BEFORE THE PANEL
APPOINTED BY THE DUNEDIN CITY COUNCIL

Under	The Resource Management Act 1991 (the **Act** or **RMA**)
IN THE MATTER	of proposed Variation 2 (Additional Housing Capacity) to the Second Generation Dunedin District Plan (**2GP**)
BY	**GLADSTONE FAMILY TRUST** **Submitter (OS219.003, 219.004, 219.005, 219.008)**

STATEMENT OF EVIDENCE OF GRANT COLIN FISHER

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BRIEF OF EVIDENCE OF GRANT COLIN FISHER

1. My full name is Grant Colin Fisher. I am Director of Modal Consulting Limited based in Invercargill, though operating throughout New Zealand.

2. I hold a Bachelor of Science Degree in Land Planning and Development from the University of Otago, New Zealand. I am an Affiliate Member of Engineering New Zealand, and I am also a member of the Engineering New Zealand Transport Group Southern Branch committee.

3. I have over 14 years' experience in traffic engineering, transportation planning, and road design and construction in New Zealand.

4. Although not necessary in respect of council hearings, I can confirm I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note dated 1 December 2014 and agree to comply with it. I have complied with the Code of Conduct in preparing this evidence, and I agree to comply with it while giving oral evidence before the hearing panel. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

5. I have prepared an Integrated Transport Assessment in relation to this matter which I attach as Appendix 1.

Date: 5 August 2022

Grant Fisher

Appendix 1

PROPOSED PLAN CHANGE – GLADSTONE FAMILY TRUST

INTEGRATED TRANSPORT ASSESSMENT

CONTENTS

INTRODUCTION

1. Modal Consulting Limited has been commissioned by Gladstone Family Trust (the developer) to prepare an Integrated Transport Assessment (ITA) in relation to proposed rezoning request for the properties at 100 Irwin Logan Drive, 21 Pinfold Place, 21, 43, 55, 65, 75, 77, 79, 111, 121 Chain Hills Road.

2. The proposal aims to rezone the site to enable residential development with a mix of different density residential zones. The lot yields and spatial configuration of the proposed zones are shown on Appendix 1 of this assessment report (also shown in Figure 1, below).

3. The proposal also includes details of the proposed transport network to be provided within the site, including an extension of Irwin Logan Drive/Jocelyn Way which in effect links Gladstone Road North to Chain Hills Road.

4. This report provides an assessment of the transport aspects of the proposal, but generally does not include matters relating to spatial planning. It also describes the transport environment in the vicinity of the site, describes the transport related components 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.

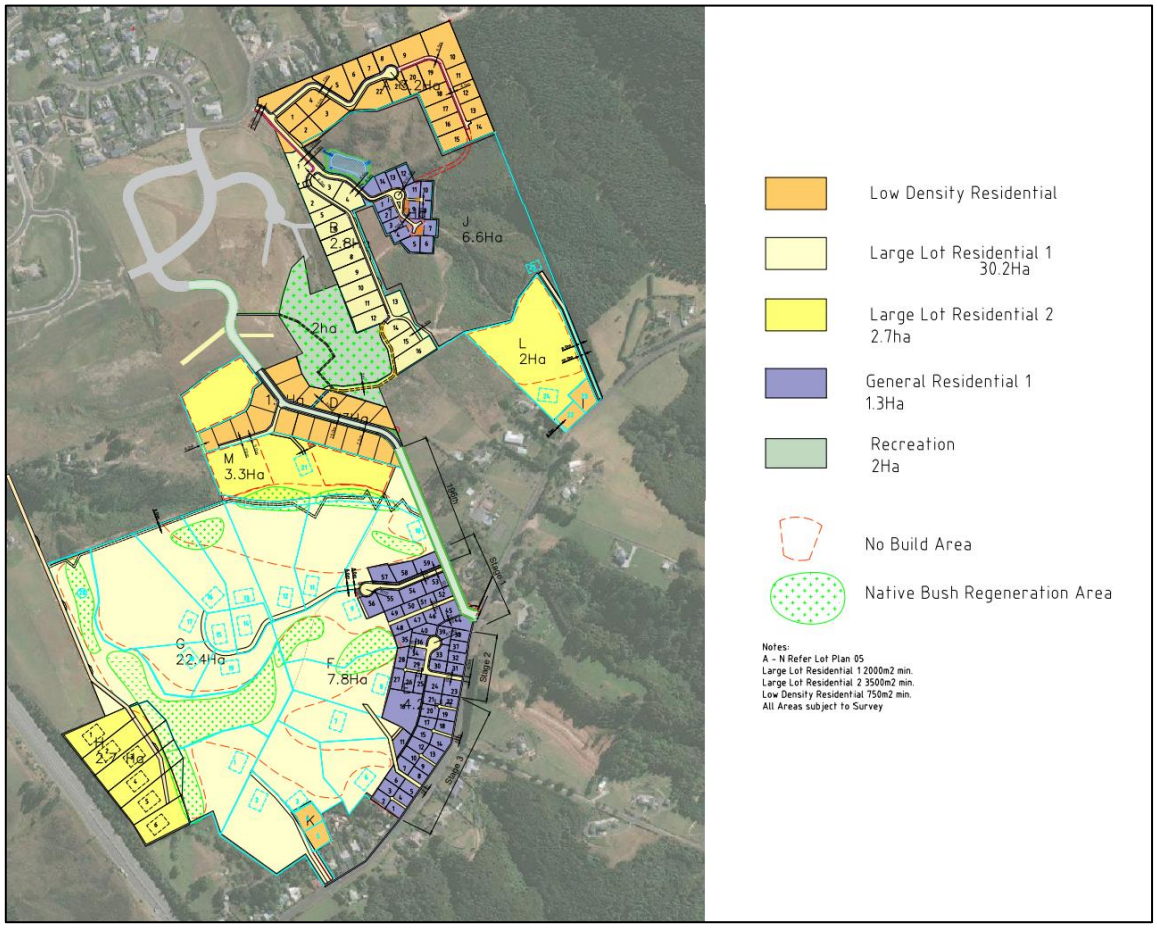

Figure 1 – Concept plan for the proposed rezoning of the site.

TRANSPORT ENVIRONMENT

SITE LOCALITY AND ZONING

5. The site has an area of approximately 54ha, although part of this area is already rezoned Low Density Residential via previous 2GP decisions and appeal processes. The land is currently used for pastoral grazing purposes with a woolshed and yards located within 75 and 79 Chain Hills Road, and a tractor shed located within 121 Chain Hills Road. The plan change site is shown in Figure 2 below.

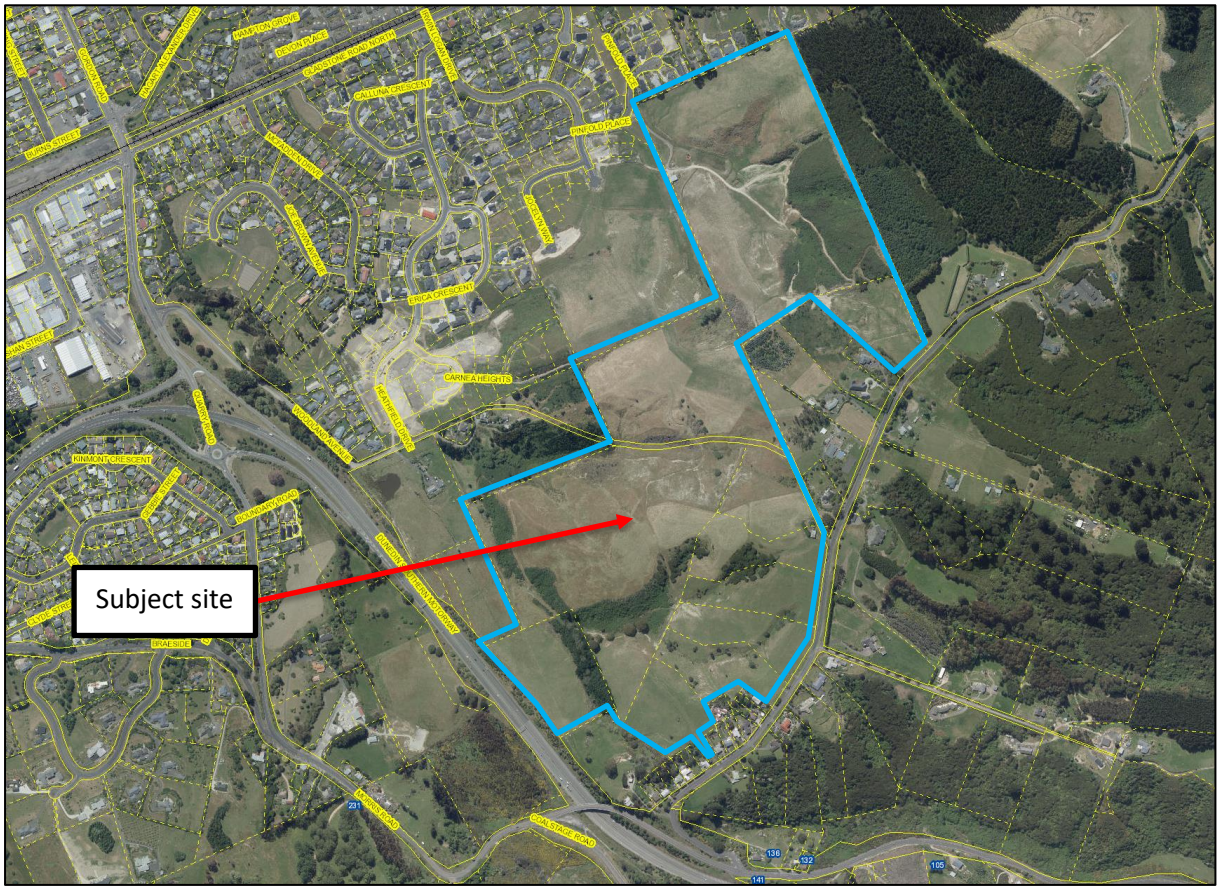

Figure 2 - Site location at 21, 43, 55, 65, 75, 77, 79, 111, 121 Chain Hills Road

EXISTING ROAD NETWORK

6. The site is accessed via Gladstone Road North/Irwin Logan Drive to the north, and Chain Hills Road/Morris Road to the South. The operational characteristics of this transport network are summarised in the table below. The NZTA's One Network Road Classification (ONRC), while not strictly adopted by the 2GP, is also noted.

FEATURE	COMMENTARY
Road Name	**Gladstone Road North**
Road Classification	Collector Road (2GP), Secondary Collector (ONRC)
Cross section	Total sealed carriageway width of 6m with a painted centreline and edge lines. A formed shoulder on southern side of road, transitioning to footpath with kerb and channel west of Irwin Logan Drive.
Traffic Volumes	Average Daily Traffic Volume of 3000vpd (1.5% heavy traffic) at the Gladstone Road North/Irwin Logan Drive intersection. Traffic figures obtained from MobileRoad and based on RAMM data.
Speed	The posted speed limit site is 50km/h in the vicinity of the Gladstone Road North/Irwin Logan Drive intersection, changing to 80km/h at the eastern edge of the site.
Pedestrians and cyclists	Footpaths are provided in certain areas. There is no specific infrastructure provided for cyclists.

Figure 3 - Gladstone Road North, looking east

Figure 4 - Gladstone Road North, looking west

FEATURE	COMMENTARY
Road Name	**Irwin Logan Drive**
Road Classification	Local Road (2GP), Access Road (ONRC)
Cross section	Total sealed carriageway width of approximately 9m.
Traffic Volumes	Average Daily Traffic Volume of 495vpd (1.6% heavy traffic) at the Gladstone Road North/Irwin Logan Drive intersection. Traffic figures obtained from MobileRoad and based on RAMM data.
Speed	The posted speed limit is 50km/h.
Pedestrians and cyclists	Footpaths with kerb and channel are provided on both sides of the road. There is no specific infrastructure provided for pedestrians or cyclists.

Figure 5 - Irwin Logan Drive, looking south from Gladstone Road North intersection

Figure 6 - Typical view of Irwin Logan Drive

FEATURE	COMMENTARY
Road Name	**Chain Hills Road**
Road Classification	Local Road (2GP), Secondary Collector (ONRC)
Cross section	Total sealed carriageway width approximately 6.5m with minimal presence of unsealed shoulders. Painted centreline but no edge lines or edge marker posts.
Traffic Volumes	Average Daily Traffic Volume of 750vpd (3.4% heavy traffic) at the Morris Road/Chain Hills Road intersection. Traffic figures obtained from MobileRoad and based on RAMM data.
Speed	The posted speed limit of Chain Hills Road in the vicinity of the site is 70km/h, changing to 80km/h at the eastern edge of the site.
Pedestrians and cyclists	There is no specific infrastructure provided for pedestrians or cyclists.
Future use	No programmed future upgrades identified.

Figure 7 - Typical view of Chain Hills Road looking northeast toward proposed General Residential 1 zone – Area "E"

Figure 8 - Typical view of Chain Hills Road looking northeast toward proposed General Residential 1 zone – Area "I"

FEATURE	COMMENTARY
Road Name	**Morris Road**
Road Classification	Arterial (2GP), Primary Collector (ONRC)
Cross section	Total sealed carriageway width approximately 8m with painted centreline and edge lines. Sealed and unsealed shoulders present over most of its length (Main Road to Chain Hills Road).

Traffic Volumes	Average Daily Traffic Volume of 1210vpd (12.4% heavy traffic) at the Gladstone Road North/Irwin Logan Drive intersection. Traffic figures obtained from MobileRoad and based on RAMM data.
Speed	The posted speed limit site is 50km/h within urban areas, changing to 80km/h rural areas.
Pedestrians and cyclists	There is no specific infrastructure provided for pedestrians or cyclists. Morris Road forms part of the Dunedin Strategic Cycle Network.

Figure 9 – Morris Road looking north. Speed limit is 50km/h. Note residential land use at left of image.

Figure 10 – Morris Road looking north. Speed limit is 80km/h. Adjacent land use is rural.

CRASH HISTORY

7. The NZTA Crash Analysis System has been reviewed to identify crashes that have been reported on the road network in the vicinity of the site from 2017 to 2022 inclusive. The areas studied include Gladstone Road North, Irwin Logan Drive, and Chain Hills Road, detailed below.

Gladstone Road North

8. The assessment area chosen for Gladstone Road North is shown within the blue shaded area in Figure 11, below, and includes the State Highway 87/Gladstone Road North Intersection. There have been 18 reported crashes on within the assessment area during this period, primarily clustered at the State Highway 87 intersection.

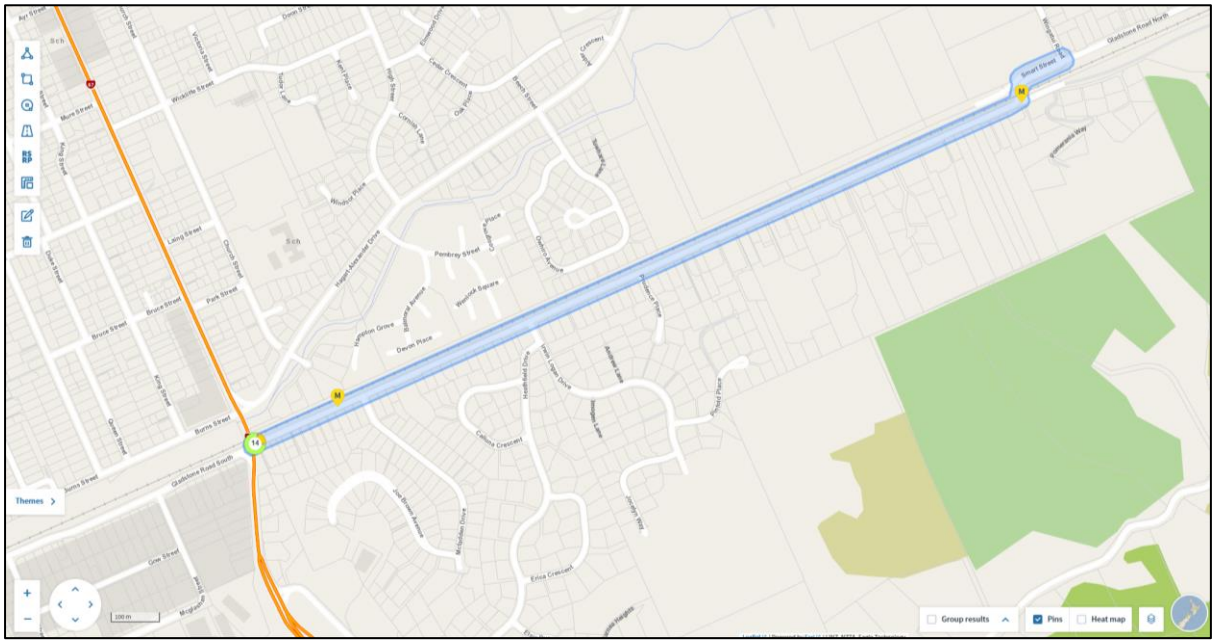

Figure 11 – CAS output map, Gladstone Road North (assessment area shaded blue)

9. Details of these crashes are summarised as follows, with the two minor crashes on Gladstone Road east of the State Highway 87/Gladstone Road North intersection highlighted in blue:

Crash ID	Date	Time	Description of Events	Crash factors	Junction	Severity
201813778	5/05/2018	23:15	Car/Wagon1 EDB on Gladstone Road North lost control turning left, Car/Wagon1 hit non specific traffic sign	CAR/WAGON1, alcohol test above limit or test refused, lost control when turning, speed entering corner/curve	Nil (Default)	Minor
2020163600	8/09/2020	19:30	Car/Wagon1 NDB on GLADSTONE ROAD NORTH, MOSGIEL, DUNEDIN hit Car/Wagon2 U-turning from same direction of travel , Car/Wagon2 hit fence	CAR/WAGON2, alcohol test below limit, did not check/notice another party behind	Nil (Default)	Minor
2020173065	9/12/2020	18:00	Car/Wagon1 NDB on Gladstone Road hit rear end of Car/Wagon2 stop/slow for queue	T Junction	2020173065	Non-injury
2021174956	2/01/2021	17:00	Ute1 NDB on QUARRY ROAD lost control turning right but did not leave the road	CAR/WAGON2, alcohol test below limit UTE1, alcohol test below limit, cutting corner at intersection	Crossroads	Non-injury

2021199973	13/07/2021	13:20	Cycle1 WDB on GLADSTONE ROAD NORTH sideswiped by SUV2 WDB on GLADSTONE ROAD NORTH turning left	CYCLE1, failed to notice indication of vehicle in front, overtaking on left without due care SUV2, alcohol test below limit	Crossroads	Severe
201720812	4/12/2017	8:40	Car/Wagon1 WDB on Gladstone road north hit rear end of Car/Wagon2 stop/slow for queue	CAR/WAGON1, failed to notice car slowing, stopping/stationary	Nil (Default)	Minor
2021187934	17/05/2021	10:45	Van2 turning right hit by oncoming Car/Wagon1 SDB on Quarry Road	CAR/WAGON1, did not stop at steady amber light	Crossroads	Non-injury
201962622	26/03/2019	13:00	Unknown1 DIRN on GORDON ROAD overtaking SUV2	UNKNOWN1, too far right	Crossroads	Non-injury
2020152451	21/05/2020	7:15	Left scene1 SDB on GORDON ROAD lost control turning right; went off road to left, Left scene1 hit traffic signal	LEFT SCENE1, too far left	Crossroads	Non-injury
201898715	16/10/2018	6:05	Car/Wagon1 SDB on GORDON ROAD lost control turning right; went off road to left, Car/Wagon1 hit traffic sign/signal poles, bollards	CAR/WAGON1, alcohol test below limit, swung wide at intersection	Crossroads	Non-injury
201898910	30/10/2018	9:00	Car/Wagon1 SDB on GORDON ROAD missed inters or end of road, Car/Wagon1 hit traffic signal	CAR/WAGON1, alcohol test above limit or test refused, too far left	Multileg	Non-injury
2021192711	26/06/2021	19:00	Car/Wagon1 SDB on GORDON ROAD hit Car/Wagon2 crossing at right angle from right	Crossroads	2021192711	Non-injury
2018100246	25/11/2018	16:30	Car/Wagon1 SDB on GORDON ROAD lost control turning right; went off road to left, Car/Wagon1 hit tree, hedge	CAR/WAGON1, alcohol test below limit, lost control under acceleration, other inexperience, speed entering corner/curve	Crossroads	Non-injury
201860060	6/11/2018	21:20	Car/Wagon2 turning right hit by oncoming	CAR/WAGON1, alcohol test below limit CAR/WAGON2, alcohol	Crossroads	Non-injury

			Car/Wagon1 NDB on QUARRY ROAD	test below limit, did not check/notice another party from other dirn, failed to give way turning to non-turning traffic		
201833113	11/02/2018	14:28	Car/Wagon1 WDB on Gladstone Rd, turning onto Gordon Rd lost control turning right, Car/Wagon1 hit non specific street furniture	CAR/WAGON1, alcohol test below limit, other misjudged speed, distance or position	Crossroads	Non-injury
201754401	31/10/2017	15:00	Car/Wagon1 WDB on Quarry road lost control turning right	CAR/WAGON1, cutting corner on bend, other attention diverted	Crossroads	Non-injury
201810489	5/01/2018	16:30	Car/Wagon1 NDB on Quarry Road lost control; went off road to right, Car/Wagon1 hit non specific pole	CAR/WAGON1, emotionally upset/road rage, sudden illness	Crossroads	Minor
201748521	17/07/2017	7:10	Car/Wagon1 SDB on Quarry Road merging hit Van2 also merging	CAR/WAGON1, suddenly braked VAN2, didn't give way turn right to opp. left turn traffic	Crossroads	Non-injury

10. The CAS data shown in the table above shows that there were no fatal or serious injury crashes within the investigation area. There were, however, six crashes of minor severity mostly at the at the State Highway 87 signalised intersection. The remaining crashes were classified as non-injury.

11. Most of the crashes are clustered around the signalised intersections at State Highway 87. These intersections form part of the State Highway network at the southern end of Mosgiel. Crash trends of loss of control and misjudging the intersection layout are evident. However, these types of crashes are not necessarily considered to be unusual given the high volumes of traffic using the intersection, and the corresponding dense decision-making road environment due to the configuration of the intersections. The above crash descriptions do not show any particular crash trends along Gladstone Road North itself.

12. It is noteworthy that of the 18 crashes, 13 are listed as non-injury with the remaining crashes being classified as minor, suggesting that the road environment in the vicinity of the site typically operates to a reasonably good level of safety.

Irwin Logan Drive

13. The assessment area for Irwin Logan Drive is shown within the blue shaded area in Figure 12, below. There have been no reported crashes on Irwin Logan Drive within the assessment area from 2017-2022.

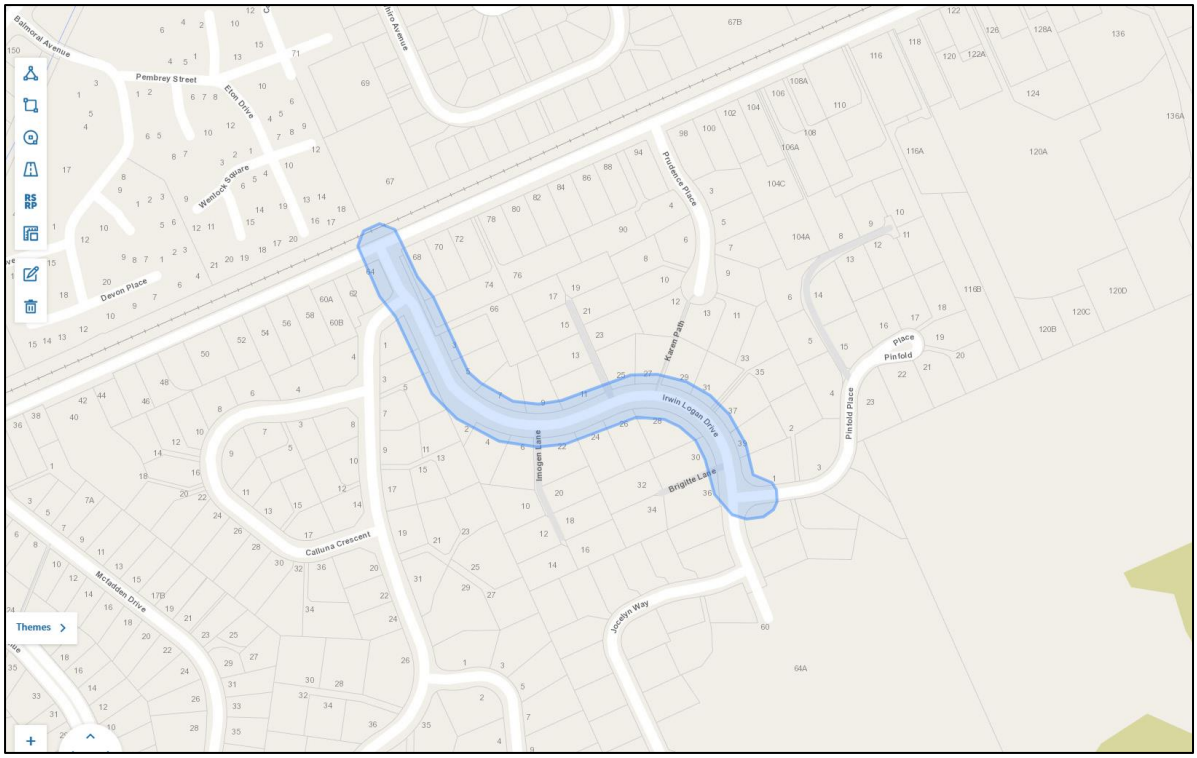

Figure 12 - CAS output map, Irwin Logan Drive (assessment area shaded blue). Note: CAS data is not available for the extension to Irwin Logan Drive, and Jocelyn Way, at the present time.

Chain Hills Road

14. The assessment area chosen for Chain Hills Road is shown within the blue shaded area in Figure 13, below, and extends from Morris Road to the southwest of the site to the easternmost corner of the frontage of the site. There has been one reported crash on Chain Hills Road within the assessment area from 2017-2022.

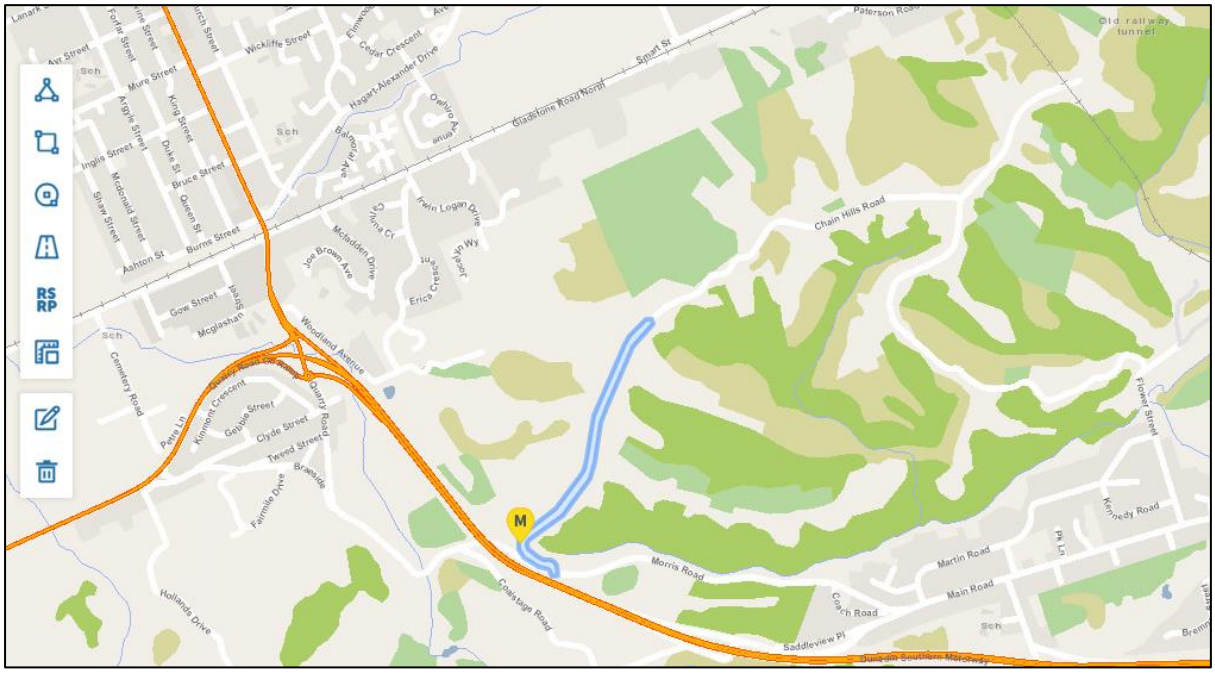

Figure 13 - CAS output map, Chain Hills Road (assessment area shaded blue)

15. Details of this crash is summarised as follows:

Crash ID	Date	Time	Description of Events	Crash factors	Junction	Severity
201712107	14/03/2017	Van1 SDB on Chain hill road lost control turning left, Van1 hit non specific embankment, non specific fence, non specific tree,	VAN1, lost control - road conditions, ENV: slippery road due to rain	Nil (Default)	201712107	Minor

16. This crash occurred at the curve in the Chain Hills Road just above Morris Road, with recent rain making the road slippery being an environmental factor contributing to the crash.

PROPOSED DEVELOPMENT

17. The Gladstone Family Trust has lodged a submission with the Dunedin City Council as part of the Second Generation District Plan Variation 2 process. They are seeking to rezone the site for residential development with a mixture of zonings including General Residential 1 (minimum site size 500m^2), Low Density Residential (minimum site size 750m2) or Large Lot Residential 1 (minimum site size 2,000m^2).

18. The vision is to create a residential development on the less steep parts of the rezone site at various densities with the gullies containing areas of regenerating indigenous vegetation linked with amenity tree plantings to create a 'town belt' backdrop for Mosgiel which will also include public pedestrian access.

19. The client, on behalf of Gladstone Family Trust, has developed a structure plan for the site shown in Figure 1 of this report. There are two important factors to note about this structure plan:

    - Area C and D are already zoned Low Density Residential.

20. The rezone proposal includes a road linking Gladstone Road North, via the Gladstone Heights residential development, with Chain Hills Road.

TRAFFIC GENERATION AND DISTRIBUTION

21. The NZTA Research Report 453 (RR453) has been used as a reference to determine the peak hour and daily trip generation for residential development of the site. Table C.1 contained within RR453 shows an 85th percentile trip generation of 0.9 peak hour trips, and 8.2 daily trips, per dwelling in outer suburban areas. These trip generation figures have been adopted for assessment purposes.

22. Based on the number of dwellings to be established within the proposed development the following overall traffic volumes are expected to be generated by development of the plan change site (note that areas already zoned for residential use, but not yet developed, are not included in these figures):

ACTIVITY	85th PERCENTILE RATE (Per dwelling)	NO. DWELLINGS	VOLUME (PEAK HOUR)	VOLUME (AVERAGE DAILY)
Proposed Development Areas (Combined)	Peak Hour: 0.9 Daily: 8.2	138	124	1132

23. In reviewing the surrounding traffic flows and catchments, and the proposed transport network within the site, it is considered that a proportion of existing and consented residential lots would primarily use the proposed link road to Chain Hills Road for access, rather than using the Irwin Logan Drive to Gladstone Road North route which they must currently do. Conversely, a proportion of new sites proposed within the plan change area will use Irwin Logan Drive to Gladstone Road North as their primary route for access. These areas are roughly equivalent in lot yield, and an indicative split between these areas is shown spatially in Figure 14. While it is impossible to forecast trip distribution with absolute accuracy, these trip assumptions are considered useful in order to establish whether there are any significant capacity constraints, particularly at intersections, that may need to be assessed in further detail.

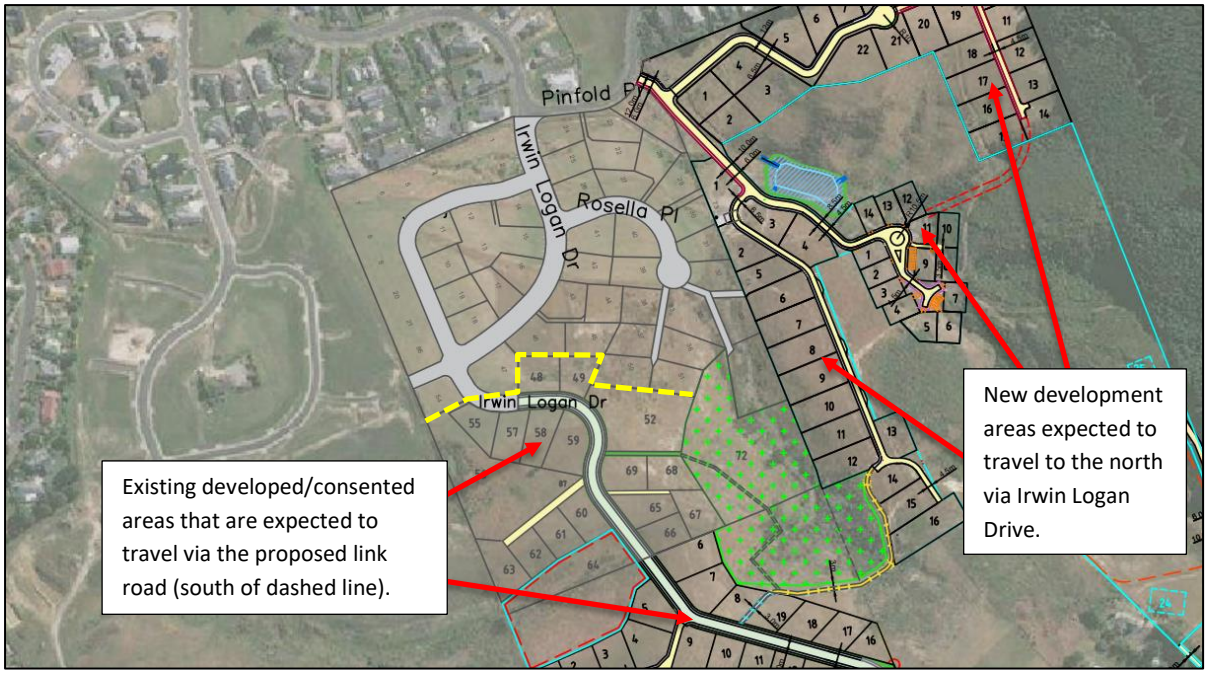

Figure 14 – Plan depicting general split of catchments for trips to the north and to the south.

24. Of those trips between the subdivision and the south, the majority can be expected to be right turn out / left turn in movements at the proposed intersection onto Chain Hills Road, and left turn out / right turn in at the Morris Road intersection (i.e. again, commuters travelling to and from the Dunedin urban area).

25. The traffic generated by the development has been distributed onto the road network as outlined above for assessment purposes, with peak hour traffic on Chain Hills Road increasing from approximately 60 vehicles in the peak hour (two-way) to 166 vehicles in the peak hour. On Morris Road, the increase is from approximately 100 vehicles in the peak hour (two-way) to 206 vehicles in the peak hour. The impact of this generated traffic is discussed in more detail later in this report.

EXTERNAL ROAD NETWORK

GLADSTONE ROAD NORTH/IRWIN LOGAN DRIVE

26. Gladstone Road North/Irwin Logan Drive each feature existing sealed two-way vehicle carriageways and infrastructural provisions for active road users. This existing infrastructure is generally in line with the New Zealand subdivision and development design standard NZS 4404:2010 for the residential land use adjoining these roads. As the proposed link road is not anticipated to increase traffic volumes on these roads it is not planned to investigate operational or safety improvements to them.

CHAIN HILLS ROAD

27. Daily traffic on Chain Hills Road, between Morris Road and the proposed link road, will increase significantly from 750vpd to around 1720vpd under the assumed traffic distribution scenario described earlier in this report. Consideration has been given to whether this may alter the characteristics of the road in terms of its classification, and whether this has implications for the scope of any upgrades required to Chain Hills Road to accommodate the increased traffic volumes.

28. There are two primary road classification systems in use in New Zealand; the road hierarchies shown in most District Plans, and the NZTA's One Network Road Classification System (ONRC). It is noted that the ONRC is in the process of being enhanced by the NZTA's One Network Framework, however work on making the enhanced framework operational across the country is presently ongoing. Both have been considered in terms of assessing the classification and functional needs of Chain Hills Road.

29. Chain Hills Road is classified differently under each of these systems; under the 2GP it is classified as a Local Road, and under the ONRC it is classified as a Secondary Collector. Local Roads are typically not intended as through routes and their primary function is to serve as access to adjacent property. Secondary Collector Roads are balanced between providing access for adjacent land use and collecting and distributing local traffic and may require enhanced infrastructure for active transport modes. It is evident that upon development of the proposed plan change site Chain Hills Road will provide both an access function and a through traffic function for local traffic, and it is therefore considered that its ONRC classification of Secondary Collector is appropriate to inform infrastructural requirements for the road.

30. The New Zealand subdivision and development design standard NZS 4404:2010, and traffic engineering guidelines Austroads, are guidelines most used in New Zealand for determining the operating characteristics for transport networks. In this case it is noted that NZS 4404:2010 supersedes the previous NZS 4404:2004 upon which the Dunedin Code of Subdivision and Development is based.

31. The sealed vehicle carriageway of Chain Hills Road is generally 5.5 to 6m wide and is considered to be of acceptable width and surfacing for residential traffic. As these sealed width characteristics are consistent with expectations under NZS 4404:2010 for a two-way carriageway no upgrade to the sealed carriageway is considered necessary, other than some minor road widening which can be identified and addressed at the time of subdivision.

32. There are no existing infrastructure provisions for pedestrians or cyclists on Chain Hills Road. NZS 4404:2010 anticipates provision for pedestrians (with cyclists being shared in the movement lane) and it is therefore recommended that walking connections be accommodated in any upgrade to the road due to increased demand generated by the development. However, it is also noted that there would be a differing density of land uses on each side of the road which should also be taken into account for any proposed road upgrades.

33. The proposed development along the edge of Chain Hills Road (predominantly the proposed development Area "E") will be a typical residential density of around 500m^2 per lot/dwelling. A sealed footpath, kerb and channel, and indented parking will therefore be provided along the road frontage immediately abutting Area "E", connecting to the proposed link road. This footpath will also be extended south-west along Chain Hills Road to link with the existing residential land use on the north/east side of the road, between the link road and Morris Road. These improvements are consistent with NZS 4404:2010 recommendations for a Collector Road within a suburban area.

34. Land use opposite the site (to the south of Chain Hills Road) is predominantly rural residential/large lot residential. The Austroads Guide to Road Design Part 6A: Paths for Walking and Cycling states that the overall need for pedestrian paths should be related to the functional requirements of the network. For example, the guide notes that the presence of pedestrians on roads in a rural setting may be a relatively rare event and the provision of paths are often not economically justified.

35. In this case it is considered that improvements for pedestrians on the southern side of Chain Hills Road (i.e. opposite the plan change site) is not justified given the low density of development on that side of the road. It is noted that this approach is the same as that taken for the most recent residential developments around Mosgiel, particularly those that have expanded the urban edge of the township to the south and to the east including the Heathfield, Gladstone Oaks, Highland Park, Glen Rothes, and Silver Springs residential developments. These developments have only provided footpath infrastructure on the side of the road immediately adjacent to their site, and not the opposite side of the road which have generally remained in a state of low-density residential/rural development.

36. Consideration has been given to whether the footpath should also connect to Morris Road. However, as Morris Road does not contain specific footpath or cycling infrastructure, it is considered that connection to this road is not justified as there is no wider linkage to the Braeside or Fairfield suburbs for active road users. The level of infrastructure provided on Morris Road is discussed in the next subsection of this report.

37. The general scope of the proposed footpath upgrades on Chain Hills Road is outlined below in Figures 15 and 16.

Figure 15 – General scope of proposed footpath to be installed on Chain Hills Road for active road users, adjacent to and opposite the development site. Image looking south-west along Chain Hills Road.

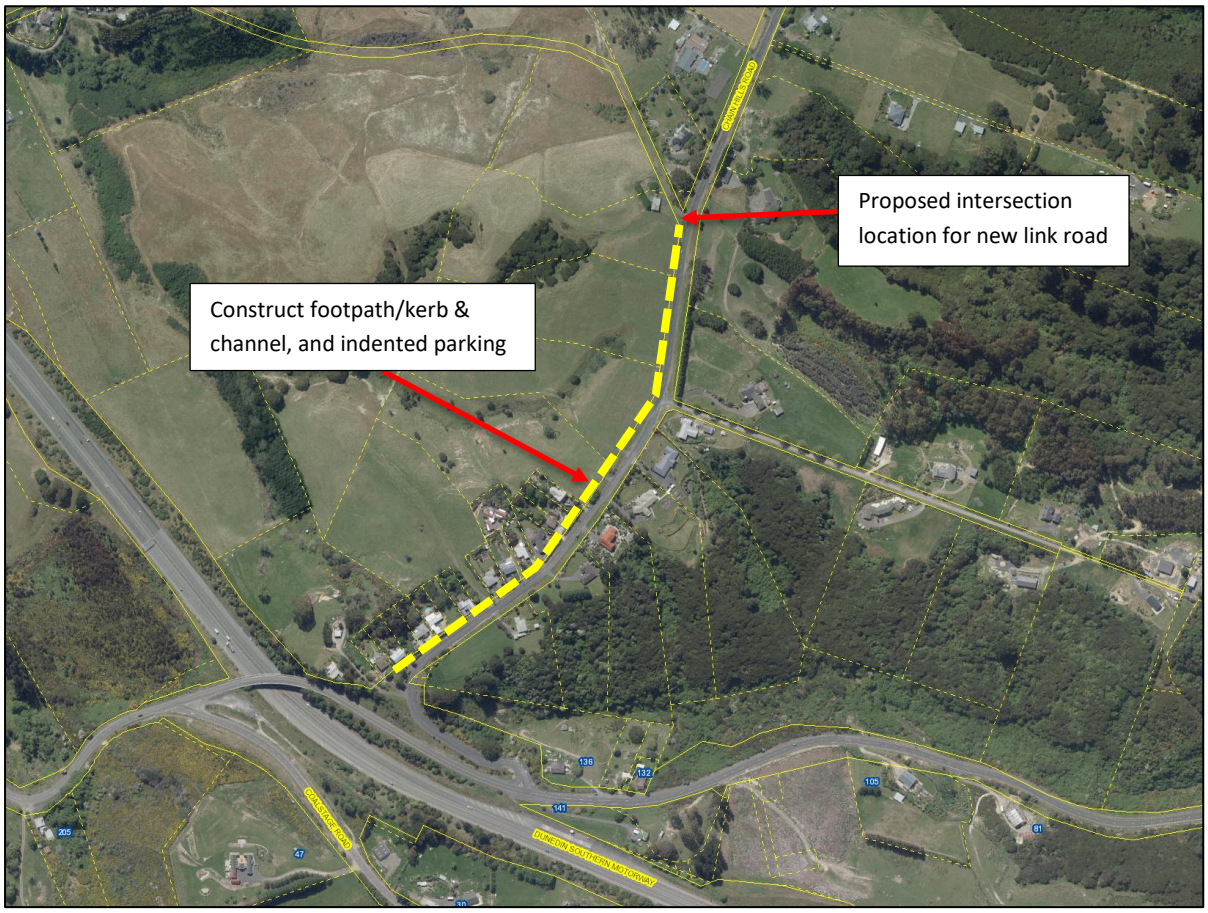

Figure 16 – General scope of proposed footpath to be installed on Chain Hills Road for pedestrians, adjacent to and opposite the development site.

MORRIS ROAD

38. Morris Road features a relatively steep grade in parts, with land on either side either rising, or dropping away, steeply from the edge of the road along its alignment. These features can provide significant constraints on the provision of footpaths and/or cycle lanes. While the provision of infrastructure for active road users along this route may appear desirable, in reality the prevailing topography and lack of passive surveillance from adjoining land use activity on either side of the road would be a significant deterrent to walking on cycling on this route between the plan change site and the developed residential suburbs of Braeside and Fairfield.

39. Long-term it is acknowledged that improvement of Morris Road may be required in order to better provide for active transport modes if Dunedin's strategic interests grow in connecting Dunedin and Mosgiel. As Morris Road is generally rural in nature and already forms part of the strategic cycling network and is subject to these wider strategic considerations by the Council over and above those relevant to this proposal, investigation and development of infrastructure for cycling and/or other active modes is considered to be more appropriate for the local authority to pursue in the future. It is noted that development of the site will be subject to relatively significant development contributions in accordance with Dunedin's Development contributions policy, and that the policy is to recover from developers a fair, equitable, and proportionate portion of the costs of capital expenditure necessary to service growth. Contributions made under this policy would conceivably provide toward any long-term upgrades to the wider strategic transport network including provision of footpaths or cycle lanes.

INTERNAL TRANSPORT NETWORK

40. Although cross sections and designs for the internal road network are not yet available, and have therefore not been assessed as part of this Integrated Transport Assessment, it is expected that the transport network within the subject site will be designed and constructed in general accordance with its intended Local Road status and adhere with the relevant requirements of the appropriate subdivision engineering standards. These standards include the Dunedin City Code of Subdivision and Development 2010, NZS 4404:2010, and Austroads guidelines.

41. Detailed design of the internal road network will include (but is not limited to) vehicle crossing spacings, sight distances, provisions for active road users, and street lighting. Of these, sight distances for the proposed link road onto Chain Hills Road are a particularly important safety consideration. It is understood that the intersection can achieve a Safe Intersection Sight Distance (SISD) of 151m for an operating speed of 70km/h. However, if lowering of the speed limit on Chain Hills Road is adopted as recommended later in this report, then the SISD requirement is only 97m for a 50km/h operating speed.

42. The transport network within the site is expected to be provided in general accordance with Table 3.2 of NZS 4404:2010, subject to local authority approval, outlined as follows:

    - Proposed link road - Figure E12: 5.5m to 5.7m sealed carriageway width, additional recessed width for parallel parking; minimum 1.5 metre footpath on at least one side of the street; cyclists shared in the movement lane; 15.0m legal road width.
    - Secondary roads - Figure E11: 5.5m to 5.7m sealed carriageway width, pedestrians and cyclists share the movement lane; 15.0m legal road width.
    - Private access lanes: Figure E10: 2.75m to 3.00m sealed carriageway width with passing bays, or 5.5m to 5.7m sealed carriageway width; pedestrians and cyclists share the movement lane; minimum 6.0m legal road width.

43. It is noted that the gradient of the link road may exceed the nominal 12.5% (1V:8H) requirement in the NZS 4404:2010 for a short distance. This is considered acceptable subject to appropriate engineering design and surfacing, noting that this threshold is routinely exceeded across Dunedin and is a normal feature in provision of transport networks in hilly environments. These matters are normally addressed at the subdivision consent stage of development.

44. Internal connectivity is provided in several locations as shown on the concept plans for development of the site, including:
    - Area B will have right of way access to both Irwin Logan Drive and to the proposed link road via Area “D”.
    - Public walkways are to be provided:
        - Within Areas “F” and “G” providing linkage to the existing footpath on Woodland Avenue.

- Proposed residential areas “A” and “N” include road access to Irwin Logan Drive, plus internal linkage for pedestrians between each of these areas. They also connect to the proposed walking track that links to Chain Hills Road through areas I, J, and L.

45. Overall connectivity is considered to be good, with the proposed link road in particular providing greater level of resilience for the overall transport network by providing direct access through the site. The link road would also bring the access for the existing residential development on the lower slopes of Chain Hills in line with the requirements of the Council’s Code of Subdivision and Development 2010, which states that “All residential neighbourhoods of more than 75 lots or dwelling units shall be provided with more than one connection to a collector street or higher order road”. It had been identified that connectivity to Areas “A” and “N” could be enhanced by linking them to the right of way within Area “B”, however it is understood that the steep topography in this location makes providing such a link impracticable.

46.

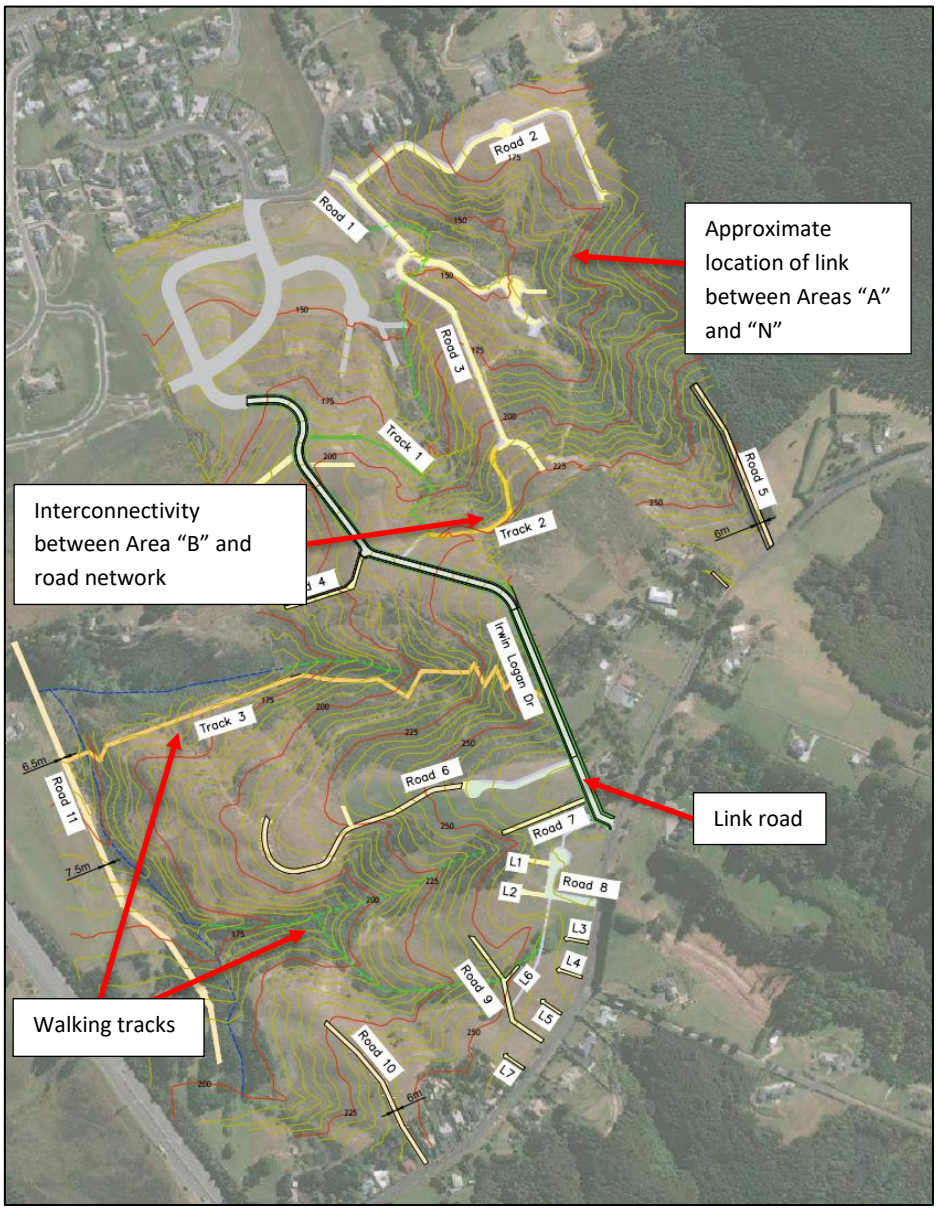

Figure 17 – Key connectivity locations provided within the site

TRAFFIC EFFECTS ASSESSMENT

INTERSECTION PERFORMANCE

47. Observation of the State Highway 87 intersection with Gladstone Road North, and discussion with the New Zealand Transport Agency (NZTA) and DCC Transport confirms that this intersection is under significant operational pressure. It presently experiences long queuing times and correspondingly low levels of service during peak AM and PM commute times.

48. Measures to upgrade this intersection are complicated by the presence of the railway line between Gladstone Road North and Hagart Alexander Drive. It is understood that while the NZTA is aware of these issues a cost-effective solution has not yet been identified to improve intersection performance. At a conceptual level it would appear that such an upgrade would likely require a split grade solution (such as an overpass) to significantly improve intersection performance. Obviously, such infrastructure would be significant to plan, design, fund, and construct.

49. Discussions with the Dunedin City Council Transport department indicates that this poor intersection performance may be causing traffic to divert to nearby streets to avoid intersection queues, such as the route following Irwin Logan Drive/Heathfield Drive/Woodland Avenue/State Highway 87. Several observations of this route were therefore undertaken in both the AM and PM peak periods, though no such diversions were noted.

50. The capacity constraints relating to this intersection contribute toward the overall traffic distribution assumptions outlined earlier in this report, and the benefit of creating the proposed link road for overall connectivity and network resilience. It is noted that the assumed traffic distribution would be unlikely to increase demand on Gladstone Road North and the associated State Highway 87 intersection, as providing the link road is a potentially more attractive alternative transport route for some existing Irwin Logan Drive users. As this scenario does not increase demand on the State Highway 87/Gladstone Road North intersection, effects on levels of service at this intersection have not been assessed further.

51. The proposal will, however, lead to a significant increase in traffic using Chain Hills Road and its intersection with Morris Road. Morris Road is classified as an Arterial Road under the 2GP and has an estimated peak hour traffic volume of 100vph, from a total average daily traffic volume of 1210vpd (obtained from Mobileroad and based on RAMM data). It is therefore appropriate to investigate how this will impact the Morris Road/Chain Hills Road intersection.

52. As a result of traffic generated by development of the proposed plan change site, traffic using the Morris Road/Chain Hills Road is assessed as being in the order of the following volumes:

    - Morris Road: 206 vehicles in the peak hour
    - Chain Hills Road: 166 vehicles in the peak hour

53. At unsignalized intersections between major and secondary roads, where turning movements are largely unconstrained, capacity considerations are usually insignificant and detailed capacity analysis is unnecessary. The 2009 edition of the Austroads Guide to Traffic Management Part 3, Traffic Studies and Analysis, contains guidance on traffic volume thresholds below which such analysis is not required. These thresholds are shown in the Table below:

	Traffic Volumes - Vehicles Per Hour (vph)	
	Major Road (Morris Road)	Secondary Road (Chain Hills Road)
Two-Lane Road	400	250
	500	200
	600	100

54. Predicted traffic volumes turning at this intersection are considered to be well within the threshold parameters shown in the above table, and it is therefore considered unnecessary to undertake specific traffic modelling of the Morris Road/Chain Hills Road intersection as the level of service (i.e. traffic delays) at this intersection is expected to be good.

SAFE AND APPROPRIATE SPEEDS

55. The Austroads Research Report AP-R509-16 Safe Systems Assessment Framework identifies a reduction in speed as being a primary, or supporting, treatment measure that addresses road safety risks relative to prevailing land use. The management of speed on Chain Hills Road is appropriate to consider given the change in land use from rural to residential activity. The NZTA Speed Management Guide, shown in Figure 18 below, has been used to assess the appropriateness of existing speed limits for the road network in the vicinity of the site. The NZTA Guide contains an evidence-based Speed Management Framework to assist in the setting of safe and appropriate speeds and has been used in this report to consider the existing speed limit of Chain Hills Road.

Function / Feature	Road safety metric	Infrastructure Risk Rating	Safe and Appropriate Speed (km/h)
• **ONRC** is Class 1 or 2 • Identified as a Freight Priority Route in a Network Operating Framework • Limited Access Road controls • Median Divided	• Personal Risk ≤ Low–Medium;	• **'Low' or 'Low Medium'**	• **80**
• **ONRC** is Class 1 or 2 • Non–commercial[2] adjacent land use	• Personal Risk ≤ Medium;	• **'Low' or 'Low–Medium'**	• **60**
• **ONRC** is Class 1 or 2 • Non–commercial[2] adjacent land use	No road safety metric used in the assessment	• **Any IRR**	• **50**
• **ONRC** is Primary Collector • Residential adjacent land use	• Personal Risk ≤ Medium–High	• **Low to Medium**	• **50**
• **Any ONRC** • Non–commercial and non–residential adjacent land use	• Personal Risk ≤ Medium–High	• **'Low' to 'Medium'**	• **50**
• **Any ONRC** • CBD/town centre • Residential neighbourhoods	No road safety metric used in the assessment	• **'low' to 'Medium–High'**	• **40**
• **Any ONRC** • CBDs or town centres with high place function and concentration of active road users	No road safety metric used in the assessment	• **'High'**	• **30**
• **Parks**	No road safety metric used in the assessment	• **Any rating**	• **20**
• **Shared spaces** with high place function and concentration of active road users • **Car parks**	No road safety metric used in the assessment	• **Any rating**	• **10**

Note 1: HRIG – NZ Transport Agency High-Risk Intersection Guide, 2013
Note 2: Commercial land use excludes Industrial land use activities.
Note 3: No road safety metrics are used in the assessment of roads with a safe and appropriate speed of 40km/h or less, but the corridor's look and feel should be conducive to achieving the safe and appropriate speeds.

Figure 18 - NZTA Speed Management Guide. Status of Chain Hills Road highlighted.

56. As noted earlier in this report Chain Hills Road is classified as "Secondary Collector" road under the NZTA One Network Road Classification. Given that the proposed Plan Change is for residential use of the site, Table 2.1 of the NZTA Speed Management Guide (shown in Figure 17 above) indicates that a safe and appropriate speed would be 40km/h for Chain Hills Road. Note that this is the target operating speed, and that a 50km/h posted speed limit may be appropriate and consistent with Dunedin's approach to setting speed limits.

57. It is therefore recommended that should the Plan Change for the site be approved, the existing posted speed limit on Chain Hills Road be lowered. It is appreciated, however, that permanently lowering the speed limit is a legal process that must be undertaken outside the RMA process by the Dunedin City Council, as it is the Road Controlling Authority for the local road network.

WIDER NETWORK CONSIDERATIONS

58. Further from the site, the wider permeability of the urban roading network means that traffic will disperse and thus any traffic-related effects will be reduced significantly as distance from the site increases. Nevertheless, in conjunction with discussions with the Dunedin City Council, a high-level assessment of the key route between the proposed link road on Chain Hills Road, and the State Highway 1 interchange from Old Brighton Road, has been undertaken to address key safety and accessibility matters. This route is shown on Figure 19 below.

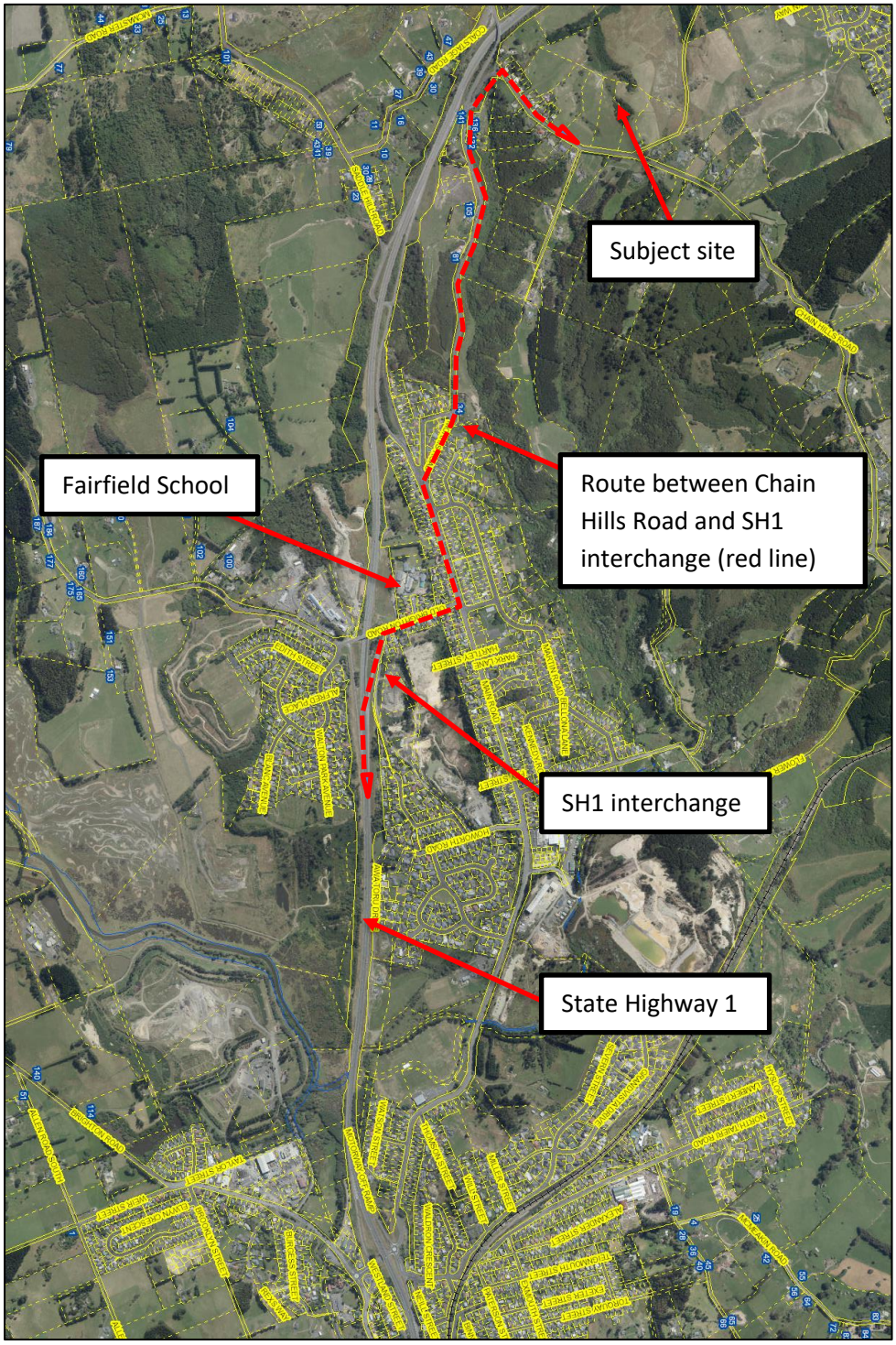

Figure 19 – Key route between Chain Hills Link Road and State Highway 1 via Fairfield

59. The route shown in Figure 18 comprises both Collector and Arterial roads. Main Road, between Morris Road and Old Brighton Road, carries 3300 vehicles per day with an estimated 265 vehicles in the peak hour. Old Brighton Road, between Main Road and the SH1 interchange, carries 3200 vehicles per day with an estimated 255 vehicles in the peak hour. These volumes will increase as a result of the proposal.

60. While these traffic volumes will impact on capacity levels of service at key intersections along the route shown in Figure 17, they are still considered to be well within the capacity limits. Both of these intersections are expected to operate with minimal additional delays for turning traffic.

61. It is noted that this route passes Fairfield School, which is a primary school located on Old Brighton Road. Analysis of the NZTA CAS data shows that there has only been a single reported crash on the section Old Brighton Road between Main Road and the SH1 interchange in the period from 2017 to 2022. This crash was classified as minor and did not involve school-related traffic.

62. The proposal will increase traffic volumes past the school. Noting that Old Brighton Road already carries a significant volume of traffic, prevailing safety in terms of reported crash history suggests that the road operates to a good level of safety. There do not appear to be compelling factors that would suggest that this level of safety would change due to anticipated increases to traffic volumes.

63. The Dunedin City Council also operates a road safety improvement programme that aims to complete safety improvements around all 80 Dunedin schools by 2030. Safety improvements may include raised and painted crossings, kerb buildouts which narrow intersections, speed humps and variable electronic speed signs. It is anticipated that an increase in traffic past the school may accelerate the Council's plans to undertake such safety measures in the vicinity of Fairfield School.

64. Specific analysis of the wider transport network and intersections further from the site has not been undertaken given the increasing dispersal of traffic effects as distance from the site increases.

STRATEGIC DIRECTION

65. The Dunedin City Integrated Transport Strategy identifies five key 'Areas of Focus' which encapsulate many of the key transport challenges faced by Dunedin, and the vision and objectives for Dunedin's transport outlined in the Strategy. A range of priorities and approaches are listed under each of the 'Areas of Focus' that provide guidance towards achieving the Strategy's objectives and vision.

66. The key areas of focus relevant to this proposal are:
    - Focus on safety
    - Focus on travel choices
    - Focus on resilience

67. The two other key area of focus are freight movement, and movement within centres, which are not considered relevant to this proposal.

68. Broad assessment of the proposal in respect of the relevant key areas of focus within the scope of this report are outlined in the table below. Commentary is informed by the assessments undertaken in this report and scope of infrastructural improvements proposed by the developer.

KEY AREA OF FOCUS	STRATEGIC RESPONSE	DEVELOPMENT RESPONSE
Safety	Prioritise safety improvements according to risk in order to reduce the number of fatal and serious injury crashes occurring on Dunedin's road network, with particular focus on improving safety in the central city and centres, and for vulnerable road users.	***Targeting Risk*** Intersections will be designed in accordance with best practice, ensuring that sight distances and traffic controls comply with the requirements of the road controlling authority. ***Vulnerable road users*** Footpaths will be provided within the site, and along Chain Hills Road, in accordance with NZS 4404:2010 design standards. ***Safe Speeds*** The prevailing speed limit on Chain Hills Road is higher than that recommended by NZTA speed management guidelines. While the developer cannot effect a formal change to the speed limit as this is a matter for the road controlling authority, they do support review of the speed limit.

Travel Choice	Reprioritise investment and reallocate space on the transport network to achieve a significant improvement in the provision of active travel modes and public transport in Dunedin and explore initiatives to support the uptake of travel choices.	***Support for Travel Choices*** Internal roads will be designed to accommodate the travel needs of residential traffic. Footpaths will be provided within the site to meet primary operational needs. Walkways will be provided within reserve areas in the wider site for recreational use. ***Public Transport*** Design of the internal roading network will be designed to accommodate future public transport use.
Resilience	Promote the integration of land use and transport planning to reduce the demand for vehicle travel, and plan, prioritise and support local community responses, to ensure Dunedin's critical transport infrastructure is resilient in the face of future threats and constraints.	The proposed road extension that links Gladstone Road North and Chain Hills Road will improve the resilience of the transport network by creating an alternative route that avoids the State Highway 87 intersection at the southern end of Mosgiel which is under significant operational pressure. This will also bring the road network within the existing developed / consented part of the site in line with the Dunedin Code of Subdivision and Development 2010 which requires all residential neighbourhoods of more than 75 lots or dwelling units to be provided with more than one connection to a collector street or higher order road. Upgrades to the existing road network, and proposed linkages within and to the development site, support active road users. It is acknowledged that the proposal is unlikely to reduce the demand for private vehicle travel. However, on balance the provision of the link road outlined above is considered to outweigh the disbenefit of not reducing private vehicle travel, in terms of overall transport network resilience and route choice selection.

RESPONSE TO SUBMISSIONS

69. Several submissions have raised transport matters in relation to the proposed plan change. The main topics of these submissions are responded to below:

SUBMISSION POINT	RESPONSE
Speed Limit on Chain Hills Road	Reduction of the speed limit on Chain Hills Road, from Morris Road along the frontage of the development, is recommended. However, changes to the speed limit will need to be undertaken by the road controlling authority (DCC) as part of their speed limit review process.
Safety of Chain Hills Road connection (including the Morris Road intersection)	There are no specific or significant crash trends that have been identified on Chain Hills Road. Traffic volumes will increase significantly on Chain Hills Road, however there are no specific underlying road safety issues that would be exacerbated by the increased use. Any minor road safety improvements can be incorporated under subdivision consent requirements at the time the plan change site is developed.
Increased congestion on Chain Hills Road / Irwin Logan Drive	While traffic volumes would increase significantly on Chain Hills Road, this route (including the Morris Road intersection) is expected to operate to a high level of efficiency. Traffic volumes on Irwin Logan Drive are expected to be similar to those generated by existing developed and consented development areas, therefore impacts on existing levels of service on Irwin Logan Drive are expected to be minimal.
Lack of pedestrian / cycling facilities on Chain Hills Road	Pedestrian facilities will be provided on Chain Hills Road along the frontage of the development which will also extend along the northern side of the road to include the properties from 1 to 39 Chain Hills Road. Cycling facilities are not warranted under NZS 4404:2010.
Lack of pedestrian / cycling facilities on Morris Road and Main Road.	The subdivision is likely to result in increased levels of walking and cycling in the immediate area. However, these will only be moderate because of the lack of destinations within a viable walking/cycling distance via this route, meaning that most walking/cycling will occur for more sporadic recreational use. The traffic flows on Chain Hills Road will remain low, even with the plan change site fully developed, and consequently it is not considered that any additional infrastructure is required for pedestrians or cyclists above what is proposed by the developer.
Impact on Fairfield Primary School	Impacts on the Fairfield Primary School are discussed earlier in this report. It is noted that the Dunedin City Council is actively improving road safety around all schools in the city, which are expected to cater for any increased traffic volumes in the vicinity of the school site.

Impact of connection to Woodland Avenue	Only a small number of lots will require access to Woodland Avenue, therefore impacts on safety/efficiency of this road are expected to be negligible.
Lack of consideration for public transport	Roads will be designed to accommodate public transport, however this is ultimately a matter than can only be addressed by the public transport provider (Otago Regional Council).
People using proposed link road as a bypass	Given the proposed link road geometry, and observations of Heathfield Drive, it is considered unlikely that the proposed link road will be used as a bypass/"rat-run". Nevertheless, this can be addressed at the future subdivision consent stage and road features installed to discourage the proposed link road as a bypass. Such features could include road narrowing, speed cushions, or other such infrastructure.

RECOMMENDATIONS

DESIGN STANDARDS AND REQUIREMENTS

70. Although cross sections and designs for the internal road network are not yet available it is expected that the internal network within the subject site will be designed and constructed in general accordance with its intended network hierarchy and adhere with the relevant requirements of the appropriate subdivision engineering standards, including the Dunedin City Code of Subdivision and Development 2010, NZS 4404:2010, and Austroads. This includes (but is not limited to) vehicle crossing spacings, intersection and vehicle access sight distance, and provisions for active road users.

71. Specific provision for active road users should be made on Chain Hills Road between the proposed link road toward Morris Road. These provisions should comprise widening of road shoulders to provide for an appropriate level of service for rural/recreational-style users.

GENERAL TRAFFIC OPERATIONS

72. The future traffic demand around the road network, both with or without the development traffic in place, gives rises to a potential need for capacity upgrade of the State Highway 1/Gladstone Road North intersection.

73. Therefore, an appropriate long-term monitoring of the intersection performance and safety is recommended which is normal to be undertaken by the road controlling authorities. In particular, the performance of the intersections with the State Highway network will be significantly affected by future route choice. It is expected that in the medium to long term, changes to intersections may be required, though this would be the case even if the development were not to go ahead.

CONSTRUCTION TRAFFIC

74. It is expected that there would be an increase in construction traffic on the local roading network associated with the plan change. This is not expected to impact on the safe and efficient function of the network. It is assumed that any future roading upgrades required to support development within the subject site in line with the proposed zone changes would be undertaken with the Code of Practice for Temporary Traffic Management (CoPTTM).

75. Some specific elements of the proposed development are expected to generate higher levels of construction-related traffic, and Council may wish to consider requirements for Construction Traffic Management Plan's (CTMP) at the subdivision consent stage to manage onsite activity; in particular, the protection of the existing/proposed local roading network.

CTMP's outline how activities would be managed on site and should include (but not be limited to):

- Details of how construction materials would arrive at the site, including the location of stockpiling areas, loading areas, and routes for heavy or over-dimension vehicles accessing the site; and

- General site operational information including details of hours of operation, location of parking for construction workers, provision for managing dust/debris migration onto the public road network, temporary traffic management requirements, maintenance of existing pedestrian and cyclist access, and access to neighbouring properties. It should also cover the requirement for communications and problem/incident reporting.

CONCLUSIONS

76. The proposed Plan Change area is considered to be reasonably well located for residential development from a road safety and efficiency perspective. Except for promoting reduction in vehicular use, it generally aligns with the transport outcomes of the Dunedin Integrated Transport Strategy outlined in this report. Significantly, the proposed link road will provide additional transport network resilience toward the south of the Mosgiel township at a time when the State Highway 87/Gladstone Road North intersection is under considerable operational pressure.

77. Connectivity will be possible to the surrounding land use via walking and cycling between the site and the established Mosgiel urban area south of the railway line. Across the wider area, the site is well situated for accessing the primary road network, with the arterial corridor via Morris Road located near to the south-west, and the State Highway network easily accessible outside of peak commute times. Access and circulation within the subdivision itself will be designed to deliver an appropriate level of service for all transport modes, in the manner anticipated by the current New Zealand Standard 4404:2010.

78. An assessment of the current speed limit on Chain Hills Road adjacent the site has shown the current 80km/h speed limit is higher than that what would be recommended by the NZTA Speed Management Guidelines. While it is noted that the process to change speed limits sits outside of the Resource Consent process, additional development facilitated by the proposed Plan Change would further reinforce the appropriateness of reducing the speed limit on this part of the network.

79. An assessment of the likely traffic generation levels associated with the residential subdivision indicates a significant increase in traffic using Chain Hills Road, and a slight decrease in traffic using Gladstone Road North. Overall traffic from the development of the proposed Plan Change area would be dispersed across the adjacent road network, with local trips to the Mosgiel urban centre to the north, and trips to the Dunedin urban area via Chain Hills Road/Morris Road to the south. Vehicular traffic generated by the development is expected to be able to be accommodated by the existing transport network, with proposed upgrades to Chain Hills Road for active road users being appropriate.

80. Overall, it is assessed that the proposed Plan Change to provide for development of the site for residential subdivision would not cause the function, safety, or capacity of the surrounding road network to be compromised, and that an acceptable transportation outcome for all modes and users can be delivered in this location.