Matamata Piako District Council Plan Change 47

Structure Plans for Horrell Road Rural Residential Zone, Morrinsville and Tower Road Residential Zone, Matamata

Structure Plan Transportation Assessment Summary

June 2016

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Structure Plan Transportation Assessment Summary

Quality Assurance Statement

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1. Introduction

The Matamata-Piako District Council (MPDC) is currently completing Plan Change 47 on Urban Development in Morrinsville, Matamata and Te Aroha. It is intended that growth areas identified in the District Plan integrate land use with transport and other infrastructure in accordance with the Waikato Regional Policy Statement (RPS).

The Proposed Waikato Regional Policy Statement decisions state that appropriate information for the zoning of new urban development is supportive of the location, type, scale, funding and staging of infrastructure required to service the area, provides for multi-modal transport links and connectivity.

Two new areas have been identified by Council that require structure plans to provide development details for the roading and utility infrastructure. The two areas are:

- Horrell Road, Morrinsville: 59 additional lots are envisaged within a 76 ha rural-residential zone which allows minimum size lots of 1 ha.
- Tower Road, Matamata: Approximately 193 additional residential lots are envisaged within a 24.2 ha zone based on current Council yield expectations of 8 lots / ha.

1.1 Objective

The stated objective for this transportation study is *to develop structure plans that ensure in the two identified growth areas, transportation is planned to ensure that the areas are safe, cost effective, well connected and provides for multiple modes of transport*.

The project is intended to identify options for provision of the necessary transport connections, identify a preferred option and complete structure plan maps with associated cost implications.

1.2 Scope

The key project outcome is a summary report to be developed with assistance from Council staff incorporating the following for each area:

- Identification of the feasible transport options considered;
- Assessment of the accessibility /connectivity of the options;
- Assessment of the safety implications of the options;
- Identify any necessary level of service improvements for the surrounding road network;
- Complete cost estimates for two preferred options;
- Recommend preferred option (from a transport perspective).
- Complete a structure plan with indicative road alignment, with staging of off-site upgrades as necessary, with project cost estimates.

2. Background

2.1 Regional Policy Statement

As noted in the project brief, *"The Waikato Regional Policy Statement provides an overview of resource management issues in the Waikato region. It provides policies and a range of methods to achieve integrated management of natural and physical resources across resources, jurisdictional boundaries and agency functions, and guides the development of sub-ordinate plans (regional as well as district) and the consideration of resource consents. In accordance with the Resource Management Act, District Council's must give effect to the Regional Policy Statement".*

The Proposed Waikato Regional Policy Statement decisions state that appropriate information for the zoning of new urban development is supportive of the location, type, scale, funding and staging if infrastructure required to service the area, provides for multi-modal transport links and connectivity.

2.2 Regional Transport Strategy

The project brief states "*The Regional Land Transport Plan (RLTP) has been developed for the region by the Waikato Regional Transport Committee, and sets out how we intend to develop the region's land transport system over the next 30 years. It also identifies proposed regional transport activities for investment (local and/or central government) over the next six years*".

2.3 Accessibility/ Connectivity

The NZ standard for *Land Development and Subdivision Infrastructure* - NZS 4404 – defines the objective of best practice subdivision access as: *to provide roads that are safe for all road users and designed to the context of their environment*.

NZS 4404 describes the purpose of roads as: *a place (for access and interaction); a link (for connection and movement of people and goods); and a corridor (for utility and amenity infrastructure).*

Furthermore NZS4404 describes well connected networks as:

"Well-connected networks (roads and other links) are achieved with smaller block sizes and regular connections. Network connectivity shall be designed to achieve:

a) Shorter travel distances;

b) An increased number of alternative routes for all types of users;

c) Increased opportunity for interaction;

d) Improved access to; public transport, cycling and walking networks, and access to destinations.

Development design shall ensure connectivity to properties and roads that have been developed, or that have the potential to be developed in the future. The design process should ensure the following maximum walking distances from a lot to a connector/ collector or arterial road:

- *Rural: No maximum distance. The design should maximise future connectivity to a suburban network;*
- *Suburban: 400 m. A shorter distance shall be considered near centres and major public transport routes;*
- *Urban 300 m;*
- *Centre 200m.*

Where factors, such as topography or barriers, limit the ability to achieve the network connectivity standard, the designer shall optimise network connectivity and access to the maximum extent practical. The designer shall maximise connectively to existing development".

With particular reference to the last paragraph, the intention of this access assessment for the proposed urban growth sites is to maximise connectively for both the existing network and identify future links to secure connectivity with future growth cells.

A walkable neighbourhood is typically characterised by having a range of facilities within 10 minutes' walk[1] of residential areas (i.e. around 800m). Relevant facilities include public transport, shops, schools, parks and reserves. Furthermore, schools should be well located depending on the age of pupils catered for, with primary level ideally within walking distance, while intermediate to secondary level may require increased travel of say 2 – 3 km (which would correspond to around 10 - 15 minutes cycling time).

[1] Department for Transport "*Manual for Streets" 2007*

3. Matamata Growth Area

3.1 Proposed Tower Road Residential Area

Council has identified a block of land on the north east side of the existing Matamata urban area for potential rezoning as Residential land. The land is currently in single ownership and currently has road frontage to the south with Bridie Avenue and to the west with Magnolia Drive as shown in Figure 1.

Approximately 193 additional residential lots are envisaged within a 24.2 ha zone based on current MPDC yield expectations of 8 lots / ha. A further 48.2 ha has been flagged as a future residential policy area.

Figure 1: Matamata Growth Area: Tower Road Residential Zone

While this report does not include assessment of the effects of the additional 48 ha that has been indicated as 'future residential policy area", the need for future connections has been considered.

3.2 Existing Road Network

The proposed Tower Road Residential Zone has two boundaries with road frontage: one at the end of Magnolia Drive and the second at the end of Bridie Avenue, as shown on Figure 1 and depicted in Photographs 1 and 2. These two potential connections provide linkage to the arterial road network.

Access to the arterial road network will be feasible using the above two connections. Bridie Avenue provides a link to Tower Road, an arterial road to the south of the proposed zone. Linkage to Rawhiti Avenue, which is also an arterial road and provides numerous connections to Matamata retail areas and State Highway 24 (SH24), can be accessed by the local road network by way of Magnolia Drive, Findlater Street and one of the links to the south-west such as Ngaio Street or Weka Street.

Photograph 1: Bridie Avenue existing end of road and proposed connection to residential zone

Photograph 2: Magnolia Drive existing end of road and proposed connection to residential zone

Existing carriageway widths and traffic volumes for each of these potential linkage roads are given in Table 2, later.

3.3 Road Width Standards

The District Plan includes recommended road standards for residential roads (Table 3.1) summarised in Table 1 below:

Road Type (Residential	Traffic Volume (vpd)	Road Reserve Width (m)	Traffic Lanes (m)	Parking Lanes (m)	Total Carriageway Width (m)
Local Road	56-200	18	3.5	2.5	6-7
Local Road	200-1,000	20	3.5	2*2.5	8.5
Sub-collector[2]	800-1,200	20	2*3.5	2*2.5	11
Collector	1,000-2,500	20	2*3.5	2*2.5	12

Table 1: MPDC District Plan Residential Road Standards

The District Plan requires a footpath on both sides of residential roads except for local roads carrying less than 200 vpd, where a single footpath is considered adequate.

Subdivision road width standards vary between local authorities for the same volume and type of traffic. For example some local authorities permit residential carriageway widths of 6m for up to 1,000 vpd and 10- 10.4 m for up to 3,500 vpd (comprising of 3.0 traffic lanes and 2.0 - 2.2 m parking lanes).

The New Zealand standard NZS 4404 recommends traffic lane widths of 5.5 – 5.7 m (two-way) for up to 2,000 vpd and 8.4 m for up to 8,000 vpd. For parking lane widths NZS4404 defaults to AS 2890, which recommends 2.1 m minimum width for parallel parking (where wide vehicles are unlikely and a "*continuously marked narrow parking lane will aid traffic flow*" (or 2.3 m for normal conditions). With consideration to the various criteria the resultant total minimum recommended width is 9.7 m to 9.9 m for up to 2,000 vpd. However, in a practical sense, the minimum two way width is 5.0 m (based on the minimum legal lane width of 2.5 m). This minimum two-way width requires and encourages slow speeds in order to safely pass oncoming vehicles.

3.4 Traffic Generation

The proposed urban growth cell has a gross area of 24.2ha which is expected to ultimately yield up to 193 lots[3]. Traffic generation associated with residential lots in an urban area typically range from 8 to 11 vpd/lot. The design rate recommended by the NZTA research report *Trips and Parking Related to Land Use* (RR 453) is 10.4 trips/day per lot with a peak hour flow of 1.1 trips/h per lot (based on typical peak hour proportion of 10% of the daily flow). On this basis the expected trip generation associated with the residential block of land is 2,007 vpd and 212 vph in the peak hour.

3.5 Connectivity Options

It is desirable that the proposed residential zone is well connected to facilities including schools, shops, health centres and reserves as well as the adjacent residential area. Overall the proposed land to be zoned residential is increasingly remote from these facilities with even the closest boundary off the end of Magnolia Drive being over 1 km from The Broadway shops, school and services. It is desirable therefore that consideration is given to

[2] Lane width and total width is not consistent – either traffic lanes need to be 3.0m or total width increased to 12m
[3] Council brief dated 9 December 2015

a new neighbourhood centre or primary school to service the north-eastern side of Matamata township. While the addition of 193 lots does not itself generate sufficient demand for new facilities, when coupled with the neighbouring areas and the future residential zone it is likely that additional facilities will be necessary. It is recommended that Council consider the need for additional facilities including commercial zones and/or primary schools at the time of zoning the future area.

The growth cell currently has two common boundaries with a road: one at the end of Magnolia Drive and the second at the end of Bridie Avenue. These two potential connections provide linkage to the arterial road network.

The two available connections are approximately 600 m apart as measured parallel to the south-western boundary, which results in travel paths of over 1 km to connect a lot in the new zone with an adjacent existing lot on Findlater Street. Therefore an additional connecting road (or as a minimum pedestrian access) is desirable between Findlater Street and the proposed zone (somewhere between Sim Street and Weka Street). As all lots in this area on Findlater Street are fully developed, it would likely require significant impact on a landowner (and associated cost) to pursue such an additional access and this option has not been pursued further in this assessment[4].

To protect the potential for future connections from the subject zone to the future residential zone it is recommended that the future connections are marked on the structure plan for the zone at intervals of 300 m to 400 m approximately. These future connections are included on the road network structure plan in Figure 2.

It is understood that development of the zone may be staged, with the northern area commencing in advance of the southern area. This will likely result in the Magnolia Drive connection being completed first.

A threshold is to be formulated based on the initial stages of development being able to be managed on the local street network with no additional infrastructure improvements over and above those proposed for the zone with all connections in place.

As the land to be zoned residential is in a single ownership, the cost of access connections and identified provision for connections to future residential development has been assumed to be incorporated as part of the development work. However it is noted that consideration should desirably be given to appropriate widths at the time of development to avoid the need for future widening of the roads within the currently proposed zone.

3.6 Local Road Effects

The traffic effects of the proposed residential development have been considered with respect to the expected traffic routes that may be adopted to access the arterial road network, i.e. access to Tower Road to the south-east or Rawhiti Road to the south–west (both of which are arterial roads). The connections modelled are based on optimised readily enabled linkages as described above. Traffic distribution is based on an approximately even split of traffic between the two connections – at Magnolia Drive and Bridie Avenue. Of the traffic demand using the Magnolia Drive connection a distribution of

[4] If a landowner on Findlater Street was interested in selling some or all of his lot to Council then the provision of an additional connection could be revisited.

70% to Ngaio Street, 15% to Weka Street and 15% to Findlater (south) has been assessed with cognisance to the main commercial areas on The Broadway and Waharoa Road East.

Based on the above described traffic distribution model, the following Table 2 sets out the existing traffic volumes and road standards and resulting proposed traffic volumes and road standards, desirable road standards and the options for catering for the future growth area.

Table 2 shows that the proposed residential zoning results in a shortfall in road standard in comparison to the District Plan on Bridie Avenue, Ngaio Street, Findlater Street (west of Magnolia) and Magnolia Drive.

3.6.1 Ngaio Street

The carriageway width of Ngaio Street falls short of District Plan standards for both existing and forecast traffic flows (with the recorded traffic volume on Ngaio Road currently 1,300 vpd). A desirable width for Ngaio Street would allow for parking on both sides plus two-way through lanes. As a minimum thiswould require 9.7 – 9.9 m.

Options for Ngaio Street are (in decreasing order of scope and cost): Widen to District Plan requirement of 12 m; widen to minimum desirable (9.7 – 9.9 m); widen to provide parking bays over selected sections; or retain existing width and monitor need for no-parking marking. The benefits of any road widening are difficult to quantify being principally amenity value to adjacent properties. Generally, the costs outweigh the benefits in widening an existing street primarily to provide parking facilities at the traffic volumes expected on Ngaio Street. Any potential road safety issue is able to be managed by traffic management markings within the existing carriageway.

The presence of driveways serves as a natural barrier to continuous parallel parking and reduces the likelihood of parking on both sides of the road over the same section. Furthermore, if vehicles park close to the kerbs then there would generally be adequate width for two vehicles to pass each other at slow speeds (i.e. minimum traffic lane width is 2.5 m and minimum vehicle parked width is 2 m - which is adequate for a slow speed environment based on 99th percentile light vehicle widths[5]). On this basis, considering the volume of traffic and frequency of opposing parked vehicles, the effects of the increase in traffic due to the proposed residential development area assessed as minor, and are principally a lower level of amenity for residents of the street.

Notwithstanding the above conclusion with respect to the minor effects, to mitigate the effects of the additional traffic and for consistency with District Plan requirements imposed on all development in the town, it is recommended to provide for parking demands outside existing residential dwellings by way of parking bays over discrete sections of the street, between driveways and where practicable. Based on the existing nominal carriageway width of 9m this would require widening by 0.5 m to 1.0 m to achieve the minimum desirable half width of 5.0 to 5.2 m (i.e. 3.0m lane plus 2.0 – 2.2 m parking bay). For the most part this is expected to be achieved by widening up to the existing footpath without changing drainage provisions by utilising a specially designed (and lower) kerb profile.

[5] AS/ NZS 2890.1 Appendix B

3.6.2 Findlater Street

The existing carriageway width on Findlater Street is nominally 9 m with a most recently constructed section west of Magnolia Drive measuring just under this target width.

The options, discussion and recommendations for Findlater Street are as for Ngaio Street above albeit with lower traffic volumes.

3.6.3 Magnolia Drive

The existing carriageway width on Magnolia Drive is nominally 9m.

The options, discussion and recommendations for Magnolia Street are as for Ngaio Street above, while acknowledging the lower traffic volumes.

3.6.4 Bridie Avenue

The available carriageway width on Bridie Avenue falls short of the District Plan requirements for the expected traffic volumes but meets the desirable minimum standard assessed for this street. The 10 m existing width will enable parking on both sides on the street whilst maintaining a though lane in each direction – albeit a narrow lane. Widening of the road to either the 11 m (traffic volume is within 10% of this threshold) or the 12 m width would provide additional width for parking but likely result in higher traffic speeds as a result of the wide carriageway particularly when few vehicles were parked on the roadside. The likely costs of widening the road (mid-block) to meet the District Plan requirements (in the order of $125,000) is not considered justified on the basis of identifiable benefits.

As noted above many of the existing streets in Matamata (including Ngaio Street) are already operating with similar traffic volumes with similar or less carriageway widths without any reported issues.

Bridie Avenue currently has a footpath on the western side only. To cater for the change in road function with additional through traffic a footpath on both sides is recommended, or alternatively a formal crossing point for pedestrians to cross to the west side. As the majority of the pedestrian demand would be to the west of Bridie Avenue on Tower Road, and the roundabout at the intersection of Bridie Avenue and Mannix Place would interrupt any pedestrian flow on the eastern side, it is recommended that the Structure Plan include provision for a footpath on the western side of Bridie Avenue. The footpath should extend from road end to the Mannix Place roundabout with inclusion of a pedestrian crossing point on the north-western roundabout leg.

3.6.5 Intersections

The two proposed connections to the existing road network will result in all traffic utilising either the intersection of Magnolia Drive and Findlater Street (followed by Ngaio Street intersections) or the intersection of Bridie Avenue and Tower Road.

The intersection of Bridie Avenue with Tower Road is a standard 'T ' layout and currently has a give way control on Bridie Street with a central splitter island, shown in Photograph 3. A flush median is marked on Tower Road providing space to shelter a right turning vehicle into Bridie Avenue. This intersection is expected to preform adequately with the assessed increase in traffic. It is noted however that the give way control does not currently include a marked limit line which should desirably be added.

The intersection of Ngaio Street with Rawhiti Avenue is a standard 'T ' layout and currently has a give way control on Ngaio Street approach. Based on the assessed traffic volumes this intersection is expected to perform adequately.

The intersection of Magnolia Street with Findlater Street and Findlater Street with Ngaio Street (photograph 4) are both uncontrolled "T" intersections. With the increase in traffic demands associated with this residential development, it is recommended that priority controls are added to both of these intersections.

Photograph 3: Tower Road facing east with Bridie Avenue intersection on the left

Photograph 4: Ngaio Street facing east with Findlater intersection on the right

3.6.6 Cost Estimates

Cost estimates for the work required on the existing road network to accommodate the proposed residential zoning have been developed based on road asset cost data provided by MPDC and includes allowance for any land requirements plus a contingency. Development of cost estimates at this high level without the benefit of detailed investigations or design leads to high variability with many unknowns and the estimates should be treated as such. For example the need for management or relocation of utility services is currently uncertain and can lead to significant cost escalation.

Project cost estimates have been grouped into three broad categories as follows:

- Parking Bays (on Magnolia Drive, Findlater Street (west), and Ngaio Street) based on approximately 17 bays and up to 370m in total: $300,000
- Bridie Avenue pedestrian facilities: $25,000
- Intersection signs and markings: $5,000

Street	Existing[6] Traffic Volume (vpd)	Existing Nominal Width (m)	Existing Footpath	District Plan Existing Required Width (m)	Forecast Traffic Volume (vpd)	District Plan Proposed Required Width (m)	Minimum Desirable Width (m)	Minimum Optimised Strategy
Magnolia Drive	416[7]	9	Both Sides	8.5	1420	12	9.7-9.9 (2*2.75 traffic plus 2*2.1 parks)	Widen with parking bays
Findlater Street (west Magnolia)	524[8]	9	Both Sides	8.5	1226	12	9.7-9.9	Widen with parking bays
Findlater Steet (north Rawhiti)	524	9	Both Sides	8.5	824	8.5	7.6- 7.8 (2*2.75 traffic plus 2.1 parking)	Retain 9 m (2*2.0 parking, 2*2.5 traffic lanes)
Ngaio Street	1305	9	Both Sides	12	2007	12	9.7-9.9	Widen with parking bays
Weka Street	735	10	Both Sides	8.5	885	8.5	7.6- 7.8 (2*2.75 traffic plus 2.1 parking)	Retain 10 m (2*2.1 parking, 2*2.9 traffic lanes)
Bridie Avenue	320	10	One Side	8.5	1323	12	9.7-9.9	Retain 10 m (2*2.1 parking, 2*2.9 traffic lanes); Either add footpath OR add pedestrian crossing facility
Rawhiti Avenue (Tawari – Kauri)	3594	11	Both Sides	Specific Design	4296	Specific Design	13.2 (2*3.0 traffic plus 2*2.1 parks, 2*1.5m cycle lanes)	Retain 11 m (2*2.2 parking, 2*3.3 traffic lanes); Consider cycle strategy
Arawa Street	3000	13	Both Sides	12		12	13.2 (2*3.0 traffic plus 2*2.1 parks, 2*1.5m cycle lanes)	Retain 13m and consider marking cycle lane following cycle strategy.

Table 2: Local Road Carriageway Widths, Traffic Volumes, Options and Optimised Strategy

[6] Based on most recent count data within last 10 years
[7] Estimated volume based on number of lots
[8] Estimated based on other section

3.7 Road Network Structure Plan

Based on the above described existing road network improvements as well as the recommended access connections to the proposed zone with allowance for future potential connections, a Structure Plan has been developed for the road network as shown in Figure 2.

Figure 2: Proposed Structure Plan – Road Network

3.8 Staged Development of Zone

It is understood that development of the zone may be staged with the northern area commencing in advance of the southern area which will likely result in the Magnolia Drive connection being completed in advance of the Bridie Avenue link. This interim road network will increase traffic on the Magnolia Drive linkages and traffic to/ from the south and east would need to use Findlater Street for access.

Additional road network improvements would be necessary for Findlater Street (east of Magnolia Drive) as well as potentially the other local roads and potentially intersections to accommodate the increase in traffic unless the development staging is linked to the road network capacity.

A development threshold has been formulated based on limiting the traffic generated by initial stages of development to the capacity volume for Findlater Street with reference to the District Plan required carriageway widths (including a 10% sensitivity to traffic distribution[9]), and the same distribution of traffic (north/westbound and south/eastbound) as for the full zone analysis above. On this basis it is recommended that the development interim staging is limited to 50% of the total area prior to completing the internal road network connection to Bridie Avenue.

[9] Ie a total flow of up to 40% of the development on Findlater Street (east) and acknowledging that there are no existing accurate traffic counts for Findlater Street in the section close to the Magnolia Drive intersection.

4. Horrell Road, Morrinsville Growth Area

4.1 Proposed Horrell Road Growth Area Description

The area proposed to be zoned rural residential is labelled Area One in Figure 3 below and comprises 76.15 ha on the western side of Horrell Road between Horrell Road and the Piako River and extends approximately 1.6 km north of Murray Road.

Horrell Road is locally known and signposted as intersecting with State Highway 26 (SH26) approximately 100 m to the west of its intersection with Murray Road, however it is noted that the District Plan describes Horrell Road as commencing at Murray Road. For the purposes of this report Horrell Road will be referred to as commencing at SH26 as is the local convention. On this basis, Murray Road provides a 500 m linkage from Horrell Road to SH26. A railway line runs parallel to Murray Road and the Murray Road formation crosses the railway line approximately 35 m north-west of the SH26 intersection. SH26 crosses the same railway line by way of an overbridge located approximately 120 m east of the Horrell Road intersection.

The Matamata Piako District Plan classifies[10] SH26 as a "Significant Road", Horrell Road as a "Collector Road" (from Murray Road to SH27) and Murray Road as a "Local Road".

Figure 3: Proposed Morrinsville Rural Residential Growth Area 1

[10] MPDC defines: Significant roads are roads that are a significant element in the national and/or regional economy; Arterial roads are roads that are a significant element in the local economy; Collector roads are roads that are preferred between or within areas of population or activities; and Local roads are roads where the primary function is property access.

4.2 Existing Intersections

Both intersections on SH26 (at Horrell Road and Murray Road are currently "T " intersections with standard highway width i.e. no additional widening for turning movements is currently available as shown in Photographs 5 and 6.

The existing intersection of SH26 and Horrell Road is currently located on the western side of the railway overbridge on SH26, which limits sight distance to the east. The available sight line to the east is 165 m which equates to a safe approach speed of 75 km/h which is less than the current surveyed 85%ile approach speeds on SH26 of 82 km/h (measured to the westernmost intersection leg, and would be less for the easternmost leg of the intersection). Sight distance to the west is approximately 265 m which is adequate for the currently surveyed operating speeds on this approach.

While the sight distance is less than desirable the intersection does not currently exhibit an atypical crash record with one minor injury crash related to turning traffic in the last 5 year period. The proximity of the adjacent rail overbridge also restricts the ability to widen the carriageway in the vicinity of the existing intersection to provide for turning traffic.

Photograph 5: Sh26/ Horrell Road Intersection with Rail overbridge beyond

Photograph 6: SH26/ Murray Road Intersection with rail crossing behind

4.3 Road Width Standards

The District Plan includes recommended road standards for rural residential roads (Table 3.1) summarised in Table 3 below:

Road Type (Residential)	Lots Served/ Traffic Volume (vpd)	Road Reserve Width (m)	Traffic Lanes (m)	Length (m)	Total Carriageway Width (m)
Private way (rural residential)	2-3	12	3	0-1000	3
Private way (rural residential)	4-6	12	4	0-1000	4
Local Road	48-350	20	2*3.0	500+	6.0
Collector	250-1500	20	2*3.0-3.5		6.0-7.0

Table 3: MPDC District Plan Rural- Residential Road Standards

The District Plan does not require a footpath or allowance for parking on rural residential roads.

Subdivision road width standards vary between local authorities for the same volume and type of traffic. For example some local authorities permit low volume rural roads with a carriageway width of 5.5 m to serve up to 10 lots and private ways for up to 14 lots using carriageway widths of 3.5 m (with passing bays) up to 1200 m long.

The New Zealand standard NZS 4404 recommends traffic lane widths of 5.5 – 5.7 m (two-way) for up to 20 lots or 200 vpd with 0.5 m shoulders. The minimum two-way width is 5.0 m (based on the minimum legal lane width of 2.5 m). This minimum two-way width requires and encourages slow speeds in order to safely pass oncoming vehicles.

4.4 Traffic Data

Traffic surveys of the existing infrastructure and current traffic volumes have been undertaken on the key roads in the vicinity of the proposed zone between November 2015 and March 2016. The existing seal widths and two-way traffic volumes both daily and peak hour are given in Table 4 below.

Road	Existing Seal Width (m)	Daily Traffic Volume (vpd)	Peak Hour Traffic Volume (vph)
Horrell Road north Murray Road (Nov 2015)	6.3 – 6.5	684	85
Horrell Road (adjacent SH26)	7.0	-	-
Murray Road (Nov 2015)	6.0	189	32
Roache Road (Nov 2015)	-	365	53
SH26 (Mar 2016)	9.7	6191	673

Table 4: Traffic Data Adjacent Roads

The SH26 traffic survey included a speed survey located on SH26 immediately east of the Horrell Road intersection (and near to the west abutment of the rail overbridge). The speed survey indicates that existing 85%ile traffic speeds are:

- Westbound Traffic: 82 km/h (5.4% HCV)
- Eastbound Traffic : 84 km/h (5.7% HCV)

4.5 Traffic Generation

The proposed rural residential growth cell has a gross area of 76 ha which is expected to ultimately yield up to 59 additional lots[11] in the proposed rural residential zone, which is intended to allow an average minimum lot size of 1 ha. Traffic generation associated with residential lots typically range from 8 to 10 vpd/lot. Rural residential lots on the outer edges of urban areas are expected to have traffic generation rates either less than or at the lower end of this range. On this basis the expected trip generation associated with the rural residential block of land is 472 vpd and up to 53 vph in the peak hour.

An additional 164 ha has been indicated as potential future rural residential zone and while this report does not include assessment of the effects of that future zone, the need for future connections has been considered.

4.6 Connectivity Options

It is desirable that the proposed rural residential zone is well connected to facilities including schools, shops, health centres and reserves. Overall the proposed land to be zoned Rural-Residential is increasingly remote from these facilities being located on the east side of the Piako River with the only existing linkage between Horrell Road and Morrinsville township being provide by State Highway 26. There is currently no provision for pedestrians or cyclists along SH26.

The options for providing safe and effective connections to the proposed zone have been considered and are depicted in Figure 4 for vehicle access connectivity, pedestrian and cycle connectivity and effects on local roads. The total project costs for each access option include costs associated with the identified mitigation required for each category.

4.6.1 Vehicle Access

The majority of the land subject to the proposed rural residential zone has existing access onto Horrell Road. The zone is located over the first 1.6 km approximately of Horrell Road (north of Murray Road) and lies between Horrell Road and the Piako River.

Horrell Road provides existing access to the lots and could continue to do so. However, there are potential safety issues associated with the existing intersection of Horrell Road and SH26 which has required consideration of alternative access options to the proposed zone. These are described below.

[11] Council brief dated 9 December 2015

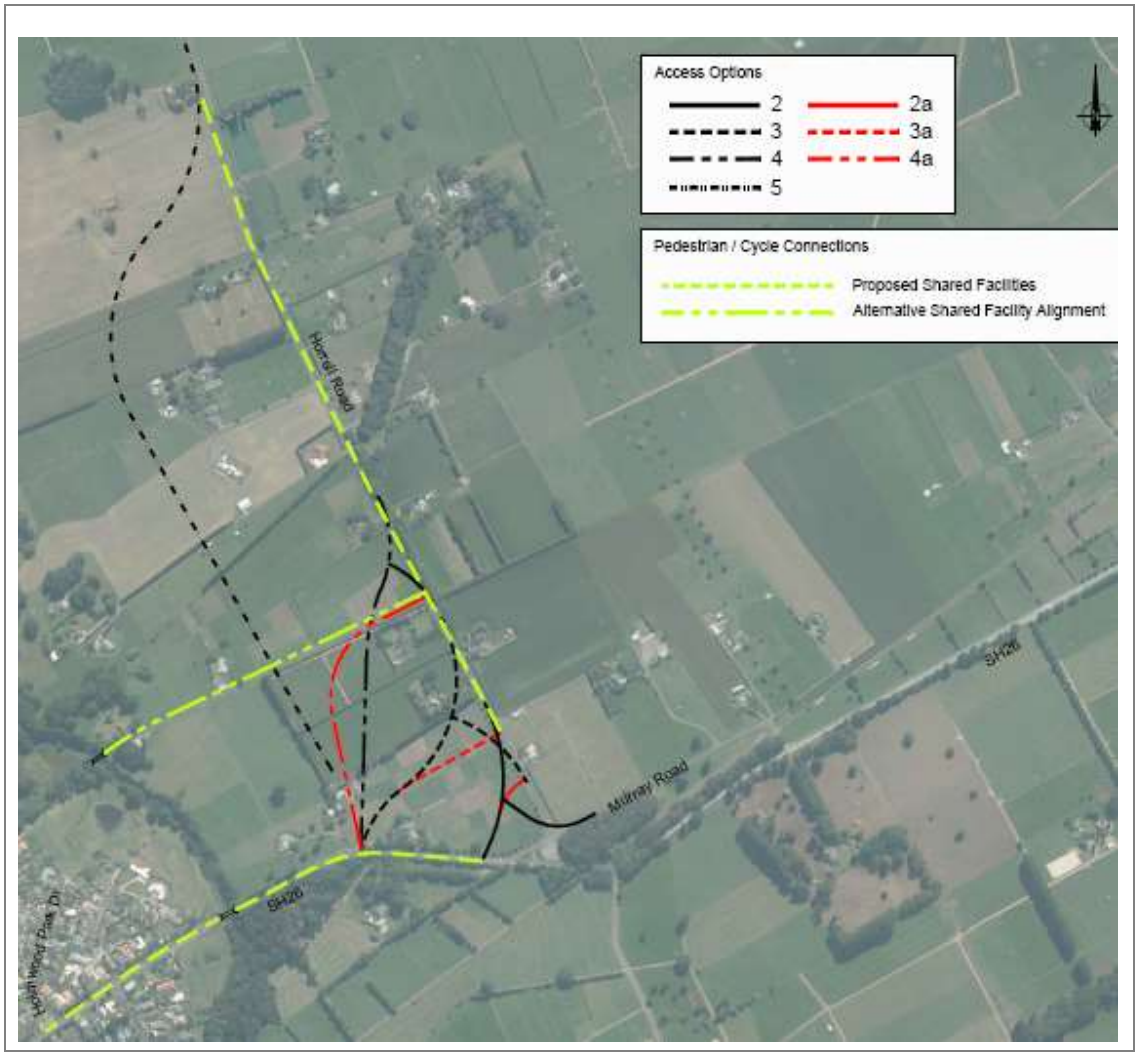

Figure 4: Proposed Structure Plan – Road Network Options

4.6.1.1 SH26 Intersections Layout

The peak hourly flows on SH26 (673 vph) are sufficiently high that the threshold for installation of a right turn bay[12] is reached with right turn-in flows exceeding 5vph.

On this basis, a right turn bay is considered desirable for both existing and future traffic turning at the SH26 intersections for all options that significantly increase right turn-in demand.

While the absolute increase in right turn-in traffic associated with this zoning is relatively low[13](i.e. 66 vpd or 8 vph based on a 12% peak hour factor), based on the above thresholds it is recommended that a right turn bay is included for all options that result in the potential for a right turn-in traffic flow to meet the warrant.

On this basis, options that include a right turn bay construction at the intersection of Murray Road and SH26 are: Options 1,1a, 2, 2a and 3a, while options that are expected to

[12] Austroads Guide to Road Design Part 4a Figure 4.9
[13] and there are no recorded high severity crashes at the existing intersections

result in demand for a right turn bay at the relocated intersection of Horrell Road and SH26 are Options 3[14], 4, 4a and 5.

Where a right turn bay is not proposed as above, then ideally the minimum treatment recommended comprises of widening to provide for the passing of turning vehicles on the left shoulder. However, as the re-zoning is not in itself creating any new right turn- in movements then this is not necessarily mandatory as part of the mitigation and will be accommodated if practical and subject to confirmation of existing right turn-in demands at the Horrell Road intersection.

4.6.1.2 Roache Road Catchment Traffic

The Options 1 through 5 described below focus primarily on the provision of access to the proposed rural residential zone. However, any option that restricts existing movements from SH26 into Horrell Road has the potential to have secondary safety issues associated with traffic destined for Roache Road.

The Roache Road intersection with SH26 is located on the outside of a curve in SH26 immediately adjacent to the eastern abutment of the railway overbridge east of Horrell Road. Visibility to the intersection and width of the carriageway at the intersection is restricted by the highway alignment and bridge structure. Poor visibility at this intersection makes its layout a significant safety concern particularly for right turn movements. More cautious drivers wishing to enter Roache Road from the west are currently understood to either make a left turn into Horrell Road followed by a right turn out of Murray Road, or make a u-turn further north on SH26 at or adjacent to the Murray Road intersection. Right turning traffic out of Roache Road may be tempted to make a left turn then a right turn into Horrell Road instead which has similar issues with respect to limited sight distance.

The resolution of safety issues at the intersection of SH26 and Roache Road requires a specific study and falls outside the scope of this assessment. Detailed traffic movement counts would be necessary to understand the volume of traffic associated with right turns at Roached Road in order to evaluate appropriate solutions. A full realignment of Roache Road is one potential solution to address the current safety risk.

Notwithstanding the need for a full study of Roache Road, it is important that any option considered for Horrell Road catchment does not exacerbate safety issues for Roache Road. In this respect, and subject to confirmation of existing turning demand patterns, it is recommended that all options (except Option 2) retain the ability to make a left turn and right turn into the existing Horrell Road, for the benefit of existing Roache Road users. Retention of these turning facilities is not expected to attract turns associated with the wider Horrell Road catchment providing the other mitigation measures within each option are installed. The facility is not considered necessary with Option 2 as this option involves only a minor relocation of existing movements to a safer location.

4.6.1.3 Option 1: Existing Horrell Road with existing SH26 intersection.

This option retains the current road infrastructure to access the zone from Horrell Road and the associated SH26 intersections of Horrell Road / SH26 and Murray Road / SH26.

[14] Noting that a right turn bay has been included for only one of the intersections for Option 3 even though there is acknowledged uncertainty of preferred traffic routes. Similarly, no right turn bay can be practically achieved for Option 2 there is a residual risk of more traffic than desirable attempting a right turn at this intersection.

The option includes upgrading of the Murray Road rail crossing and construction of a right turn bay at the intersection of Murray Road and SH26.

However, the existing available sight distance at this intersection of approximately 165m to the east which equates to a safe approach speed of 75 km/h which is less than the surveyed 85%ile approach speed on SH26 of 82 km/h (measured to the westernmost intersection leg and would be less for the easternmost leg of the intersection). Closure of the easternmost leg to right turn movements would eliminate the most hazardous movements but subject to understanding the demand for right turns in, as discussed in 4.5.1.2 above. Available sight lines to the west are clear to the horizontal curve on SH26 and greater than 260 m which is adequate for the assessed 85% ile speeds of around 90 km/h on this approach.

This option enables all existing traffic patterns to continue but retains substandard sight lines.

4.6.1.4 Option 1a: Ban Exit Movements out of Horrell Road/SH26 Intersection

This option retains the current Horrell Road/ SH26 intersection for entry into Horrell Road but eliminates the right turn out and left turn out. All outward bound movements would be diverted to the Murray Road intersection resulting in an increase in the route to Morrinsville from Horrell Road of approximately 1 km.

The option includes upgrading of the Murray Road rail crossing and construction of a right turn bay at the intersection of Murray Road and SH26.

The existing right turn into Horrell Road would be retained to cater for movements associated with Roache Road subject to a study and confirmation of this demand. If other solutions to Roache Road access are identified then this leg may also be closed retaining only a left turn in.

This option would result in all traffic associated with the growth area having safe access through intersections with adequate sight distance. The Horrell Road intersection design would need to include specific traffic management measures to ensure that exit movements would not be inadvertently undertaken.

This is a low cost option requiring minimal upgrade work with the disadvantage of longer route to/from Morrinsville.

4.6.1.5 Option 2: Relocate Horrell Road Intersection to West

This option involves relocation of Horrell Road to the west by approximately 40 m (from the existing right turn out limit line). The objective of this option is to optimise the available sight lines to the west and east. The proposed location will result in around 214 m sight line to both the west and east of the proposed intersection location (which equates to an equivalent safe speed of 90 km/h and meets the surveyed and assessed operating speeds on the east and west approaches respectively). Movement of the intersection further still to the west is constrained by a vertical curve on SH26 which coincides with the horizontal curve approximately 260 m west of the Horrell Road intersection, and approach speeds from the west are expected to be higher than those from the east due to the sharper radius horizontal curve to the east (and as confirmed by the speed surveys to the east of the site).

It is recommended that additional speed surveys are undertaken to the west of Horrell Road to enable the exact intersection location to be optimised.

This option is intended to enable all movements at the new intersection and in this way cater for all movements that are currently feasible at the existing Horrell Road intersection albeit with improved sightlines.

As for Option 1 this option includes upgrading of the Murray Road rail crossing and construction of a right turn bay at the intersection of Murray Road and SH26.

4.6.1.6 Option 2a: Relocate Horrell Road Intersection to West

This option includes the same SH26 intersection location as described for Option 2 above with an alternative tie into existing Horrell Road at a new "T" intersection and retains the intersection of Horrell Road and Murray Road in the current form.

The option is a lower cost alternative to Option 2 and results in priority flow to/from Murray Road as opposed to the new SH26 intersection whilst retaining the sharp radius intersection between Murray Road and Horrell Road. The exact location and layout for the tie-in to Horrell Road and Murray Road will be developed in the preliminary design phase as a secondary option exists to realign Murray Road as the priority and have Horrell Road intersection as a controlled side road in a similar fashion to the existing layout.

4.6.1.7 Option 3: Relocate Horrell Road Intersection to 260 m W- Short Alignment

This option involves relocation of Horrell Road to the west by approximately 260 m (from the existing right turn out limit line) to the outside of an existing horizontal curve on SH26. The exact location of the proposed intersection will be partially governed by the existing vertical curve on SH26 which restricts the intersection sight distance to the east. Appropriate placement of the intersection will result in sight lines exceeding 250 m in both the east and west directions and therefore provide for safe operating speeds in excess of 100 km/h both directions.

Sight lines to the west will require trimming of vegetation and trees on the side of the existing road formation. Furthermore it is noted that the existing highway formation is partially on private property with the actual road corridor to the north of the highway. Both the sight lines and the highway itself will need to be legalised to enable this option and associated intersection widening to proceed. A nominal sum has been included to allow for additional land for an intersection sightline to be established but the cost of existing highway legalisation has been omitted and will need to be discussed with the road controlling authority.

This option is intended to enable all movements at the new intersection and in this way cater for all movements that are currently feasible at the existing Horrell Road intersection albeit with improved sightlines. However, the existing left turn and right turn into Horrell Road would be retained to cater for movements associated with Roache Road subject to a study and confirmation of this demand (as for Option 1a). If other solutions to Roache Road access are identified then this leg may also be closed.

As for Option 1 this option includes upgrading of the Murray Road rail crossing and construction of a right turn bay at the intersection of Murray Road and SH26.

4.6.1.8 Option 3a: Relocate Horrell Road Intersection 260 m W – Short Alignment

This option includes the same SH26 intersection location as described for Option 3 above with an alternative tie into existing Horrell Road at a new "T" intersection.

The option is a shorter lower cost alternative to Option 3 and results in priority flow to/from Murray Road as opposed to the new SH26 intersection whilst retaining the sharp radius intersection between Murray Road and Horrell Road. As the priority flow is to/from Murray Road, the addition of a full right turn bay on SH26 is not considered essential for the likely volume of right turning traffic.

4.6.1.9 Option 4: Relocate Horrell Road Intersection 260 m W – Long Alignment

This option involves relocation of Horrell Road to the west to the same location as described for Option 3, but with a different alignment to tie into Horrell Road. The alignment is longer but results in improved larger radius curves than for Option 3.

This option also traverses more existing land parcels than for Option 3 which will enable better connectively to those lots whilst increasing the road corridor requirements and hence cost.

4.6.1.10 Option 4a: Relocate Horrell Road Intersection 260 m W – Long Alignment

This option includes the same SH26 intersection location as described for Option 4 above with an alternative tie into existing Horrell Road at a new "t" intersection.

The option is a shorter lower cost alternative to Option 4 and results in priority flow to/from Murray Road as opposed to the new SH26 intersection whilst retaining the sharp radius intersection between Murray Road and Horrell Road.

Attributes are similar to Option 4.

4.6.1.11 Option 5: New Access Road

This option involves construction of a new access road running parallel to Horrell Road around the middle of the zone area and connecting back to Horrell Road at the north of the growth area. The tie in to existing Horrell Road would either be as a series of reverse curves or as a "T" intersection in a similar fashion to the other options considered.

The new road would be in the vicinity of 1.6 km long with associated higher construction costs than for the other options. The key advantage with a new road is providing a spine connector allowing the land on either side to connect to without the need for long roads or private ways back to Horrell Road as for the other options. This would minimise the proliferation of new access roads/private ways on Horrell Road with an overall improved safety on Horrell Road (although in effect the new access road would become a new collector road and it is likely that a similar proliferation of private ways may appear on the new access road).

Construction of the new access road could have been undertaken by the developer at the time of subdivision with only the boundary link cost attributable to Council. However, as the road would cross multiple land parcels, landowners would be interdependent on each

other to complete the access road before accessing individual blocks and for this reason it is likely that Council would need to construct the road at the outset.

The location of the intersection with SH26 and its effects are as described for Option 3.

Also as for Option 3 the option includes retention of the existing left turn and right turn into Horrell Road to cater for movements associated with Roache Road subject to a study and confirmation of this demand. If other solutions to Roache Road access are identified then this leg may also be closed.

4.6.2 Pedestrian and Cycle Connectivity

There is currently no pedestrian or cycle facilities providing connectivity between Horrell Road and Morrinsville township. The closest facilities are a footpath on the southeast side of SH26 commencing south of Oak Street and a footpath on the north-west side of SH26 commencing south of Holmwood Park Drive. The existing road bridge of SH26 across Piako River does not have any pedestrian facilities and the deck is not sufficiently wide enough to enable a path to be readily constructed without bridge widening.

Council's Open Spaces Strategy shows a "green/open space" link that flows the Piako River and therefore connects the southern side of Morrinsville along the river up to SH26 and crosses beneath the state highway at the road bridge and follows the river north for approximately 400 m before linking back to Seales Road following a gully to the north-west of the existing developed residential area (and connecting to Seales Road approximately opposite North Street). The section from SH26 to the end of Holmwood Park Dive is currently complete. The proposed linkages are shown in Figure 5 below.

Two options have been considered for provision of safe linkages to the proposed Horrell Road zone:

4.6.2.1 Shared Facilities within road corridors

This option involves construction of a shared off road cycle/pedestrian path alongside the road from the end of the existing footpath on SH26 along the north-west side of SH26 to Horrell Road intersection (Option dependant location) and along the length of Horrell Road (on the western side) as far as the rural–residential zone extends. To avoid the need for any crossing of SH26 the recommended route involves a new Piako River crossing structure immediately north of the existing road bridge and new shared facility to connect with the existing on the south side of Holmwood Park Drive intersection. This route involves approximately 140 m of additional path than if the route followed the southern side of SH26 and crossed the highway by way of an at-grade crossing or made use of the existing path beneath the bridge on the south abutment.

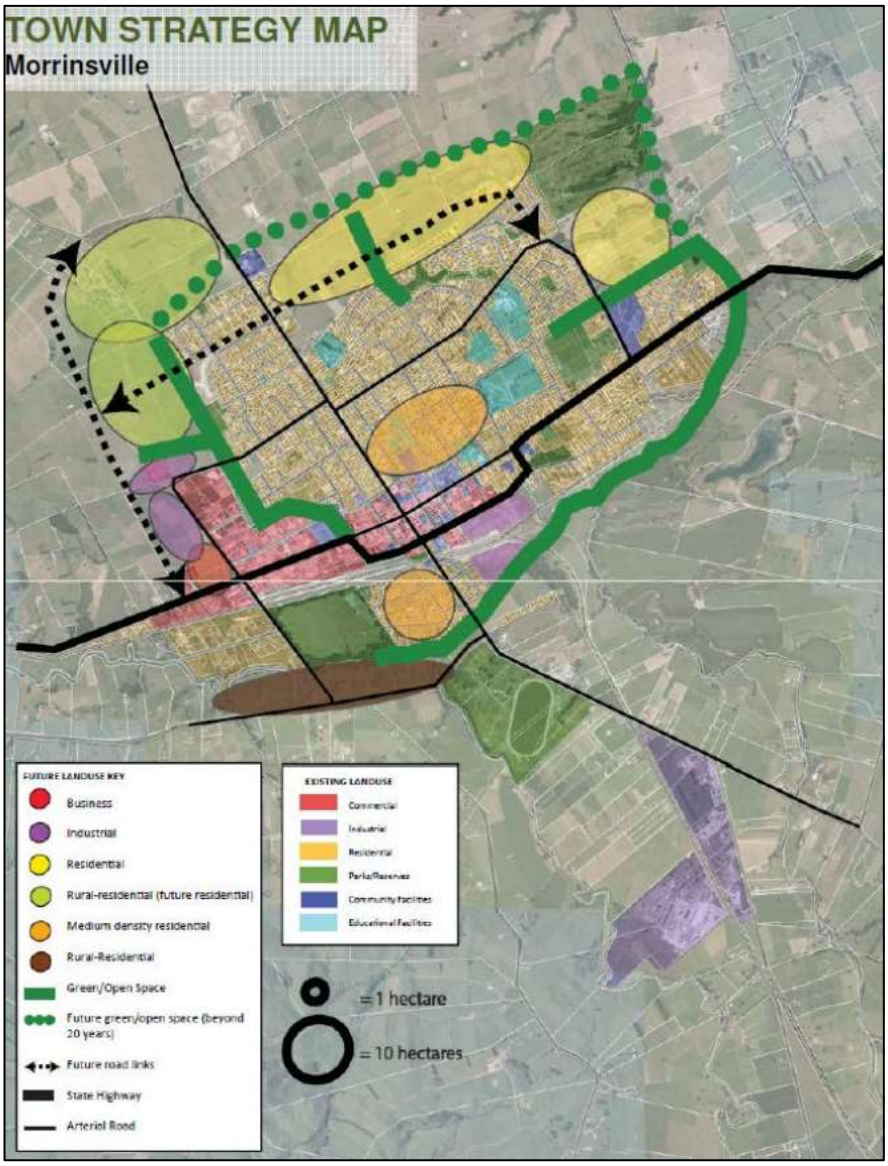

Figure 5: MPDC Open Spaces Strategy: Morrinsville

4.6.2.2 Shared Facilities within zoned land

An alternative or additional option to provide a shared facility connection between Horrell Road and Morrinsville township involves construction of a new Piako River crossing approximately 400 m north of the existing road bridge to link up with the proposed open spaces strategic route identified by Council (and connects to Seales Road in the vicinity of North Street intersection.

From the river to Horrell Road would require a shared path to be constructed across land proposed to be zoned rural-residential, traversing perpendicular to Horrell Road approximately 400 to 450 m north of SH26. From the intersection with Horrell Road a shared facility would be constructed along the south-west side of Horrell Road as for the road alignment option.

The potential route of the alternative alignment is indicated on Figure 4. The off-road route of this option will provide an attractive alignment away from traffic (although this

remoteness can also create secondary safety concerns). As this option requires purchase of private land, it is will be significantly more expensive than for facilities sharing the road corridors and therefore only the road corridor option has been included in the structure plan cost estimates.

If the landowners concerned are in favour of this alignment for public use then this route could be adopted either in addition to, or instead of, the road corridor option.

4.6.3 Local Road Effects

The traffic effect of the proposed residential development have been considered with respect to the expected traffic routes that may be adopted to access the arterial road network i.e. access to SH26 which is a "significant" road.

Traffic distribution is based on the existing traffic volume distribution patterns on the road network i.e. 72% of Horrell Road traffic uses the intersection of Horrell Road and SH26 while 28% uses Murray Road and its intersection with SH26. While there would be a small proportion of traffic using Horrell Road to/from the north towards SH27, this volume is not expected to be significant and no reduction has been made to traffic volumes to SH26 on this basis.

4.6.3.1 Horrell Road

In all access options, some if not all of the expected traffic from the proposed zone will utilise Horrell Road for access. Only should a new parallel access road be considered within the zone itself would the traffic volumes on Horrell Road not experience the full traffic generation of the proposed zoning.

Based on the traffic data and forecasts described above the proposed zoning could be expected to increase traffic on Horrell Road from the existing 684 vpd to 1,156 vpd. This increase in traffic meets the District Plan requirements for a collector road as currently classified and the existing 6.3 – 6.5 m seal width (or up to 7.0 m in the vicinity of SH26) is assessed as adequate to cater for this expected increase in traffic.

4.6.3.2 Murray Road

Based on the traffic data and forecasts described above the proposed zoning could be expected to increase traffic on Murray Road from the existing 189 vpd to 321 vpd (for all options except Option 1a). This increase in traffic meets the District Plan requirements for a local road as currently classified and the existing 6.0 m nominal seal width is assessed as adequate to cater for this expected increase in traffic.

In the case of Option 1a, the increase in traffic on Murray Road is expected to be much higher with all traffic exiting the Horrell Road catchment being diverted to Murray Road with an associated increase in traffic to 491 vpd. This expected increase in traffic volume changes the function of Murray Road to a collector route as denoted by the expected traffic volume, and it is recommended that Murray Road would be desirably be widened to 7.0 m or as a minimum to match the seal width on the adjacent section of Horrell Road (i.e. 6.5 m).

4.6.3.3 Murray Road Rail Crossing

Murray Road crosses an existing railway line, with approximately 35 m between the SH26 give way limit line and the railway crossing limit line. The railway crossing is currently signed and marked as a priority controlled (give way) crossing without bells or flashing warning lights. Council have previously consulted Kiwirail with respect to the appropriateness of the crossing control for both the existing and forecast traffic volume. There are reportedly about 8 trains per day in the peak milk season on this line and all trains are expected to operate at slow speeds of 25 km/h. On this basis Kiwirail have advised that they do not believe any upgrading of this crossing is necessary for the forecast increases in traffic.

Irrespective of the Kiwirail assessment based on volume/speed warrants, it is recommended that warning flashing lights with bells are considered as a safety improvement for this crossing to cater for the increase in traffic associated with any of the proposed access options (except for Option 5 – new internal road). Given that Kiwirail consider the warrant for warning lights has not been met, the addition of these warning devices is a decision for Council and/or Kiwirail to conclude. The cost of warning bells and lights is approximately $140,000[15].

Additionally it is noted that the Murray Road formation crosses reserve land between the end of the legal road on the north-west side of the rail crossing to SH26 on the south-east side. The legalisation of this section of Murray Road is considered necessary regardless of any increase in traffic using the road and therefore no costs associated with this work have been included in the options. If for any reason the passage of traffic over this section of Murray Road formation is considered at risk then Option 1a which relies heavily on Murray Road would not be feasible.

4.6.4 Cost Estimates

Cost estimates for the transport infrastructure options to accommodate the proposed rural-residential zoning have been developed based on road asset cost data provided by MPDC and include allowance for any land requirements[16] plus a contingency. Development of cost estimates at this high level without the benefit of detailed investigations or design, leads to high variability with many unknowns and the estimates should be treated with caution for this reason. The cost estimates for each option are included in Table 5 and are intended for comparison purposes only in order to assist option selection. For example the need for management or relocation of utility services is currently uncertain and can lead to significant cost escalation. Following adoption of the preferred option the cost estimate will need to be refined.

4.6.5 Public Betterment Contribution

The existing intersection of Horrell Road with SH26 has been identified as of potential safety concern as a result of less than desirable sight lines. Any improvement to the existing intersection will be of benefit to existing road users of that intersection. On this basis it would be reasonable for a portion of the improvements cost to be borne by the

[15] Kiwirail website
[16] Except noting that the land costs associated with legalisation of the existing SH26 have been excluded

relevant road controlling authority (those costs that relate only to the intersection itself). However, the intersection does not currently appear in any forward works programme for either Council or NZTA and there is no certainty that the intersection would be prioritised for works in the near future.

Council has requested guidance on the proportional betterment to existing road users versus new users due to the rezoning and traffic volumes currently using the Horrell Road intersection with SH26 are one mechanism for deriving this share. Based on the traffic data to hand, the traffic volume on Horrell Road at the intersection with SH26 is expected to increase from 580 vpd currently to 1005 vpd due to the proposed zoning[17] which results in a public share versus development zone share of traffic at the intersection of 58% to 42% respectively. However, the public betterment ratio will depend on the preferred option adopted by Council as the ratio will differ for different parts of the network e.g. the traffic volumes on Murray Road are substantially lower and therefore the effect of development traffic on this portion proportionally higher.

[17] with the traffic volume at the intersection assessed using the Horrell Road counts west of Murray Road less an allowance for Horrell Road traffic that uses Murray Road and based on 90% of the traffic from the zoned area using the intersection.

Option	Description	Sight Distance Achievable	SH26 Intersection Safety Ranking	Local Road Safety Ranking	Access Efficiency Ranking	Comment	Preliminary Estimate	Transportation Ranking
1	Maintain existing Horrell Road intersection RTB at Murray Road Pedestrian / Cycle Path and Stream Crossing Murray Road Bells/Lights	165 m East >260 m West	4	3	2	Substandard Sight Distance at SH26 intersection	$1.0M	6
1a	SH26 Horrell Road intersection ban exit movements RTB and widening on Murray Road Pedestrian / Cycle Path and Stream Crossing Murray Road Bells/Lights	NA	1	3	5	Increased travel to Morrinsville	$1.2M	5
2	Relocate Horrell Road/SH26 intersection Realign Murray Road to Horrell Road RTB at Murray Road Pedestrian / Cycle Path and Stream Crossing Murray Road Bells/Lights	214 m East 214 m West	2	2	2	Improved sight distance to minimum standard for prevailing speeds	$1.7M	3
2a	Relocate Horrell Road/SH26 intersection – Option 2 with alternative Horrell Road tie in.	214 m East 214 m West	2	3	2	Improved sight distance to minimum standard for prevailing speed	$1.3M	4
3	New Horrell Road intersection located on outside of SH26 curve – short option RTB at Murray Road and realigned Horrell Road intersection Pedestrian / Cycle Path and Stream Crossing Murray Road Bells/Lights Secure sight line on SH26	250+ m East 250+ m West	1	2	1	Optimised sight lines Requires vegetation clearance on SH26 and legalisation work (not included in estimate)	$2.3M	1
3a	New Horrell Road intersection located on outside of SH26 curve – Option 3 with alternative tie-in to existing Horrell Road RTB at Murray Road and widening only at realigned Horrell Road intersection	250+ m East 250+ m West	1	3	2	Optimised sight lines Requires vegetation clearance on SH26 and legalisation work (not included in estimate)	$1.4M	2

Option	Description	Sight Distance Achievable	SH26 Intersection on Safety Ranking	Local Road Safety Ranking	Access Efficiency Ranking	Comment	Preliminary Estimate	Transportation Ranking
4	New Horrell Road intersection located on outside of SH26 curve alternative – long option alignment RTB at new Horrell Road Intersection Widening at Murray Road Intersection Pedestrian / Cycle Path and Stream Crossing Murray Road Bells/Lights Secure sight line on SH26	250+ m East 250+ m West	1	2	1	Optimised sight lines Requires vegetation clearance on SH26 and legalisation work (not included in estimate)	$2.1M	1
4a	New Horrell Road intersection located on outside of SH26 curve alternative alignment – Option 4 with alternative tie in at t intersection	250+ m East 250+ m West	1	3	2	Optimised sight lines Requires vegetation clearance on SH26 and legalisation work (not included in estimate)	$1.8M	2
5	New 1.6km Access Road creating central spine road	250+ m East 250+ m West	1	2	1	Optimised sight lines Provides good internal connectivity for subdivision but poor connectivity to potential expanded rural-residential zone to the east of Horrell Road.	$3.1M	1

Table 5: Access Option Ranking : Transportation Safety and Connectivity Criteria

Based on the ranking criteria adopted in Table 5 the preferred option(s) from a transportation perspective are Options 3, 4 and 5 which rank top equal. These options all use the same proposed new intersection on SH26 and afford priority to the Horrell Road traffic movements at the interface with the junction to existing Horrell Road.

4.6.6 Options Summary and Ranking

The options for access to the proposed Horrell Road rural-residential zone as described above are summarised in Table 5. Table 5 ranks the safety and access efficiency of each option with an overall transportation ranking noting that no weighting has been applied at this stage.

The preferred options are those that provide a safe intersection with SH26 and maintain the priority flow on Horrell Road (as a collector road route).

To the transportation considerations, the final option choice will need to consider other benefits and costs particularly those related to land effects, community consultation and other environmental considerations.

4.6.7 Consultation with NZTA

The NZTA has been consulted with respect to the connectivity options outlined above to service the proposed rezoning and a draft copy of this report provided for comment.

The NZTA have responded (19 April 2016) as summarised below:

- *The Transport Agency considers it appropriate that a principle-based approach is taken in relation to the transportation issues and options associated with the proposed rezoning. The Transport Agency puts forward the following principles: Integration…..Connectivity….Context…..and Safety.*
- *Options 2 – 5 in the TDG Structure Plan Transportation Assessment report observe the above principles to varying degrees, and can therefore all be considered. The Transport Agency is happy to provide further technical input and advice on the improvement options for the transport network if the proposed rezoning of Horrell Road is confirmed.*

4.7 Intersection Risk Assessment

The sight lines at the existing Horrell Road intersection with SH26 fall short of recommended standards for the prevailing speeds of traffic, however there has been only one injury crash at this intersection in the last 5 years. An assessment has been made on the likely risk of future crashes due to the increase in traffic from the development. Reference has been made to crash models in the NZTA Economic Evaluation Manual (EEM) as well as the High Risk Intersections Guide (HRIG) in assessing the existing and likely future potential risk.

The EEM includes crash risk models for rural tee intersections which consider available sight lines as a factor. This model has been used to assess the existing and forecast expected injury crash rate for the intersection. The HRIG has been used to assess the equivalent death and serious injury casualty rate and the associated risk profiles. The risk assessment is summarised in Table 6 below.

Scenario	EEM DSI Casualties (5 years)	Collective Risk	Crash Rate (DSI /100M vkt)	Personnel Risk
Existing Traffic Volumes	0.30	Low - Medium	30	Medium- High
Existing plus Fully developed traffic volumes	0.51	Low - Medium	41	High
Existing plus Partial Development Fully developed traffic volumes (existing plus 17%)	0.35	Low - Medium	32	Medium-High/High threshold

Table 6: HRIG Intersection Risk Assessment

Table 6 indicates that the addition of the Horrell Road development zone traffic will result in no increase in the Collective Risk category and an increase in the Personnel Risk from "medium- high" to "high". However, an intersection is only categorised as an overall High Risk Intersection if there are 4 or more injury crashes in a 5 year period which is not expected to be reached based on the safety models used.

4.7.1 Staged Mitigation Implementation

In recognition of the above described risk assessment indicating minor to moderate increase in the risk profile, consideration has been given to possible plan rules that would enable staging and monitoring of the intersection performance to determine the appropriate time for mitigation intervention.

An increase of 10 veh/h (or 1 vehicle every 6 minutes) is considered a less than minor increase in traffic. Based on the traffic generation rates adopted this equates to 11 rural residential lots. Furthermore the equivalent increase in development of 13 lots equates to the threshold of increased intersection risk (i.e. medium-high to high indicated in Table 6 above).

Based on the above analysis, it is recommended that a maximum of 13 lots may be developed as "initial" development within the proposed zone without implementation of mitigation. The exact timing of mitigation following the initial development may then be subject to a rule requiring design and land acquisition within eighteen months of the initial development and the physical works completed within 12 months of the intersection reaching a high risk classification or sooner.

TDG