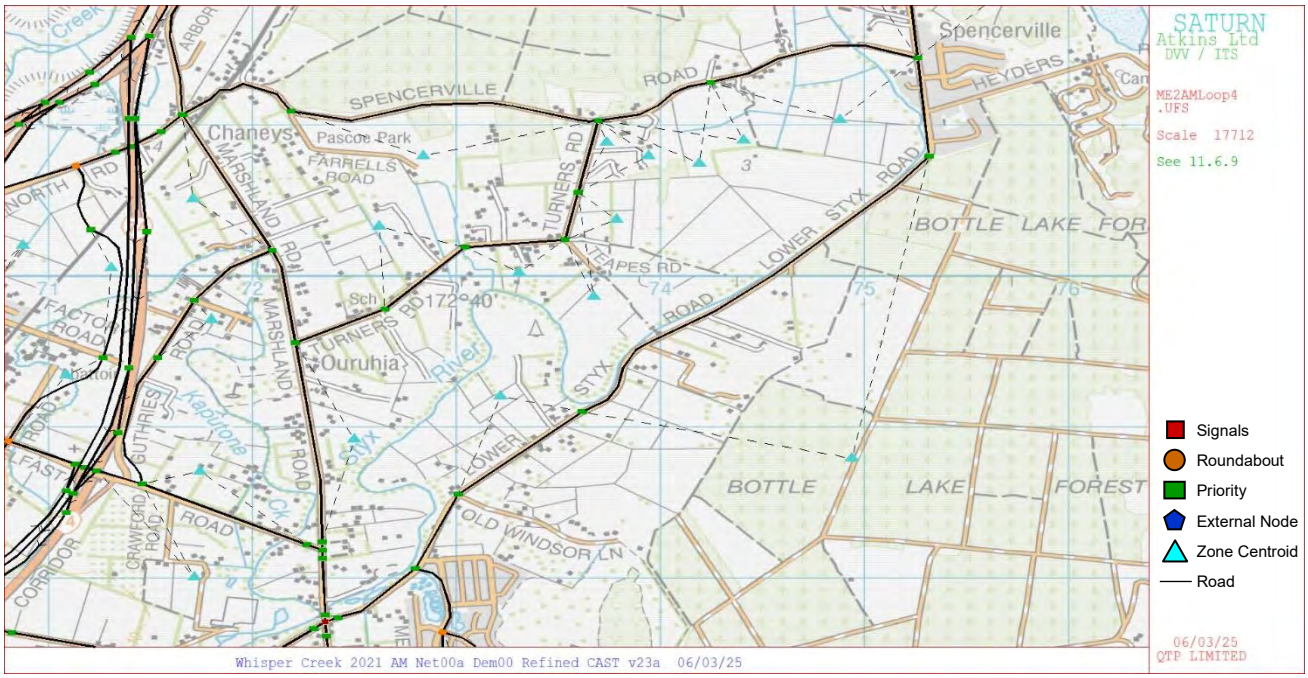


Figure 3.3: Project Model Network and Zone Loading, 2021

3.4 2021 Model vs Count Comparison

3.4.1 We have reviewed available count data for the local area within CCC's intersection traffic counts website. The following diagram illustrates the available counts since 2021 in the study area.

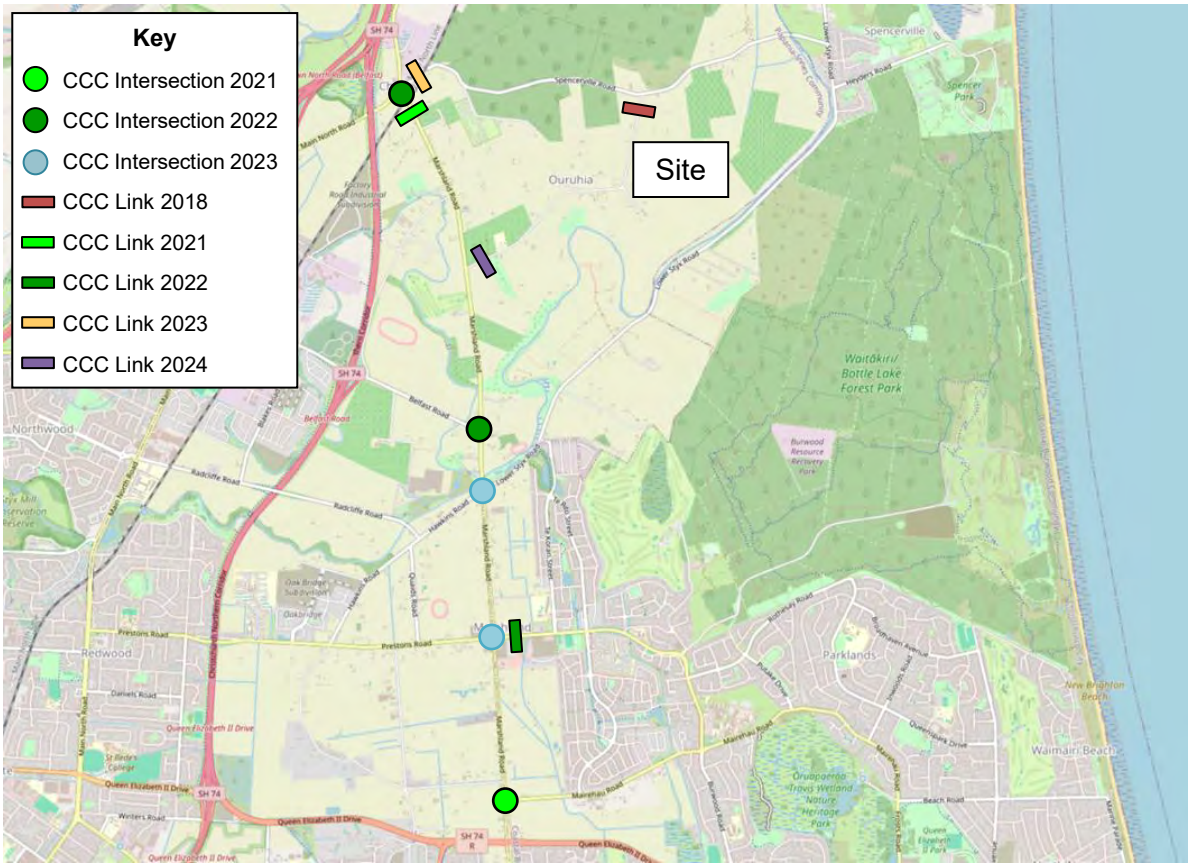


Figure 3.4: CCC Counts Used in 2021 Model vs Count Check

3.4.2 Ideally, all counts would be for 2021, but counts within 2 years after the modelled year have been referenced. In addition, the only counts available for Turners Road are link counts, being a 2024 count east of Marshlands Road and a 2018 count south of Spencerville Road. These counts are still considered valuable in providing confidence in the model. This is because use of the 2024 count in a calibration sense provides a robust analysis in terms of the model estimating slightly higher flows than would be anticipated at 2021, whilst the 2018 count south of Spencerville Road is for a location with very low volumes (directional counts and model flows <20 vph) where no development (or network changes) are likely to have significantly changed volumes since 2018.

3.4.3 After an initial comparison of the modelled flows to counts, some relatively minor changes were made to the v23 2021 generic model network, summarised as follows:

- Widespread changes in speed limits in the immediate study area typically from 80kph to 60kph, were not reflected in the model, the link types being modified accordingly.
- The Lower Styx Road / Marshlands Road signals installed in late 2021 have been added.
- The Guthries Road connection to Belfast Road has been added.
- The Turners Rd approach to the Marshland Road intersection has been modified to reflect a single lane. Whilst there is localised widening at the stop-line (around 6.3m), the road is not sufficiently wide on approach for another vehicle to comfortably pass (i.e. the painted road width is around 4.2m around 5m back from the stop-line).
- Superficial changes were made to node locations and curved links in the immediate study area to better match road geometry based on LINZ topographical mapping

3.4.4 The result of the above modifications was a model with improved reflection of the 2021 counts, but there was significant scatter in the model vs count comparisons such that the TMDG criteria were not met. As noted earlier, the 2021 model is a forecast from the calibrated 2018 base model that aims to forecast flows following the opening of the Northern Arterial Motorway. Forecast peak hour directional volumes on the new Northern Arterial in 2021 are up to 2,500 vph, and thus forecasting the number of vehicles on Marshland Road after the opening of the new Motorway is subject to a degree of error.

3.4.5 With no consistent trends in the model vs count differences (some high, some low, varying by period and location along the Marshland Road corridor), the 2021 model has been subject to a round of ‘light’ matrix estimation, using the count data illustrated in Figure 3.4 above.

3.4.6 The effects of the matrix estimation at 2021 are illustrated in the following plots, with green bands as increases in flows and blue as decreases.

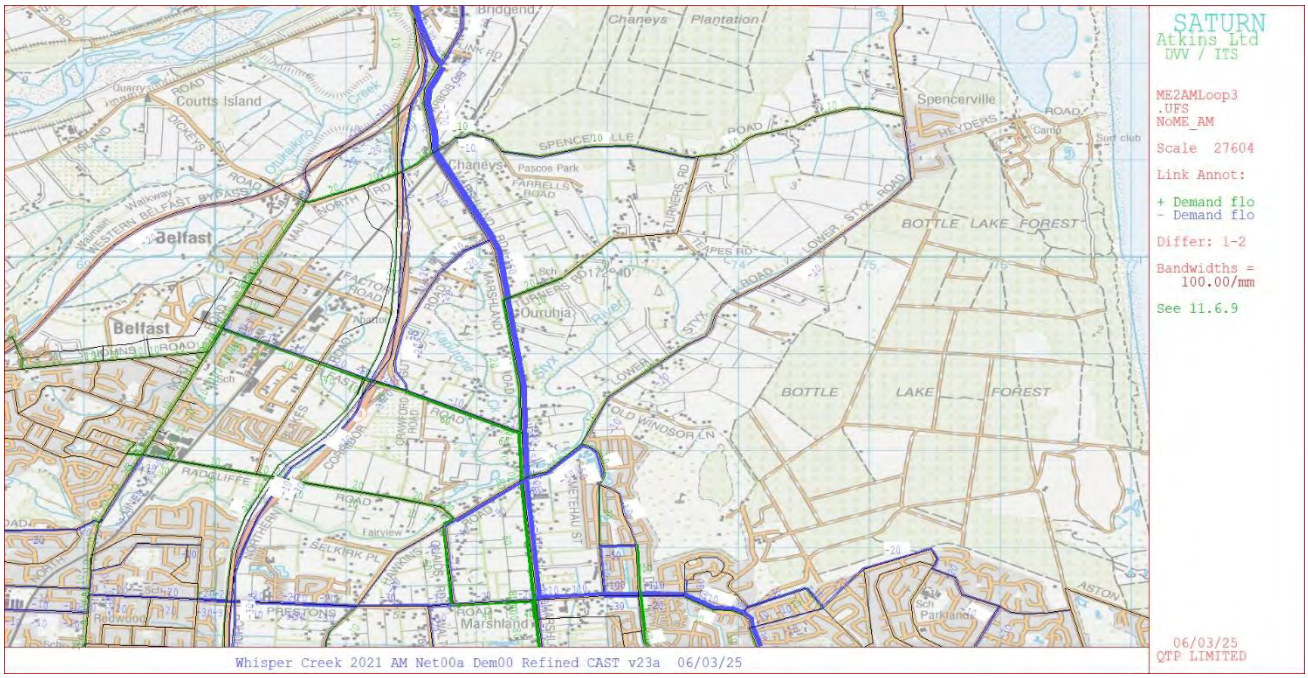


Figure 3.5: Effects of Limited Matrix Estimation, 2021 AM Peak Hour

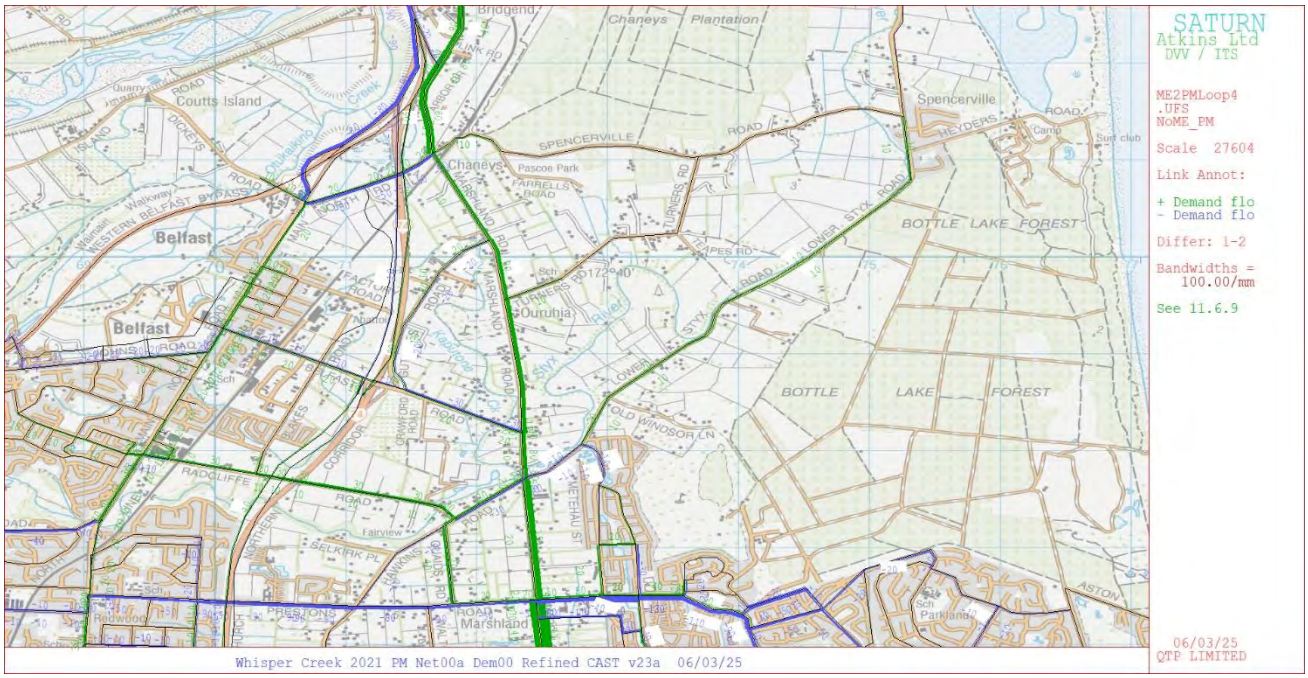


Figure 3.6: Effects of Limited Matrix Estimation, 2021 PM Peak Hour

3.4.7 As can be seen from the above plots, generally the changes in flows are not particularly large, compared to forecast volumes on the Northern Arterial Motorway (up to 2,500 vph in the peak hours). The dominant change in flows being a reduction in southbound flows of around 160vph on the Marshland Road corridor (near Turners Rd) southbound in the AM peak and an increase to the same movements of around 80vph in the PM peak hour.

3.4.8 The desired effect has been achieved, with the model much more closely reflecting the count data. The following Table summarises the performance of the 2021 project model against the TMDG criteria.

Criteria	Target Type E	AM	PM
R^2	>0.95	0.983	0.992
y = **M**x	0.95-1.05	0.997	0.992
GEH<5	>85%	93%	93%
GEH<7.5	>90%	98%	97%
GEH<10	>95%	98%	97%
<12	>100%	100%	98%
RMSE	<15%	15%	10%
Ave. Error	-	9%	11%
No. Counts	-	52	52

Table 3.2: 2018 Model Local Performance Against TMDG Criteria

3.4.9 The not particularly intuitive RMSE target value of 15% is marginally missed, the model value being 15.4%. Only one count does not meet the GEH criteria, this being for the right turn from Hawkins Road to Marshland Road (southbound) in the PM peak hour.

3.4.10 The recorded count is 78 vph, but the model assigns no traffic to this turning movement. The reverse turning movement, from Marshland Road northbound left into Hawkins Road, is also (apparently) under-estimated in the model. The only period where the model reflects this (reverse) movement well is in the AM peak hour. This occurs because of relatively high delays for through-vehicles westbound on Prestons Road at the Marshland Road intersection, making the right-turn and longer route to Radcliffe Road via Marshland Road and Hawkins Road more attractive than the through-movement and shorter route via Quaids Road and Hawkins Road. Whilst there are a few properties on the section of Hawkins Road between Radcliffe Road and Marshland Road (that aren't explicitly modelled in a separate zone at this location), these are not anticipated to generate this number of turning movements. The route between the intersections of Marshlands Road / Prestons Road and Radcliffe Road / Hawkins Road is around 400m shorter via Quaids Road than Marshland Road, and around 1 minute quicker in both the model and Google Maps. Despite this, Google Maps does illustrate the use of Marshland Road as the main route, reflecting it's higher order (than Quaids Road) in the roading hierarchy. Whilst the CAST model does reflect different speeds for a given traffic volume for differing roads in the hierarchy, in this instance this is not sufficient to make Marshland Road the preferable route. This issue reflects relatively few vehicles and is not anticipated to be influential to the assessment of effects of the PPC.

3.4.11 Overall, the calibration exercise indicates the model is reflecting count data with reasonable accuracy. Full tabulations of the model vs counts and XY scatter plots are provided as **Appendix A**.

3.5 Model Performance Field-Check

3.5.1 Traffic conditions were observed in the vicinity of the proposed rezoning during the AM peak period on Wednesday 26th February 2025. Observations were by way of 'sweeps' of the road network in the vicinity of the Whisper Creek PPC area, focusing on the Marshland Road corridor intersections. The following points were noted:

- The Spencerville Road, Turners Road, Belfast Road and Lower Styx Road intersections with Marshlands Roads were all observed to be 'quiet' with very little traffic on the side-

roads observed and no significant queueing, from 07:30 through to 09:00.

- Traffic management was in place at the Prestons Road intersection (with Marshlands Road), owing to works being undertaken in the northeast quadrant of the intersection. The works were on the west side of Marshlands Road immediately north of Prestons Road, with coning in place to deflect the northbound traffic to the east, with narrow, coned lanes in both directions. Accordingly, the traffic management included restrictions at the Prestons Road intersection to limit northbound traffic to one through-lane (usually two through-lanes are provided both northbound and southbound on Marshland Road through the intersection). Whilst the Marshland Road approaches continued to function without being over capacity (i.e. queued traffic discharged during a typical cycle), the Prestons Road westbound approach was over capacity for a period and long queues formed at around 08:35. It is suspected that capacity issues on this approach were exacerbated by the traffic management restrictions which may have resulted in more green time being provided to Marshlands Road, either automatically under SCATS detections of vehicles being present on the loops or through manual intervention to priorities. By contrast, Google Maps indicates generally ‘fast’ typical traffic conditions at the intersection during the week day peek periods.
- The Marshland Road / QEII Drive intersection is a relatively high-volume, high-capacity intersection. During four observations between 07:15 and 08:45, queues on all approaches generally discharged by the end of the green time. On occasion, right-turning vehicles from the west did not quite clear at the end of green, but did on subsequent cycles. This is a product of SCATS optimising green time to just meet capacity on the lower volume right-turns whilst minimising delays to the higher volume multi-lane through-movements.
- Overall, notwithstanding the roadworks at the Prestons Road intersection with Marshlands Road, the traffic network was observed to be operating within capacity and with minimal delays to traffic. Road sections and intersections on the minor roads nearer the site (Spencerville Road and Turners Road) were observed to be very lightly trafficked with no capacity issues observed.

Figure 3.7: Traffic Management in Place On Marshlands Road, North of Prestons Road

Figure 3.8: Queuing Observed on the Prestons Road Westbound Approach To Marshlands Road, from around 8:35, Believed to be Exacerbated Due to the Intersection Traffic Management (Previous Photo)

Figure 3.9: The Turners Road Approach to the T-Intersection with Marshland Road

3.5.2 The generic AM and PM peak CAST models are configured to be run either as linked time-slices or as individual time slices. The former are typically applied for economic assessment to capture varying demands and delays across the modelled networks across the peak periods. For the assessment of traffic impacts, as in this case, typically the models are run as single peak-hour assignments (and simulations), requiring substantially less model run times. Given the location of the PPC on the periphery of Christchurch, the 07:30-08:00 time slice has been adopted for assessment because the traffic volumes on Marshland Road in the vicinity of the site are higher (as an hourly flow) than the 08:00-09:00 'peak' hour generally modelled for central Christchurch. This is true both in terms of modelled volumes and counts and provides a more robust analysis of potential delays and impacts during the true peak of the morning commuter period local to the PPC area. By way of example, the 2021 CCC link count for Marshland Road south of Main North Road is 12% higher for the 7:30-8:30 period than the 08:00-09:00 period (5-day average), whilst the CAST model flows (always expressed in hourly rates) are 13% higher for the 07:30-08:00 time-slice than for 08:00-09:00.

3.5.3 For the PM peak period, the same count data suggest the 16:30-17:30 'traditional' modelled peak hour for central Christchurch is applicable to this study, being equal to the 16:00-17:00 count and higher than the 17:00-18:00 count.

3.5.4 The following plots, output from the model, indicate the level of delays forecast on the sections of road network in the vicinity of the proposed development, first on the network local to the PPC site and second on the wider network. The link delays include average delays encountered on approach to intersections and are colour-coded to a simplified Level of Service (LoS) as follows:

- LoS A-C (<30s) – Green
- LoS D (30-50s) – Orange
- LoS E (50-70s) – Red
- LoS F (>70s) – Black

3.5.5 Note that for the sake of clarity, only modelled delays greater than 25 seconds are illustrated. Note also that modelled delays are average approach delays that do not reflect the variation in delays by turn.

Figure 3.10: Modelled Average Link Delays, Local Network, 2021 AM Peak

Figure 3.11: Modelled Average Link Delays, Local Network, 2021 PM Peak

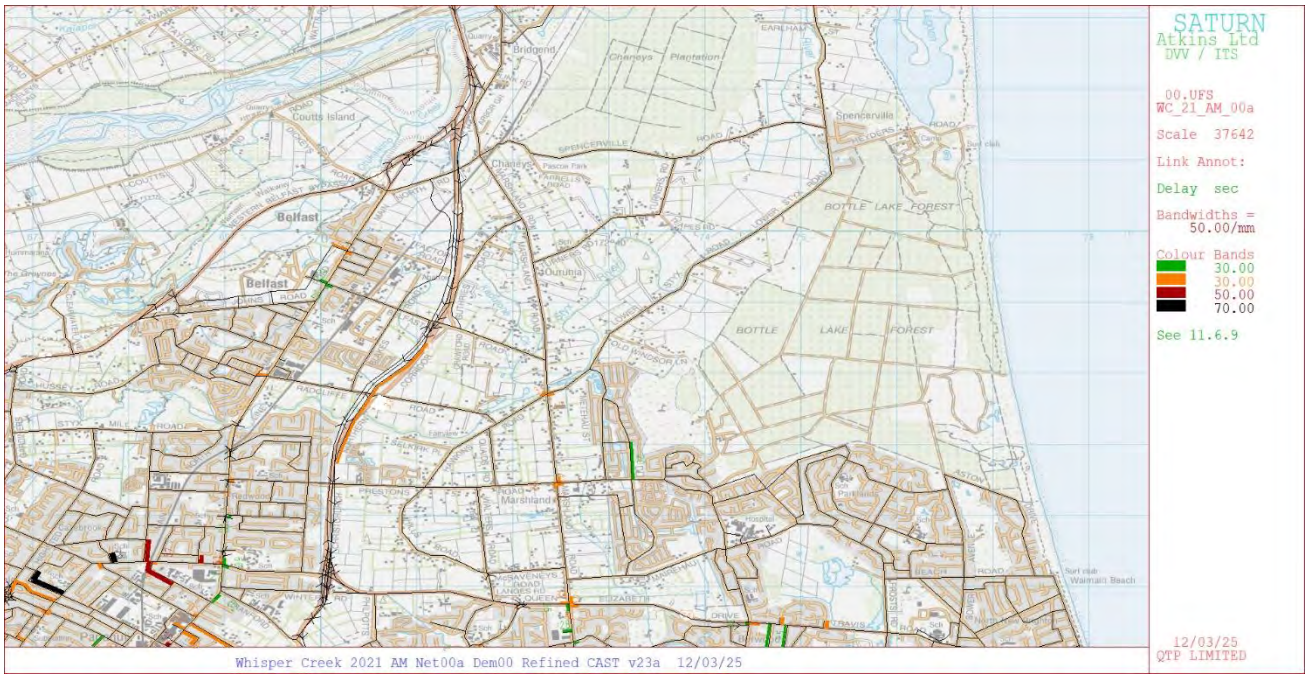


Figure 3.12: Modelled Average Link Delays, Wider Network, 2021 AM Peak

Figure 3.13: Modelled Average Link Delays, Wider Network, 2021 PM Peak

3.5.6 The above plots indicate no significant delays at the locations of potential access to the PPC area via the Marshland Road intersections with Turners Road and Spencerville Road. On the wider network, modelled delays at the Styx Mill Road, Prestons Road and QEII Drive intersections with Marshland Road are all at LoS D, with average approach delays between 30 and 50 seconds per vehicle, reflecting conditions observed on-site.

3.5.7 The observed long queue of vehicles on the Prestons Road westbound approach to Marshlands Road is not reflected in the model. This is in-line with the Google Maps illustration of minimal delays at this location and aligns with the assumption that the queues observed during the survey were exacerbated due to temporary traffic management reducing capacity

of the intersection.

3.5.8 Overall, the model is reasonably reflecting conditions observed during the site survey in the direct vicinity of the PPC site and on the length of Marshland Road between Spencerville Road and QEII Drive.

3.6 2038 Base Model

3.6.1 For the purpose of this study, the 2038 base model is the v23 generic 2038 model, with the network and zonal demands subsequently refined as described above for 2021 (including the zone splitting and matrix estimation changes).

3.6.2 Note that the single zone, 831, encompassing the PPC area, assumes no significant demographic growth, with the 2021 estimated population of 70 increasing to 78, and no additional jobs (or school roll) assumed within the zone. As such, for the base model, traffic demand to/from the immediate PPC area remain similarly low per the 'present-day' 2021 model.

3.6.3 The generic future year CAST model assumes new signals at Belfast Road / Marshland Road. For all the future year model runs, traffic signals at the intersections of Marshland Road with Belfast Road, Lower Styx Road, Prestons Road, Mairehau Road and QEII Drive are all set to have phase times optimised within the SATURN software[1]. This broadly reflects the situation where in-practice the SCATS system that manages the traffic signals in Greater Christchurch adapts automatically to changes in demands at each intersection.

3.6.4 The following diagrams illustrate the modelled peak hour traffic flows (in vehicles per hour) on the local road network at 2038[2]. Traffic volumes are indicated as directional bands, with the widths of the bands proportional to the directional flows illustrated.

[1] Phase times were initially optimised for the 2038 base model, and a second iteration of assignment and signal optimisation (and intersection simulation) undertaken. Similarly, the with-development scenario models include the initial timings from the initially optimised base model and are then subject to a second iteration of assignment, signal optimisation and simulation.

[2] Illustrated link volumes do not include localised traffic loading to/from model zones loading to a link. The volumes are however included at the intersection 'nodes' for the purpose of simulation of intersection performance and are included in the turning volumes in the model vs count analysis.

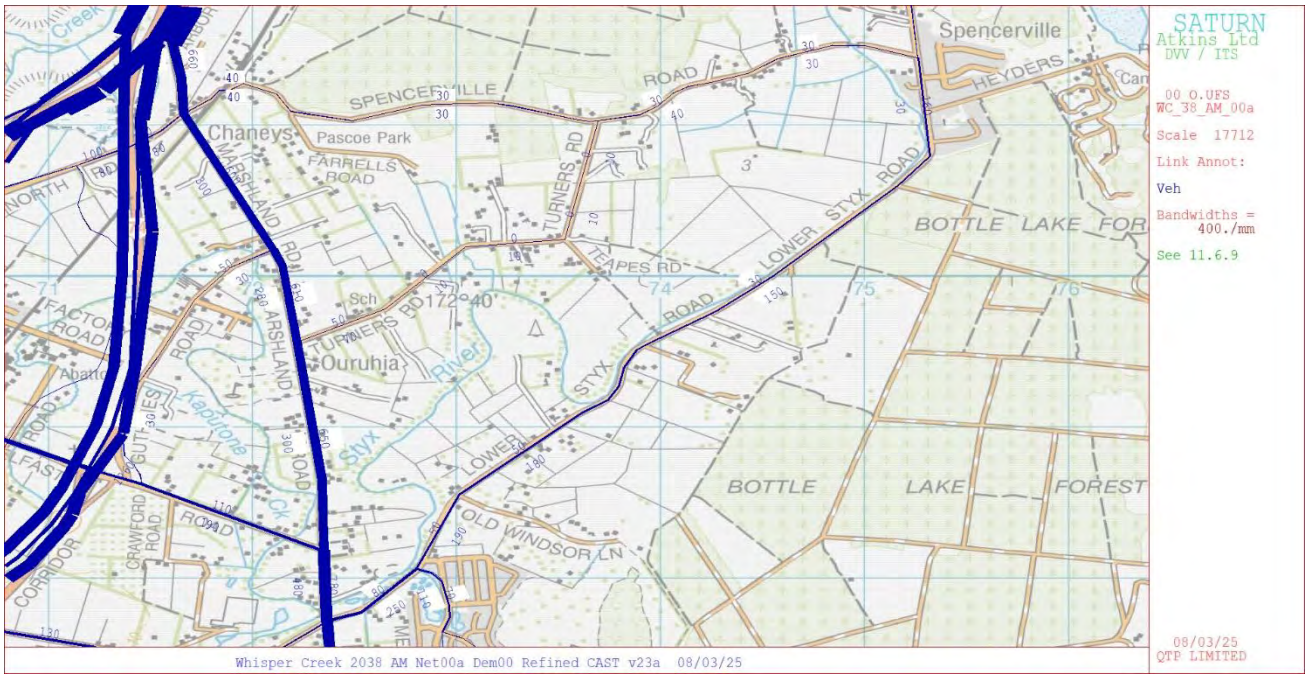


Figure 3.14: Modelled Flows, Base Model, 2038 AM Peak Hour

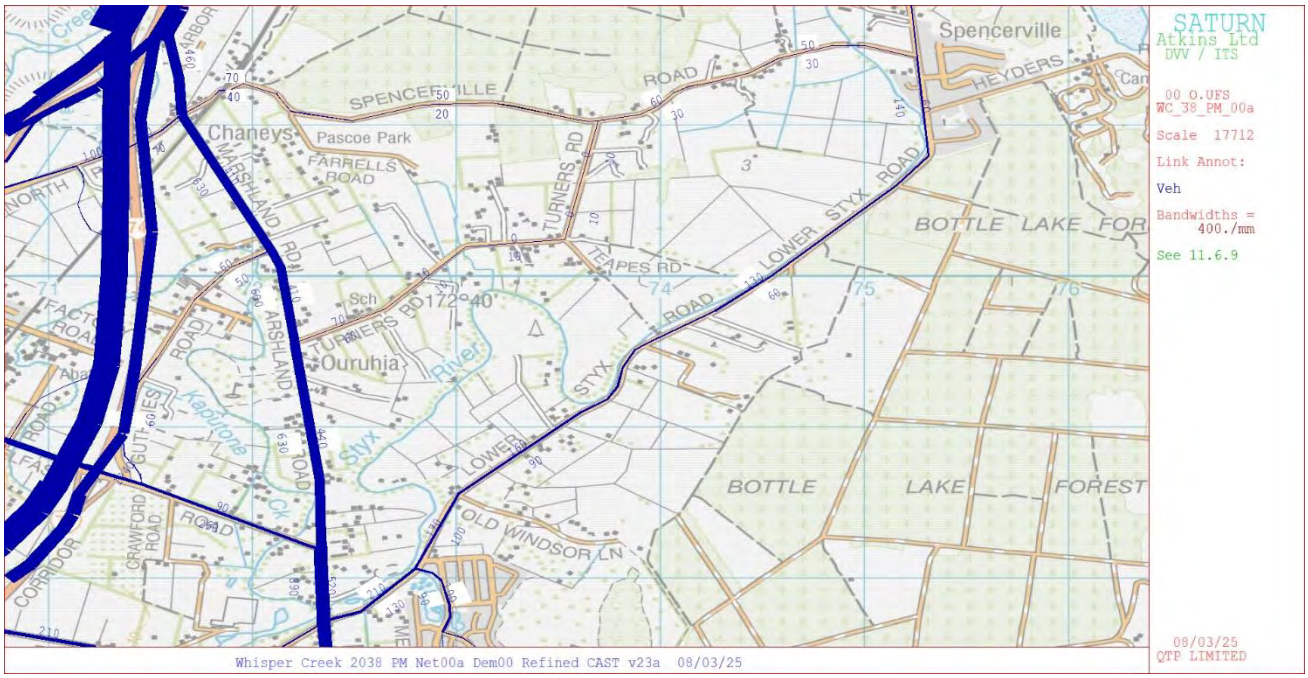


Figure 3.15: Modelled Flows, Base Model, 2038 PM Peak Hour

3.6.5 The following diagrams illustrate the modelled delays for the base model in 2038.

Figure 3.16: Modelled Average Link Delays, Base Model, 2038 AM Peak Hour

Figure 3.17: Modelled Average Link Delays, Base Model, 2038 PM Peak Hour

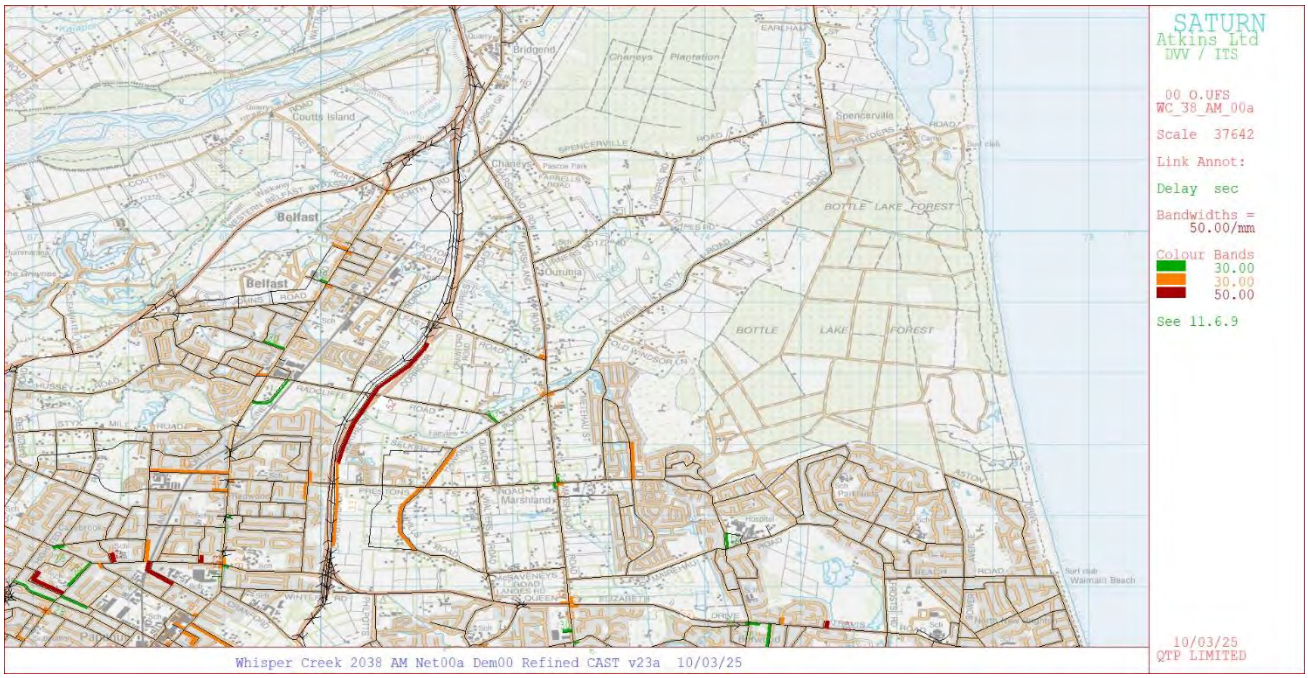


Figure 3.18: Modelled Average Link Delays, Base Model, 2038 AM Peak Hour, Wider Network

Figure 3.19: Modelled Average Link Delays, Base Model, 2038 PM Peak Hour Wider Network

3.6.6 Under wider-model traffic growth between 2021 and 2038, there are slight delay increases modelled at the Marshland Road intersections with Lower Styx Road and QEII Drive, with delays transitioning from below 50s (CAST LoS D) to just above 50s (CAST LoS E) at two locations in the PM peak hour. Intersections on the Marshland Road corridor however remain within capacity. On the wider-network, increased delays on the Northern Arterial southbound in the AM peak are noted as demands in the single non-HOV[3] lane approach the sustainable throughput of the lane, travel speeds decrease under the higher volume and thus delays, relative to free-flow times, increase. Also note the high delays forecast for the Philpotts Road

[3] High Occupancy Vehicle Lane or Transit Lane designated for single occupant vehicles in the morning peak period

northbound in the PM peak hour (LoS F), though subsequent analysis presented at section 7.3 indicates the model is over-estimating both demand and delays at this location.

3.6.7 Overall, the road network in the vicinity of the Whisper Creek PPC continues to provide a similar modelled level of service in the 2038 base model as observed in the 2021 model.

4 'With Development' Demand Adjustments

4.1 Approach

4.1.1 The approach adopted to developing the 'with development' demand scenarios is summarised as follows:

- Trip patterns for the Golf Resort scenario have been based on model zone 951 comprising the existing Clearwater Golf Resort, also in north Christchurch.
- Trip patterns for the residential (800hh) scenario have been based on model zone 911 comprising the nearby Spencerville predominantly residential area.
- Both of these 'template' model zones have first had any intra-zonal trips removed. This is the for the purpose of ensuring desired trip-end totals for the development zones include a full-complement of trips loading to the road network under the development scenarios (and do not include very short trips simply staying within the model zones).
- The template zones are then copied to the new development zones with factors specified to equal the desired 'trip-ends' ('to and from' trip generation) for each development scenario.

4.2 Trip Generation Assumptions

4.2.1 Trip generation assumptions for the two development scenarios for the Whisper Creek area have been provided by Novo Group, as follows:

Assumed Development		
Dwellings:	150	
Resort:	380	Bedrooms
Golf Course:	18	Holes

Traffic Generation - Total			
	Arrivals	**Departures**	**Total**
AM Peak	148	145	293
PM Peak	173	154	327

Trip Rates - Residential			
	Arrivals	**Departures**	**Total**
AM Peak	0.21	0.69	0.90
PM Peak	0.60	0.30	0.90

Traffic Generation - Residential			
	Arrivals	**Departures**	**Total**
AM Peak	31	104	135
PM Peak	90	45	135

Trip Rates - Resort			
	Arrivals	**Departures**	**Total**
AM Peak	0.22	0.09	0.31
PM Peak	0.18	0.24	0.42

Traffic Generation - Resort			
	Arrivals	**Departures**	**Total**
AM Peak	85	33	118
PM Peak	69	91	160

Trip Rates - Golf Course			
	Arrivals	**Departures**	**Total**
AM Peak	1.76	0.47	2.23
PM Peak	0.81	0.98	1.79

Traffic Generation - Golf Course			
	Arrivals	**Departures**	**Total**
AM Peak	32	8	40
PM Peak	14	18	32

Table 4.1: Golf Resort Trip Generation Assumptions

Dwellings:	800

Trip Rates			
	Arrivals	**Departures**	**Total**
AM Peak	0.21	0.69	0.90
PM Peak	0.60	0.30	0.90

Traffic Generation			
	Arrivals	**Departures**	**Total**
AM Peak	167	553	720
PM Peak	480	240	720

Table 4.2: Residential (800hh) Trip Generation Assumptions

4.2.2 We note that the subdivision plan includes for a limited amount (around 1.5 ha) of commercial activities. It is anticipated that this would service the proposed residential subdivision, rather than forming a destination for trips from other residential areas. As such, no additional trip generation is assumed for this area. It could be argued that a proportion of the assumed

residential vehicle trip generation would be for short trips to/from this commercial area. For the purposes of simplicity and providing a robust assessment, it is assumed that all the residential trips are to destinations beyond the Whisper Creek PPC area.

4.3 Zonal Trip Generation

4.3.1 In order to provide greater accuracy of likely route choice to/from the PPC area, the supplied subdivision plan has been used as the basis of modelling the proposed road network and a number of discrete model zones representing different areas of the development. The total trip generation for the proposed 800hh has been split between 6 model zones based on their relative areas, as indicated in the following image.

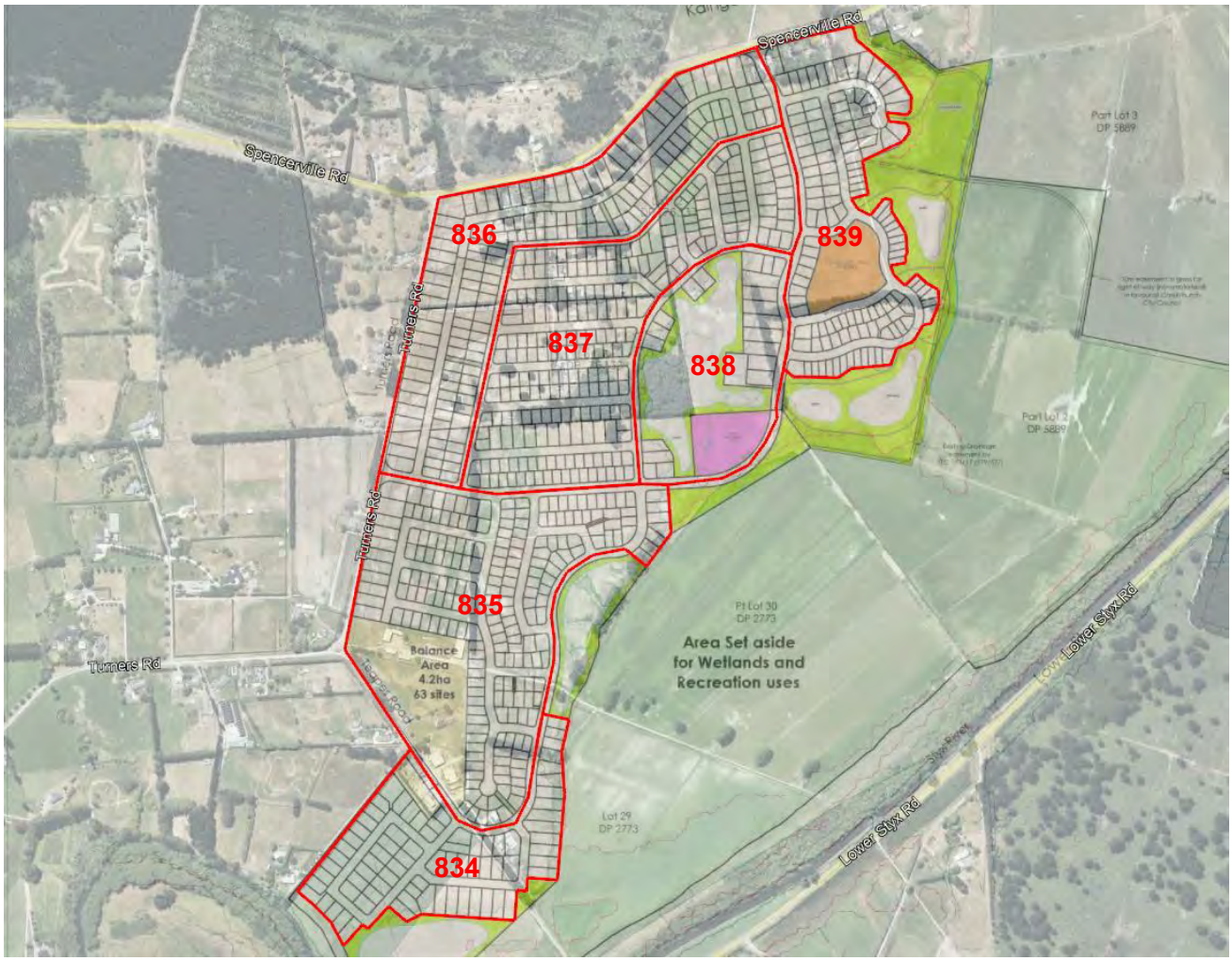


Figure 4.1: Proposed Residential Development Model Zoning

4.3.2 Based on the above zonal areas, the total trip generation for the residential development has been applied as follows:

Zone	Area	%	AM		PM	
			From	To	From	To
834	9	11%	61	18	26	53
835	19	24%	134	41	58	116
836	14	18%	102	31	44	88
837	16	21%	114	34	49	99
838	9	11%	63	19	28	55
839	11	14%	79	24	34	69
Totals	**78**	**100%**	**553**	**167**	**240**	**480**

Table 4.3: Zonal Trip Generation for 800hh Scenario

4.3.3 It is emphasised that the key purpose of the above zoning is to provide realistic routing to/from the proposed development, given it is served by both Spencerville Road to the north and Turners Road to the south. The zoning and modelled subdivision road network (refer Figure 6.1) also provide a reasonable basis for modelling the operation of the intersections providing access to the PPC area from Spencerville and Turners Road.

4.3.4 The key scenario modelled and described within this report is the proposed 800hh scenario. The Golf Resort scenario has also been modelled to allow comparison of the operation of the road network for the PPC to that with development permitted under existing zoning. For the sake of ease of comparison, the same development zoning and network have been assumed for the comparative Golf Resort scenario, though in practice it would not be developed in this manner.

5 Modelled Trip Distribution

5.1 PPC Traffic Trip Distribution

5.1.1 The trip distribution for the proposed new housing, is based on the inherent trip distribution within the CAST traffic model for zone 911 encompassing Spencerville, with predominantly residential demographics (as opposed to employment) per the proposed zoning. This in-turn originates from the 'parent' regional Christchurch Transportation Model (**CTM**) based on households and population allocated to the model zone. The trip distribution is a synthetic statistical distribution that assumes a trip proportion to and from all other zones in the model for each trip purpose, calibrated to trip lengths from Household Travel Surveys and Statistics New Zealand Census Journey to Work data. The trip distribution between households and 'attraction' destinations such as employment zones, schools, retail etc. is accordingly 'wide' and distributed across hundreds of model zones. This provides a reasonable basis of the trip distribution to the proposed residential development.

5.1.2 The following model plots illustrate the modelled trips to and from the six zones representing the Whisper Creek subdivision in the AM and PM peak hours. As noted above, the distribution of trips (locations to where trips are coming from and going to) are based on those of the regional model based on demographic inputs. Routing through the transport network for this assessment using the project-version of the CAST model is however undertaken based on the optimal routes between origins and destinations, taking into account simulated delays at intersections.

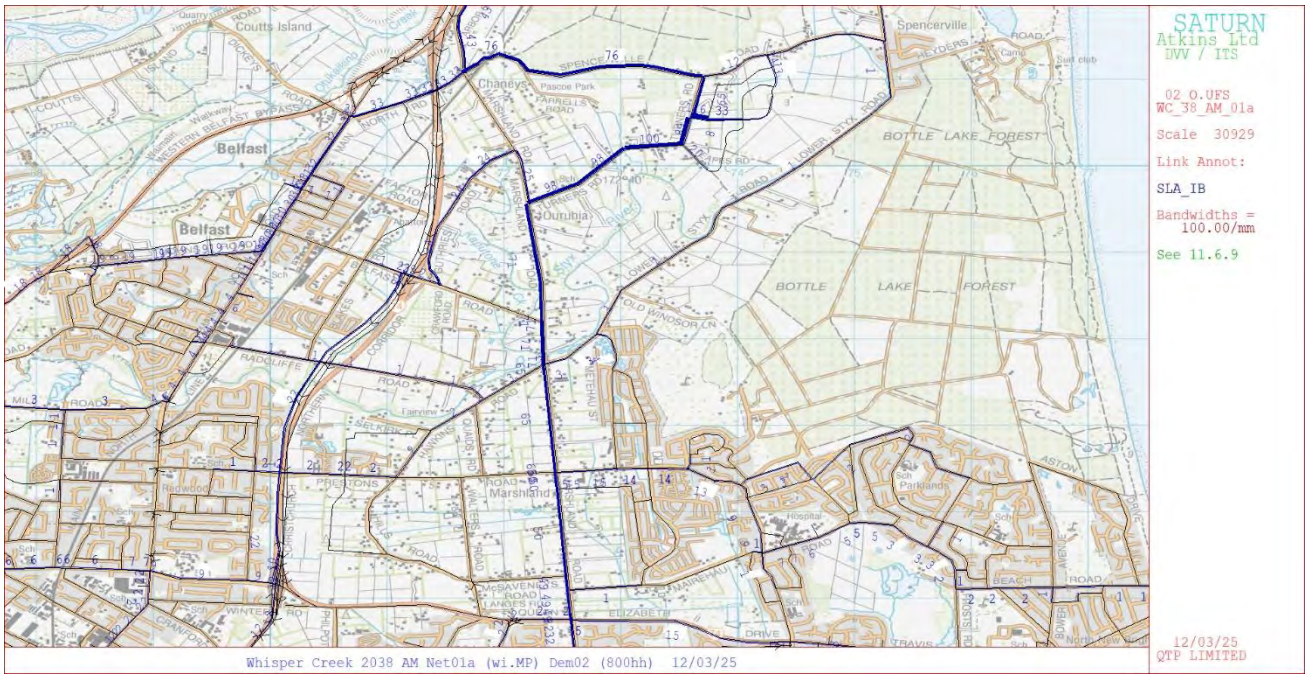


Figure 5.1: Modelled Routing of Inbound Trips <u>To</u> Site, 2038 AM Peak Hour

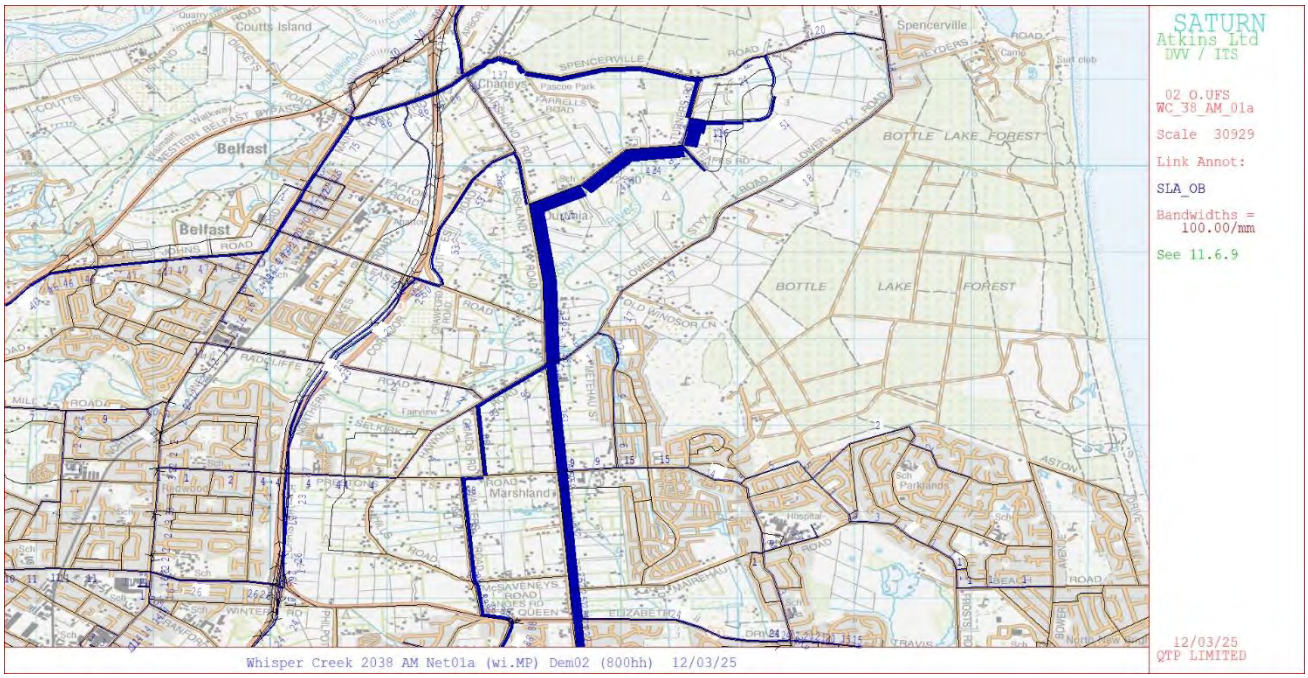


Figure 5.2: Modelled Routing of Outbound Trips From Site, 2038 AM Peak Hour

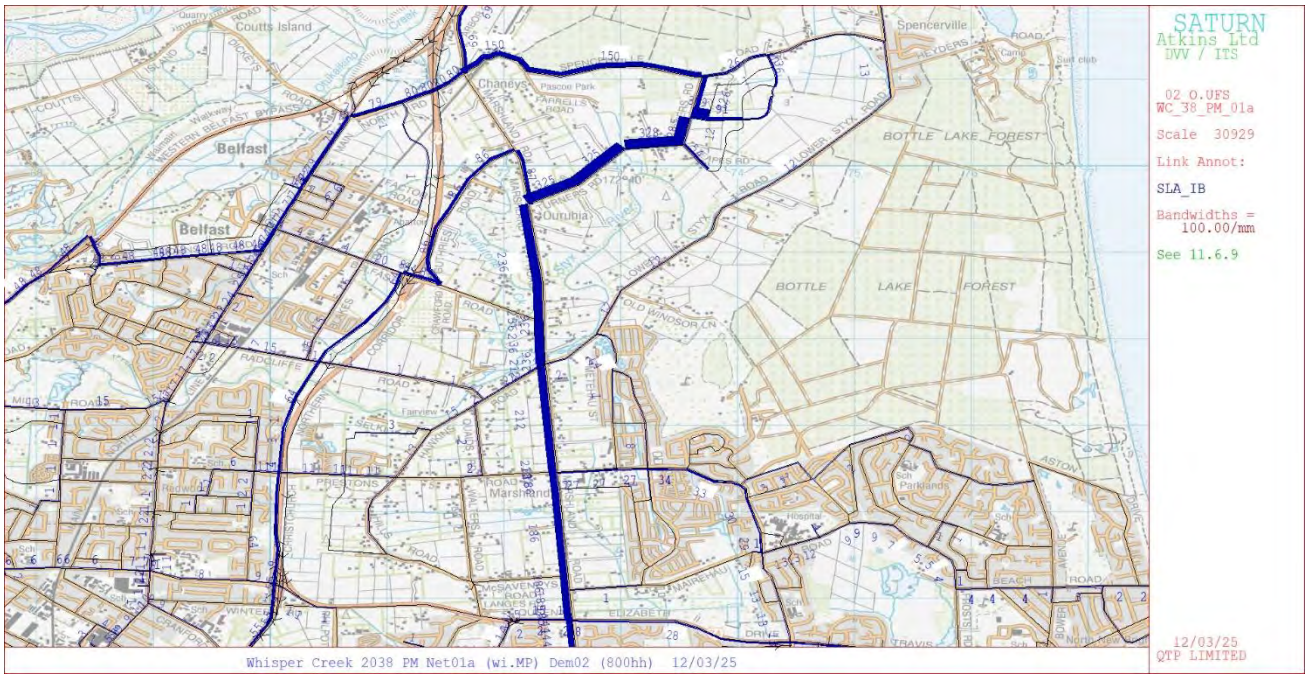


Figure 5.3: Modelled Routing of Inbound Trips To Site, 2038 PM Peak Hour

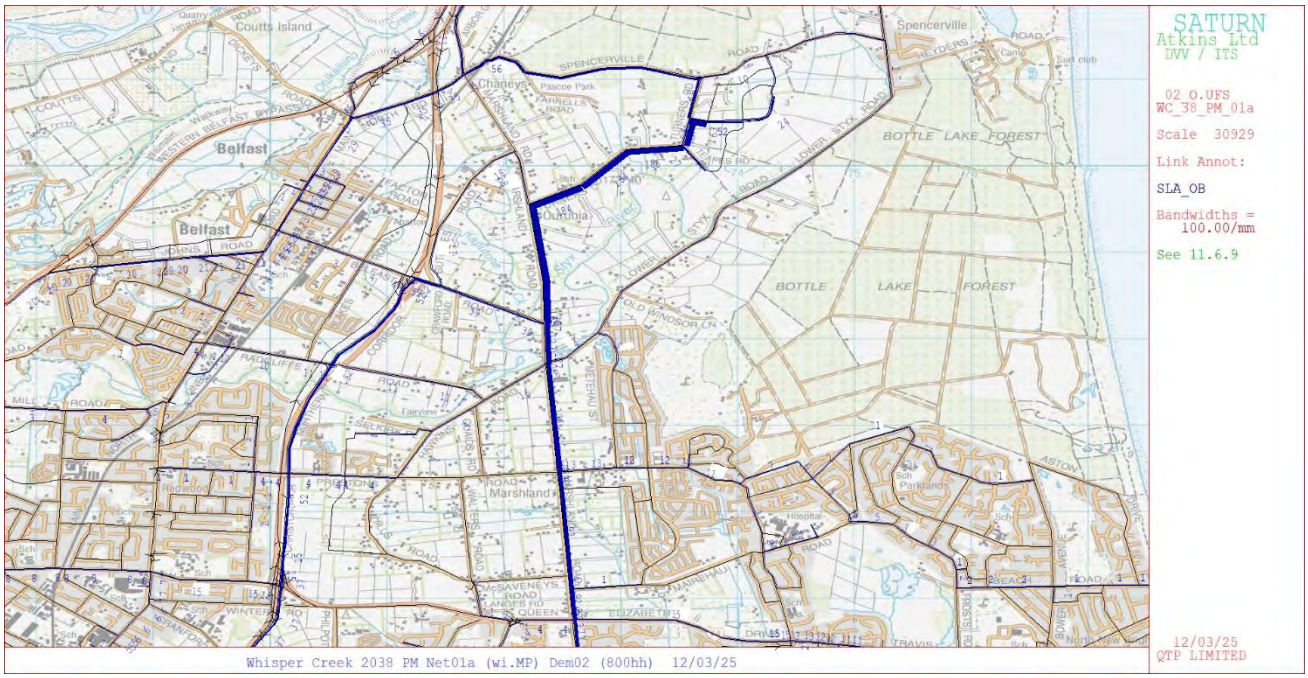


Figure 5.4: Modelled Routing of Outbound Trips From Site, 2038 PM Peak Hour

5.1.3 The following table summarises the above distribution plots local to the site.

Road	AM		PM	
	To	From	To	From
Spencerville Rd W of Turners	42%	23%	30%	23%
Turners W of Teapes	56%	73%	67%	76%
Spencerville Rd E of PPC Area	1%	3%	3%	2%
Main North N of Spencerville	24%	8%	14%	9%
Main North W of Marshland	18%	15%	16%	14%
Guthries S of Marshland	13%	9%	17%	7%
Hawkins W of Marshland	2%	16%	4%	7%
Prestons E of Te Korari	8%	3%	7%	5%
QEII Drv E of Marshland	8%	4%	6%	6%
QEII Drv W of Marshland	0%	0%	3%	2%
Marshland S of QEII Drv	18%	39%	29%	30%

Table 5.1: Trip Distribution for 800hh Scenario

5.1.4 Note that the first three rows of the above table reflect the distribution of trips within the immediate vicinity of the site and therefore sum to approximately 100% of the directional total trip generation. The remainder of the table indicates the trip proportions at locations further from the site. These sum to less than 100% due to a relatively small number of short trips occurring to/from the PPC area within these 'extents'.

5.1.5 As might be anticipated, in both periods and directions, the largest proportion of trips route via Turners Road to the West of the site. This is around 70% of all trips in the principal direction of travel, being from the site in the AM peak hour and to the site in the PM peak hour. As can be seen from the plots, Spencerville Road provides a secondary function in providing access to relatively few trips between the site and northern Christchurch and Waimakariri District. Around 1/3 of trips in the peak direction of travel are to/from locations

served by Marshland Road south of QEII Drive.

5.1.6 Overall, the modelled trip distribution appears reasonable.

5.1.7 For the sake of brevity, trip distribution information has not been summarised for the Golf Resort scenario, but such information is available on request.

6 PPC Residential Development Scenario (800hh) Modelling Results

6.1 Overview

6.1.1 This chapter provides model outputs illustrating the modelled network performance for the PPC scenario, with 800hh assumed in place for the assessment year of 2038. In addition to presenting the modelled flows and delays on the network, the effects of the PPC (changes to flows and delays) are presented relative to both the base (no development) and permitted zoning (Golf Resort) scenarios.

6.1.2 The supplied subdivision plan has been used to code the key roads serving the PPC area within the project model, as illustrated in the following model plot, with the resulting model network overlaid on the subdivision plan.

Figure 6.1: The PPC Modelled Network Overlaid on the Subdivision Plan

6.2 Modelled Peak Hour Traffic Flows

6.2.1 The following diagrams illustrate the modelled peak hour traffic flows (in vehicles per hour) on the local road network in 2038 with the proposed plan change for residential development comprising 800 households.

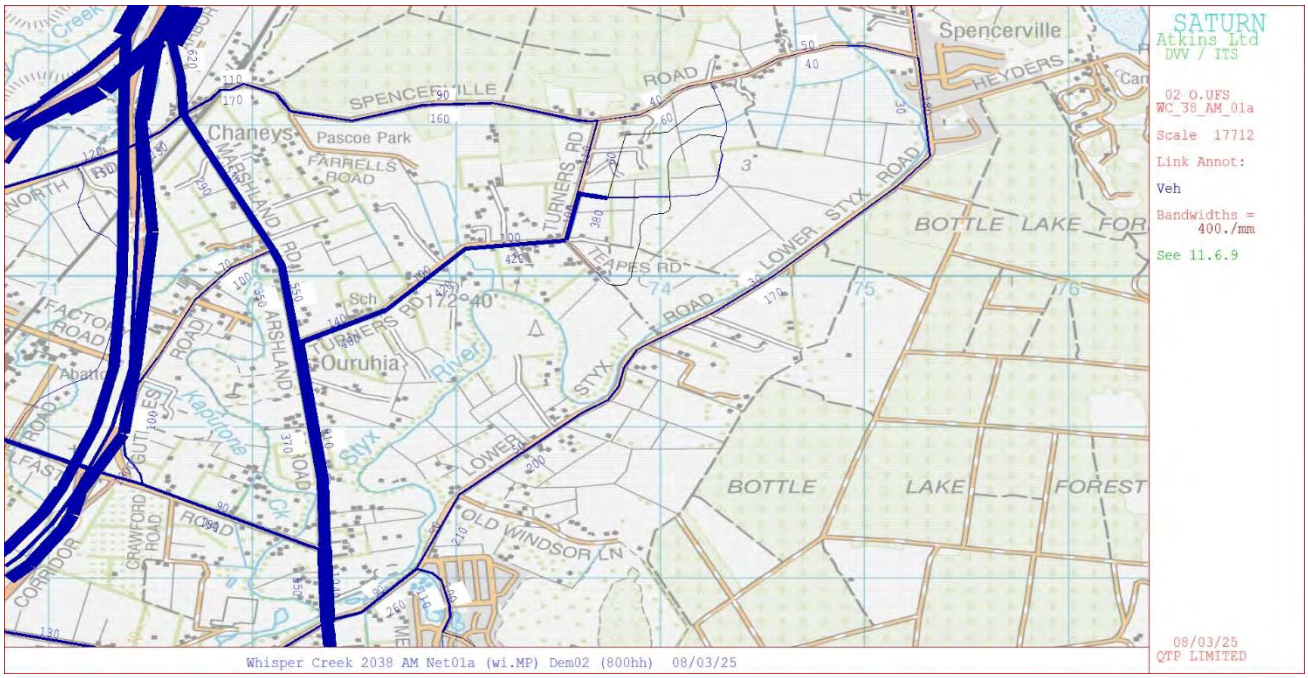


Figure 6.2: Modelled Flows, With PPC for 800hh, 2038 AM Peak Hour

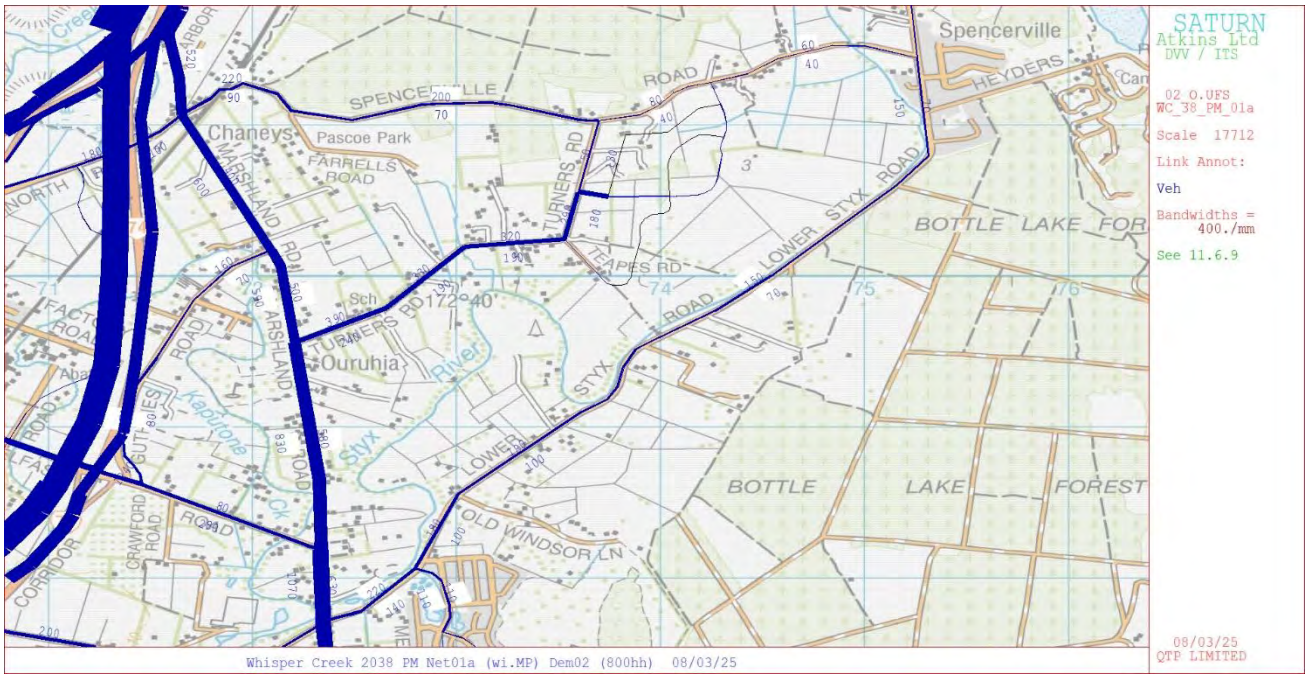


Figure 6.3: Modelled Flows, With PPC for 800hh, 2038 PM Peak Hour

6.3 Traffic Flow Changes

6.3.1 The following model plots illustrate the changes in modelled traffic volumes due to the PPC to accommodate 800hh. The changes are presented first relative to the base 2038 scenario with no development of the PC area and secondly relative to the scenario with the Golf Resort per the current district plan zoning. Increases are illustrated as red bands and reductions in green, with the width of the bands proportional to the annotated change in flow (to the nearest 10 vph). For clarity, only changes greater than 10 vph are illustrated.

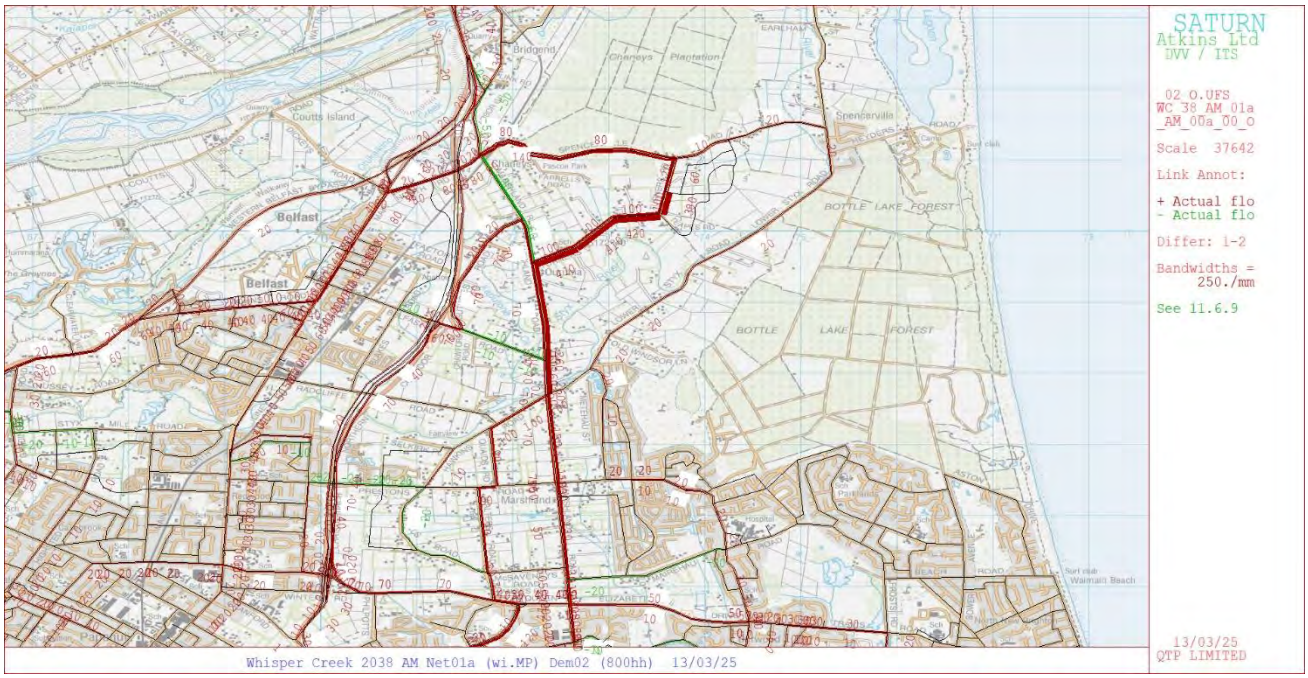


Figure 6.4: Modelled Changes in Traffic Flows With PPC (800hh) vs No Development in PC Area, 2038 AM Peak Hour

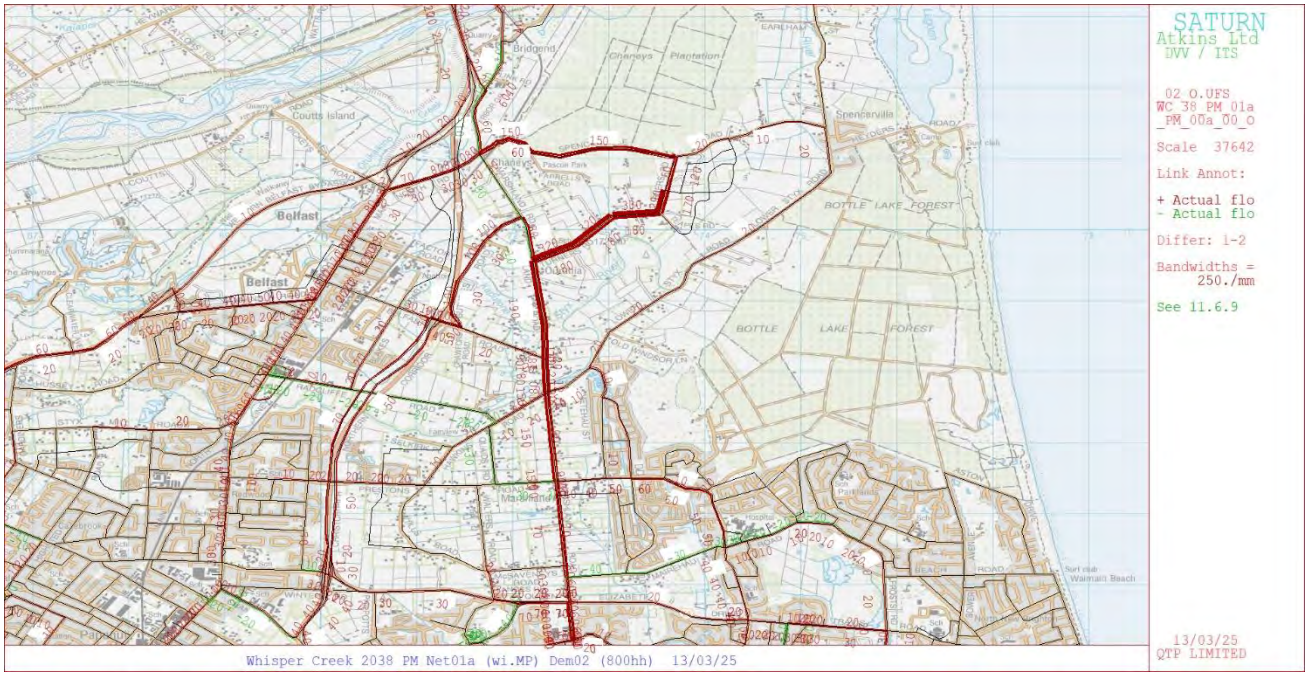


Figure 6.5: Modelled Changes in Traffic Flows With PPC (800hh) vs No Development in PC Area, 2038 PM Peak Hour

6.3.2 The following points are noted:

- The largest change in flows occurs on Turners Road, being around 500 vph two-way in both the AM and PM peak hours
- Traffic increases on Marshland Road vary from a little over +300 vph immediately south of Turners Road, down to around +100 vph two-way south of QEII Drive
- Note a few locations of relatively small modelled flow reductions (in green) due to the PPC. This typically happens where non-development through-traffic is displaced from a

corridor (e.g. Marshland Road) due to increases in travel time downstream due to the presence of development traffic. This occurs on Marshland Road north of Turners Road (-60 vph in the AM peak hour). Such trips re-assign in the model to more optimal alternative routes such as the Northern Corridor or Main North Road, as would occur in practice where motorists are faced with increasing travel times on a particular corridor.

6.3.3 The following model plots illustrate the change in modelled traffic volumes due to the PPC to accommodate 800hh relative to the scenario with the Golf Resort per the current district plan zoning.

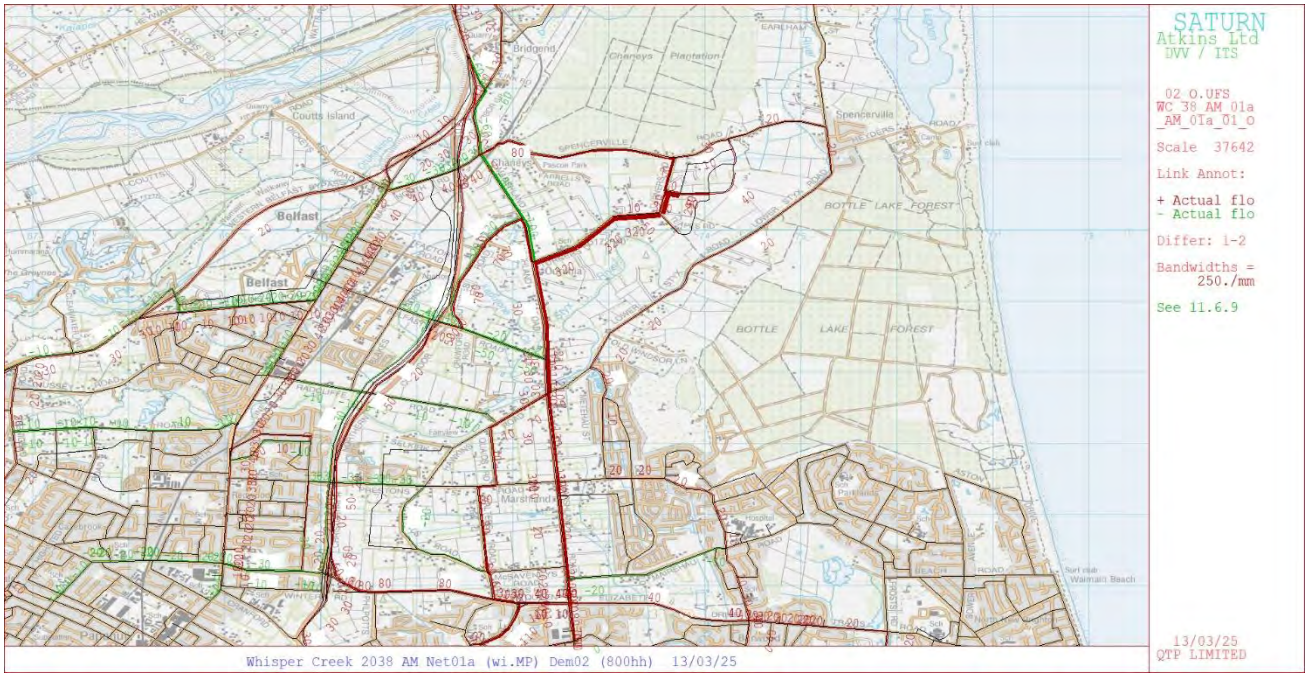


Figure 6.6: Modelled Changes in Traffic Flows With PPC (800hh) vs Golf Resort in PC Area, 2038 AM Peak Hour

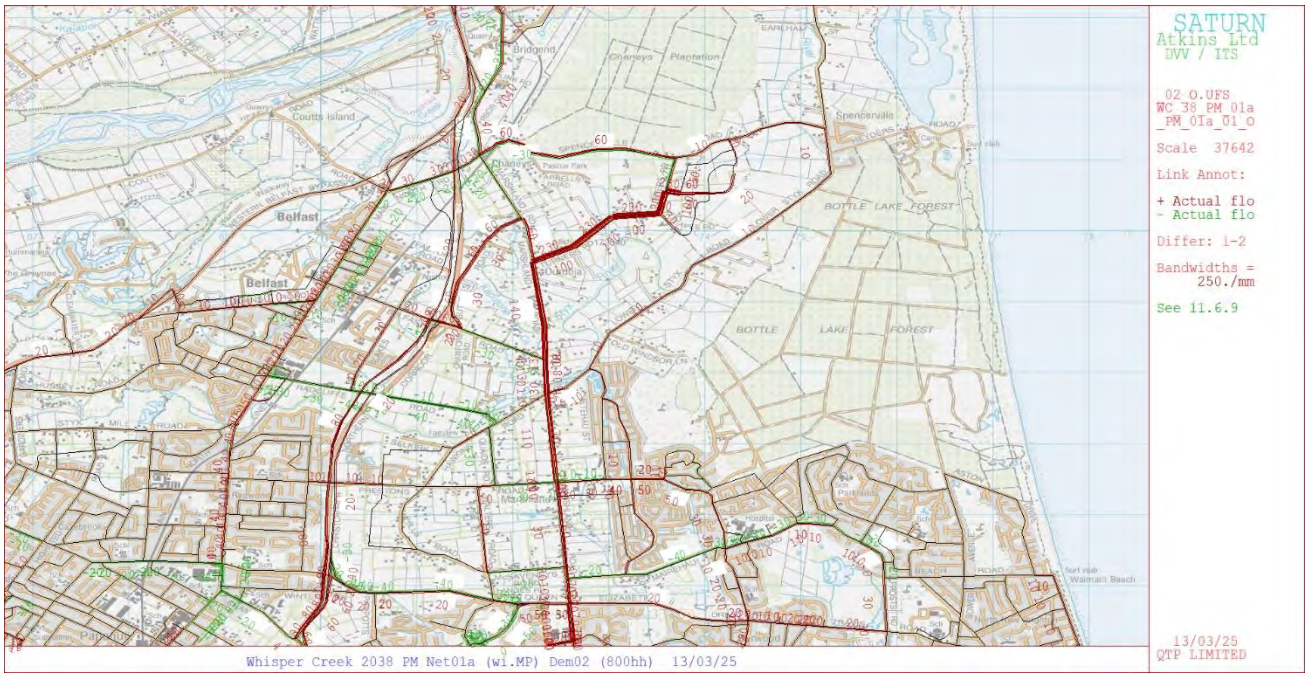


Figure 6.7: Modelled Changes in Traffic Flows With PPC (800hh) vs Golf Resort in PC Area, 2038 PM Peak Hour

6.3.4 As would be expected, the modelled network flow changes vs the Golf Resort scenario are generally less than vs the No Development scenario:

- The largest change in flows occurs on Turners Road, being around +330 vph two-way in both the AM and PM peak hours
- Traffic increases on Marshland Road vary from around +230 vph immediately south of Turners Road, down to around +100 vph tww-way south of QEII Drive.

6.4 Modelled Approach Delays

6.4.1 The following plots illustrate the modelled delays around the network at an intersection approach level, first on the network local to the PPC site and second on the wider network.

Figure 6.8: Modelled Average Link Delays, with PPC (800hh), Local Network, 2038 AM Peak Hour

Figure 6.9: Modelled Average Link Delays, with PPC (800hh), Local Network, 2038 PM Peak Hour

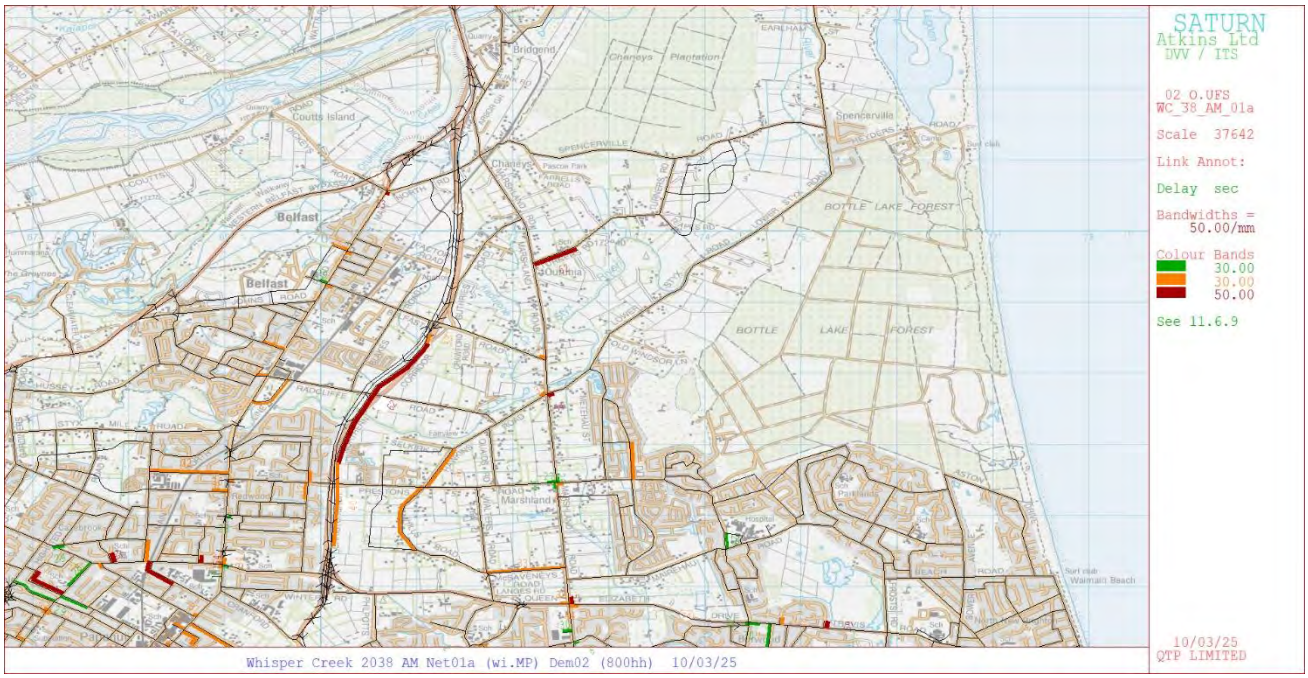


Figure 6.10: Modelled Average Link Delays, with PPC (800hh), Wider Network, 2038 AM Peak Hour

Figure 6.11: Modelled Average Link Delays, with PPC (800hh), Wider Network, 2038 PM Peak Hour

6.4.2 Within the immediate vicinity of the site, the notable delay occurs in the morning peak on the Turners Road approach Marshland Road, being just over one minute (CAST LoS E).

6.4.3 On the wider network, a few other locations are indicated to be operating with a poor LoS (Los E or F with delays of around 1 minute or more), including on the Southern Corridor southbound from Belfast Road in the AM peak.

6.4.4 The above illustrated modelled link delays are most useful when considered together with the relative **changes** in delays due to the proposed development (presented next). In this way, locations of material changes can be considered in the context of the level of delay forecast.

6.5 Modelled Delay Changes vs No Development at PC Area

6.5.1 The following plots illustrate the modelled **changes** in approach delays due to the proposed residential development at Whisper Creek, compared to a scenario with no new development at the PPC area.

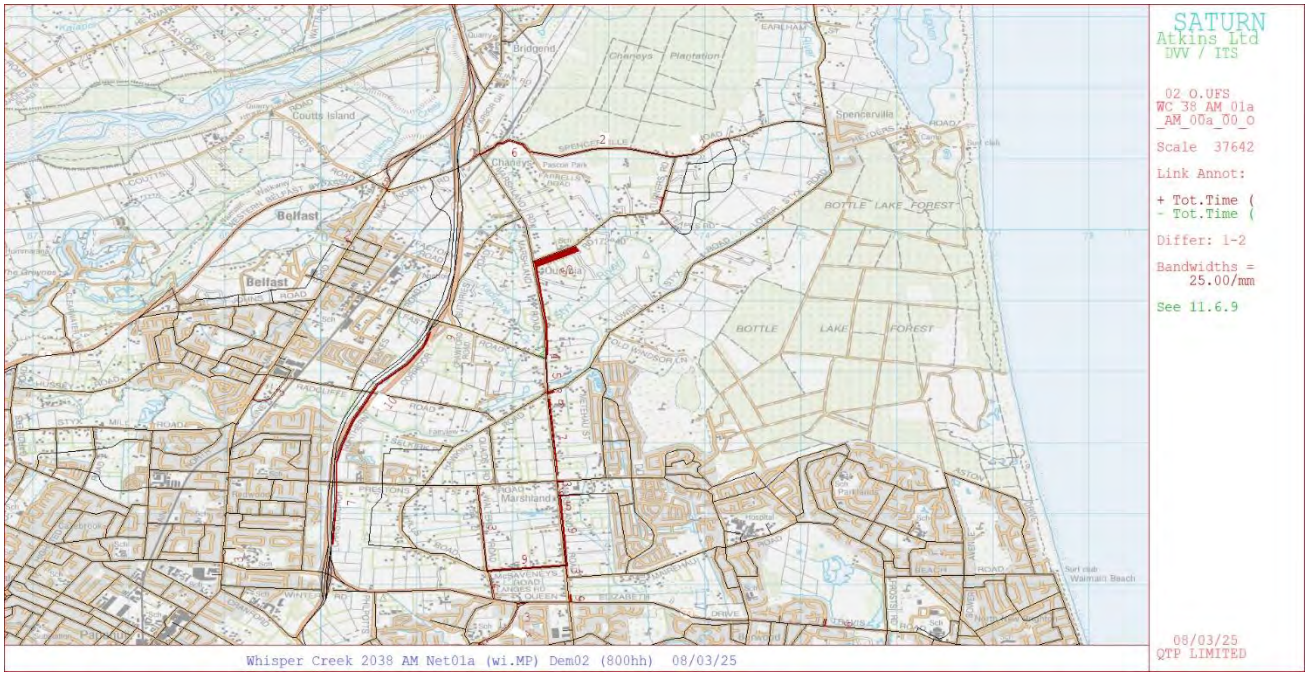


Figure 6.12: Modelled Changes in Link Delays With PPC (800hh) vs No Development in PC Area, 2038 AM Peak Hour

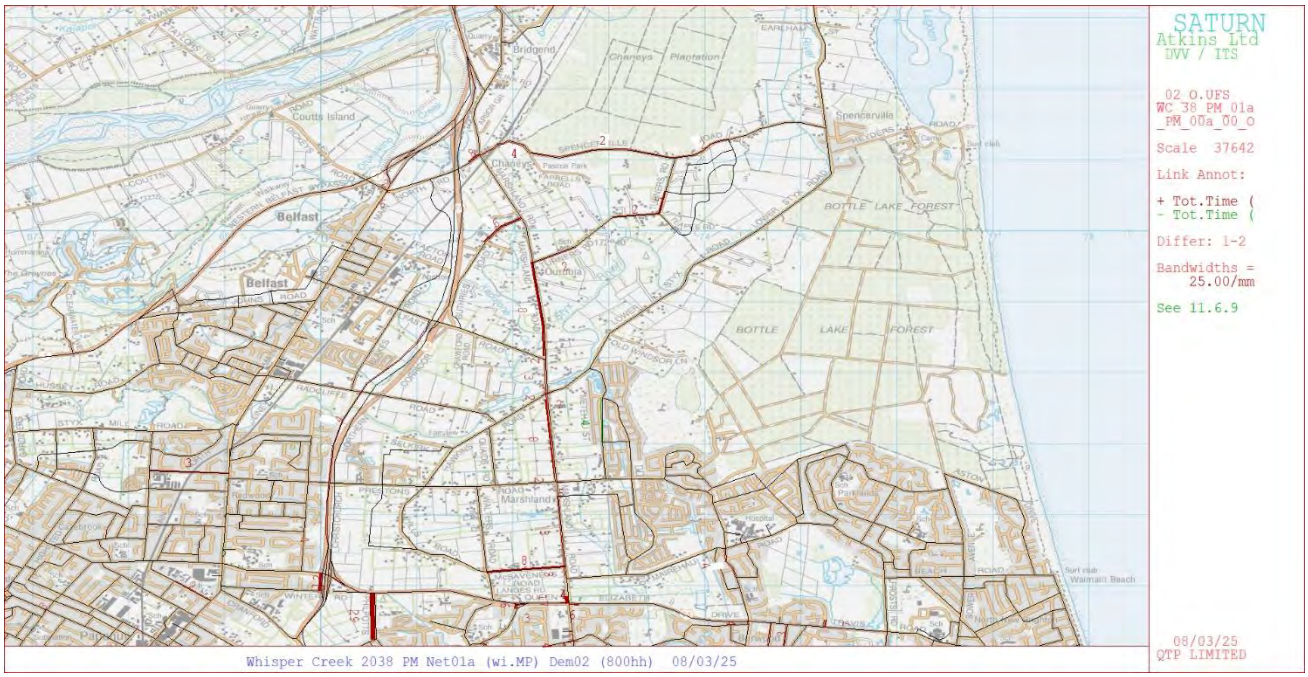


Figure 6.13: Modelled Changes in Link Delays With PPC (800hh) vs No Development in PC Area, 2038 PM Peak Hour

6.5.2 From the above plots of changes in modelled link delays >2s in the peak hours, the following points are noted:

- The single location with the largest change in link delay occurs during the AM peak hour

on the Turners Road approach to Marshland Road, being an increase in average modelled approach delays of just over 50 seconds. Referring back to the delay plot of Figure 6.8, the modelled delay is just over one minute on this give-way (stop) approach to a priority intersection. Delays of this magnitude are considered to introduce a potential safety impact as frustrated drivers from the side-road seek to take smaller gaps in the mainline flows. A cross-check of intersection performance and possible mitigation is provided in the subsequent Chapter.

- On the wider network, modelled delay impacts at any one location are generally modest at around 10s or less. The one illustrated exception is on Philpotts Road on approach to QEII Drive in the PM peak hour, with a delay impact of around 30s illustrated. This potential impact has also been investigated further and is reported in the subsequent section. The conclusion of that investigation is that the traffic volumes are over-estimated in the model and a cross-check using the SIDRA Intersection software indicates minor delay impacts.
- Whilst delay impacts for through-traffic at any one location on Marshland Road are modest at <10s, cumulative impacts due to the presence of the PPC traffic are more significant, adding around 1 minute to modelled travel times southbound in the AM peak between Guthries Road and just south of QEII Drive (from around 8.5 to 9.5 minutes).

6.6 Modelled Delay Changes vs Golf Resort at PC Area

6.6.1 The following plots illustrate the modelled changes in approach delays due to the proposed residential development at Whisper Creek, compared to a scenario with a Golf Resort at the PPC area.

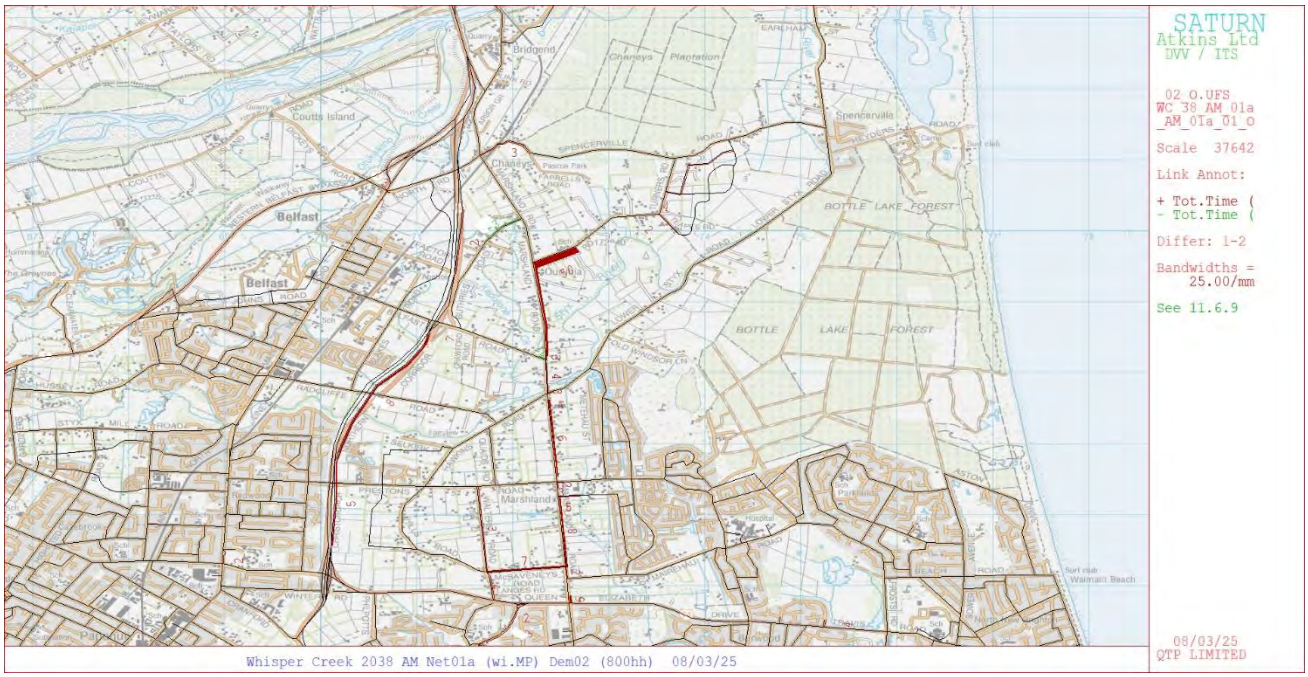


Figure 6.14: Modelled Changes in Link Delays With PPC (800hh) vs Golf Resort in PC Area, 2038 AM Peak Hour

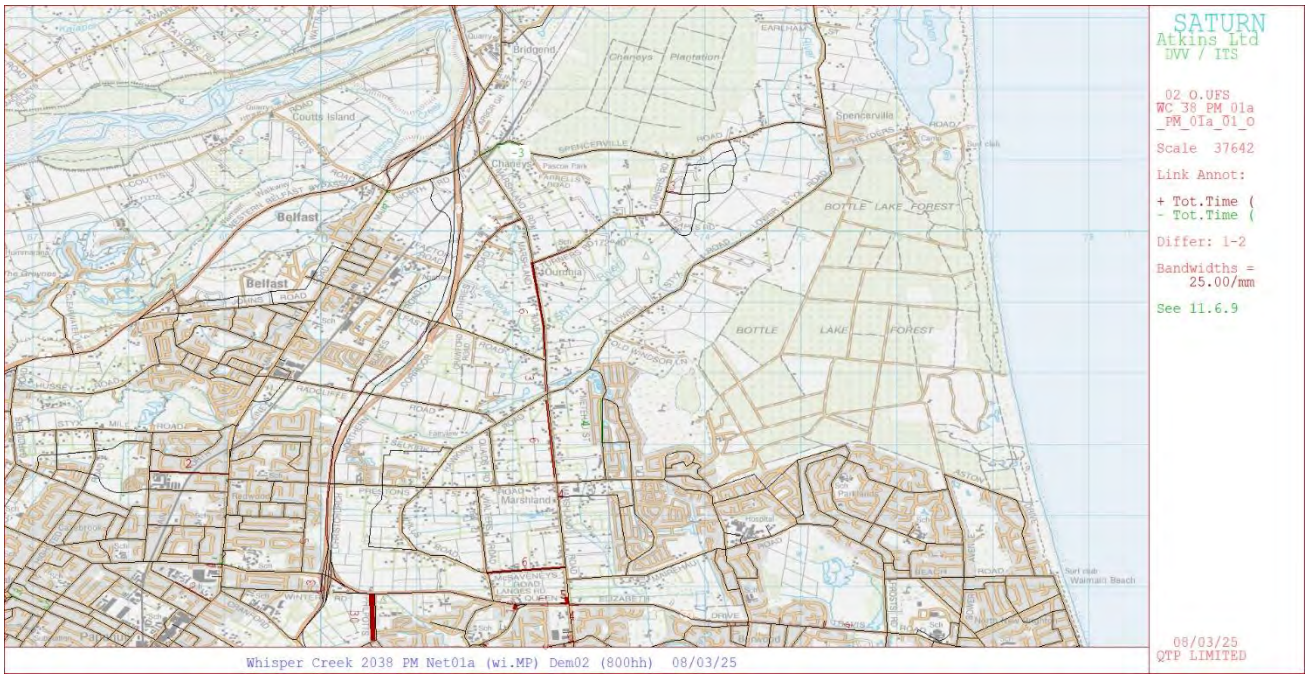


Figure 6.15: Modelled Changes in Link Delays With PPC (800hh) vs Golf Resort in PC Area, 2038 PM Peak Hour

6.6.2 There is only a slight reduction in the key modelled delay impact, occurring on the Turners Road approach to Marshland Road, assuming a Golf Resort in the PPC area as opposed to no development. The morning peak delay impact reduces from 52s to 50s. Cumulative Marshland Road corridor impacts (Guthries Road to QEII Drive) remain similar at 56s relative to the Golf Resort scenario, vs 61s relative to the No Development scenario.

7 SIDRA Intersection Modelling Cross-Check

7.1 Overview

7.1.1 The CAST model is an Assignment and Simulation model that assigns inter-zonal travel demands to the traffic network on optimal routes based on simulated operation, in an iterative manner. This allows realistic assessment of the network effects of development because development traffic is assigned to optimal routes and through-traffic on the wider traffic network is able to re-route to optimal routes with the development traffic in place on the network.

7.1.2 CAST includes relatively detailed intersection simulation modelling for a wide-area model (covering Greater Christchurch). The SATURN software simulates intersection interactional effects such as queues of traffic blocking between intersections, the effects of signals on varying traffic arrival profiles, gaps and queues throughout the cycle time, platoon dispersal and network capacity constraints.

7.1.3 The industry standard SIDRA Intersection software can however be useful as a cross-check of the likely operation of an intersection for a given set of traffic flows. It is also useful as a design tool to more rapidly assess the effects of alternative intersection configurations.

7.2 Marshland Road / Turners Road

7.2.1 The following diagram illustrates the existing layout of the Marshland Road / Turners Road stop-controlled T-intersection assumed within SIDRA Intersection.

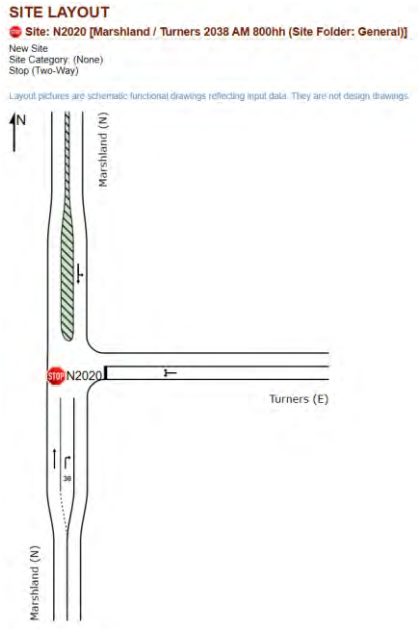


Figure 7.1: SIDRA Site Layout, Marshland Road / Turners Road, Existing Configuration

7.2.2 The following tabulation summarises the modelled intersection performance based on the traffic volumes from the CAST network modelling for the PPC scenario (800hh).

MOVEMENT SUMMARY

Site: N2020 [Marshland / Turners 2038 AM 800hh (Site Folder: General)]

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 [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Marshland (N)															
2	T1	All MCs	286	6.9	286	6.9	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	102	6.2	102	6.2	0.119	8.7	LOS A	0.5	3.5	0.58	0.78	0.58	50.1
Approach			391	6.7	391	6.7	0.155	2.3	NA	0.5	3.5	0.15	0.20	0.15	57.0
East: Turners (E)															
4	L2	All MCs	427	2.2	427	2.2	0.934	34.6	LOS D	16.0	114.8	0.95	2.01	4.04	36.7
6	R2	All MCs	76	4.2	76	4.2	0.934	57.1	LOS F	16.0	114.8	0.95	2.01	4.04	36.6
Approach			503	2.5	503	2.5	0.934	38.0	LOS E	16.0	114.8	0.95	2.01	4.04	36.7
North: Marshland (N)															
7	L2	All MCs	51	12.5	51	12.5	0.326	5.8	LOS A	0.0	0.0	0.00	0.05	0.00	56.3
8	T1	All MCs	533	12.8	533	12.8	0.326	0.1	LOS A	0.0	0.0	0.00	0.05	0.00	59.3
Approach			583	12.8	583	12.8	0.326	0.6	NA	0.0	0.0	0.00	0.05	0.00	59.0
All Vehicles			1477	7.7	1477	7.7	0.934	13.8	NA	16.0	114.8	0.36	0.76	1.42	48.5

Figure 7.2: SIDRA Movement Summary, Marshland Road / Turners Road, With PPC, 2038 AM Peak Hour

7.2.3 Fundamentally, SIDRA indicates similar performance issues as the CAST project model, indicating the Turners Road approach to be nearing capacity (93% saturated in SIDRA vs 100% in CAST) with delays close to a minute for the right-turners (LoS F) and a 95%ile queue of 16 vehicles.

7.2.4 The following diagram illustrates a potential mitigation scheme to provide localised widening on the Turners Road approach to provide separate left and right-turning lanes for a 30m length back from the stop line (noting the presence of a driveway access to the Ouruhia Nursery (plants), from around 43m back from the stop-line)

7.2.5 Figure 7.11: SIDRA Site Layout, Marshland Road / Turners Road, Existing Configuration

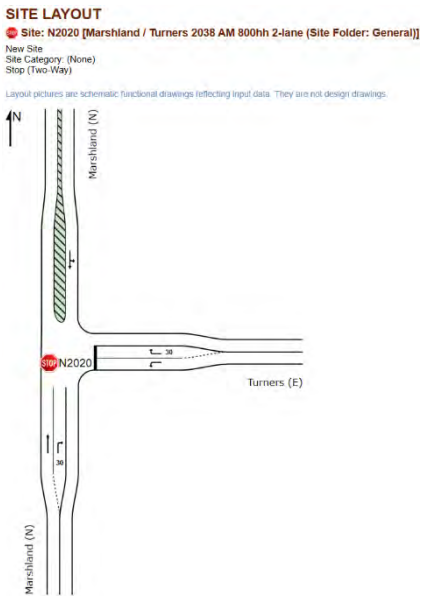


Figure 7.3: SIDRA Site Layout, Marshland Road / Turners Road, Localised Widening on Turners Road Approach

7.2.6 The following tabulation summarises the modelled intersection performance based on the traffic volumes from the same CAST network modelling for the PPC scenario (800hh).

MOVEMENT SUMMARY

Site: N2020 [Marshland / Turners 2038 AM 800hh 2-lane (Site Folder: General)]

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 [Total	HV]	Arrival Flows [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue [Veh.	Dist]	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South: Marshland (N)															
2	T1	All MCs	288	6.9	288	6.9	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	102	6.2	102	6.2	0.119	8.7	LOS A	0.5	3.5	0.58	0.77	0.58	50.2
Approach			391	6.7	391	6.7	0.155	2.3	NA	0.5	3.5	0.15	0.20	0.15	57.0
East: Turners (E)															
4	L2	All MCs	427	2.2	427	2.2	0.587	15.0	LOS C	4.2	30.1	0.71	1.16	1.21	47.4
6	R2	All MCs	76	4.2	76	4.2	0.347	27.6	LOS D	1.3	9.4	0.85	1.05	1.05	40.7
Approach			503	2.5	503	2.5	0.587	16.9	LOS C	4.2	30.1	0.73	1.14	1.18	46.2
North: Marshland (N)															
7	L2	All MCs	51	12.5	51	12.5	0.326	5.8	LOS A	0.0	0.0	0.00	0.05	0.00	56.3
8	T1	All MCs	533	12.8	533	12.8	0.326	0.1	LOS A	0.0	0.0	0.00	0.05	0.00	59.3
Approach			583	12.8	583	12.8	0.326	0.6	NA	0.0	0.0	0.00	0.05	0.00	59.0
All Vehicles			1477	7.7	1477	7.7	0.587	6.6	NA	4.2	30.1	0.29	0.46	0.44	53.5

Figure 7.4: SIDRA Movement Summary, Marshland Road / Turners Road, With PPC, 2038 AM Peak Hour

7.2.7 The above table indicates that the widened Turners Road approach would operate well within capacity (59% saturated) with queues for the critical right-turn reduced from 57s to 28s (LoS F to LoS D) and a reduction in 95%ile queue from 16 to 4 vehicles.

7.2.8 As such, it would appear that the described improvement scheme would provide adequate performance for the level of traffic attributed to the PPC.

7.3 Philpotts Road / QEII Drive

7.3.1 The CAST 2021 base model flows for Philpotts Drive have been checked against those of the CCC count site at this location (L4580). Counts exist for 2022 and 2024. The highest PM peak weekday counts are 185 and 206 respectively. This compares to a 2021 CAST model flow of 311 vph. Thus it appears that CAST is over-estimating demands for this road.

7.3.2 The CAST 2038 base model flow is 423 vph, an increase of 112 vph from the 2021 model. This growth has been applied to the 2024 count (206) to yield a revised 2038 assessment no-development flow of 318 vph. The CAST PPC volume on this approach is just 6vph higher than the no-development scenario, providing a revised flow of 324 vph. Flows for the SIDRA analysis on QEII Drive have been based directly on those from the CAST project model scenarios for the no-development and PPC (800hh) scenarios.

7.3.3 The following tabulations summarise the SIDRA modelling of the no-development and PPC (800hh) scenarios.

MOVEMENT SUMMARY

Site: 101 [Philpotts / QEII 2038 PM Base - Philpotts Count+Grwth (Site Folder: General)]

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 [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Philpotts Road															
1	L2	All MCs	335	0.0	335	0.0	0.768	24.9	LOS C	5.1	35.6	0.92	1.37	2.09	37.3
Approach			335	0.0	335	0.0	0.768	24.9	LOS C	5.1	35.6	0.92	1.37	2.09	37.3
East: QEII Drive															
4	L2	All MCs	12	0.0	12	0.0	0.006	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	46.0
5	T1	All MCs	1955	0.0	1955	0.0	0.501	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	49.7
Approach			1966	0.0	1966	0.0	0.501	0.3	NA	0.0	0.0	0.00	0.00	0.00	49.7
All Vehicles			2301	0.0	2301	0.0	0.768	3.9	NA	5.1	35.6	0.13	0.20	0.30	47.4

MOVEMENT SUMMARY

Site: 101 [Philpotts / QEII 2038 PM 800hh - Philpotts Count+Grwth (Site Folder: General)]

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 [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Philpotts Road															
1	L2	All MCs	341	0.0	341	0.0	0.791	26.2	LOS D	5.5	38.4	0.93	1.41	2.23	36.8
Approach			341	0.0	341	0.0	0.791	26.2	LOS D	5.5	38.4	0.93	1.41	2.23	36.8
East: QEII Drive															
4	L2	All MCs	12	0.0	12	0.0	0.006	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	46.0
5	T1	All MCs	1966	0.0	1966	0.0	0.504	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	49.7
Approach			1978	0.0	1978	0.0	0.504	0.3	NA	0.0	0.0	0.00	0.00	0.00	49.6
All Vehicles			2319	0.0	2319	0.0	0.791	4.1	NA	5.5	38.4	0.14	0.21	0.33	47.2

Figure 7.5: SIDRA Movement Summary, Philpotts Road / QEII Drive, No Development (Above) and With PPC (Below), 2038 PM Peak Hour

7.3.4 The above tabulations suggest that:

a. The intersection should operate within capacity with the PPC in place (79% saturated)
b. That the effects of the PPC are minor, serving to increase delays on the Philpotts Road approach by around just 1 second, from 25 to 26 seconds.

8 Modelling Results Summary

8.1 The following points summarise the scenarios modelled and indicated network operation and effects:

a. The 2038 ‘no development’ scenario assumes no new development at the PPC site, per the generic CAST model. Modelling suggests no significant capacity issues on the road network in the vicinity of the site

b. The 2038 ‘with PPC’ scenario assumes 800hh per the subdivision plan and traffic generation assumptions supplied by Novo Group. Both CAST network modelling and a cross-check in the SIDRA Intersection software indicate capacity issues on the Turners Road approach to the Marshland Road intersection during the AM peak with delays of around 1 minute. SIDRA Intersection modelling indicates that localised widening to provide separate left and right turn lanes for a length of around 30m on approach to the intersection should provide satisfactory performance with the highest modelled delays occurring for the right-turn out movement reducing to less than 30s.

c. Wider network delay impacts (with PPC vs no development scenarios) are considered modest, with no delay impacts greater than around 10s at any one location. Cumulative impacts are noted on the Marshland Road corridor southbound in the AM peak hour between Guthries Road and south of QEII Drive of around 1 minute, increasing the total travel time for through-traffic from around 8.5 to 9.5 minutes.

d. A baseline scenario including a Golf Resort consistent with the District Plan has also been modelled, again with traffic generation assumptions supplied by Novo Group. Comparison instead of the ‘with PPC’ scenario to this baseline scenario has little bearing on the modelling of the relative impacts of the ‘with PPC’ scenario.

Appendix A: Local Area Model vs Count Comparisons

2018 Base Model vs Counts

GEH<	Target
5	80%
7.5	85%
10	90%
12	100%

AM Peak 08:00-09:00	All Veh	GEH<	%
Cnts:	52	5	90%
RMSE:	14%	8	100%
Tot C:	12812	10	100%
Tot M:	12555	12	100%
% Diff:	-2%		
R^2: 0.987		AAE: 9%	

PM Peak 16:30-17:30	All Veh	GEH<	%
Cnts:	52	5	87%
RMSE:	20%	7.5	94%
Tot C:	15135	10	100%
Tot M:	15152	12	100%
% Diff:	0%		
R^2: 0.973		AAE: 11%	

Sequence ID	Row ID	Intersection	Approach	Turn	CAST Node Ref	AM Peak 08:00-09:00				PM Peak 16:30-17:30			
293	293	Spencerville / Marshlands	North	L	6653-1143-2021	22	7	-15	4	18	18	0	0
294	294	Spencerville / Marshlands	North	T	6653-1143-2015	959	938	-21	1	663	726	63	2
295	295	Spencerville / Marshlands	North	R	6653-1143-5146	71	83	12	1	58	78	20	2
296	296	Spencerville / Marshlands	East	L	2021-1143-2015	15	1	-14	5	14	3	-11	4
297	297	Spencerville / Marshlands	East	T	2021-1143-5146	22	46	24	4	10	18	8	2
298	298	Spencerville / Marshlands	East	R	2021-1143-6653	6	5	-1	0	6	9	3	1
299	299	Spencerville / Marshlands	South	L	2015-1143-5146	307	320	13	1	655	645	-10	0
300	300	Spencerville / Marshlands	South	T	2015-1143-6653	231	236	5	0	638	590	-48	2
301	301	Spencerville / Marshlands	South	R	2015-1143-2021	8	0	-8	4	11	6	-5	2
302	302	Spencerville / Marshlands	West	L	5146-1143-6653	50	53	3	0	79	98	19	2
303	303	Spencerville / Marshlands	West	T	5146-1143-2021	3	6	3	1	9	21	12	3
304	304	Spencerville / Marshlands	West	R	5146-1143-2015	4	0	-4	3	8	10	2	1
1247	704	Belfast / Marshlands	North	T	8715-1489-8716	1121	1020	-101	3	747	766	19	1
1248	705	Belfast / Marshlands	North	R	8715-1489-8717	20	1	-20	6	23	22	-1	0
1249	706	Belfast / Marshlands	South	L	8716-1489-8717	58	76	18	2	38	28	-10	2
1250	707	Belfast / Marshlands	South	T	8716-1489-8715	580	572	-8	0	1354	1291	-63	2
1251	708	Belfast / Marshlands	West	L	8717-1489-8715	27	1	-26	7	64	22	-42	6
1252	709	Belfast / Marshlands	West	R	8717-1489-8716	27	19	-8	2	26	29	3	1
704	710	Lower Styx / Marshlands	North	L	8718-1333-8719	68	120	52	5	31	54	23	4
705	711	Lower Styx / Marshlands	North	T	8718-1333-8720	1031	919	-112	4	644	741	97	4
706	712	Lower Styx / Marshlands	East	L	8719-1333-8720	183	146	-37	3	122	121	-1	0
707	713	Lower Styx / Marshlands	East	T	8719-1333-8721	29	34	5	1	5	2	-3	1
708	714	Lower Styx / Marshlands	East	R	8719-1333-8718	50	46	-4	1	37	26	-11	2
709	715	Lower Styx / Marshlands	South	L	8720-1333-8721	79	81	2	0	34	0	-34	8
710	716	Lower Styx / Marshlands	South	T	8720-1333-8718	562	568	6	0	987	1266	279	8
711	717	Lower Styx / Marshlands	South	R	8720-1333-8719	37	15	-22	4	45	54	9	1
712	718	Lower Styx / Marshlands	West	L	8721-1333-8718	35	35	0	0	57	27	-30	5
713	719	Lower Styx / Marshlands	West	T	8721-1333-8719	2	14	12	4	6	25	19	5
1253	720	Prestons / Marshlands	North	L	8722-1490-8723	134	96	-38	4	166	161	-5	0
1254	721	Prestons / Marshlands	North	T	8722-1490-8724	996	895	-101	3	647	646	-1	0
1255	722	Prestons / Marshlands	North	R	8722-1490-8725	56	76	20	2	47	56	9	1
1256	723	Prestons / Marshlands	East	L	8723-1490-8724	177	161	-16	1	144	74	-70	7
1257	724	Prestons / Marshlands	East	T	8723-1490-8725	246	240	-6	0	212	266	54	4
1258	725	Prestons / Marshlands	East	R	8723-1490-8722	190	219	29	2	368	329	-39	2
1259	1247	Prestons / Marshlands	South	L	8724-1490-8725	72	72	0	0	80	81	1	0
1260	1248	Prestons / Marshlands	South	T	8724-1490-8722	433	445	12	1	1094	994	-100	3
1261	1249	Prestons / Marshlands	South	R	8724-1490-8723	117	117	0	0	130	125	-6	0
1262	1250	Prestons / Marshlands	West	L	8725-1490-8722	14	0	-14	5	33	1	-32	8
1263	1251	Prestons / Marshlands	West	T	8725-1490-8723	198	251	53	4	286	353	67	4
1264	1252	Prestons / Marshlands	West	R	8725-1490-8724	106	102	-4	0	134	143	9	1
714	1253	QEII / Marshlands	North	L	8700-1336-8701	181	217	36	3	221	234	13	1
715	1254	QEII / Marshlands	North	R	8700-1336-8702	544	553	9	0	404	296	-108	6
716	1255	QEII / Marshlands	North	S	8700-1336-5081	883	935	52	2	645	654	9	0
717	1256	QEII / Marshlands	East	L	8701-1336-5081	213	167	-46	3	136	67	-69	7
718	1257	QEII / Marshlands	East	T	8701-1336-8702	766	803	37	1	660	646	-14	1
719	1258	QEII / Marshlands	East	R	8701-1336-8700	129	133	4	0	195	213	18	1
720	1259	QEII / Marshlands	South	L	5081-1336-8702	197	158	-39	3	284	281	-3	0
722	1260	QEII / Marshlands	South	T	5081-1336-8700	457	464	7	0	1102	968	-134	4
721	1261	QEII / Marshlands	South	R	5081-1336-8701	72	53	-19	2	149	145	-4	0
723	1262	QEII / Marshlands	West	L	8702-1336-8700	314	321	7	0	504	592	88	4
724	1263	QEII / Marshlands	West	T	8702-1336-8701	466	481	15	1	796	812	16	1
725	1264	QEII / Marshlands	West	R	8702-1336-5081	244	239	-5	0	309	318	9	1

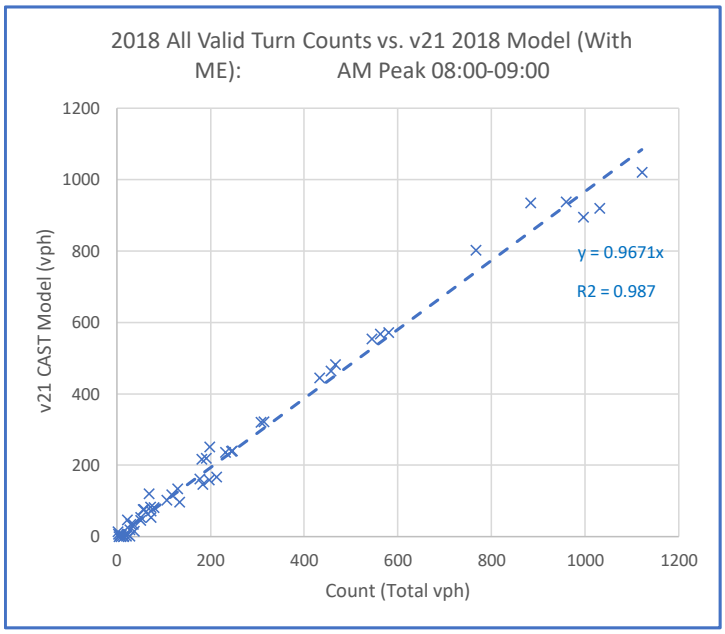
2018 Base Model vs Counts

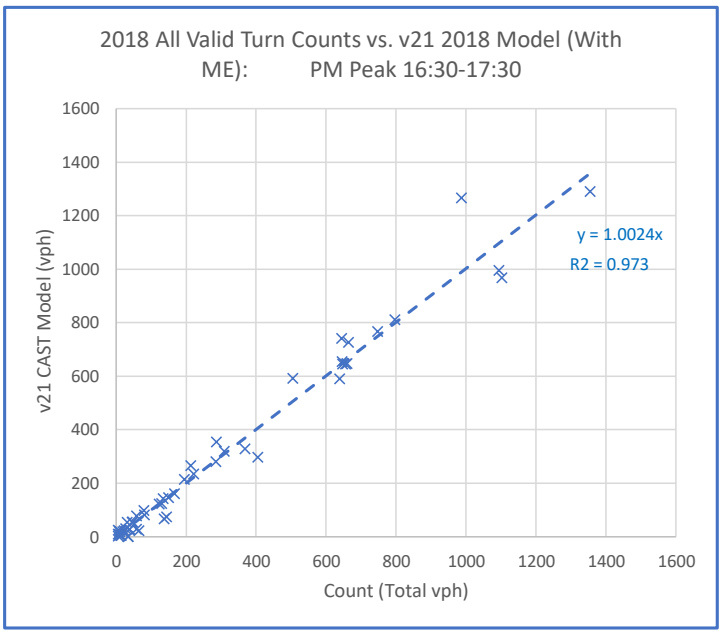
GEH<	Target
5	80%
7.5	85%
10	90%
12	100%

AM Peak 08:00-09:00			
All Veh		GEH<	%
Cnts:	52	5	90%
RMSE:	14%	8	100%
Tot C:	12812	10	100%
Tot M:	12555	12	100%
% Diff:	-2%		
R^2: 0.987		AAE: 9%	

PM Peak 16:30-17:30			
All Veh		GEH<	%
Cnts:	52	5	87%
RMSE:	20%	7.5	94%
Tot C:	15135	10	100%
Tot M:	15152	12	100%
% Diff:	0%		
R^2: 0.973		AAE: 11%	

Sequence ID	Row ID	Intersection	Approach	Turn	CAST Node Ref	AM Peak 08:00-09:00	PM Peak 16:30-17:30





2021 Model vs Counts

GEH<	Target
5	80%
7.5	85%
10	90%
12	100%

AM Peak 08:00-09:00			
All Veh		GEH<	%
Cnts:	58	5	93%
RMSE:	15%	7.5	98%
Tot C:	8438	10	98%
Tot M:	8386	12	100%
% Diff:	-1%		
R^2: 0.983		AAE: 9%	

PM Peak 16:30-17:30			
All Veh		GEH<	%
Cnts:	58	5	93%
RMSE:	10%	7.5	97%
Tot C:	10518	10	97%
Tot M:	10285	12	98%
% Diff:	-2%		
R^2: 0.992		AAE: 6%	

Sequence ID	Row ID	Intersection	Approach	Turn	CAST Node Ref	AM Peak 08:00-09:00				PM Peak 16:30-17:30			
						Cnt	Mod	Diff	GEH	Cnt	Mod	Diff	GEH
1	1	Spencerville / Marshlands	North	Left	6653-1143-2813	16	12	-4	1	16	18	2	0
2	2	29/06/2022		Thru	6653-1143-2015	281	332	51	3	324	342	18	1
3	3			Right	6653-1143-5146	71	64	-7	1	76	73	-3	0
4	4		East	Left	2813-1143-2015	10	9	-1	0	9	11	2	0
5	5			Thru	2813-1143-5146	26	27	1	0	18	23	5	1
6	6			Right	2813-1143-6653	9	9	0	0	4	4	0	0
7	7		South	Left	2015-1143-5146	45	55	10	1	53	61	8	1
8	8			Thru	2015-1143-6653	151	175	24	2	383	374	-9	0
9	9			Right	2015-1143-2813	13	8	-5	1	8	14	6	2
10	10		West	Left	5146-1143-6653	51	51	0	0	70	39	-31	4
11	11			Thru	5146-1143-2813	10	10	0	0	22	23	1	0
12	12			Right	5146-1143-2015	5	5	0	0	13	14	1	0
13	13	Belfast / Marshlands	North	Thru	8715-1489-8716	480	412	-68	3	401	411	10	1
14	14	4/05/2022		Right	8715-1489-8717	46	38	-8	1	26	24	-2	0
15	15		South	Left	8716-1489-8717	111	109	-2	0	97	97	0	0
16	16			Thru	8716-1489-8715	256	257	1	0	450	448	-2	0
17	17		West	Left	8717-1489-8715	18	18	0	0	32	32	0	0
18	18			Right	8717-1489-8716	47	47	0	0	86	81	-5	1
19	19	Lower Styx / Marshlands	North	Left	8718-1333-8719	38	36	-2	0	59	59	0	0
20	20	27/06/2023		Thru	8718-1333-8720	376	411	35	2	411	423	12	1
21	21			Right	8718-1333-8721	13	13	0	0	6	10	4	1
22	22		East	Left	8719-1333-8720	77	80	3	0	24	51	27	4
23	23			Thru	8719-1333-8721	58	70	12	2	20	21	1	0
24	24			Right	8719-1333-8718	58	57	-1	0	41	38	-3	0
25	25		South	Left	8720-1333-8721	62	53	-9	1	69	0	-69	12
26	26			Thru	8720-1333-8718	300	299	-1	0	479	481	2	0
27	27			Right	8720-1333-8719	22	22	0	0	67	68	1	0
28	28		West	Left	8721-1333-8718	9	10	1	0	25	25	0	0
29	29			Thru	8721-1333-8719	22	24	2	0	70	70	0	0
30	30			Right	8721-1333-8720	52	0	-52	10	78	0	-78	12
31	31	Prestons / Marshlands	North	Left	8722-1490-8723	108	105	-3	0	201	205	4	0
32	32	27/06/2023		Thru	8722-1490-8724	378	386	8	0	304	269	-35	2
33	33			Right	8722-1490-8725	16	0	-16	6	13	0	-13	5
34	34		East	Left	8723-1490-8724	194	196	2	0	140	138	-2	0
35	35			Thru	8723-1490-8725	263	282	19	1	216	230	14	1
36	36			Right	8723-1490-8722	152	189	37	3	203	216	13	1
37	37		South	Left	8724-1490-8725	120	85	-35	4	132	131	-1	0
38	38			Thru	8724-1490-8722	226	185	-41	3	374	333	-41	2
39	39			Right	8724-1490-8723	109	108	-1	0	251	238	-13	1
40	40		West	Left	8725-1490-8722	13	0	-13	5	16	0	-16	6
41	41			Thru	8725-1490-8723	148	174	26	2	358	347	-11	1
42	42			Right	8725-1490-8724	93	96	3	0	111	107	-4	0
43	43	Mairehau / Marshlands	North	Left	1872-1154-8795	32	29	-3	1	75	52	-23	3
44	44	19/10/2021		Thru	1872-1154-8700	724	716	-8	0	619	604	-15	1
45	45		East	Left	8795-1154-8700	434	510	76	4	315	317	2	0
46	46			Right	8795-1154-1872	65	44	-21	3	54	45	-9	1
47	47		South	Thru	8700-1154-1872	467	461	-6	0	940	924	-16	1
48	48			Right	8700-1154-8795	301	301	0	0	395	437	42	2
49	49	QEII / Marshlands	North	Left	8700-1336-8701	97	181			169	148		
50	50	7/04/2023		Thru	8700-1336-5081	576	534			461	471		
51	51	Good Friday Public Holiday !		Right	8700-1336-8702	279	511			120	302		
52	52		East	Left	8701-1336-5081	7	**97**			3	59		
53	53			Thru	8701-1336-8702	667	874			859	759		
54	54			Right	8701-1336-8700	-56	141			66	156		
55	55		South	Left	5081-1336-8702	66	333			343	467		
56	56			Thru	5081-1336-8700	225	349			606	775		
57	57			Right	5081-1336-8701	57	59			-23	68		
58	58		West	Left	8702-1336-8700	144	272			325	430		
59	59			Thru	8702-1336-8701	589	476			914	863		
60	60			Right	8702-1336-5081	326	328			57	339		
61	61	L2545 Turners E of Marshland 12/02/24	EB		2020-2814	39	36	-3	0	44	42	-2	0
62	62	L2545 Turners E of Marshland 12/02/24	WB		2814-2020	56	54	-2	0	28	36	8	1
63	63	L5231 Turners S of Spencerville 19/09/18	NB		2811-2021	22	1	-21	6	9	3	-6	3
64	64	L5231 Turners S of Spencerville 19/09/18	SB		2021-2811	12	8	-4	1	10	3	-7	3
65	65	L0384 Spencerville E of Marshland 28/08/23	EB		1143-2813	33	30	-3	0	59	55	-4	1
66	66	L0384 Spencerville E of Marshland 28/08/23	WB		2813-1143	47	45	-1	0	42	38	-4	1
67	67	L5562 Marshland S Spencerville 25/06/21	NB		2015-1143	228	236	8	1	435	445	10	0
68	68	L5562 Marshland S Spencerville 25/06/21	SB		1143-2015	325	342	17	1	361	361	0	0
69	69	L0338 Prestons E of Marshland 4/07/22	EB		1490-8723	376	387	10	1	794	790	-4	0
70	70	L0338 Prestons E of Marshland 4/07/22	WB		8723-1490	724	667	-58	2	583	584	1	0

2021 Model vs Counts

GEH<	Target
5	80%
7.5	85%
10	90%
12	100%

AM Peak 08:00-09:00			
All Veh		GEH<	%
Cnts:	58	5	93%
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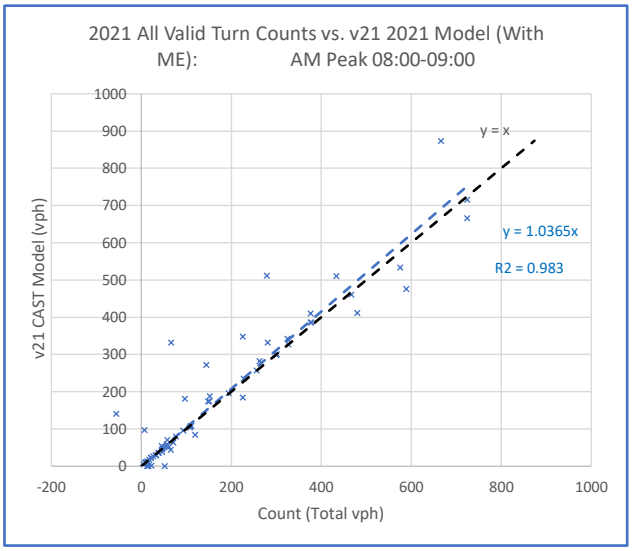
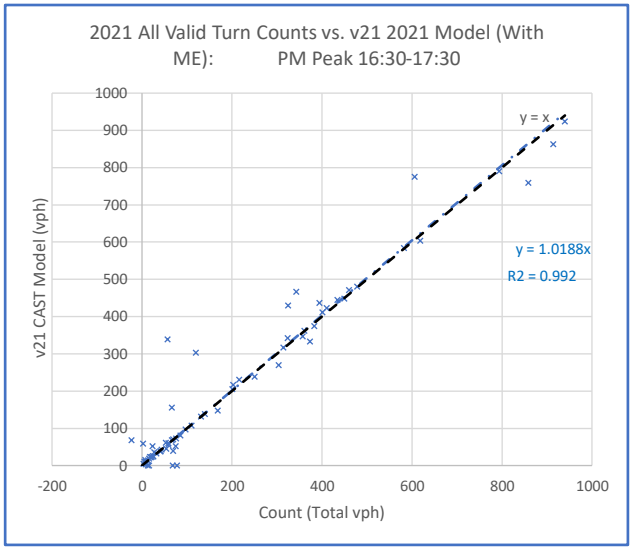
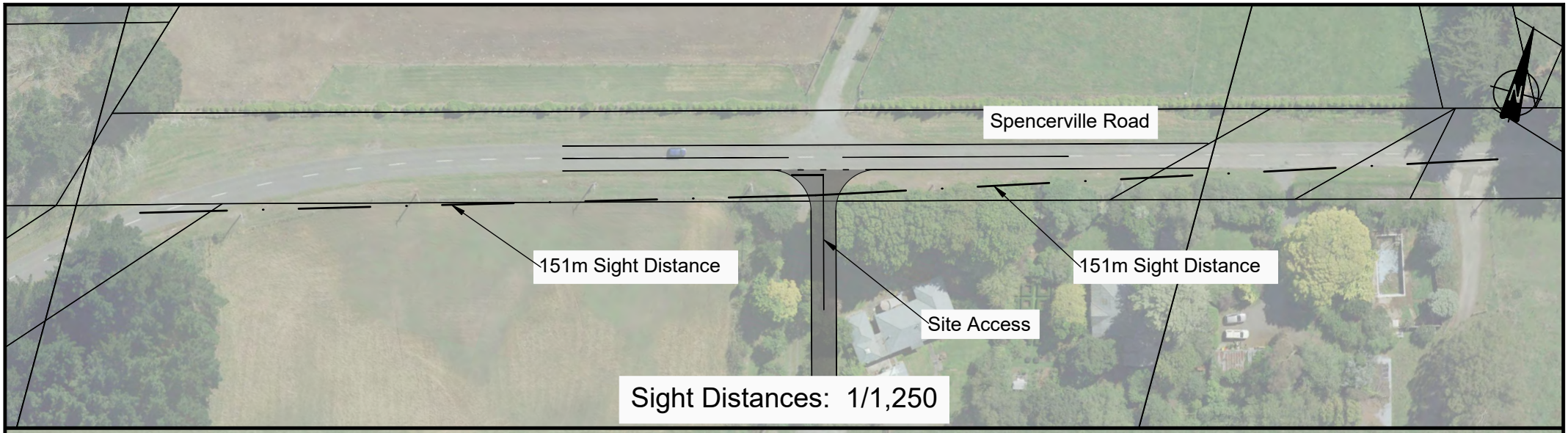
Sequence ID	Row ID	Intersection	Approach	Turn	CAST Node Ref	AM Peak 08:00-09:00				PM Peak 16:30-17:30			
						Cnt	Mod	Diff	GEH	Cnt	Mod	Diff	GEH



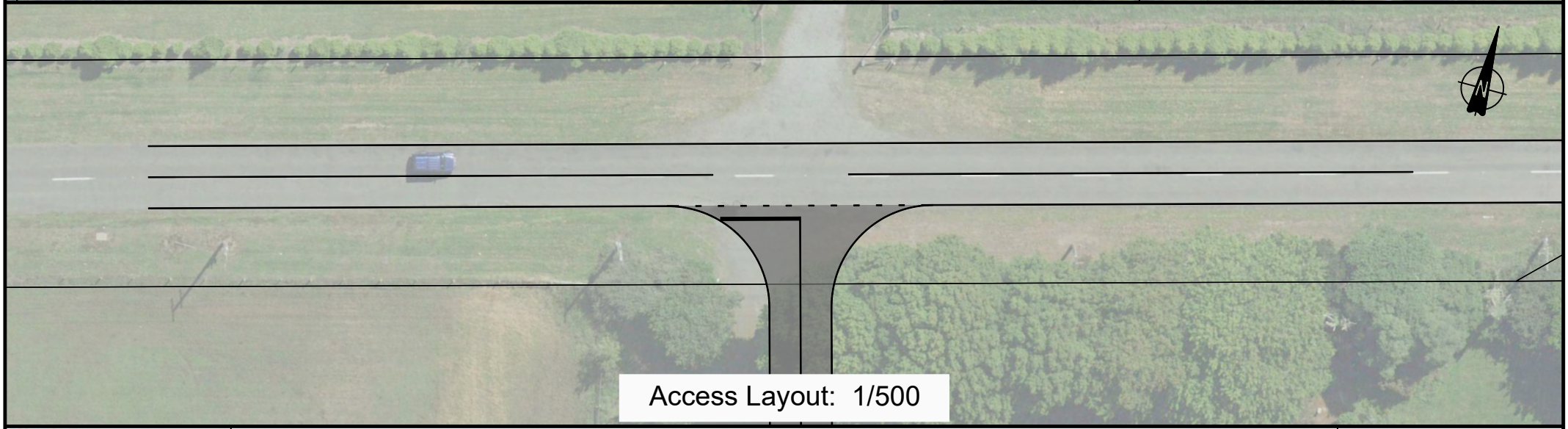


Appendix 3

Concept Access Intersections



Sight Distances: 1/1,250



Access Layout: 1/500

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PO Box 365
Christchurch 8014

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Whisper Creek
LMM Investments 2012 Ltd

Concept Spencerville Road / Site Access Arrangement

For Information

Drawing: **1221-003 - Whisper Creek - DWD100X-A**

Sheet

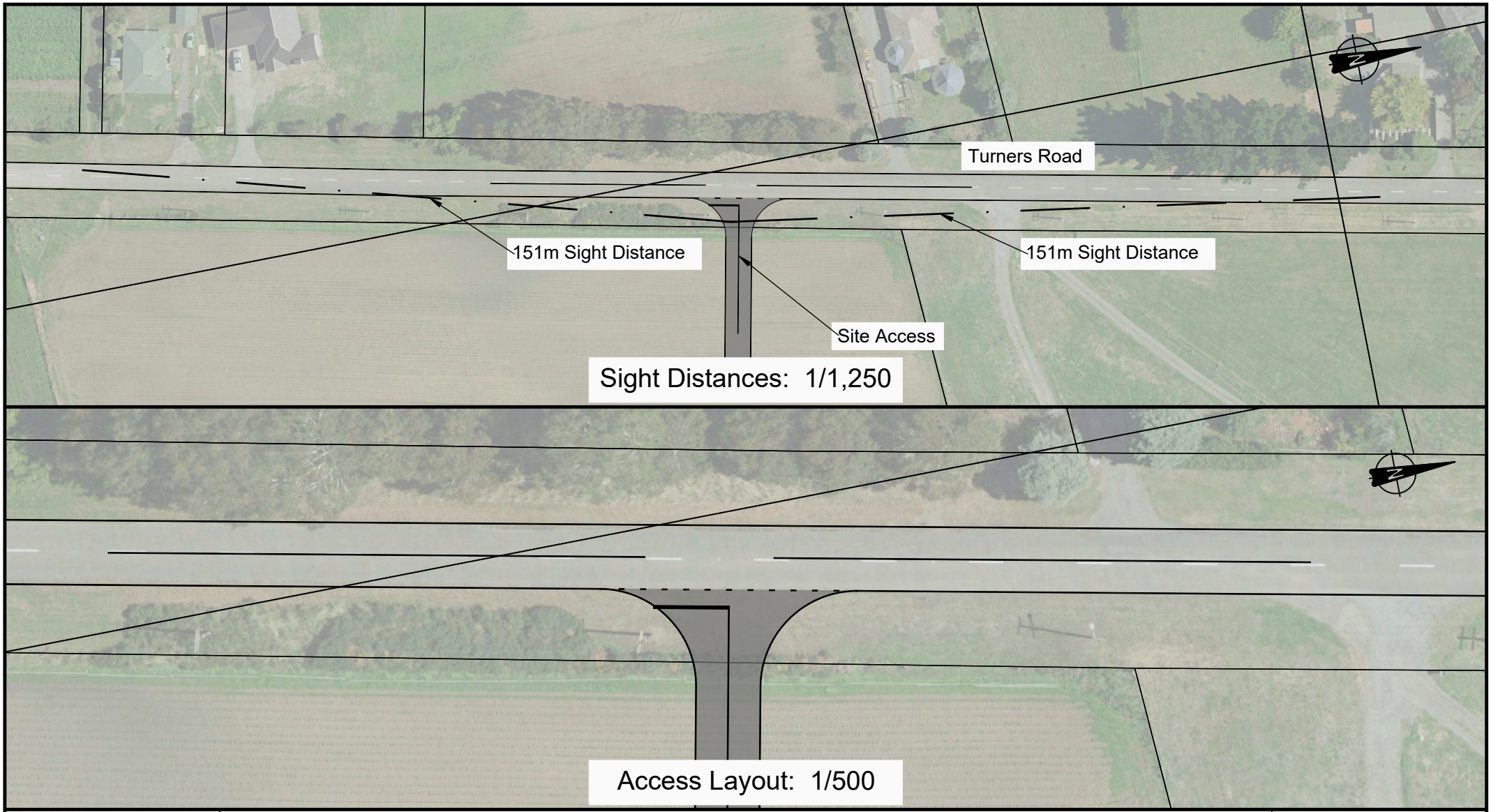
1221-003-DWD1001-A

Scale @A4 As Shown

Date 01/04/2025

By N Fuller

Project #1221-003



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Whisper Creek
LMM Investments 2012 Ltd

Concept Turners Road / Site Access Arrangement

For Information

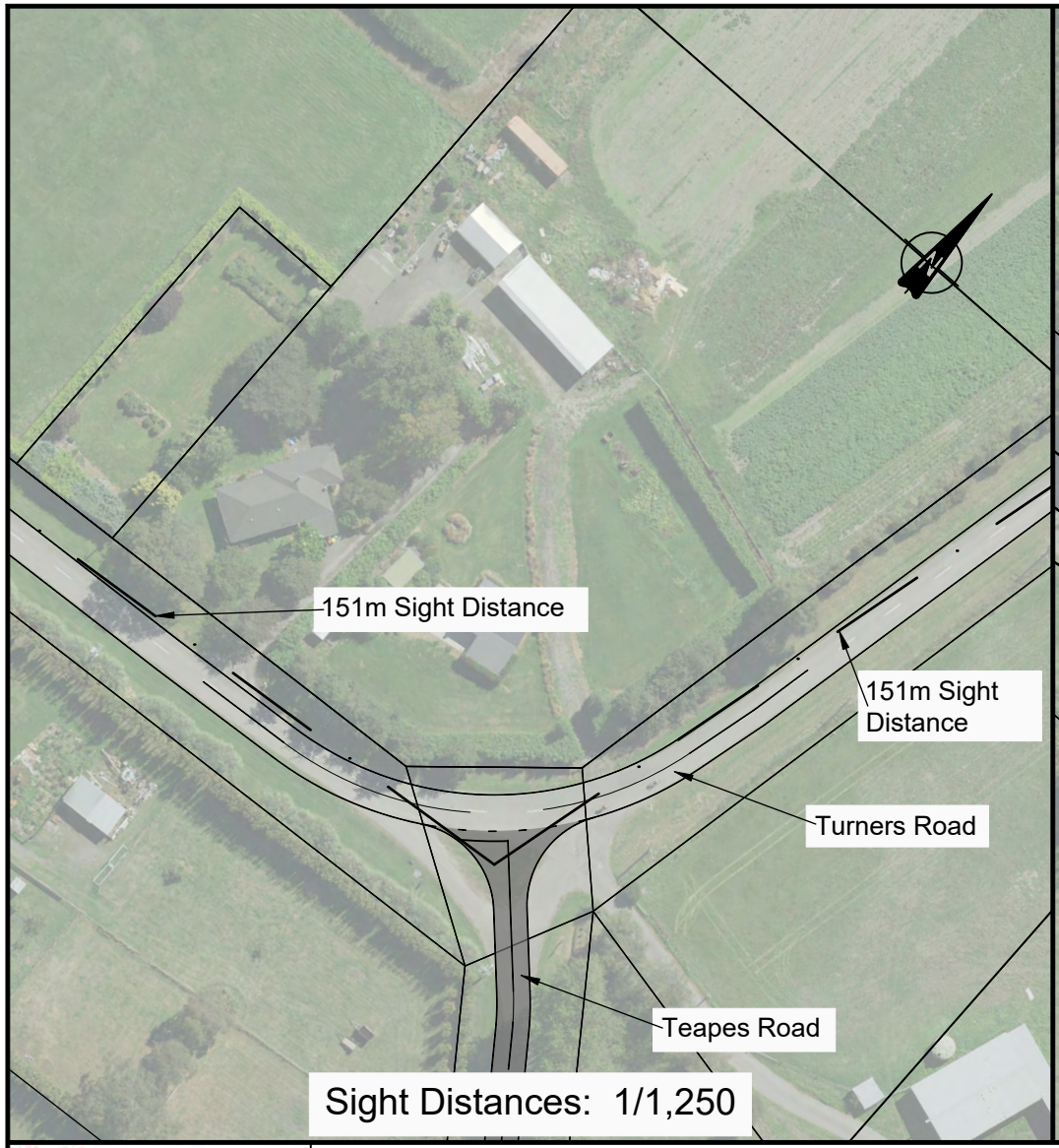
Drawing: **1221-003 - Whisper Creek - DWD100X-A**

Sheet
1221-003-DWD1002-A

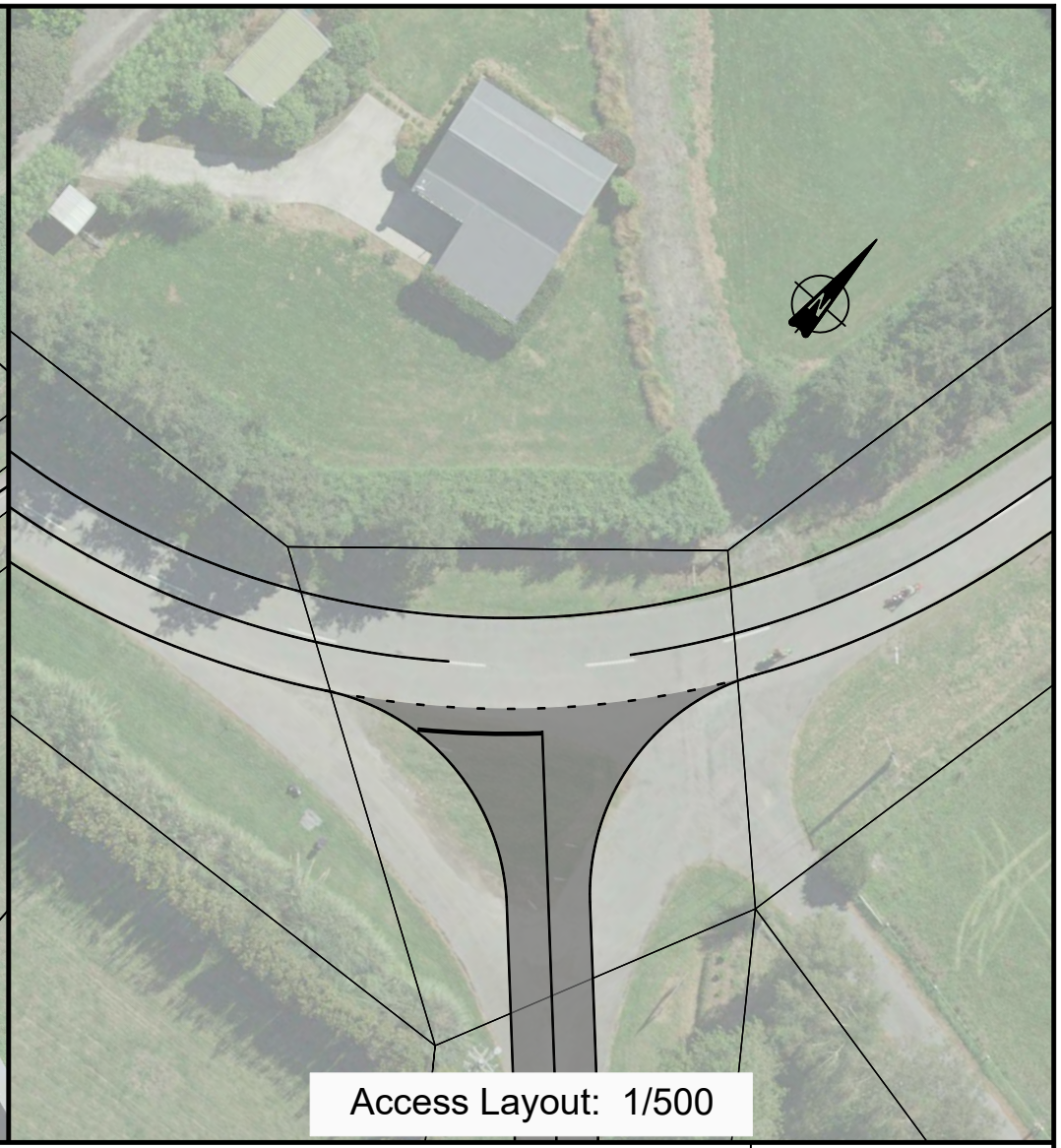
Scale @A4 As Shown
Date 01/04/2025
By N Fuller
Project #1221-003

Appendix 4

Concept Turners Road / Teapes Road Intersection



Sight Distances: 1/1,250



Access Layout: 1/500

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LMM Investments 2012 Ltd

Concept Turners Road / Teapes Road Intersection Arrangement

For Information

Drawing: **1221-003 - Whisper Creek - DWD100X-A**

Sheet
1221-003-DWD1003-A

Scale @A4 As Shown

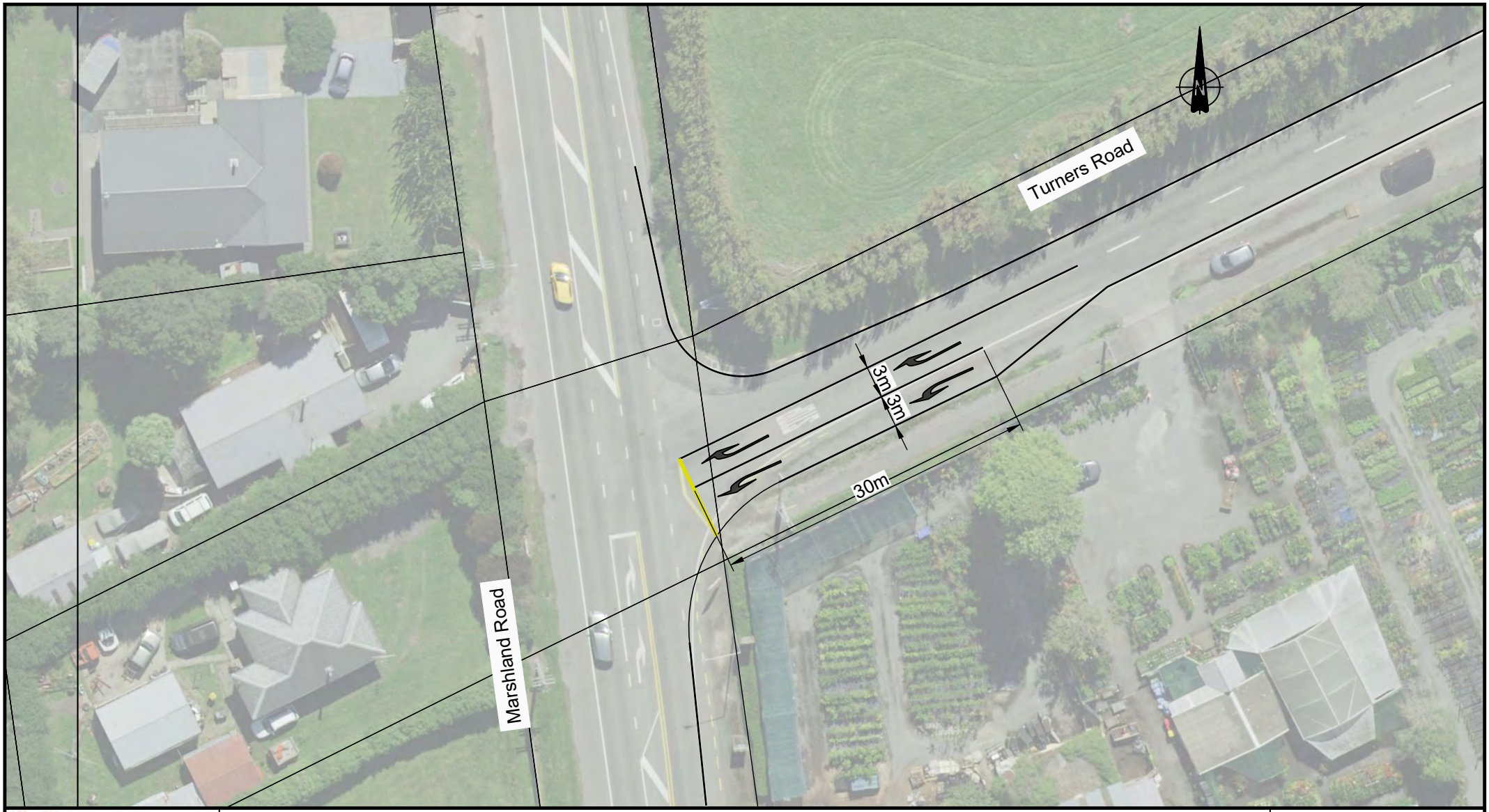
Date 01/04/2025

By N Fuller

Project #1221-003

Appendix 5

Concept Marshland Road / Turners Road Intersection



Whisper Creek
LMM Investments 2012 Ltd

Concept Turners Road / Marshland Road Intersection Arrangement

For Information

Drawing: 1221-003 - Whisper Creek - DWD100X-A

Sheet
1221-003-DWD1004-A

Scale @A4 As Shown
Date 01/04/2025
By N Fuller
Project #1221-003

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Appendix 6

Marshland Road / Turners Road Intersection Modelling Results – 2038 AM Peak with 700 Dwellings

MOVEMENT SUMMARY

Site: N2020 [Marshland / Turners 2038 AM 700hh (Site Folder: General)]

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 [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Marshland (N)															
2	T1	All MCs	288	6.9	288	6.9	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	94	6.7	94	6.7	0.111	8.7	LOS A	0.4	3.3	0.58	0.78	0.58	50.1
Approach			382	6.9	382	6.9	0.155	2.2	NA	0.4	3.3	0.14	0.19	0.14	57.2
East: Turners (E)															
4	L2	All MCs	394	2.4	394	2.4	0.861	25.3	LOS D	10.6	75.5	0.90	1.64	2.88	40.6
6	R2	All MCs	69	3.0	69	3.0	0.861	45.6	LOS E	10.6	75.5	0.90	1.64	2.88	40.5
Approach			463	2.5	463	2.5	0.861	28.3	LOS D	10.6	75.5	0.90	1.64	2.88	40.6
North: Marshland (N)															
7	L2	All MCs	46	11.4	46	11.4	0.328	5.8	LOS A	0.0	0.0	0.00	0.05	0.00	56.4
8	T1	All MCs	542	12.8	542	12.8	0.328	0.1	LOS A	0.0	0.0	0.00	0.05	0.00	59.4
Approach			588	12.7	588	12.7	0.328	0.6	NA	0.0	0.0	0.00	0.05	0.00	59.1
All Vehicles			1434	7.9	1434	7.9	0.861	10.0	NA	10.6	75.5	0.33	0.60	0.97	51.1