MANGAWHAI TOWN PLAN - TRANSPORTATION

Prepared for Kaipara District Council

6/3/17

QUALITY STATEMENT

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Kaipara District Council

Mangawhai Town Plan - Transportation

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1 Introduction

Kaipara District Council (KDC) have commissioned MWH New Zealand Ltd to assess the following transportation issues impacting the urban areas of Mangawhai and Mangawhai Heads:

- Define form and function of the Insley/Moir Street intersections within Mangawhai, incorporating the desire to improve mobility for non-motorised users.
- Assess the current network for B-train movements between Estuary Estates and Insley/Moir intersection.
- Confirm potential walking/cycling links within the Mangawhai area.
- Define the likely triggers for developing alternative arterial routes on the current Moir Street/Molesworth Drive/Mangawhai Heads Road corridor. This could range from medium-long term traffic demands, unacceptable conflict between local and through traffic, reduced safety and amenity, promoting development of the western edge of Mangawhai.

2 Insley / Moir Intersection

Insley/Moir intersection and the nearby Moir/Molesworth intersection are both priority Tees located in Mangawhai village centre. Presently these are the main obstacles to free flowing peak holiday through traffic for either Mangawhai or Mangawhai Heads. In both cases a dominant side-road flow must make a right turn giving way to a minor priority flow, resulting in relatively inefficient intersection operation at peak times. However, at non-peak times flows are better balanced towards the current intersection layout.

In addition, the acute angle approach to the intersections combined with a modest Moir St carriageway width can create swept path turning issues for larger commercial vehicles, as detailed in section 3 Molesworth Drive B-Train Capacity.

Council have requested that the Insley/Moir intersection be considered for improvement. The primary driver is improved safety for all users, with increased capacity being a secondary criteria, albeit an important one. For this reason our proposed option traffic capacity is judged against off-peak traffic demand, rather than the significantly higher but also very short duration holiday peak, which is assumed to only occur 15 days of the year.

Available data has made it difficult to model for both peak and off peak conditions (future and present). The best data available relates to peak conditions corresponding to the major holiday seasons. As such, the modelling has been performed on peak flows to establish the worst case conditions for a given intersection. Further data is required to establish the function in normal conditions, this should be collected to confirm the validity of the border line options.

2.1 Current Issues

The intersection suffers from a variety of issues, although some of the issues are infrequent or intermittent.

- Traffic travelling from Insley onto Moir Street is often subjected to moderate to significant delays due to relatively strong flows on Moir Street.
- Large vehicle tracking is workable but suffers in all but perfect conditions, and tyre marks are evident on the Insley splitter island.
- Pedestrian/shared use facilities are substandard on all legs. Insley Street has a splitter island which has been reduced in size to accommodate tracking, and is undersized for larger groups of pedestrians, or people with bicycles or pushchairs.
- Multiple access are situated at or very close to the intersection which exacerbate traffic conflicts.
- The petrol station has a large undefined frontage that is often used for undisciplined parking, for example parking/waiting behind other cars that are parked.

- There are a number of perpendicular parking bays on Moir Street contributing to traffic conflicts, located on the approaches to the intersection, at the Four Square, outside the Town Hall and parallel parking on the North West side of Moir Street.
- The county market held in the town hall every Saturday attracts large amounts of people to the area. During this period any available space on Moir Street and adjoining streets is used for parking, waiting, and loading. Despite this, the parking on nearby Molesworth Drive is often under-utilised. The market also often coincides with peak weekend traffic delays.

2.2 Design Capacity

The competing demands of accommodating future development flows whilst retaining Mangawhai's "beach town"1 persona are increasingly difficult to meet. Options and strategies are raised that have the potential to have significant wider network impacts, and may even require the diversion of traffic elsewhere. These analyses are heavily influenced by predictions of future demand.

At present, in the absence of a calibrated local network model, traffic modelling in this report is based on current measured traffic turning counts merged with some peak holiday through-traffic counts and further merged with a simple estimate of development flow. These three sources are combined to create future turning volumes for each of the intersections modelled in SIDRA. The method is somewhat crude but appropriate to the information available. The modelling makes several key assumptions that have the potential to sway investment decision making;

- Survey data is 2 years old,
- Traffic growth is assumed at 2%/yr,
- Turning volumes at off-peak periods is expected to be magnified in proportion to increased holiday peak flows,
- The measured holiday flows assumed to correspond to Councils' ideal design criteria,
- Trip generation in future developments that may not eventuate, given the towns proportion of short term occupancy.

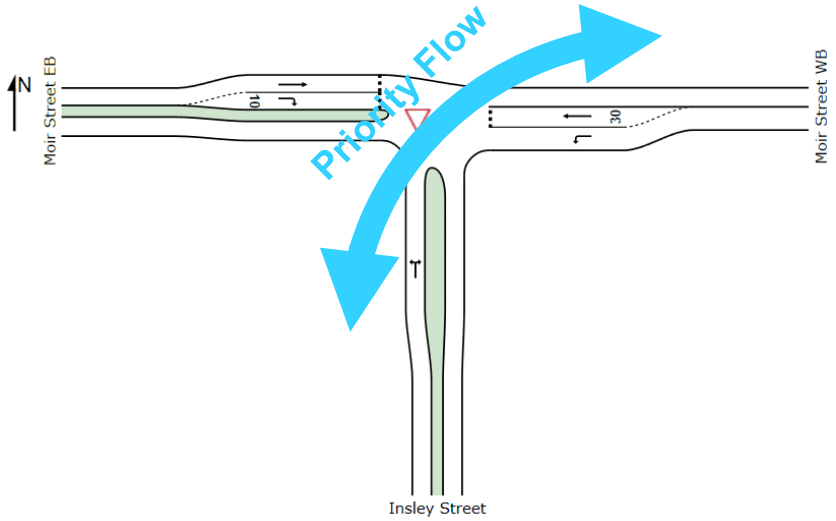
The following improvements should be considered to improve the quality of predictive traffic modelling for the next stage of project investigations:

- Additional traffic counting to establish a yearly flow profile, particularly a holiday period "top 50" demand hours. This can be used by Council to identify an expected Level of Service target.
- Counting to understand heavy vehicle proportions at peak times.
- Additional peak turning counts to better evaluate impacts on key intersections.
- Identify a design horizon – consider alignment with Council's LTCCP.
- Detail review of count data to identify potential large vehicle classes that could be excluded from route.
- Detail review of count data to better establish growth trends.
- Detail review with Council of size and timing of future development.
- Development of a network traffic model to better test demand for route alternatives. The quality of model should aim to meet the requirements of NZTA's EEM economic evaluation procedures.

2.3 Changed Priority

An option was investigated to change the priority to make the traffic between Insley and Moir East the priority flow. Moir Street eastbound would become give-way controlled with a right-turn bay. Moir St westbound approach would have two (2) lanes to separate through and right turning movements. SIDRA modelling suggests this is a workable option at peak 2025 flows, with the worst movement (right turn from Moir St EB) experiencing a moderate 30 second delay.

[1] "Planning for the Future", 2009-2019 LTCCP



The issues with this option are:

- How to reconfigure the access in the petrol station, as this would effectively become a forth leg without room to accommodate both existing entrances. The layout of the station is too small to allow the internal manoeuvring that would be required for a single entranceway.
- In order to reduce the intersection footprint, removal of right turn bays were considered. This layout would create excessive delays for through movements. However, if right turn bays are adopted then vehicle tracking tests show the footprint of the intersection becomes too large for the available road reserve corridor. Even moving the road over towards the Four Square does not provide sufficient room - an intersection wide enough to accommodate all vehicle turning movements would require acquisition of the Four Square site.
- The sweeping corner required at the end of Insley St would be an out of context curve that would be situated at the end of a long straight section of road. This could lead to vehicles travelling at an unsafe speed into the curve, especially given this is the commercial centre of Mangawhai Village.
- The layout allows for pedestrian crossing points with a refuge at the Insley approach and a refuge on Moir St opposite the Tavern. This presents a deviation from some pedestrian desire lines, particularly the natural Moir St (southside) longitudinal movement between the Town Hall and Four Square. Increased traffic speeds though the intersection due to the radius of the turn is also less desirable for pedestrian crossing movements.
- An existing business would need to be relocated to accommodate a workable solution, namely having a right turn bay for traffic traveling towards Kaiwaka.

Because of these issues, changing the priority of the intersection is not a recommended solution.

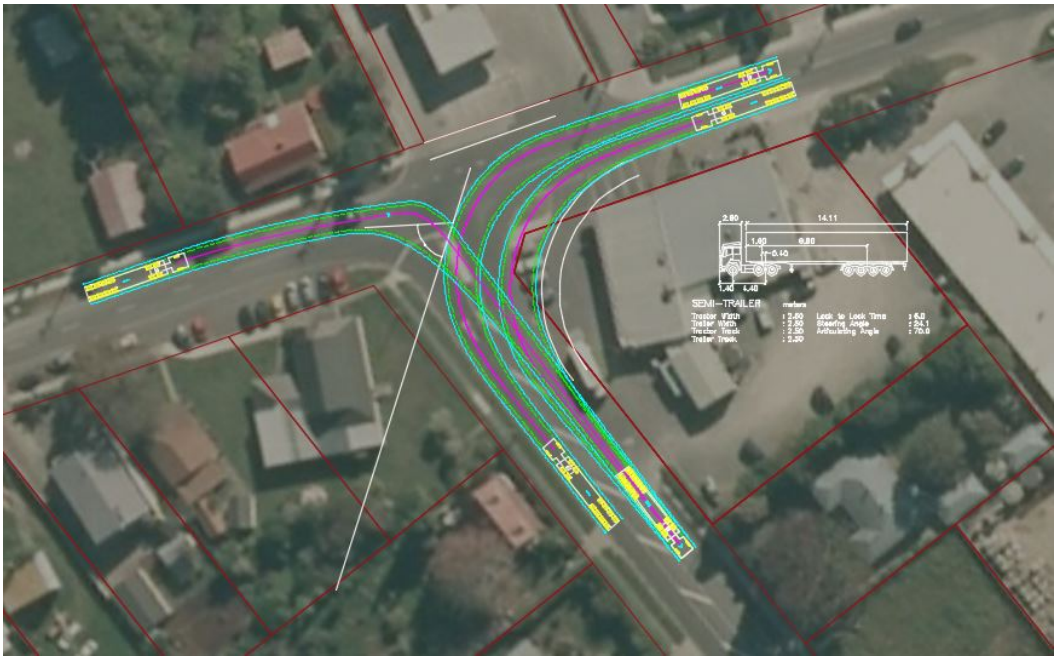


Figure 2-1: RTS18 tracking to check possibility of right turn bay without relocating 4 Square

Figure 2-2: RTS tracking to check possibility of right turn bay with relocating 4 Square

2.4 Compact Roundabout

Compact roundabouts are single-lane roundabouts with inscribed circle diameters in the range of 30–40m. The associated tighter entry and exit radii, narrower lane widths, and a higher entry deflection angle, all contribute to a speed environment that is low enough to be suitable for all users in urban situations. The consequences of achieving this level of safety are increased delay to motor vehicles and reduced capacity when compared to larger roundabouts with dual approach lanes.

A compact roundabout could fit within the available road corridor, however if a shared path was added to the south western quadrant the roundabout would need to move sideways onto the property occupied by Four Square. As with the existing road layout, large HCV tracking is marginal.

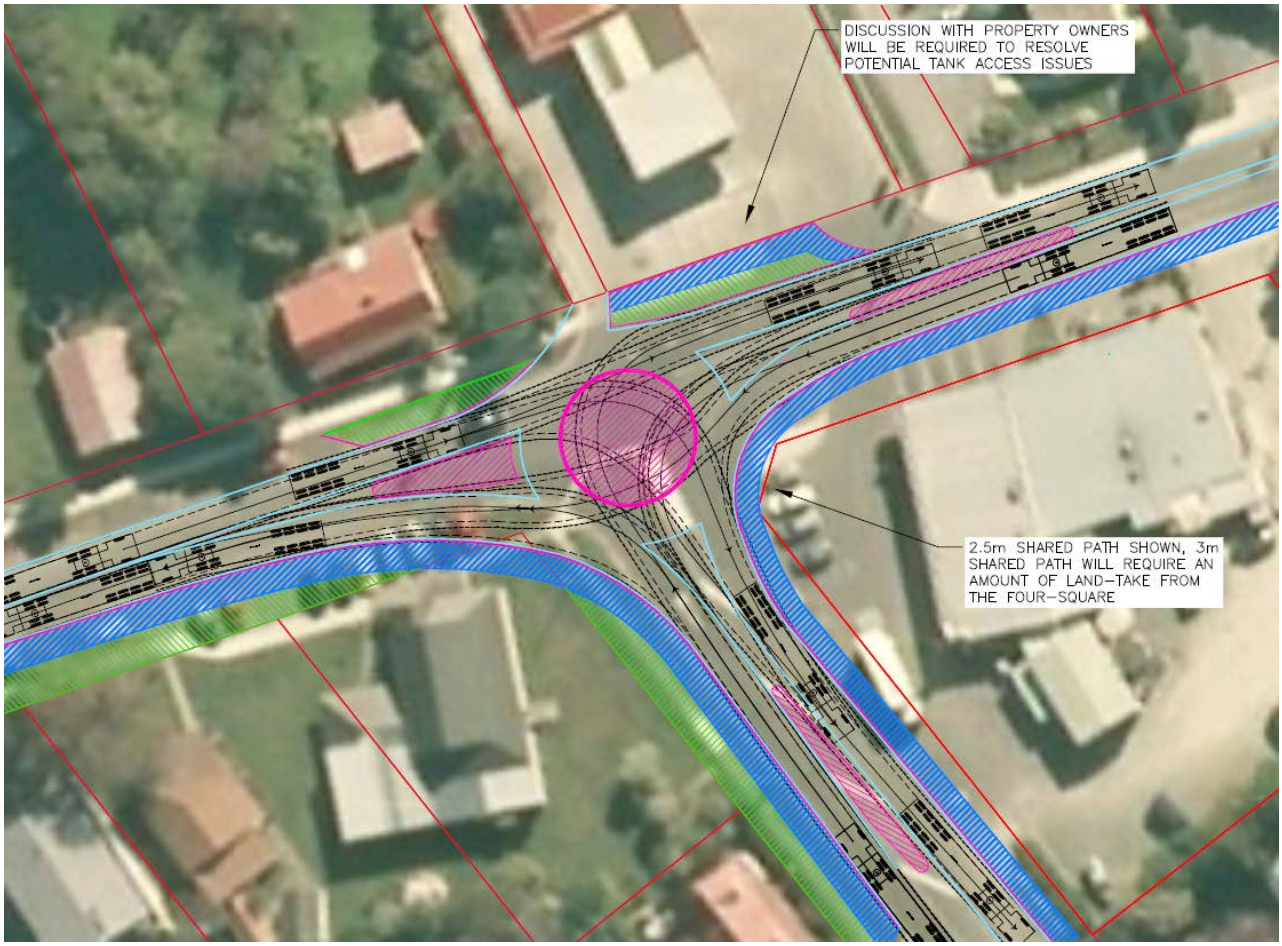
The G.A.S. Service Station becomes the fourth leg and would function as entry only. The exit for this station and garage would be very close to the roundabout and there may be some difficulty achieving satisfactory geometry that would allow safe exiting onto Moir St both east and west.

Splitter islands can be accommodated on the Moir west approach and the Insley approach. Locating pedestrian refuges in these splitter islands suits the existing pedestrian desire lines. On the Moir St east approach the narrow median may only permit flush markings, requiring a separate pedestrian refuge situated midway between this intersection and the Moir/Molesworth intersection.

Introducing traffic calming on the approach to all legs would be beneficial. Either a flushed or raised median would further reduce speeds and make the area considerably more pedestrian focused. One of the side advantages of a roundabout is its ability to accommodate u-turns - if paired with a mirror roundabout at Molesworth intersection, the option of a solid Moir St median can be considered.

As noted above, compact roundabouts do suffer reduced capacity when compared to full sized roundabouts. SIDRA modelling indicates that capacity is much the same when compared to the existing intersection – the roundabout can accommodate 142% of current off-peak volumes whereas the existing layout is limited to 136% of current volumes. In theory the existing priority intersection could operate at even higher capacities but to do so would require low gap acceptance values – the willingness of turning vehicles to “pull out’ in front of oncoming traffic. Higher capacity is thus achieved at the expense of increased crash risk. Conversely, small roundabouts are very good at moderating speeds on all approaches.

Compact roundabouts are recommended as a relatively low cost option that would improve safety for all users, although any capacity increase would be modest.



2.5 Multi-Lane Roundabout

A small multi-lane roundabout is a potential option although it would have significant impact on either the adjacent Four Square or village hall properties. The roundabout would have two (2) lane approaches, dual circulating, and single lane departures.

The main advantage of a multi-lane roundabout is superior traffic capacity. SIDRA modelling indicates a 30m inscribed circle roundabout with two circulating lanes has just enough capacity to cope with 2025 holiday peak flows totalling some 2800 vehicles per hour. Secondary advantages of multi-lane approaches are increased ability to cater for very large HCV tracking (whereby the vehicle occupies both approach lanes) and the ability to accommodate HCV u-turns to facilitate local access. Again, if paired with a mirror roundabout at Molesworth intersection, the option of a solid Moir St median can be considered.

Figure 2-3: Tracking for Dual lane Roundabout

This option also has a number of operating issues that are undesirable. Controlling speeds through multi-lane roundabouts is a particular challenge as, during times of low volume, some drivers will straighten their alignment through the roundabout by cutting across the lane lines. The higher speeds, increased number of conflict points and more complex operation make multi-lane roundabouts less safe and more difficult for all users to negotiate. Pedestrians are disadvantaged by the increased width of carriageway to cross. Less-confident cyclists should be diverted onto a path to cross the entries and exits.

The width of the approaches means that, in order to both moderate speeds through deflection and fit within the available footprint, an optimum approach alignment may be difficult to achieve.

In terms of cycling, the safety principles for single lane arrangements apply to dual-lane roundabouts - reducing vehicle speeds, stopping shoulders or marked cycle lanes on approaches, and facilitating lane-claiming by cyclists. While single-lane roundabouts are preferable in terms of comfort and safety for cycling, a more cycle-friendly roundabout design for two-lane approaches may be achieved by reducing approach speed into the roundabout by increasing deflection on the approach to the roundabout. This would require considerable realignment of all the approaches that are presently all straight.

Of all the options considered, a multilane roundabout would occupy the largest footprint and have the largest property and construction cost impact.

This option is not recommended because a large amount of private land would need to be acquired and the roundabout would operate at low traffic volumes for most days making it an unsafe option. If forecast population growth suggests that traffic flows would increase to the levels that would warrant a dual lane roundabout a detailed corridor would be required to determine if local bypass options would offer a better solution.

2.6 Signalised Intersection – 1 Lane Approach

The key advantages for a single lane approach signals arrangement is the compact, pedestrian and cycle friendly footprint of the intersection, and the superior safety of signalised pedestrian phases. It is relatively low cost with minimal disturbance to pavements and kerb lines. It offers some capacity improvement over the existing arrangement – some 80% of 2025 flows, about 2,200 vehicles per hour.

The intersection, as tested, incorporates a fourth exit leg only into the G.A.S Service Station. Pedestrian crossings are assumed to operate on all legs except the westbound approach, which would instead be served by a mid-block crossing.

The key disadvantage is poor efficiency at low flows (relatively long delays), lack of capacity at high flows and safety concerns with red light running at low flows.

A raised median along Moir St east would be required to stop right turning out of the G.A.S Service Station, as these movements would be turning directly into a controlled intersection. This limits the station to serving northbound customers only, unless a roundabout is also installed at Moir/Molesworth intersection.

2.7 Signalised Intersection – Dual Lane Approach

A dual lane approach signal has the same advantages and disadvantages of a single lane approach but requires a greater footprint which reduces the available berm for pedestrian development and may require adjacent land purchase. In return it gives slightly better capacity of at least 90% of 2025 flows (2,400 vehicles per hour). Further refining of phasing, signal timing and lane geometry is likely to yield higher capacities.

2.8 SIDRA Result Summary

2.8.1 SIDRA Analysis

SIDRA analysis for Insley St/Moir St intersection was performed in SIDRA 6.1. The intersection was considered stand-alone (non-networked). Assumptions adopted were:

- Existing flows (off peak and holiday-peak) were measured in accordance with section 6 of Mangawhai and Mangawhai Heads Infrastructure Plan (MWH, 2016).
- Peak period modelled is the AM (morning) peak
- Future flows include Estuary Estate development flows plus 2 other developments on Estuary Drive & Moir Point Rd, plus 2% assumed growth.
- Priority Gap Acceptance values range from 4.0 to 5.5 secs (right turn out).
- Existing 50kph single lane approaches are retained,
- Signals are actuated, with Practical cycle time capped at 120 seconds,
- 95% peak flow factor.
- Sensitivity analysis adopts 'Worst Movement capacity' option (v/c = 1)

A key change from previous analysis is that Estuary Estate (which has not yet commenced construction) will produce full development flow in 2025, deferred from 2018.

Total intersection turning traffic demand during SIDRA tested hours are:

Table 2-1: Modelled Traffic Volumes

	2015 Off-Peak	2015 Peak	2025 Peak	G.A.S. Station
Veh/hr	812	1348	2528	41

Intermediate years are assumed to be a straight interpolation between 2015 and 2025.

Table 2-2: Intersection Option SIDRA Summary

Option	Year	Peak	Av. Delay	Worst Movement			
				v/c	Queue (m)	Delay (s)	LOS
Existing Priority Tee	2015	Offpeak	4.3	0.31	10	8.6	A
	2015	Holiday	4.9	0.52	17	10.2	B
	2025	Holiday	>1000	>2	400	>1000	F
	Holiday capacity reached = **2016**						
Re-Prioritised Tee, no turn-bays	2015	Offpeak	-	-	-	-	-
	2015	Holiday	6.5	0.46	28	10.8	B
	2025	Holiday	224	1.46	252	433	F
	Holiday capacity reached = **2021**						
Re-Prioritised Tee, with turn-bays	2015	Offpeak	-	-	-	-	-
	2015	Holiday	4.0	0.28	5	6.0	A
	2025	Holiday	5.8	0.77	22	19.5	C
	Holiday capacity reached = **2026**						
Roundabout - Single Lane Approach	2015	Offpeak	-	-	-	-	-
	2015	Holiday	8.1	0.62	6	10.1	B
	2025	Holiday	226	1.27	1417	264	F
	Holiday capacity reached = **2020**						
Roundabout -Dual Lane Approach	2015	Offpeak	-	-	-	-	-
	2015	Holiday	6.4	0.31	13	8.9	A
	2025	Holiday	11.6	0.76	71	18.2	B
	Holiday capacity reached = **2027**						
Signals - Single Lane Approach	2015	Offpeak	-	-	-	-	-
	2015	Holiday	9.8	0.59	57	15.2	B
	2025	Holiday	>1000	5.0	2200	>1000	F
	Holiday capacity reached = **2021**						
Signals - Dual Lane Approach	2015	Offpeak	-	-	-	-	-
	2015	Holiday	25.0	0.61	69	39.8	D
	2025	Holiday	89.3	1.10	551	166	F
	Holiday capacity reached = **2023**						

Intersection OK	Intersection fails

2.9 Option Costs

Two options have been priced, a single and a dual lane roundabout, as these represent “typical” short term and medium term upgrade options that accommodate capacity increase whilst moderating village centre speeds. Costs are rough order costs, with contingencies typically 30-60%, and include property, investigation, fees, construction, and exclude GST.

Table 2-3: Modelled Traffic Volumes

Costs ($000)	Single lane RAB	Dual lane RAB
Property	166	1,237
Fees	315	390
Construction	1,641	1,803
Total	2,122	3,430

2.10 Moir/Molesworth Intersection

Opus International Consultants (Opus) have been commissioned to consider Moir/Molesworth Intersection. The existing intersection form is approximately five (5) years old and is orientated as a conventional Tee with Moir St priority. Moir St north however is a short no-exit residential street with very low (40 AADT) volume.

Opus have considered changing the priority so that Moir St north becomes the “Give Way” leg, and have also considered a single lane roundabout. We have made no attempt to re-assess any of these options in detail. However the implementation of the single lane roundabout at Moir/Molesworth, which would enable u-turn manoeuvres for smaller vehicles, greatly increases the viability of other safety initiatives, such as the introduction of a raised Moir St median and the banning of right turn out from the Four Square and the G.A.S. Service Station.

Note that the size of the roundabout likely to be considered at Molesworth St would not accommodate larger HCV vehicle 180 degree u-turns.

2.11 Recommendations

A single lane roundabout represents the best compromise for short-term increased capacity and improved safety for all users, whilst maintaining a threshold at the edge of the village centre. There may be a requirement for some land purchase to accommodate the roundabout and suitable adjacent shared path / pedestrian infrastructure. This will need to be confirmed with preliminary geometric design.

Alternative options which are better able to accommodate medium-term projected holiday peak traffic demand arising from known local development would be a re-prioritised junction with turn bays, or, a two lane roundabout. The roundabout retains the threshold function of the existing intersection but imposes a large, costly footprint on the site. Re-Prioritisation will also require land and also loses the threshold function, encouraging peak time higher speeds and volumes through the village centre.

From a traffic management perspective all of the options, including retaining the same intersection form would benefit from relocating the Saturday market away the intersection. However this is likely to be an unpopular move, with local businesses benefiting from having this Saturday attractor. A compromise could be to have more formalised traffic management and prevent all but disabled parking on Moir Street approaches to the intersection.

3 Molesworth Drive B-Train Capacity

3.1 Heavy Commercial Vehicle Issues

Council has expressed concern that larger heavy commercial vehicles (HCVs) such as B-Trains may have manoeuvring issues using Molesworth Drive and Moir St between Insley St and the proposed Estuary Estates, particularly after the Estate is built. The following considers the route's ability to accommodate B-Trains, as well as the problematical quad-axle semi-trailer combination identified in Road Traffic Standards 18 (RTS18) as having the most onerous tracking requirements.

All tracking tests shown below use the worst case standard legal vehicle, the 4-axle semi-trailer.

3.1.1 HPMV

Special classes of vehicle, such as higher-mass, 50MAX or over-length vehicles, or wide load requirements, are not considered in this report. However, there is some potential for short term demand over and above a quad-axle semitrailer – during emergency bypass for SH1, for example if the weight limit of the Upper Estuary Bridge can support these abnormal loads. Any requirement in excess of the standard quad-axle semitrailer has yet to be identified and discussed with Council.

3.2 Route Description

Molesworth Drive south of Sunlea Lane is 1.85km of sealed, two (2) lane two (2) way road with the following characteristics:

- 8.5m seal, edge markings and reflective delineators,
- Flat Alignment, skirting the edge of the Mangawhai estuary,
- 2 x 300m radius corners, 1 x 150m radius corner
- 2 x priority (Give Way) intersections

Only the southern half on one side (northbound) is kerbed. The shoulder next to this kerb is 2m wide and delineated for parking, as this area is largely commercial. The shoulder and adjacent lane is insufficient to accommodate traffic, on-road cyclists and parking all at the same time.

The remainder of the route is served by wide 1:10 sloping shoulders and shallow water tables. These shoulders are narrow and also insufficient to accommodate heavy vehicles with on-road cyclists.

About 50% of the adjacent development is residential, mostly with direct access, especially in the southern half of the length. The commercial development is limited to the southernmost 450m south of Pearson St. In addition to this there are 5 side streets, all priority controlled no-exit residential. There are no median or turn bays to facilitate access to these side streets or properties, except for Old Waipu Rd. The main impediment to HCVs will be the turning manoeuvres generated by this side friction development.

Moir St represents the commercial centre of the village, and is of a correspondingly higher standard. It is kerbed both sides and a minimum width of 10m. Both sides are designated no parking and there is all off road parking for customers of adjacent businesses. The impediments to HCVs are the splitter islands installed at the intersections at each end.

Existing businesses along Moir and Molesworth are not generally expected to require frequent large HCV access, with the exception of Carters Building Supplies. The Carters' entrance is located on Moir St midway between Insley and Molesworth. It is a single entry/exit and is shared with a small shopping mall and tavern.

3.3 Tracking Restrictions

Vehicle track plots have been prepared for Molesworth/Moir, and Moir/Insley intersections as described above. Tracking has not been performed for the five (5) other side roads, as most are minor roads with modest numbers of residences, which do not attract larger HCV. The exceptions are:

- Old Waipu Rd which may require occasional stock truck access. Old Waipu Rd intersects Molesworth Drive at an acute angle, which may force large vehicles to track into the adjacent side road lane. However, the low of Old Waipu traffic volume (245 vpd) and the lack of a splitter island reduce the risk of conflict.

- Carters Building Supplies entrance on Moir St is shared with a number of small retail business in the adjacent retail mall. The entrance is large enough to accommodate HCV but an RTS 18 exiting towards Auckland will occupy the access width and will track onto the Moir St eastbound lane, effectively closing the route.

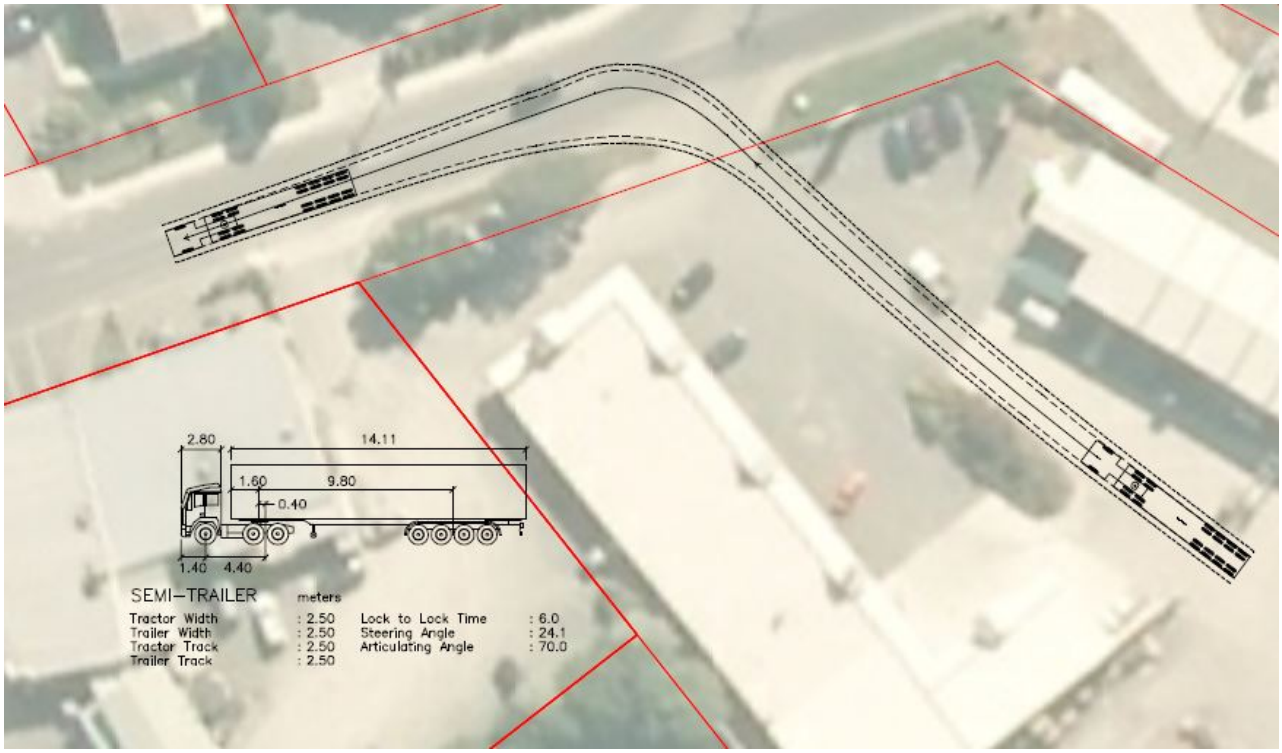


Figure 3-1: RTS 18 Design Vehicle Exiting Carters Building Supplies yard

3.4 Intersection Restrictions

Computer simulation is used to test the swept path of various design vehicles to ensure they can navigate an intersection keeping within the confines of the carriageway without encroaching into other lanes, hitting islands or mounting adjacent kerbs or footpaths.

It should be noted that specific heavy vehicles known to use an existing intersection can fail when reproduced on one of the industry standard tracking tools. This is because modern vehicles can often perform better than the computer simulation tools which consider vehicles that are worst-in-class. However, this is not a reason to disregard the results, as they allow for minor driver error. A computer user may have multiple attempts to navigate an intersection, whereas a truck driver does not have this luxury.

From site observation of both intersections it is apparent that the splitter island is relatively new compared the rest of the intersections. From the tracking undertaken as part of this report it is apparent that HCV tracking has been considered, with the intersection form representing the vehicle turning envelope required for a RTS quad axle design vehicle.

Both intersections, however, do have a number of issues when the RTS quad axle design vehicle tracking is simulated. The issues are summarised below, with the number of the issue corresponding the number of Figure 3-4: RTS 18 Truck Tracking.

1. Tracking speed – all movements have to be reduced to 5kph or slower to fit within the available carriageway. This is not in compliance with RTS that mandates all intersections must be tracked at 15kph. However, with the exception of the left turn into Insley Road, all the other movements are controlled by a give-way or stop line making a speed of 5kph or less appropriate when modelling the existing situation.
2. Double Movement – The left turn into Molesworth Drive requires three movements. A 60 deg turn into the intersection, a short straight and another 55 – 60 deg turn on the exit of the intersection. This would normally be considered bad practise, however the presence of the giveway part way around the intersection makes this movement more logical.
3. The 0.5m clear zone of a southbound HCV vehicle making the left turn into Insley overhangs the pedestrian splitter island. This island is quite narrow and in peak period is in constant high pedestrian demand. It is somewhat intimidating for pedestrians using the splitter island for a large vehicle to swing so closely, perhaps causing them to retreat into the opposing live lane.

Figure 3-2: Pedestrian Demand crossing Insley Street

4. A similar issue exists at the splitter island at the Moir/Molesworth intersection. There is also visual evidence of vehicles tracking over the island at this location. However, the footpath is not so well used at this location, which reduces the probability of a conflict.

Figure 3-3: HCV tracking over Molesworth Drive intersection

5. The Insley/Moir intersection has been designed so the right turning vehicle exiting onto Moir Street can over-steer, enabling them to make the turn. In is also noted that different surfacing has been used to differentiate between the carriageway and footpath (asphalt and concrete). Even with this pedestrians have been observed to walk across the asphalt vehicle overrun area because it is the most direct route across the petrol station frontage. Vehicles also often park in the area intended for turning HCVs, this would prohibit the turn until the vehicle has moved.

6. At three locations the body of two turning HCV vehicles are shown to clash. This is a standard check that represents the worst case, but if quad axle articulated trucks are rare it may never eventuate in the life of the intersection.

Figure 3-4: RTS 18 Truck Tracking (Insley to Molesworth)

3.5 Midblock Restrictions

There are currently no midblock corners or restrictions (i.e. median refuges) that restrict access for HCV movement. HCV are only impeded by other users due to limited roadspace; i.e. cars paused in the traffic lane turning right, or cyclists in the minimal shoulder.

3.6 Cycling Conflict

The current width of Molesworth Drive provides insufficient room for cyclists and HCVs to share the carriageway. Austroads recommends a gap of 1.5m between the cyclist's envelope and heavy vehicles to allow for the effects of the turbulent air that surrounds large high sided vehicles.

This issue is only destined to become more pronounced as the number of heavy vehicles increases once large box stores establish in Mangawhai as the population grows in line with expectations.

It is noted that providing a shared path will not solve this issue, the cyclists most likely to be using Molesworth Drive are sports cyclists who will continue to use the road even when alternative exist.

Establishing the extent of the issue by monitoring cycle and heavy vehicle usage along the arterial route is recommended.

3.7 Improvement Options

Overall the route offers no restriction specific to HCVs, other than:

- turning manoeuvres at the various low-volume side roads and business accesses that line the route, and
- turning manoeuvres at the two Moir St intersections.

However, HCVs tend to amplify and advance the effects of overall traffic-stream congestion. Options to address issues discussed above that provoke HCV-related congestion are:

- Seal widening for flush median treatment, to separate turning conflicts, in 50-70kph sections,
- Seal widening or separated shared path to accommodate cyclists clear of the traffic stream. If an on-road solution is being contemplated then (assuming a 3.5m marked traffic lane) AUSTROADS Pt 3 Geometric Design table 4.17 recommends 1.5m between a cyclist envelope and an adjacent truck. The shoulder must protected from parking.
- Right and left turn bays for side roads or multi-resident driveways within the 80kph section
- Protection of the route from further direct access ribbon development
- Protection of the route at Planning level to accommodate new activities that require HCV access/manoeuvring

4 Mangawhai Cycling Links

4.1 Current Issues

Currently Mangawhai has no cycling provisions with cyclists currently using the road or footpaths that are not designated or designed for shared use traffic.

The carriageway widths in Mangawhai are currently narrow, this statement is applicable to both local and arterial routes. Footpaths are mostly narrow and are intended for pedestrian usage.

There is growing interest from the Council and local interest groups to provide safe shared path links catering for both cyclists and pedestrians. The 2016 Mangawhai Town Centre Plan suggested a core of shared use facilities that provided a link to all the major recreation, employment and education facilities. Subsequent feedback highlighted that there is a further desire in the Mangawhai area to make cycling and walking the easiest options. To do this additional links need to be provided to provide shorter or more scenic routes.

4.2 Treatment types

Implementing a new network of cycling facilities will require multiple treatment types that depend on route length, topography, and available land and destination locations

There is no one size fits all cycling provision that serves all corridors, generally the improvements will consist of a mix of the following measures

Off – road (away from road corridor) A shared path that aims to either provide shorter route distances, safer options away from competing traffic or scenic route where the cycle/pedestrian facility is the attractor.

Off – road, can be a path along the road corridor with a vegetation or other surfacing that creates a lateral offset between the path and road surface. Off road paths are not part of the carriageway and must give way to all traffic at intersections.

On road separated cycle lanes – Provision of cycleway at road level that is separated by a physical barrier, this can be in for the form of kerb islands, planting or other street scaping. There are safety concerns with using separated cycle lanes, under current New Zealand traffic law, physically excluding general traffic from the separated cycleway results in it no longer being considered part of the ‘roadway’, even if it has been constructed at roadway level on what was formerly defined as roadway. This means that cyclists who enter the roadway at intersections are required to give way to all vehicles, even in the case where a person is cycling straight ahead and the vehicle driver is turning. This ambiguity can lead to confusion and result in crashes; it also results in delay for cyclists, which can be a deterrent, particularly for the ‘enthused and confident’ and ‘strong and fearless’.

On road exclusive cycle lanes – lane created using pavement marking, signage and sometimes coloured surfacing

On road peak period exclusive lanes – used primarily when clear ways are in operation, not considered appropriate for Mangawhai.

Wide kerbside lane – most suitable for sports and experienced cyclists, allowing enough room for cyclists to travel next to motor vehicles. Given sports cyclists very rarely use off road facilities consideration should be given to providing enough width on the arterial routes to allow for the safe sharing of space. For the traffic speeds experienced providing traffic lanes between 3.7m and 4.5m is suitable.

Narrow kerbside lanes – Existing road alignment changed, suitable for low volume low speed roads without existing safety issues.

Treatment	Pros	Cons
Off – Road away from road corridor	Can be provide shortest routes Route selection can be used for scenic purposes Users feel safe Shown to increase recreational cycling numbers	Often land required has already been developed CPTED concern due to being away from built up areas OPEX cost of new assets
Off - Road	Provides physical separation between cyclists and vehicles Can vary from road alignment, if a scenic alternative is desirable Shown to increase the cyclist numbers and number of trips Existing footpath can often be incorporated the final width of the shared path Caters for all none motorised users if designed with appropriate gradients and width Makes cyclists feel safer	Can have safety issues at intersection with property accesses, especially if visibility is restricted Property encroachment issues are required to be resolved. Additional width is required compared to on road facilities (if footpath is not currently along corridor Some research states that cyclists are more at risk at intersections compared to on road facilities
On road separated cycle lanes (1)	Provides a cycle only facility On wide carriageways can be repurposed from existing sealed surface High degree of separation supports cycling growth Vertical separation between cyclists and motorists require less room than most off road facilities	Complexity around right of way can lead to high level of crashes. (cyclist to give way to all traffic) More expensive that exclusive cycle lanes (none separated) Need to giveway at driveways Specialist maintenance equipment may be required to work in narrow separated corridor Gradients limited to the same as existing roads
On road exclusive cycle lanes	Required less width than an off road or separated facility Increasing seal width is more normally possible in existing road reserve Less ambiguity over right of way than separated cycleways, classed as part of carriageway. Useful when separating pedestrian and cycle traffic is desirable, especially through urban/retail areas where the erratic pedestrian flow is not conducive to safely sharing space.	Does not encourage the same number of new cyclists Gradients limited to the same as existing roads
On road peak period exclusive lanes		Only applicable on roads with time restricted clearways
Wide kerbside lane	Good for experienced riders Allows overtaking without crossing lanes	Not suitable for routes with significant heavy vehicle usage without significant lane width Lack of lane side markings can lead to poor lane discipline.
Narrow kerbside lane	Little to no modification of existing road network Suitable for majority of Mangawhai local roads	No separation from motorists

4.2.1 Low Volume Roads

Most of the existing cul-de-sacs, and local roads are considered suitable for shared space cycling, having the existing low speeds and low volumes that are requirements for safely accommodating motorised and none motorised traffic. Pedestrians and disabled access should be considered separately on these roads, where smooth footpaths are not currently provided there may be a need to construct one. This is not considered within this report.

These low volume roads make up the majority of routes, by length, in the Mangawhai area with only a limited amount of arterial and collector roads having volumes that exceed 3000 vehicles a day. Even on these low volume roads routine maintenance should be conducted to make sure there is adequately firm and stable shoulders/outer edge of carriageway for cycling. Encroaching vegetation or even vegetation that reduces visibility should be assessed and trimmed/removed where required.

Introducing a barrage of signage and delineation on these local roads would reduce the classic New Zealand coastal town look and feel, however there is an opportunity to introduce a “Share the Road” signage campaign. This would be best suited to the collector and arterial routes where the signs would have maximum impact.

4.2.2 Collector and Arterial Roads

Where roads service multiple local roads, experience a high percentage of heavy vehicles or serve an arterial function, consideration needs to be given to separating cyclists and motorists as much as possible. Additionally wider lanes should be considered for sports cyclists.

4.3 Cyclist User Profiles

4.3.1 Recreational Cycling

Mangawhai’s high proportion of holiday homes and popularity as a leisure destination means recreational cyclists make up a large proportion of the cyclist mix. Typically this covers a wide assortment of demographics from families with young children, adults of all ages and older children and teenagers.

To provide a safe route for recreational cyclists it is well documented that this is best achieved by providing off road cycling facilities. To make the facility as appealing and user friendly as possible it should connect as many desirable destinations are possible.

4.3.1.1 Shared Path Design Principles

The design principles shared paths are:

- The designs should cater for the volumes and the directional split of cyclists and pedestrians that use and will use the path.
- Shared paths need to be wide enough to comfortably accommodate expected volumes of both cyclists and pedestrians. Guidance notes are available for assessing the path width and capacity, this needs to be carefully considered to forecast the demand based on attractive cycling provisions being put in place. For the purpose of this report a shared cycle lane width of 3m is assumed.
- Designs should be sensitive to the environment.
- Where paths are located close to water, over water or along banks extra safety considerations should be taken into count.
- Recreational shared paths can be unsealed to fit in with the park or coastal environment, however the surface should be smooth and without loose material that becomes a hazard.

4.3.2 Sports Cyclists

Sport cyclists have different criteria to recreational cyclists in that their primary route is on the carriageway. To cater for this the improvements need to concentrate on improving the road conditions. Providing for road sport cyclists requires an understanding of the characteristic needs of the group. Generally road cyclists are made up of people into sport or simply cycling for their own enjoyment. Road cycling trips are typically up to three times longer than utility, commuter or education cycling trips. The cyclists are likely to travel through the Mangawhai area on a direct route to the surround road network.

4.3.2.1 On-Road Cycling Design Principles

The design principles for on road cycling facilities are:

- The design should seek to provide a high quality road surface which can accommodate a typical sport cycle speed of over 30 km/h.
- On-going maintenance is important to address pot holes and edge breaks. To maintain a clean surface, clear of broken glass, the cycleway should be more regularly swept.
- The design should seek to provide generous road, shoulder and cycle lane widths to accommodate road cyclist who often ride side by side. This is especially needed on roads with high speeds (above 50 km/h), particularly on arterial and rural roads. The Austroad's recommended widths for cycle lanes and shoulder widths are tabulated below. If parking is present the cycle lane widths should be wider.

4.4 Design Considerations

This report does not attempt to detail the design standards applicable to Mangawhai's proposed shared paths. Consideration still needs to be given at the planning stage to ensure that corridors provide appropriate conditions for future implementation.

4.4.1 Gradients

Gradient is a key consideration for cyclists to decide if a route is a desirable route to use, with cyclists often prepared to use a long route to avoid unpleasant climbs. As climbs are generally considered unpleasant to casual cyclists this should be given due consideration when planning routes through new subdivisions.

On existing routes the opportunity for altering gradients will be limited, especially when they are located in the road corridor. The geometric deviations between the road and the shared path may uncover services in an attempt to achieve shallower gradients for the shared path.

Gradients most affect recreational cyclists, who often comprise of the young and the old. The limit that cyclists decide a route is too steep to cycle and decide to dismount can be as low as 6% for these users. This demographic is likely to be a target user for any cycle facility, as such gradients above 6% should be limited on key recreational/school routes.

Mangawhai mostly has suitable gradients for cycle infrastructure, with the top of Mangawhai Heads being the most challenging. Of the currently developed space the area that is situated along and to the North of Mangawhai Heads Road is likely to pose the most difficulty in achieving usable gradients. Achieving these and not having excessively long local roads will more than likely require using off road shared paths to provide usable gradients, for cyclist and other users with restricted mobility alike. It will be impractical to implement this onto existing roads, Cullen Street for example, however for new subdivisions incorporating the requirement at the planning and design stage should be relatively straight forward. Whilst straightforward to provide suitable gradients within new developments it will often not be conducive to maximising the number of lots accommodated in a plot of land, as such some resistance should be expected from developers.

4.4.1.1 Boardwalks

The tidal estuary poses issues for linking up the Village and the Heads, especially as the conurbation expands to the edges of the areas zoned for residential use and even beyond when considering 30 to 40 year horizons. However the borders of the estuary also provide opportunities for installing public facilities without the need to acquire private land.

Boardwalks can help successfully build routes that are direct enough to be considered useful for all users, and incorporate gradients that are usable by all groups and link up existing paper roads. The use of boardwalks also forms a key part of the proposals detailed in the following reports.

- Mangawhai Recreational Charitable Trust – Walkway/Cycleway Proposal
- Mangawhai Estuary to Picnic Bay Walkway Feasibility Report.

Boardwalk surfacing is a key consideration and will effect long term ride quality:

- Timber decking with geogrid attached – Cheap, previously common but poor ride quality and prone to warping, environmentally sustainable.
- Concrete – highly durable with good ride quality but heavy to transport to more remote areas, not a sustainable product
- Glass reinforced/fiberglass - good ride quality, effective stormwater management (can be open grid), light weight, arguably the most environmentally conscious option but expensive.

As with any construction the Coastal Management Area there will be stringent environmental consents to obtain and also will be divisive amongst the local community.

4.4.2 Minimum widths (Shared Paths)

Minimum widths need to be agreed for various routes, the width needs to allow for the expected number of users and would follow the normal criteria set out in Figure 3-5: Standard Shared Path Widths above. However, given Mangawhai is a popular recreation destination with families with young children, it may be necessary to provide more than the minimum width to allow for cyclists to have ample room for passing and reduce the likelihood of collisions.

Gradients also effect the amount of space a cyclist requires when climbing steep gradients. Experienced cyclists will work the bicycle from side to side whilst less experienced cyclists tend to wobble from side to side due a lack of momentum. There is research to suggest that an extra 0.8m is required at low speeds on steep gradients.

Width of Path	Type of Path	Guidelines for Appropriate Use
2.0 m	Local access only Regional paths such as rail trails.	Paths at this width are adequate for pedestrians, but only cater for one cyclist or person in a wheelchair at a time. If a meeting or a passing occurs between a cyclist and another user, one of the users may need to move off the path. This width may be acceptable on paths that are less than 500m in length where cyclist volumes are less than 20 cyclists per hour. They are not suitable for new paths on the Principal Bicycle Network or the Metropolitan Trail Network.
2.5 m	Recreational and regional commuter paths	Paths at this width are also adequate for pedestrians and can accommodate low volumes of cyclists. This width allows a clearance of 0.5m between path users when passings or meetings occur. If a passing occurs at the same time as a meeting and a cyclist is involved, one of the users may need to move off the path. This width may be acceptable on paths that carry less than 600 cyclists per hour or paths that carry less than 40 pedestrians per hour as shown in charts A and B.
3.0 m	Recreational and urban commuter paths At these widths it is assumed that passings and meetings between path users is frequent, that bicycle speeds exceed 25 km/h and that a more diverse rangle of users is present such as older people and family groups. For these reasons, these paths need to be wider to provide higher clearances between path users.	Paths at this width can accommodate higher volumes of cyclists and pedestrians. This width allows a clearance of 1.0m between path users when passings or meetings occur. It also allows passings and meetings to occur simultaneously without the need for users to move off the path. In most circumstances, new shared use paths should be 3.0m wide, especially for new paths on the Principal Bicycle Network or the Metropolitan Trail Network.
3.5m		A 3.5m path provides increased clearances between path users and, as a result, provides a higher level of service for paths users. However, 3.5m wide paths do not reduce the number of delayed passings for cyclists. In addition, 3.5m wide paths may be inappropriate for their setting in terms of their visual and physical impact on the landscape, especially if they are constructed from concrete or asphalt.
4.0 m		Paths at this width can accommodate very high volumes of cyclists and pedestrians and will allow simultaneous passings to occur in both directions. However, if there is sufficient space for a 4.0m wide shared path, the provision of a 1.5m wide path for pedestrians and a 2.5m wide path for cyclists may provide a better outcome for all path users. In addition, 4.0m wide paths may also be inappropriate for their setting in terms of their visual and physical impact on the landscape, especially if they are constructed from concrete or asphalt.

Figure 4-1: Standard Shared Path Widths

In general off-road cycling facilities should aim to be 2.5m to 3.0m

4.4.3 Cycle Parking

The 2016 Mangawhai Village and Mangawhai Heads Infrastructure Plan – Transportation section 5.1.3 makes reference of the type of cycle parking that is required to encourage secure cycle storage. Whilst this report is mainly considered with high level cycle route planning, it is important during the planning stage to consider cycle facilities as all key destinations. Facilities should be highly visible to benefit from passive surveillance, set back from pedestrian thoroughfares and covered if the expected user will be leaving their bicycle for extended periods. This is especially important if cycle commuters are a target user.

4.4.4 Lighting

No design consideration has been given to the practicalities of lighting the shared path network but if the paths are to serve more than daytime recreational use then lighting may be necessary. The shared paths that are located in the road corridors are, in the most part, be adequately lit by the street lighting. However, other paths that utilise the esplanade or riparian boarders will potentially require entire new lighting systems.

Providing lighting is not mandatory but Austroads recommends:
"Where bicycle paths or shared paths carry a substantial number of cyclists during periods of darkness (i.e. dawn, dusk and at night) consideration should be given to the provision of path lighting. The decision to provide lighting is a matter for the relevant authority. If it is decided to light a bicycle path or shared path the lighting should be designed in accordance with AS/NZS 1158.3.1:2005, (e.g. lighting level P2 or higher depending on the jurisdiction, location and the circumstances)."

The provision of lighting needs to be weighed up against the capital, maintenance and operational costs against user safety. CPTED should also be a consideration for paths that are likely to deviate away from built up areas.

4.5 Planning for the future

The shared path and cycleway infrastructure that was suggested in the original 2016 Infrastructure Plan is still considered valid, as it connects all the existing leisure and commercial destinations and is relatively easy to implement within Council or public land.

The additional links contained within this report have been added to serve multiple purposes:

- Improve the number of scenic links – this will encourage cycling as a leisure activity in its own right rather than as a leisurely means of transportation.
- Provide direct links between the two sides of the estuary without the need to follow subdivision roads onto the arterial roads. This will hopefully reduce travel times for cycling to be more in line with other modes of transport. Especially if the expected proliferation of ebikes eventuates.
- Make use of potential developments to provide key parts of new routes

Short to medium term links consider the areas identified as residential or commercial within the current District Plan. In assessing the potential routes land acquisition was not necessarily excluded, however was always considered undesirable. Using public land, riparian margins and the existing road corridor it was achievable to provide a network that serves the existing and potential urbanised areas and leisure destinations without private property acquisition.

The amount of land available within the existing residential zoned areas is significant, with estimates of 1000 new properties being available.

Long term - Beyond this horizon any areas of potential development are purely speculative and not based on any known desire within the Council or other organisation.
Filling in the section from Tara Road to Cove Road provides significant land for development and makes Cove Road a viable road to service the development. Using Tara Road and Cove Road will alleviate the existing arterial route from further traffic volume increases.

4.6 Public Support

Many New Zealand towns and cities have run effective cycle marketing campaigns. Both New Plymouth and Hastings District Councils have introduced significant cycle infrastructure as part of the New Zealand Transport Agencies' "Walking and Cycling Model Community with New Plymouth and Hastings" programme. Consulting with the teams responsible with promoting the schemes may provide useful advice on marketing strategies

Should the Council proceed with the aim of making cycling/walking the easiest option there are a number of steps that would be helpful in defining the issues and seeking future funding.

Establishing a dedicated person or team that is mandated with establishing the right environment for implementing an extensive cycling programme is recommended following research into implementing other similar cycling schemes.

Making contact with the New Plymouth and Hastings cycling teams may provide useful insight into achieving the right level of branding, awareness and consultation to have a strong base support for the new infrastructure.

4.6.1 Business Case Approach

Section 6 makes reference to the process for implementing a business approach to identifying and quantifying the needs and desires of the community and stakeholders. Following this approach ensures maximum stakeholder and community by-in and is a requirement for securing some forms of funding.

4.7 Cycle numbers

Unlike the majority of the infrastructure recommendations made in this report, that caution against constructing prohibitively expensive infrastructure by designing for the peak traffic conditions that only last for a few weeks over the main holiday periods, cycling provisions should at least be considered on their peak period need. The reasons for this are:

- Support cycling as the "easiest option"
- Safety over delay
- In part the cycle network will be in place to encourage and maintain the high visitor numbers to the town
- Desirable destinations will remain in use over the entire year.
- The design of a path for off-peak cycle volumes is often very similar to a path for peak volumes, except for minor changes in width.

4.8 Funding

It is assumed that local funding will be used to finance the majority of the cycle/shared path projects. Local funding is assumed to be KDC, Northland Regional, local interest parties and developer contributions.

There may be some opportunity for contributions from the NZ Transport Agency, this is most likely on the arterial route shared path, for the reasons listed below.

- Section 3.6 Cycling Conflict identifies significant issues with available width for vehicles and cyclists to share the lane. This problem is likely to be worst when State Highway 1 bypass is in operation. Safety improvements provide a key input into achieving positive BCR values following an economic evaluation.
- If the Long Term Plan makes cycling a priority and notes that removing all recreation cycling traffic from the main arterial routes as a key policy.

At this stage no attempt has been given to trying to quantify the cost of implementing the cycling improvements given in Appendix B. However where the Council identifies synergies between the proposals contained within this report, other Council initiated reports, such as the Mangawhai Open Space Review report and the desire of the Mangawhai Recreational Charitable Trust group the most

cost effective method of funding the works could be contributions to the physical works costs of works planned by local interest groups. This would also allow Council to have an input into selecting appropriate width, geometric standards and surfacing type but perhaps benefit from private fundraising and volunteer labour.

Estuary Estates and other subdivisions should be assessed from the planning stage to incorporate appropriate cycle infrastructure and connections into other potential shared path projects. Connections do not necessarily need to be made when the subdivisions road infrastructure is first constructed, especially when many of the potential connecting projects are long term aims - what is important is the subdivision is planned in such a way that the connection is not prohibited in the future.

It is noted that the Estuary Estates plans that are currently lodged as part of the district plan would not provide good infrastructure for non-motorist users.

Select some of the desirable solutions and incorporate these into the Council's policy, either via the upcoming Long Term Plan of via some other document policy

4.9 Recommendations

4.9.1 Cycle network plans

Appendix B contains plans that illustrate potential networks that connect Mangawhai's existing developments, attractions and areas of potential development.

Drawings Z80509594/SK001 to SK003 Short to medium term links

- Includes the shared path links from the original Mangawhai Village and Mangawhai Heads Infrastructure Plan – Transportation but adds additional to increase permeability through existing and proposed subdivision.

Drawings Z80509594/SK004 to SK005 Long term links

- Includes all the short to medium term links but assumes a much greater area of growth with a 40 year horizon.

Table 4-1: Potentail Shared Path Netowrk Details

Shared Path Section	Purpose	Issues/Difficulties	Physical Works Costs (1)
Short to Medium Term Options (2)			
North West Link			
Old Waipu Road	Connection into Estuary Estates to establish cross link to North West. Widen existing path, new path at end of existing built to shared path standard.	Power poles currently located along berm, likely that some will be within the shared path alignment	Part developer funded $100,000 for upgraded section of existing path. Not including service relocations
Estuary Estates	Multiple internal links desired. Ensure there is a high quality cross development link.	Needs to be incorporated at planning stage. Also include for North/South links	Dependant on internal road network needs, developer funded
Estuary Boardwalk	Provide secondary crossing of estuary to link North west link	Boardwalk through tidal estuary, geotechnical data not available.	$1 - 2 million, assumes limited navigation requirements. Small boat or kayak.
Estuary link onto Jack Boyd Road to Mangawhai Heads Road	Part of north west link	Some sections that are steep for shared use path, may be acceptable over short distance	$300,000

Shared Path proposed by Mangawhai Recreational Charitable Trust			
Molesworth Drive to Cove Road	Shared path proposed by Mangawhai Recreational Charitable Trust. Mostly scenic link but would connect into north/west link. Proposed boardwalk is unlikely to have strategic value for increasing cyclist numbers/enabling shorter journey times	Currently connects into Molesworth Drive at narrow section that is not ideal for users approaching from the Village or Heads. The Molesworth section of shared path is required to establish safe link.	Currently volunteer and locally raised donations funded. Council input to surface type and width would lead to contributions.
Thelma Road	Northern connection, existing road reserve or paper road.	Some gradients may be unsuitable for shared path access.	$420,000
Link through subdivision Sailrock Drive			Developer Funded
Shared Path from - Mangawhai Estuary to Picnic Bay Walkway Feasibility Report			
Alternative link to Picnic Bay	Scenic link to picnic bay		$1 million. Estimated by Frame Group
Southern Heads Peninsula			
Estuary Drive/Moir Point Road/Devon Street/Moir Point Road	Link around peninsula. Acts as a collector for all the local streets	A few localised steep gradients	$800,000
Heather Street (end)	Upgrade existing path to provide link to scenic link. Shared section of coastal walkway. Scenic link to boat ramps, holiday camp and beach family friendly coastal reserve.	Very steep, would require switchbacks to achieve a useable gradient. Could not be accommodated within road/access boundary	
Long Term Option – Shared Path Arterial Routes			
Connection from South of Mangawhai			
Tern Point to Moir Street boardwalk/bridge	Connection to future development to the South of the Village. Assumes future development. Current causeway is narrow and high speed. Opens up possibility of scenic rides to the South of Mangawhai	Expensive boardwalk option that may require a navigable section	$1.5 to 3million depending on ground conditions and navigation requirements
Moir Street to Kainui Street	Esplanade link to allow Tern Point access at Mangawhai heads	Coastal environment	$400,000
Kainui Street to Molesworth Drive boardwalk/bridge	Link from Tern point to Mangawhai	Expensive boardwalk option that may require a navigable section	$1 to $2 million depending on ground conditions
Tara Road	Link to assumed urbanisation to West	If constructed off line through potential subdivision would be many years until a linked up path could be provided	Undertaken as part of road upgrades or use various subdivisions
Cover Road		Exceeds maximum gradients along existing Cove Road. If constructed off line through potential subdivision would be many years until a linked up path could be provided	Undertaken as part of road upgrades or use various subdivisions

1. All costs listed this table are based on costs of similar projects within New Zealand but do not take into account land costs, geotechnical issues, detailed topographic assessment, extensive planning processes and associated environmental constraints. All prices are likely to be subject to significant refinement during investigation and design stages.
2. Short to medium term options are to be read in conjunction with the shared path options 2016 Mangawhai Village and Mangawhai Heads Infrastructure Plan – Transportation

5 Mangawhai Bypass

Parts of the existing route through Mangawhai and Mangawhai Heads (Moir St, Insley St, Molesworth Drive and Mangawhai Heads Rd) are experiencing occasional congestion at peak times - at Moir St in Mangawhai, and near Ward St in Mangawhai Heads. The popularity of Mangawhai as a seaside destination is also driving significant development which in future is expected to add to this congestion.

In response to this, existing route capacity and future traffic demand has been assessed to determine the need for an alternative route for through traffic. This section considers whether an alternative link between the inward/outward bound routes of Kaiwaka-Mangawhai Rd and Tomarata Rd and Langs Beach would, by removing through-traffic, effectively relieve congestion on Moir St and Molesworth Drive.

5.1 Key approach routes

5.1.1 Mangawhai Rd vs. Kaiwaka-Mangawhai Rd

The key origin for peak hour out-of-town traffic is assumed to be Auckland, approaching Mangawhai via Mangawhai Rd, turning off SH1 just north of Te Hana. This route connects to Insley St, and is believed to be used by most traffic to access all of Mangawhai, Mangawhai Heads and Langs beach. An alternate route from Auckland is possible via Kaiwaka-Mangawhai Rd, turning off SH1 at Kaiwaka, but is 6.6km and 5 minutes longer to Mangawhai, and 4.4km/2 min longer to Langs Beach (via Cove Rd).

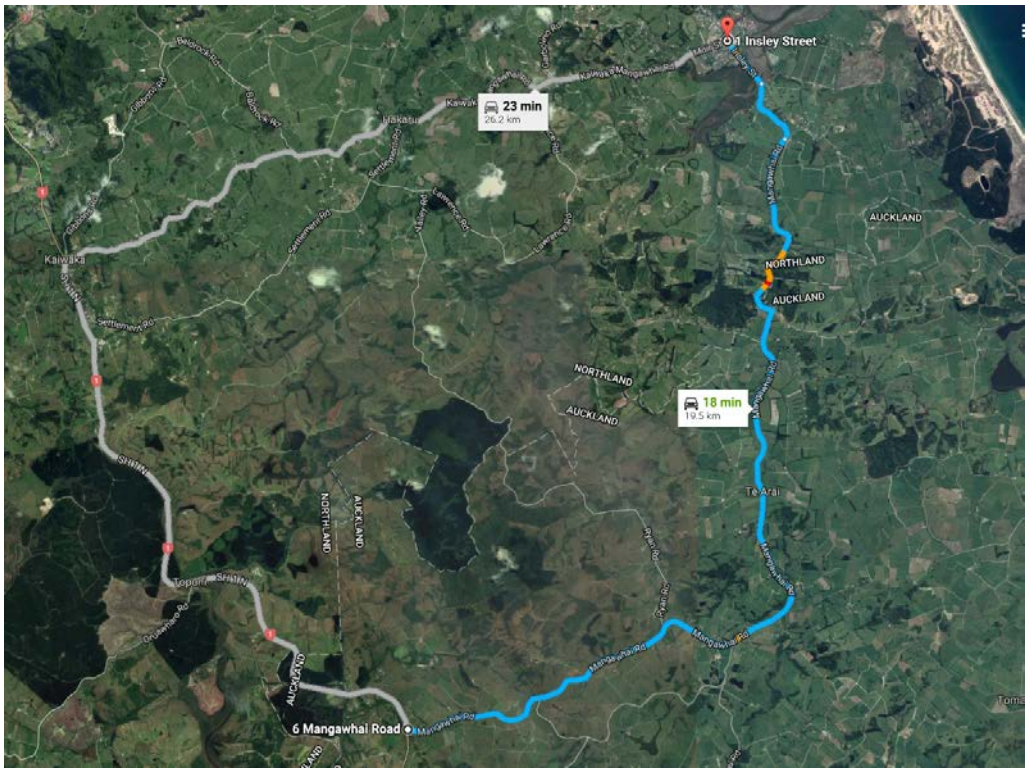


Figure 5-1: Preferred Access route from Auckland

The choice of approach route is significant, as the Kaiwaka-Mangawhai Rd approach tends to favour more westerly located bypasses.

5.1.2 Warkworth to Wellsford SH1 RONs

The first stage of Ara Tūhono Pūhoi to Wellsford Road of National Significance (Puhoi to Warkworth) is under construction. Delivery of the second stage (Warkworth to Wellsford) is nominally assumed to be 2028. The second stage terminates at SH1/Mangawhai Road intersection. These projects will combine to encourage development growth by providing a fast reliable link to Auckland.

These projects have a small effect on the choice of approach route to Mangawhai. There is some chance the Government's stated aim of a very long term 4-lane expressway to Whangarei would tend to favour the Kaiwaka-Mangawhai route. However, for the Kaiwaka-Mangawhai route to become a faster route than Mangawhai Road, the existing SH1 journey time would have to be more than halved. This is unlikely, even with an expressway, given the existing route has a moderately good alignment with average 85kph speed.

In summary, although medium to long term SH1 improvements will contribute to development growth in the Mangawhai area, these will not affect the current preference for Mangawhai Rd as the route of choice from Auckland. Therefore, the south end of a potential Mangawhai bypass will continue to be mostly influenced by Insley St as the favoured southern connection point to Mangawhai Village.

5.2 Existing route capacity & congestion

5.2.1 Midblock

Moir St and Molesworth Drive are consistently 2-lane, 2 way with 3.5m lanes, chipsealed with edgelines and variable width shoulder. There is typically has no median. Right turn bays are provided at key intersections. All intersections are priority controlled except for Mangawhai Heads/Molesworth drive intersection. Current and modelled traffic volumes are2:

Table 5-1: Key Link Traffic Volumes

Intersections	AADT	Off-Season Peak (v/hr)	Summer Peak (v/hr)	2025 Peak (v/hr)
Moir St Approach	1885			
Moir St, village centre	4840	566	1002	2307
Insley St	2810			
Molesworth Dr at Pearson St	3960			
Molesworth Dr at Estuary Estate	3745		1001	2464
Molesworth Dr at Golf Club	4500			
Molesworth Dr at Mangawhai Heads Rd	2205			
Mangawhai Heads Rd Approach	1590	382	1324	2644

Typical daily volumes range from 1,500-2,000 on the approaches and 4,500-5,000 in the village centres. The lane capacity of a typical EEM A3.8 class I or II urban road is likely to exceed 900 veh/hr/lane, indicating the existing midblock has ample capacity to accommodate current peak flows. However, by 2025 midblock capacity issues arise when demand more than doubles with the addition of background growth and traffic generated by Estuary Estates. Until that point, overall route capacity will be governed by intersection capacity.

5.2.2 Intersection Performance

5.2.2.1 Existing Issues

The existing intersections on the route that directly impact through-traffic capacity are Insley/Moir Rds, Moir/Molesworth Rds, and Molesworth/Mangawhai Heads Rds. All other intersections are priority side roads and only impact capacity if there is insufficient left-turn or right-turn-in provision.

[2] Source: Molesworth Dr Concept Planning Report, MWH March 2016

The two key intersection issues identified are the right turn out movements from Thelma and Wood Streets during summer-time peak traffic (confirmed in SIDRA3). However, the modelling suggests intersection congestion is not a significant current issue along the route as a whole.

5.2.2.2 Future Issues

Future delay issues will arise around 2025, at:

- Moir/Molesworth intersection, where the minor side road movements for Moir Rd east will be heavily delayed, and
- The single lane roundabouts proposed for Estuary Estate access.
- Private access manoeuvres

The modelling found that traffic turning out of most priority intersections along the route are beginning suffer significant summer peak time delays at 2025. The key intersections tested included Thelma, Wood, and Moir Point intersections.

The "Molesworth Drive" modelling report defines peak summer delays as occurring on 15 days of the year.

5.2.3 Intersection Form

Targeted local treatments include:

- Upgrading intersections with larger side flows to single lane roundabout,
- Intersection re-prioritisation, and
- Side street business access modifications

The current assumption is that single lane roundabouts are best suited to relieving side road delays. The advantages of this standard are:

- Single lane roundabouts are pedestrian and cycle friendly,
- Roundabouts effectively moderate urban traffic speeds,
- Single lane roundabouts work efficiently at low traffic flows, and have adequate capacity for 99% of the year,
- Roundabouts are consistent with existing provision, and avoids introducing traffic signals.

Single lane roundabouts will more effectively control speeds and are significantly safer for pedestrians and cyclists than multi-lane roundabouts, although they lack peak hour traffic capacity. Upgrading to a single lane roundabout to relieve side road delays will be adequate for 2025 off-season peak traffic, but not summer peak traffic. Summer peaks require an upgrade to a two-lane roundabout. These broad conclusions are supported by the analysis within the Estuary Estates traffic impact assessment[4] , although we note that in the intervening 10 years background growth has added only some 10% traffic to Molesworth Drive, i.e. traffic growth of 1% p.a.

However, the life expectancy and Level of Service of a single-lane roundabout regime could be extended and improved if the through-traffic element was removed from peak summer traffic flows via an effective bypass.

5.3 Bypass Options

5.3.1 Internal Bypass Options

The chicane formed by Insley/Moir/Molesworth is the current congestion hop-spot in Mangawhai, with moderately long queues on the Insley and Molesworth approaches. Short term congestion relief solutions are suggested in this report and the Opus report relating to the Moir/Molesworth intersection. A longer term solution is to directly link Insley to Molesworth via a realignment as per the 2016

[3] Source: "Molesworth Dr Concept Planning Report", MWH March 2016
[4] Source: "Proposed Plan Change for Estuary Estates - Addendum to Traffic Planning Assessment", KEA Consultants July 2007

Mangawhai Village and Mangawhai Heads Infrastructure Plan or one of the other alignment options that would come from a detailed feasibility study.

5.3.2 External Bypass – Cove Road

5.3.2.1 Western route

The wide Mangawhai Estuary envelopes the eastern sides of Mangawhai and Mangawhai Heads Villages, restricting any bypass route to the western side. The naturally bow-shaped combined urban area means the western side is also the shortest route. Cove Rd is the direct route to Langs Beach and is ideally placed as such a western side bypass. All of the options below are variations on using Cove Rd.

The Cove Rd corridor has several advantages. The road is:

- chip sealed,
- a relatively direct route,
- far enough away from Mangawhai to permit development,
- running along the edges of much of proposed growth areas such as Estuary Estate, thus providing alternate western access in the event the village spreads further west.

Its disadvantages are:

- a narrow, curvilinear low-standard alignment,
- two single lane structures,
- its connection point to Kaiwaka Mangawhai Rd is too far (2km) west of Mangawhai village to be compatible with the preferred Insley St approach.
- Frequent direct lifestyle block access.
- a longer route to Langs Beach

5.3.2.2 Future Function

We expect the future core functions of an alternative western route following the Cove Rd corridor to be:

- Peak overflow bypass to Langs Beach and northern Mangawhai Heads,
- Local Lifestyle-block access,
- Western Mangawhai urban expansion access, and possibly
- SH1 closure bypass route

5.3.2.3 Traffic Demand

There is currently little demand for Cove Rd's function as a bypass, as the congestion on Molesworth Drive is insufficient to divert through-traffic onto the significantly longer Cove Rd route. In addition, there is little or no planned urban development further west than Estuary Estates driving the need for a better linkage to Mangawhai town. Cove Roads' classification as a "Secondary Collector"[5] serving a dispersed lifestyle block community is likely to remain in place for some time yet. However, Molesworth Rd congestion and western development access will eventually combine to drive increased demand onto some sort of alternative route. Council should consider the urgency with which this route should be identified and protected from development. If a more moderate town centre solution such as a single lane roundabout is selected for Insley / Moir St Intersection, as discussed in section 2, then demand for some sort of alternative route could begin to appear by 2020 under the current traffic modelling assumptions.

5.3.3 Cove Rd Upgrade Options

The following map identifies some tentative western bypass upgrade routes, aimed at improving access to make Cove Rd an attractive alternative to Molesworth Drive for traffic bypassing Mangawhai Heads.

[5] NZTA "One Network Road Classification" map viewer

There are few options to effectively bypass the urban centre of Mangawhai village itself due to the surrounding estuary. Whilst Cove Rd effectively bypasses the majority of the urban area at Mangawhai Heads, most of the routes (except for the Clarke Rd route) do little for the southern village. As a village bypass, all the potential bypass links are largely equally ineffective. None of the links address the Cove Rd single lane bridge issue.

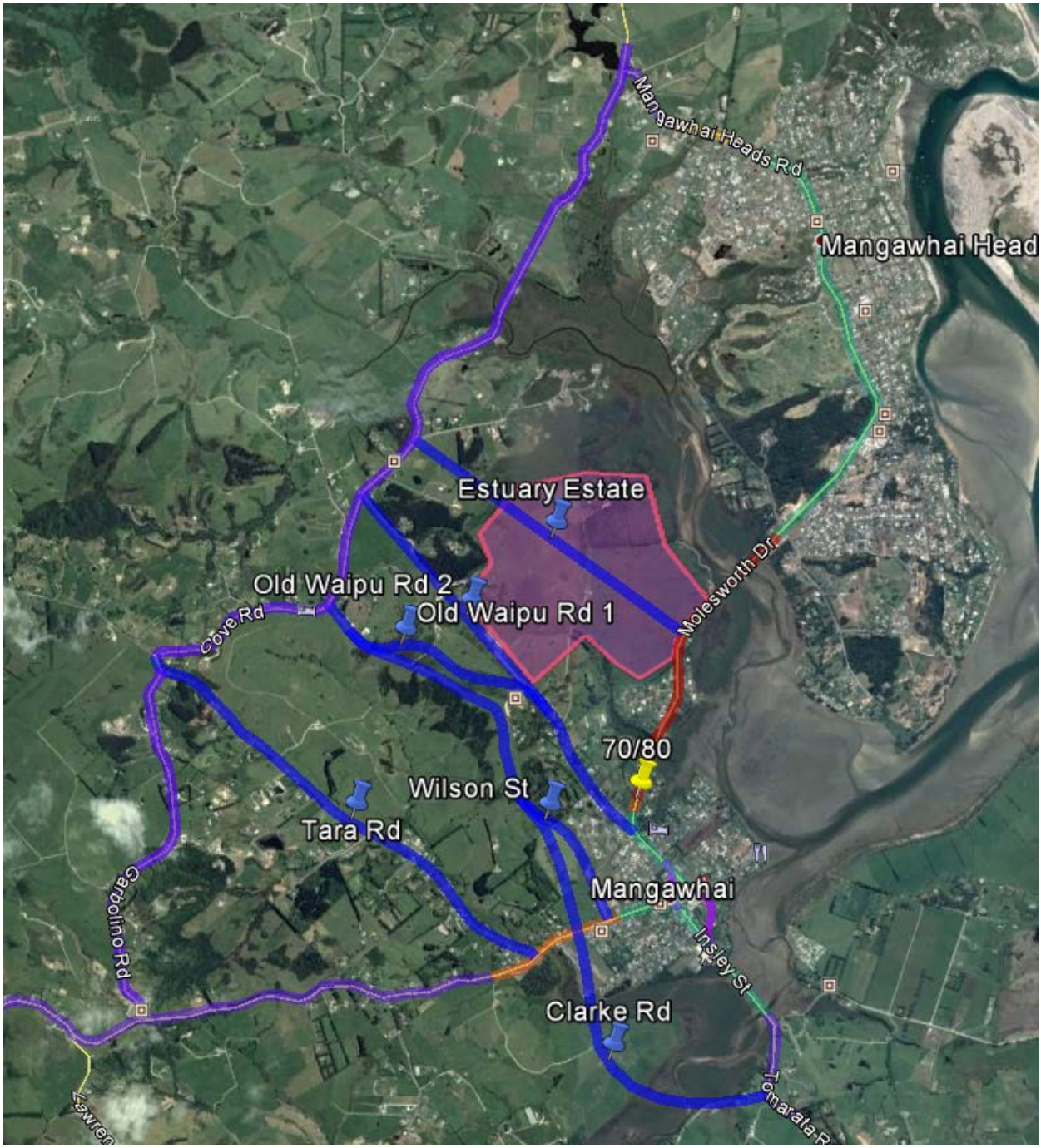


Figure 5-2: Western Bypass Cove Rd Link Options

Each route has various advantages:

Treatment	Pros	Cons
Estuary Estate	• currently undeveloped, • Could be incorporated into the proposed development. • Requires the shortest link road. • Resulting bypass is only marginally longer than the existing route along Molesworth Drive.	• Does not address Cove Rd single lane bridges. • Does not bypass Mangawhai village • Requires redesign of Estuary Estate (currently no through route) • Unlikely to be a faster route for any destinations under free flow conditions
Old Waipu Rd	• Utilises mostly existing road or paper road corridors. • Utilises existing intersections at each end	• Does not address Cove Rd single lane bridges. • Does not bypass Mangawhai village. • Cuts through or near several lifestyle block residence. • Vertical alignment issues near midpoint. • Longer than existing Molesworth Dr route
Wilson St	• Utilises some existing road or paper road corridors, • Avoids residential land. • Directs bypassing traffic away from village centre • Captures both west and south bypassing traffic	• Does not address Cove Rd single lane bridges. • Does not fully bypass Mangawhai village. • Vertical alignment issues near midpoint.
Clarke Rd	• Only option that effectively bypasses Mangawhai village from Insley St. • Quickest route for bypassing traffic • Avoids residential land. • Captures both west and south bypassing traffic	• Longest requirement for new road construction (4km). • Requires 2 major bridge structures • Negative impact on Mangawhai Domain, • Does not address Cove Rd single lane bridges.
Tara Rd	• Utilises existing road corridor, • Corridor can be widened on eastern side - avoids residential land. • Directs bypassing traffic away from village centre • Captures west bypassing traffic	• Positioned too far west to attract bypassing traffic from Insley. • Longest bypass route. • Does not address Cove Rd single lane bridges. • Does not fully bypass Mangawhai village.

5.4 Further investigation

5.4.1 Bypass Demand

The upgrade of Cove Rd to an effective bypass represents a significant investment. The first step in quantifying the effectiveness is to confirm the demand for a bypass route. This is achieved by measuring current through-traffic (i.e. non-stop) between:

- Insley St to Thelma Rd, and
- Thelma Rd to Cove Rd/Mangawhai Rd intersection

The survey would be ideally both peak summer time and off-peak time, typically using number plate survey or video monitoring. Although some traffic will be passing through Mangawhai Heads, some of those will be stopping en-route, for services, shops, fuel or visitor attractions – most of those trips could be expected to continue to use Molesworth Drive.

The results should then be modelled to determine the reduced congestion resulting from the reduced Molesworth Rd traffic. Currently, up to year 2025 is modelled – additional years will be required, ideally sufficient to build a 40 year forecast (as per NZTA EEM project requirements). This will require detail planning input from Council to help anticipate future development demand.

Once the future traffic split between the existing route and bypass route is established, options can be identified tailored to suit each route traffic profile. It is possible that any potential bypass option will not draw sufficient through traffic to be viable in the short to medium term, and effort would be better spent protecting a bypass corridor as a long term solution and concentrating on upgrading the existing Molesworth Drive route.

Mangawhai village centre is integral to demand predictions. Future village centre intersection measures aimed at maintaining the village character could significantly limit Molesworth drive capacity, hence accelerating demand for an alternative route. Early setting of expectations for the village centre is an important step in the evaluation.

6 Business Case Approach

External funding from NZTA now requires a business case approach. The business case philosophy is articulated in NZTAs Planning & Investment resource and is essentially focussed on a stakeholder led process. An excerpt from the NZTA planning process webpage:

"The Transport Agency uses a business case approach to guide our planning, investment and project development processes. It is a principles-based approach that clearly links our strategy to outcomes, and defines problems and their consequences thoroughly before solutions are considered. This approach ensures a shared view of problems and benefits early in the transport planning process without requiring that the work has to be done in a particular way."

Early Engagement
A business case approach encourages early engagement with stakeholders to confirm:

- *the fit with strategy and need to invest*
- *the way forward with short-listed options*
- *that the best value option is affordable and deliverable and that the risks are acceptable.*

New programmes/activities in the 2015–18 National Land Transport Programme are expected to follow the business case approach."

Council should consider adopting this process in order to facilitate future funding, if any of the issues raised in this report are considered to need further investigation. The first step is typically stakeholder identification and work-shopping problem statements.

Appendices

Appendix A Insley/Moir Intersection SIDRA

A.1 SIDRA Result for Options

A.1.1 Sensitivity Analysis

Sensitivity analysis was performed using SIDRA 6.1 to investigate the sensitivity of results to various parameters representing intersection geometry. The analysis determines the amount of possible increase in demand flow subject to a target level of performance. The lower and upper limits of the peak flow factor was set at 100% and 140%, respectively. The analysis was carried out assuming an average annual growth rate of 2% on the hourly flow rate. 'Worst Movement Level of Service Target' option is selected as the Design Life or Flow Scale Analysis objective. The results shown in the LOS summaries/graphs shown a flow scale closest to producing the condition where the intersection operates at acceptable Level of Service.

A.1.1.1 Existing

Flow Scale Analysis for the 2015 existing intersection configuration, with priority to Moir Street, shows that all movements continue to operate at acceptable LOS even under 2018 peak conditions. Figure 6-1 LOS summary when the worst movement in the intersection operates at LOS D and Figure 6-2 below shows the degree of saturation and the corresponding delays at the intersection when LOS for all movements is acceptable.

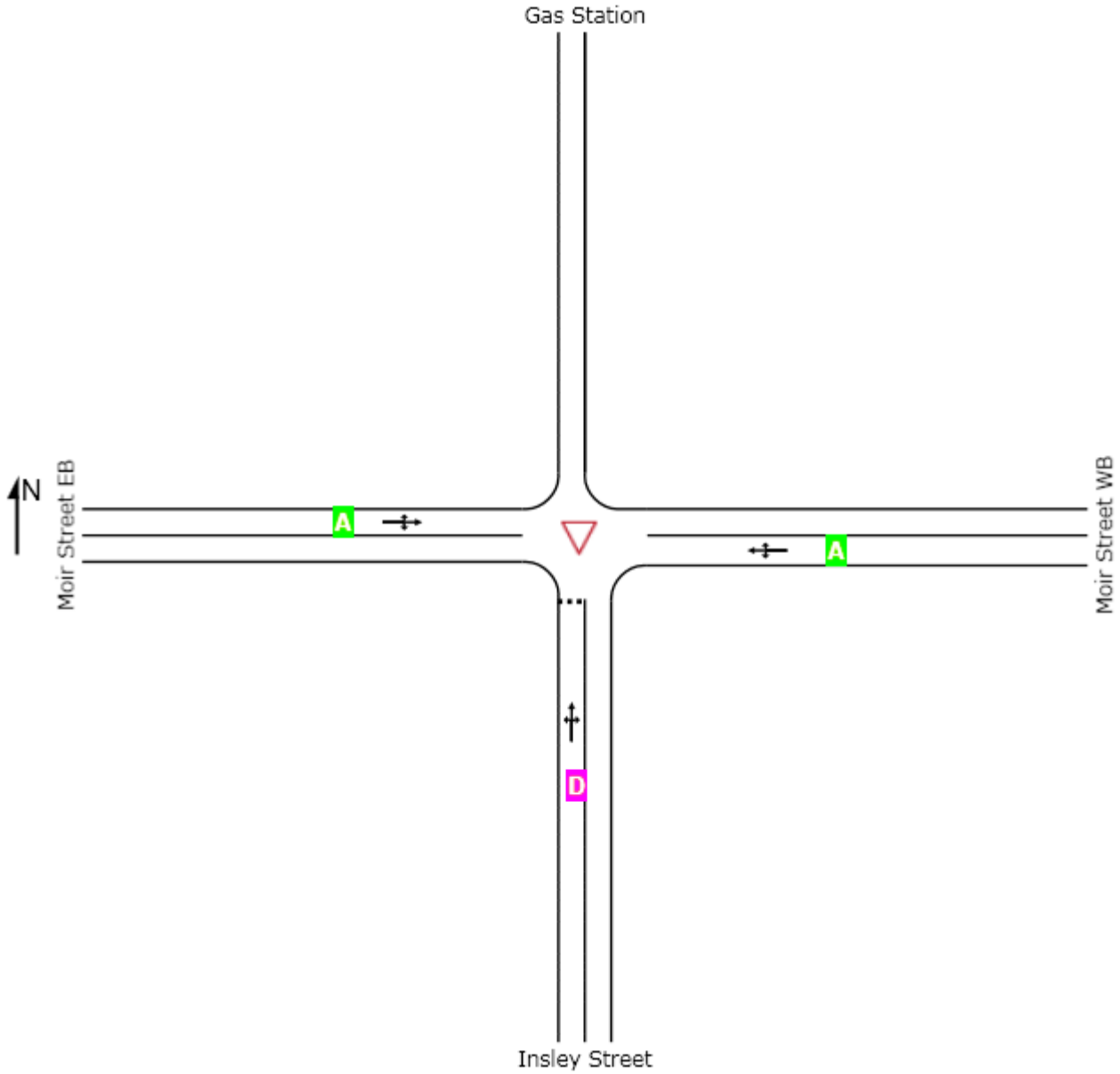


Figure 6-1: LOS Summary – 2018 Moir Street / Insley Street

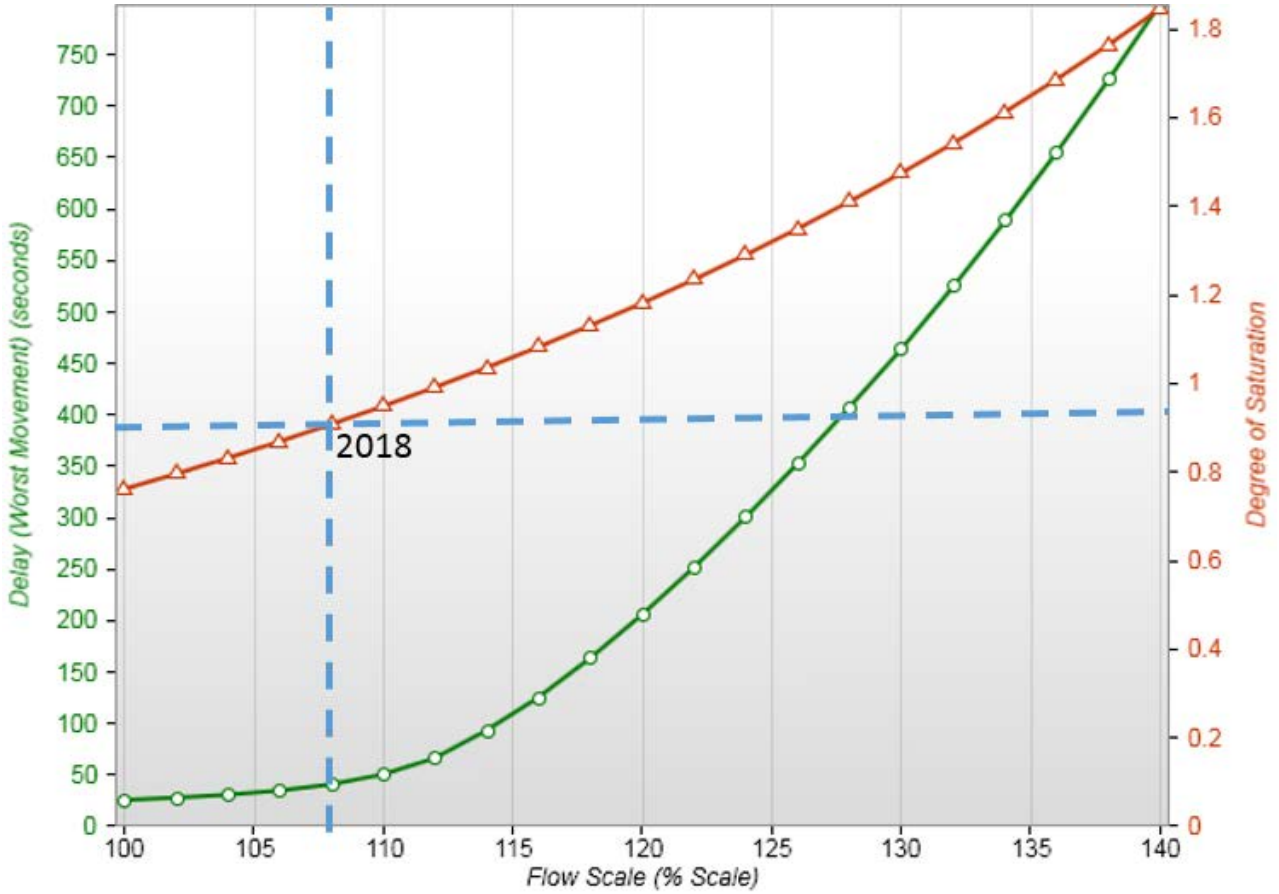


Figure 6-2: Delay and Degree of Saturation - 2018 Moir Street / Insley Street

A.1.1.2 Changed Priority

Flow Scale Analysis for the 2018 Background Plus 50 percent of traffic from other developments option, with priority to Insley Street, shows that all movements operate at acceptable LOS under 2018 peak conditions only. The analysis assumes that Estuary Estates is not built by 2018. Beyond 2018, the eastbound Moir Street operates at unacceptable LOS. Figure 6-3 shows LOS summary of all movements and Figure 6-4 below shows the degree of saturation and the corresponding delays at the intersection for the flow scale with acceptable LOS for all movements.

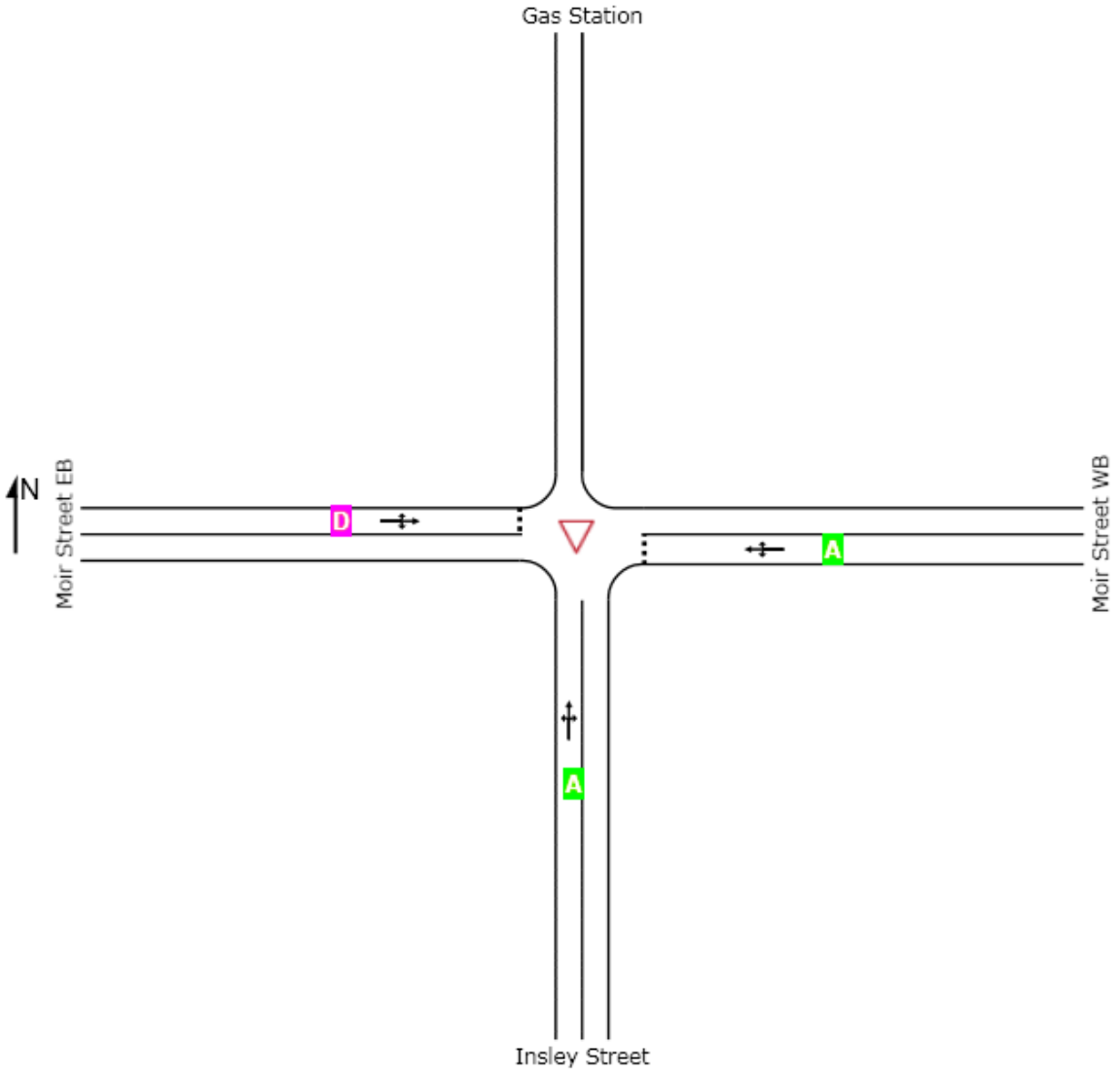


Figure 6-3: LOS Summary - 2018 Moir Street / Insley Street

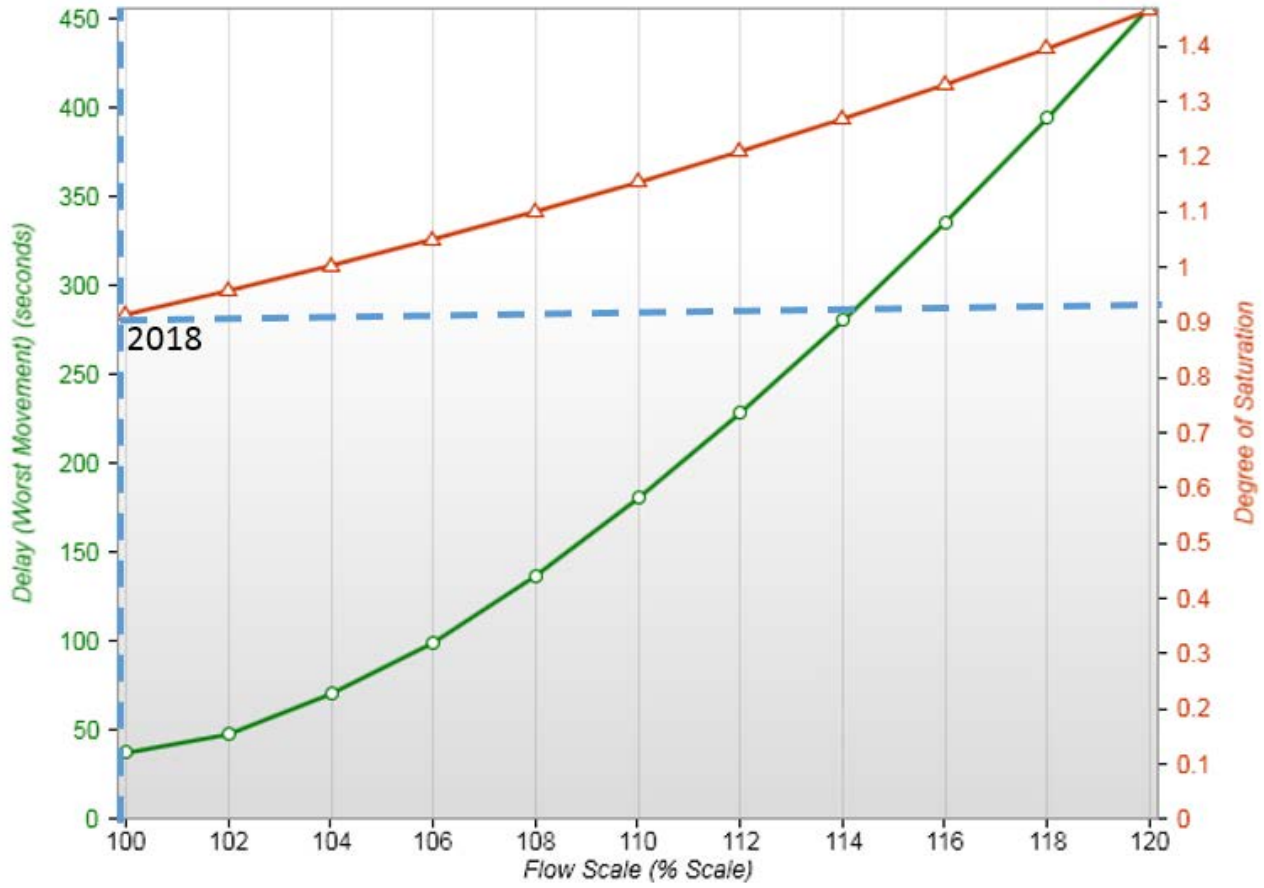


Figure 6-4: 2018 Moir Street / Insley Street Delay and Degree of Saturation

A.1.1.3 Mini Roundabout

Flow Scale Analysis for the 2018 Background plus 50 percent of traffic from other developments option, with a mini-roundabout shows that all movements operate at acceptable LOS beyond 2025 peak conditions. This option excludes traffic from Estuary Estates and other developments from the analysis. Figure 6-5 shows LOS summary of all movements and Figure 6-6 below shows the degree of saturation and the corresponding delays at the intersection.

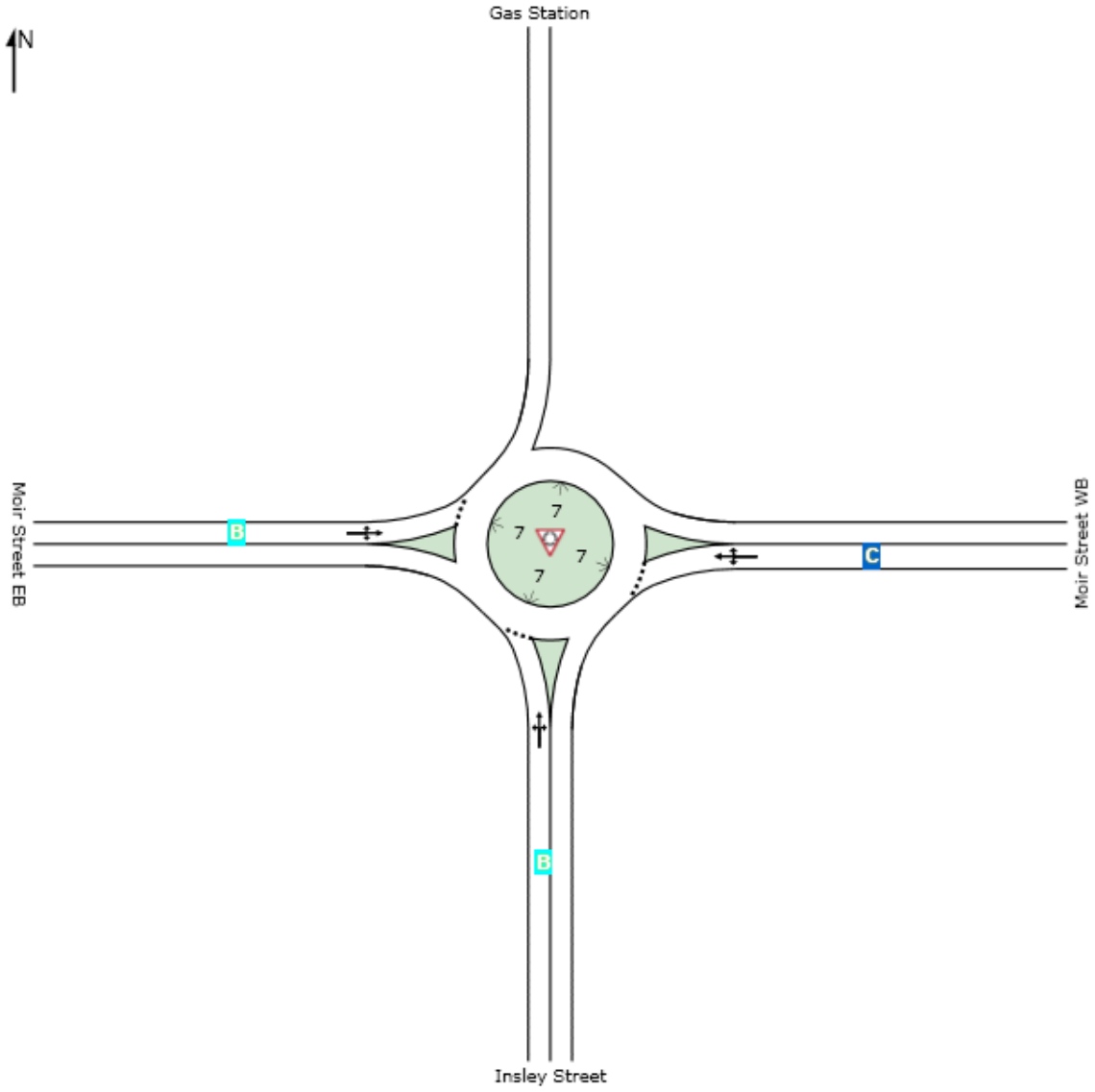


Figure 6-5: LOS Summary - 2025 Moir / Insley Mini-Roundabout (Excluding Estuary Estates)

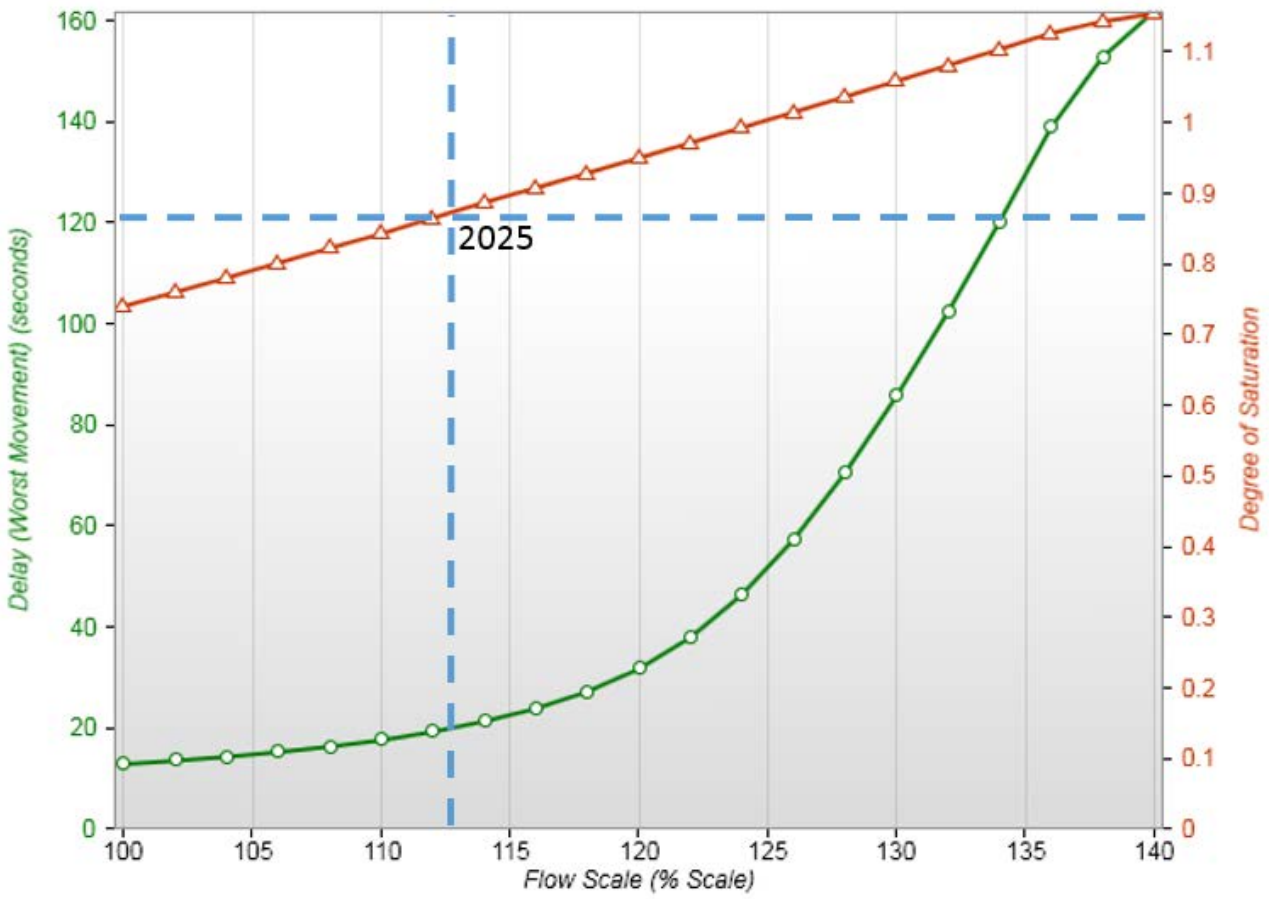
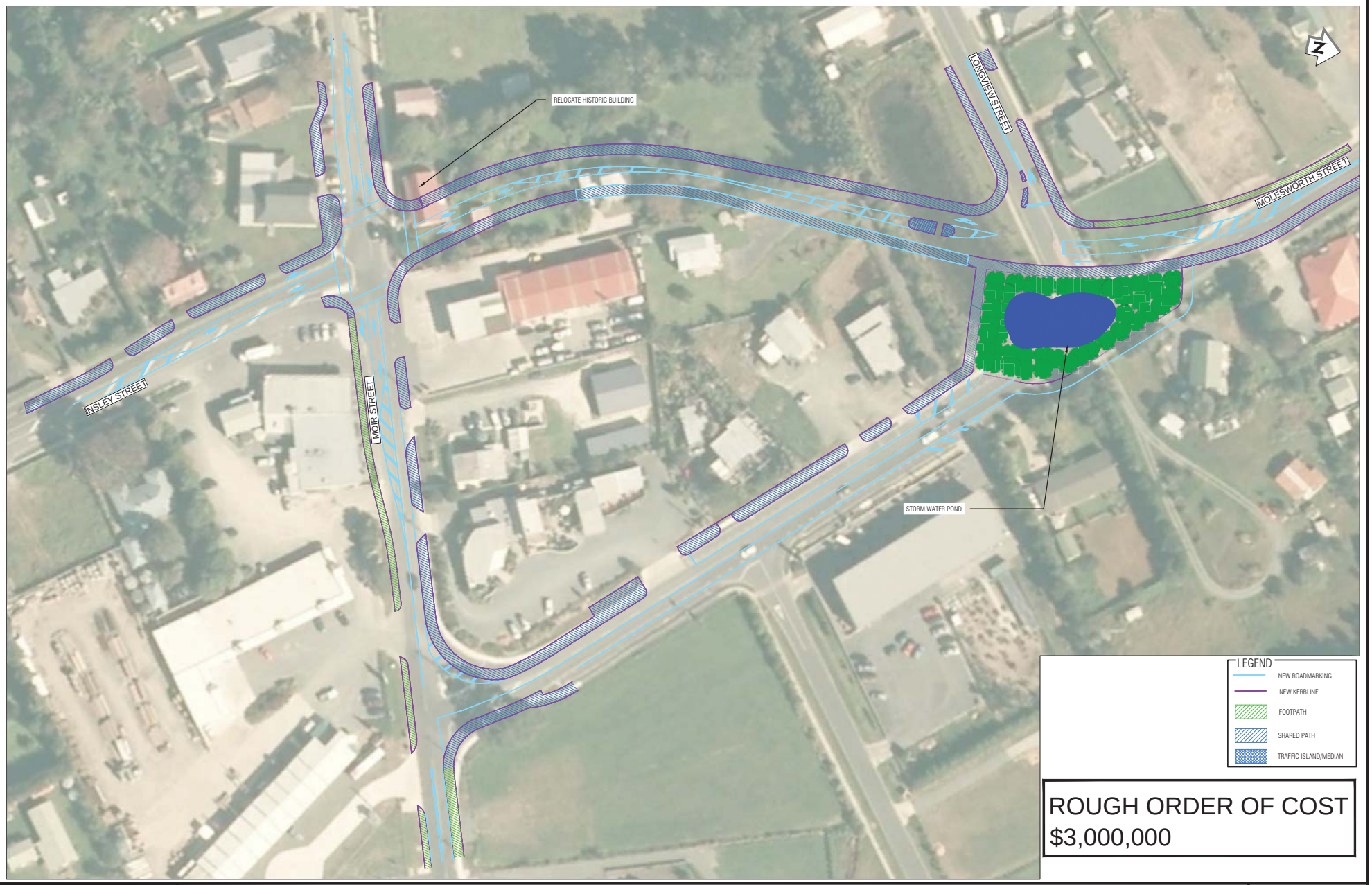


Figure 6-6: Degree of Saturation and Delay - 2025 Moir Street / Insley Street Mini-Roundabout

Appendix B Internal Bypass from 2016 Mangawhai Village and Mangawhai Heads Infrastructure Plan – Transportation



DO NOT SCALE – IF IN DOUBT, ASK

200 mm

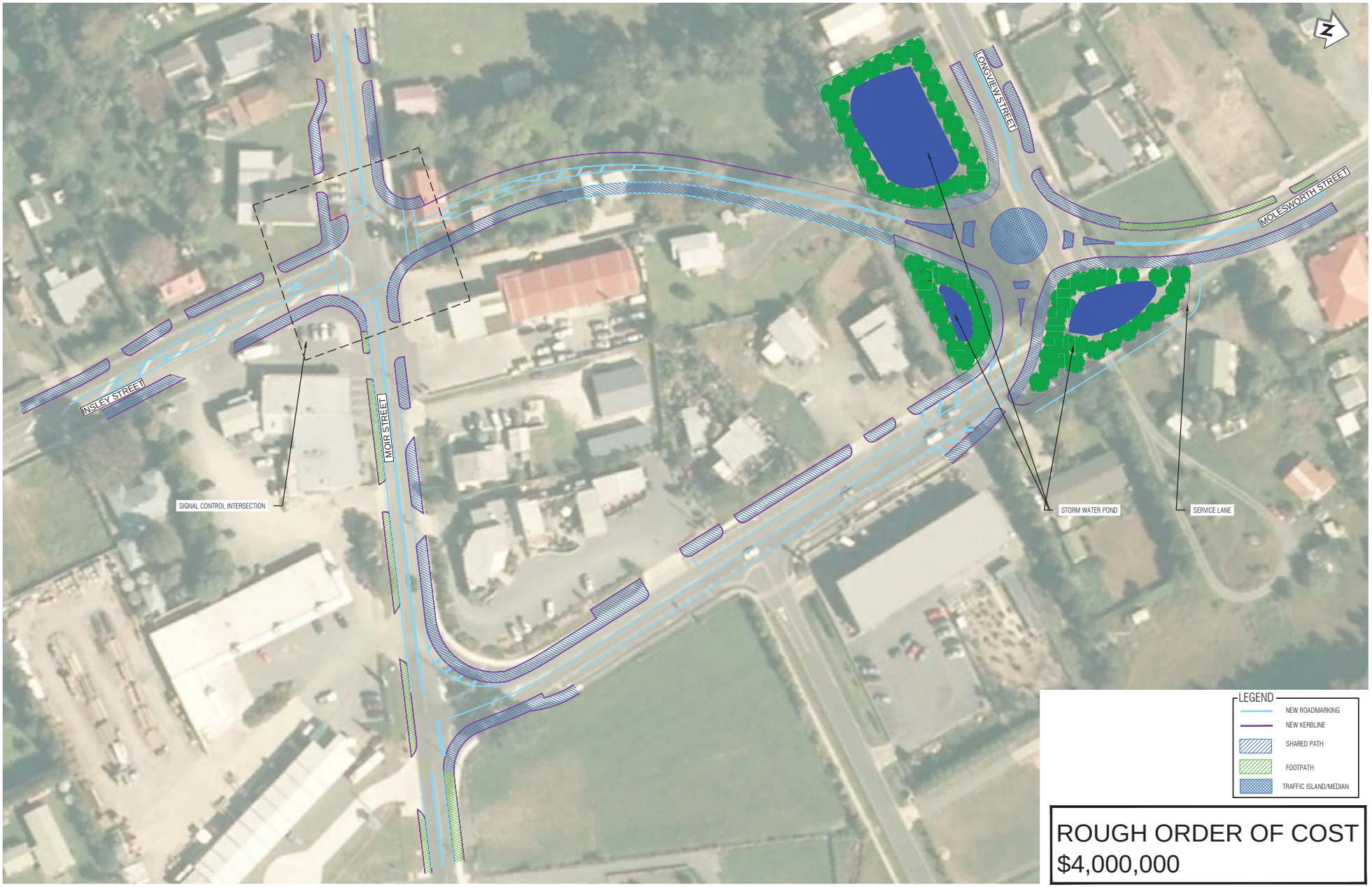
ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

FUTURE NETWORK CAPACITY ENHANCEMENT – PEAK
INSLEY STREET / MOLESWORTH DRIVE REDUCED CONNECTIVITY

KAIPARA DISTRICT



ROUGH ORDER OF COST
$4,000,000

DO NOT SCALE – IF IN DOUBT, ASK

ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

FUTURE NETWORK CAPACITY ENHANCEMENT – PEAK
INSLEY STREET / MOLESWORTH DRIVE MAXIMUM CONNECTIVITY

KAIPARA DISTRICT

Appendix C Shared Use Infrastructure Plans from 2016 Mangawhai Village and Mangawhai Heads Infrastructure Plan – Transportation

ROUGH ORDER OF COST
$200,000

DO NOT SCALE – IF IN DOUBT, ASK
200 mm
ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 1 OF 11

KAIPARA DISTRICT

ROUGH ORDER OF COST
$180,600

DO NOT SCALE – IF IN DOUBT, ASK

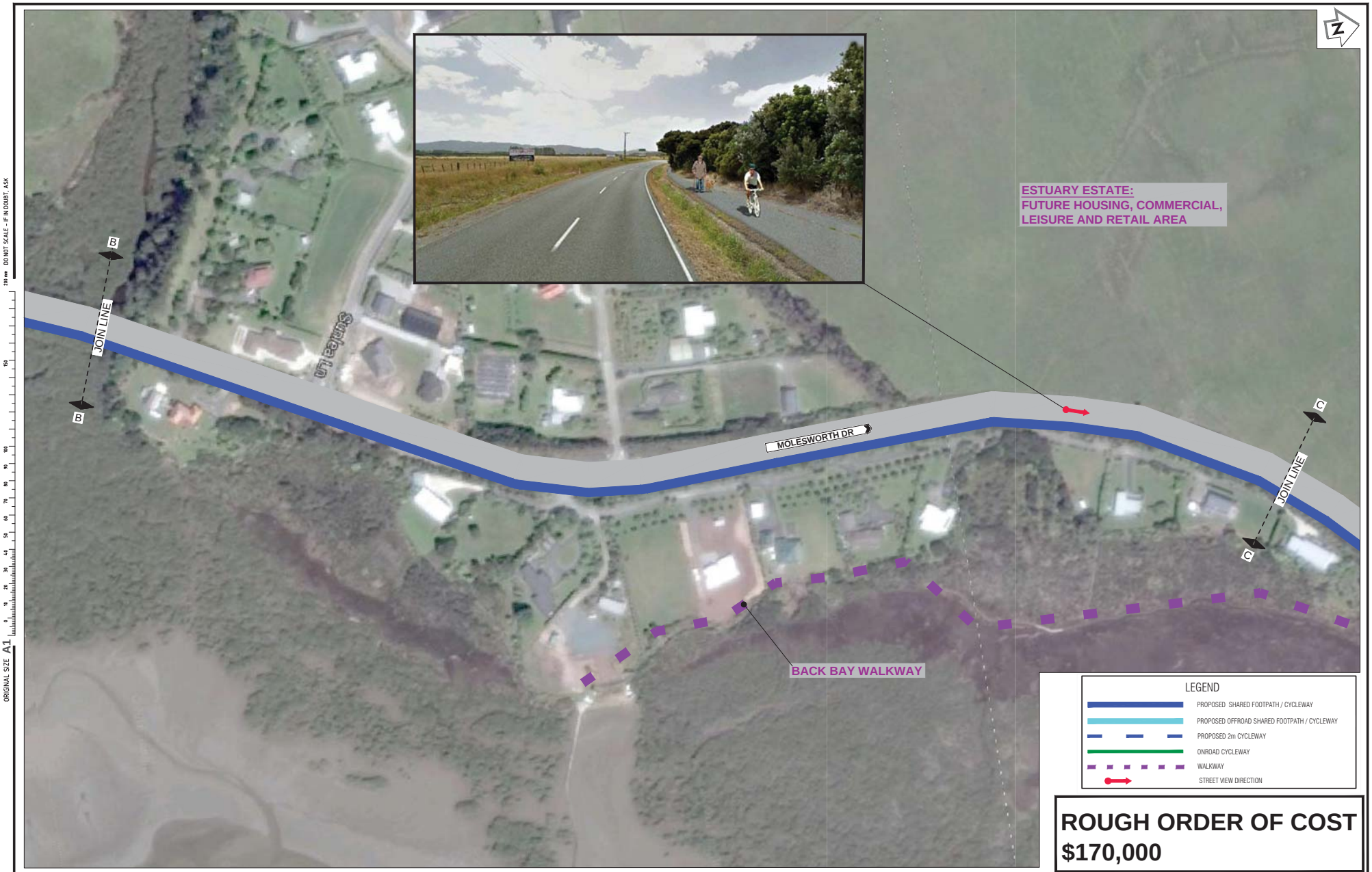
ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 2 OF 11

KAIPARA DISTRICT



ROUGH ORDER OF COST
$170,000

DO NOT SCALE – IF IN DOUBT, ASK
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ORIGINAL SIZE A1

SCALE: NTS	MANGAWHAI – TOWN CENTRE PLAN CONSULTATION PLANS SHARED PATH INFRASTRUCTURE PLAN SHEET 3 OF 11

KAIPARA DISTRICT

ROUGH ORDER OF COST $350,000 (EXCLUDING BRIDGE)

DO NOT SCALE – IF IN DOUBT, ASK

ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 4 OF 11

KAIPARA DISTRICT

CYCLE PARKING

CYCLE PARKING

MUSEUM AND HISTORIC VILLAGE

MANGAWHAI ACTIVITY ZONE AND COMMERCIAL AREA

MOLESWORTH DR

JOIN LINE

JOIN LINE

Sarah C Design

Tiranara Rd

Thelma Rd

Estuary Dr

Seabreeze Rd

Norfolk Dr

Nautical Heights

Mawau Ln

North Class

Auto & Marine

LEGEND

PROPOSED SHARED FOOTPATH / CYCLEWAY

PROPOSED OFFROAD SHARED FOOTPATH / CYCLEWAY

PROPOSED 2m CYCLEWAY

ONROAD CYCLEWAY

WALKWAY

STREET VIEW DIRECTION

ROUGH ORDER OF COST
$185,000

DO NOT SCALE – IF IN DOUBT, ASK

ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 5 OF 11

KAIPARA DISTRICT

ROUGH ORDER OF COST
$170,000

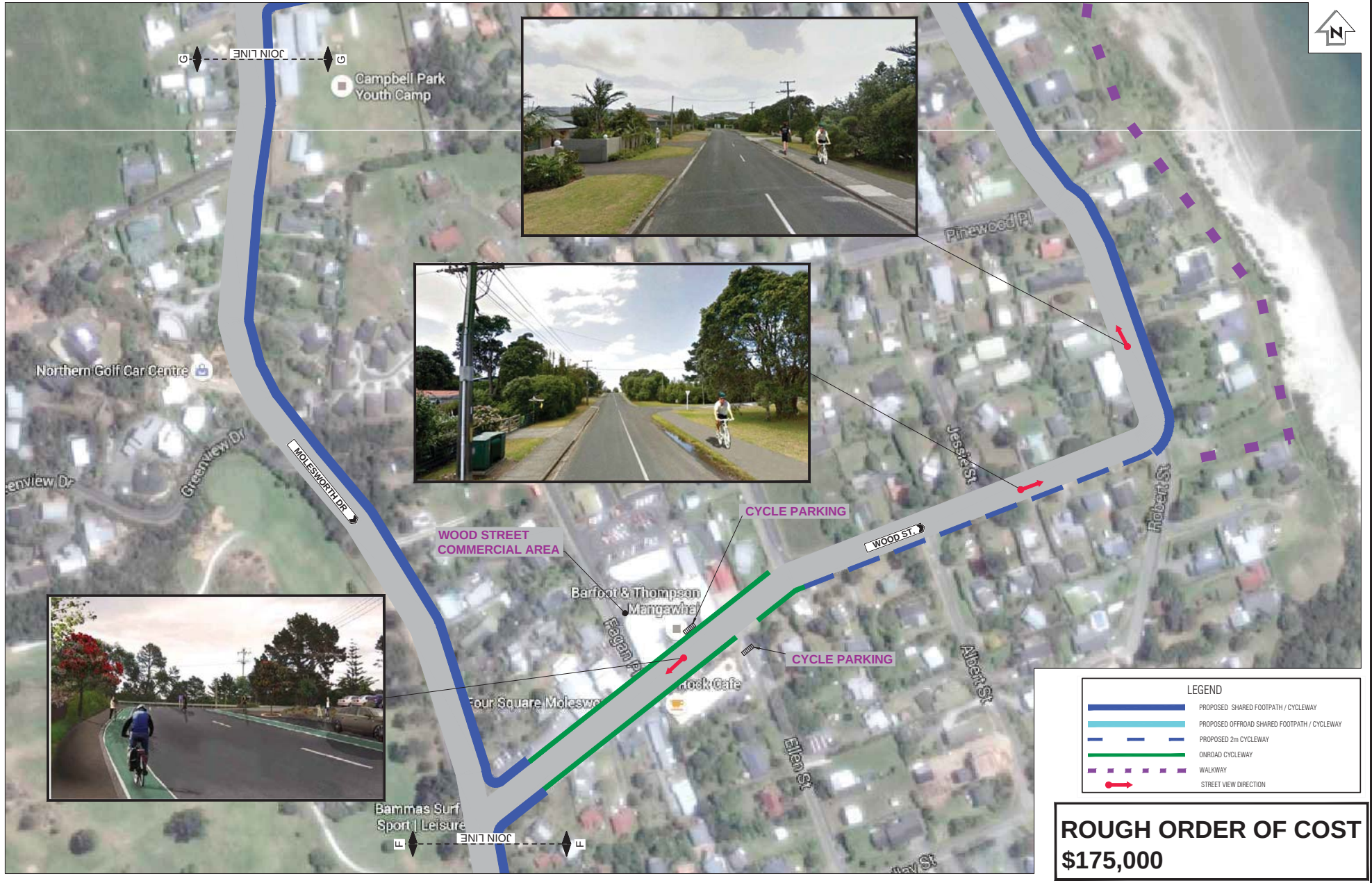
ORIGINAL SIZE A1 DO NOT SCALE – IF IN DOUBT, ASK

SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 6 OF 11

KAIPARA DISTRICT



DO NOT SCALE – IF IN DOUBT, ASK

ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 7 OF 11

KAIPARA DISTRICT

JOIN LINE

JOIN LINE

JOIN LINE

Olsen Ave

MOLESWORTH DR

Saltrock Dr

Coastal Cow Backpackers

NORTH AVE

Campbell Park Youth Camp

Holiday Cres

Reel Magic Fishing Charters

BOAT RAMP AND WILD LIFE RESERVE - BEACH ACCESS AND LEISURE ACTIVITIES

CYCLE PARKING

LEGEND

PROPOSED SHARED FOOTPATH / CYCLEWAY

PROPOSED OFFROAD SHARED FOOTPATH / CYCLEWAY

PROPOSED 2m CYCLEWAY

ONROAD CYCLEWAY

WALKWAY

STREET VIEW DIRECTION

ROUGH ORDER OF COST
$170,000

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI - TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 8 OF 11

KAIPARA DISTRICT

ROUGH ORDER OF COST
$128,000

DO NOT SCALE – IF IN DOUBT, ASK

ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 9 OF 11

KAIPARA DISTRICT

ROUGH ORDER OF COST
$190,000

DO NOT SCALE – IF IN DOUBT, ASK

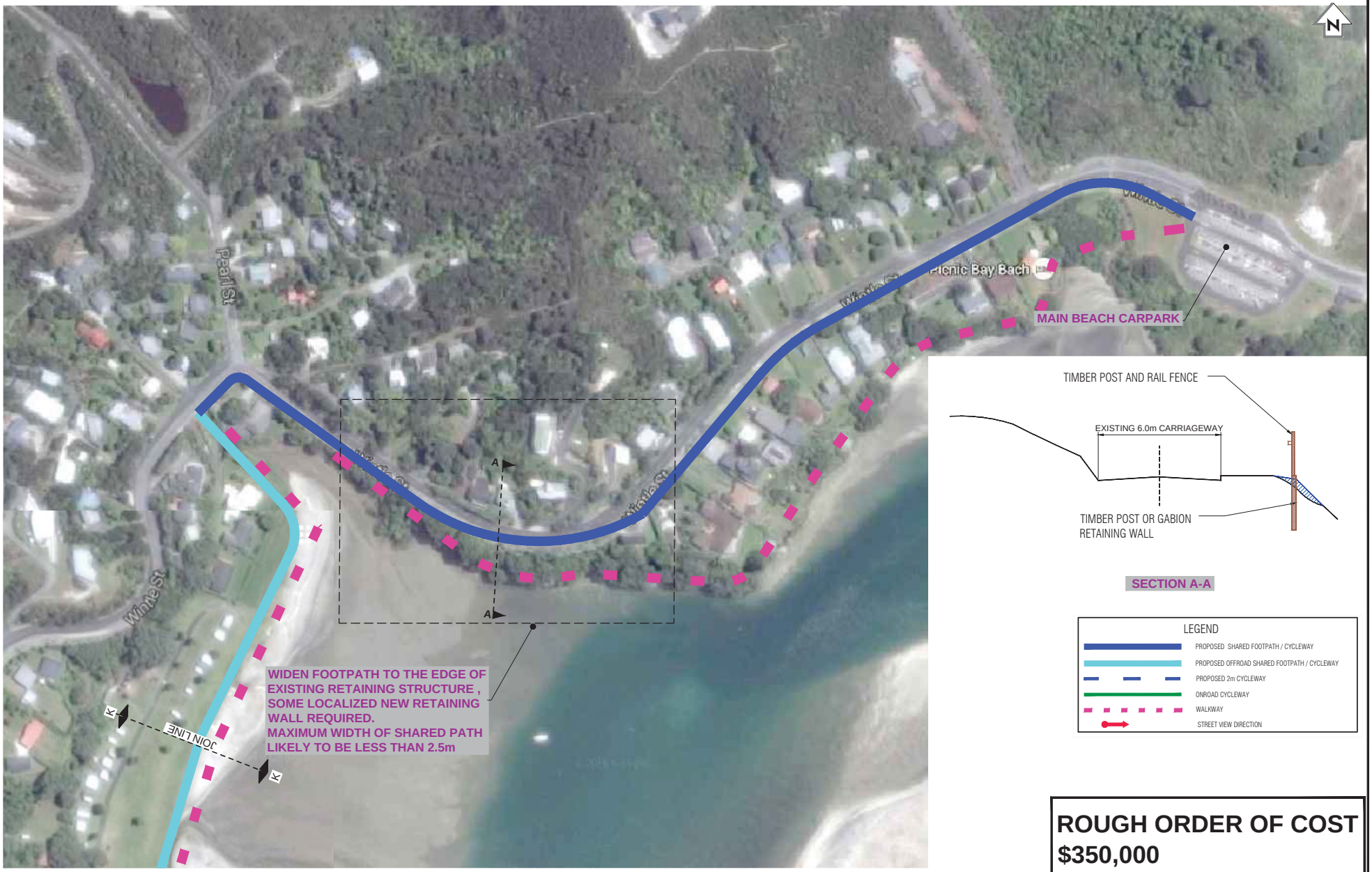
ORIGINAL SIZE A1

SCALE: NTS

MANGAWHAI - TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 10 OF 11

KAIPARA DISTRICT



SECTION A-A

LEGEND

- PROPOSED SHARED FOOTPATH / CYCLEWAY
- PROPOSED OFFROAD SHARED FOOTPATH / CYCLEWAY
- PROPOSED 2m CYCLEWAY
- ONROAD CYCLEWAY
- WALKWAY
- STREET VIEW DIRECTION

ROUGH ORDER OF COST
$350,000

DO NOT SCALE – IF IN DOUBT, ASK
ORIGINAL SIZE A1

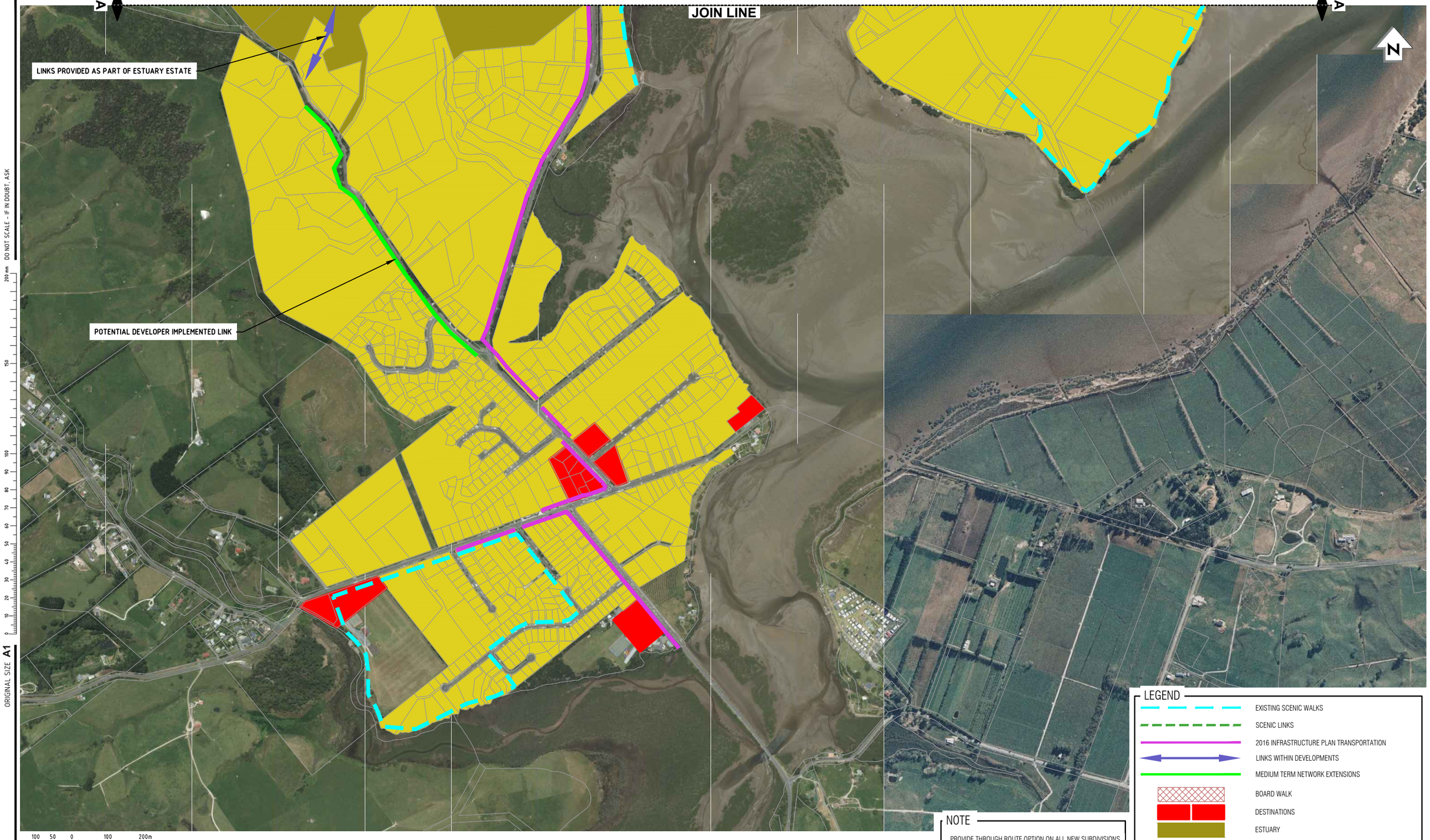
SCALE: NTS

MANGAWHAI – TOWN CENTRE PLAN
CONSULTATION PLANS

SHARED PATH INFRASTRUCTURE PLAN SHEET 11 OF 11

KAIPARA DISTRICT

Appendix D Shared Use Infrastructure Plans – Network Expansion



DO NOT SCALE - IF IN DOUBT, ASK

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ORIGINAL SIZE A1

LEGEND

- EXISTING SCENIC WALKS
- SCENIC LINKS
- 2016 INFRASTRUCTURE PLAN TRANSPORTATION
- LINKS WITHIN DEVELOPMENTS
- MEDIUM TERM NETWORK EXTENSIONS
- BOARD WALK
- DESTINATIONS
- ESTUARY
- RESIDENTIAL ESTATES

NOTE

PROVIDE THROUGH ROUTE OPTION ON ALL NEW SUBDIVISIONS TO ALLOW NEW FOOTPATH / CYCLE CONNECTION OPTION.

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	CHECKED	APPROVED	DATE
A	CONCEPTIAL	GS			03/2017

	Name	Date
SURVEYED	-	-
DESIGNED	James Caufield	03/2017
DESIGN CHECK	-	-
DRAWN	Gavin Smit	03/2017
DRAWING CHECK	-	-
APPROVED	-	-

MWH now part of Stantec

KAIPARA DISTRICT

KAIPARA DISTRICT COUNCIL
MANGAWHAI TOWN PLAN - TRANSPORTATION

CYCLING INFRASTRUCTURE PLAN
SHORT TO MEDIUM TERM (SHEET 1 OF 3)

Status Stamp: **FOR INFORMATION**
Date Stamp: **23/03/2017**
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B

JOIN LINE

B

N

ALTERNATIVE SCENIC LINK

LEGEND

- EXISTING SCENIC WALKS
- SCENIC LINKS
- 2016 INFRASTRUCTURE PLAN TRANSPORTATION
- LINKS WITHIN DEVELOPMENTS
- MEDIUM TERM NETWORK EXTENSIONS
- BOARD WALK
- DESTINATIONS
- ESTUARY
- RESIDENTIAL ESTATES

LINKS PROVIDED AS PART OF ESTUARY ESTATE

A

JOIN LINE

A

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SCALE 1:5000

NOTE

PROVIDE THROUGH ROUTE OPTION ON ALL NEW SUBDIVISIONS TO ALLOW NEW FOOTPATH / CYCLE CONNECTION OPTION.

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

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	Name	Date
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DESIGNED	James Caufield	03/2017
DESIGN CHECK	-	-
DRAWN	Gavin Smit	03/2017
DRAWING CHECK	-	-
APPROVED	-	-

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KAIPARA DISTRICT COUNCIL
MANGAWHAI TOWN PLAN - TRANSPORTATION

CYCLING INFRASTRUCTURE PLAN
SHORT TO MEDIUM TERM (SHEET 2 OF 3)

Status Stamp: **FOR INFORMATION**

Date Stamp: **23/03/2017**

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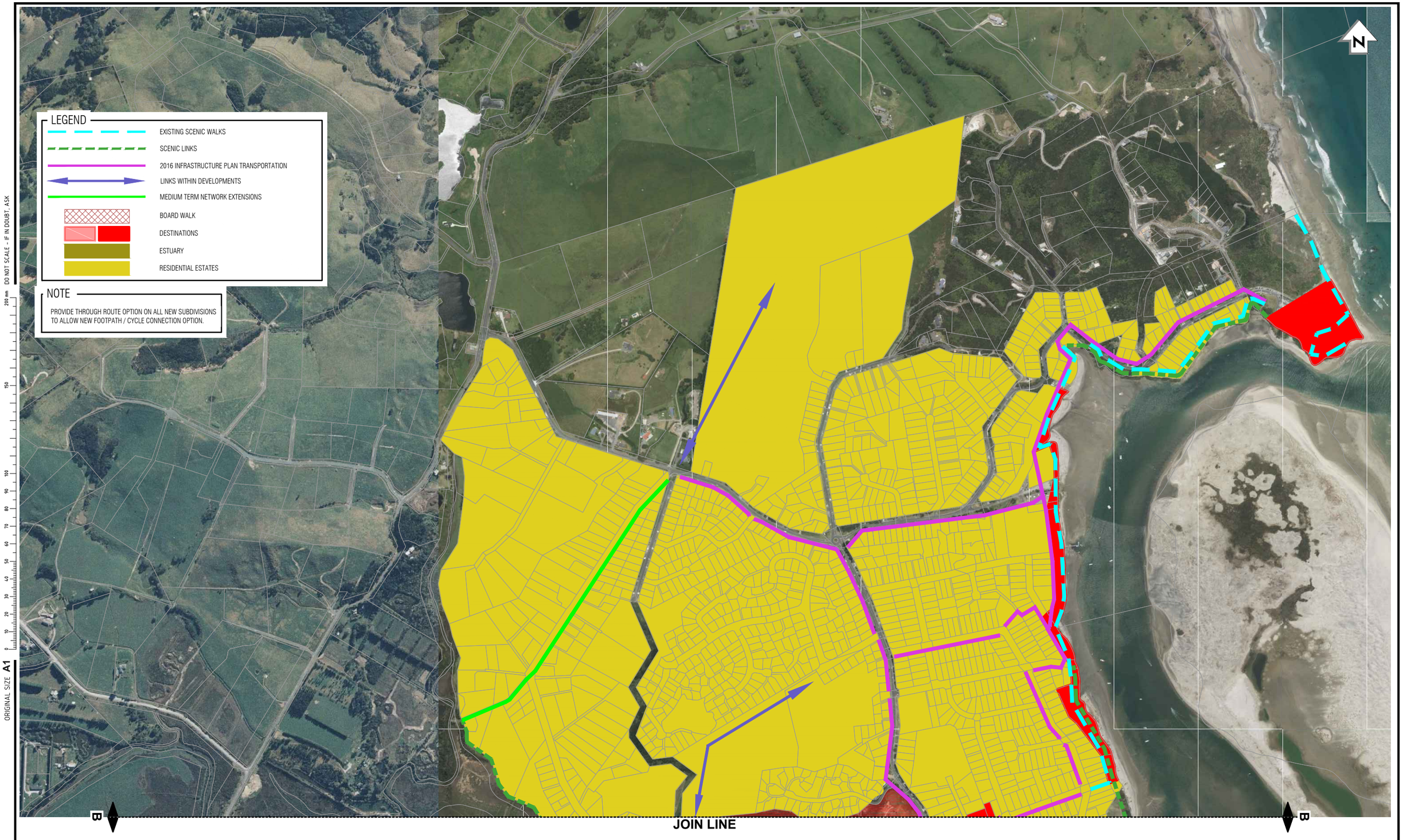

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A	CONCEPTIAL	GS			03/2017

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DESIGNED	James Caufield	03/2017
DESIGN CHECK	-	-
DRAWN	Gavin Smit	03/2017
DRAWING CHECK	-	-
APPROVED	-	-

MWH now part of Stantec

KAIPARA DISTRICT

Kaipara te Oranganui - Two Oceans Two Harbours

KAIPARA DISTRICT COUNCIL
MANGAWHAI TOWN PLAN - TRANSPORTATION

CYCLING INFRASTRUCTURE PLAN
SHORT TO MEDIUM TERM (SHEET 3 OF 3)

Status Stamp: FOR INFORMATION

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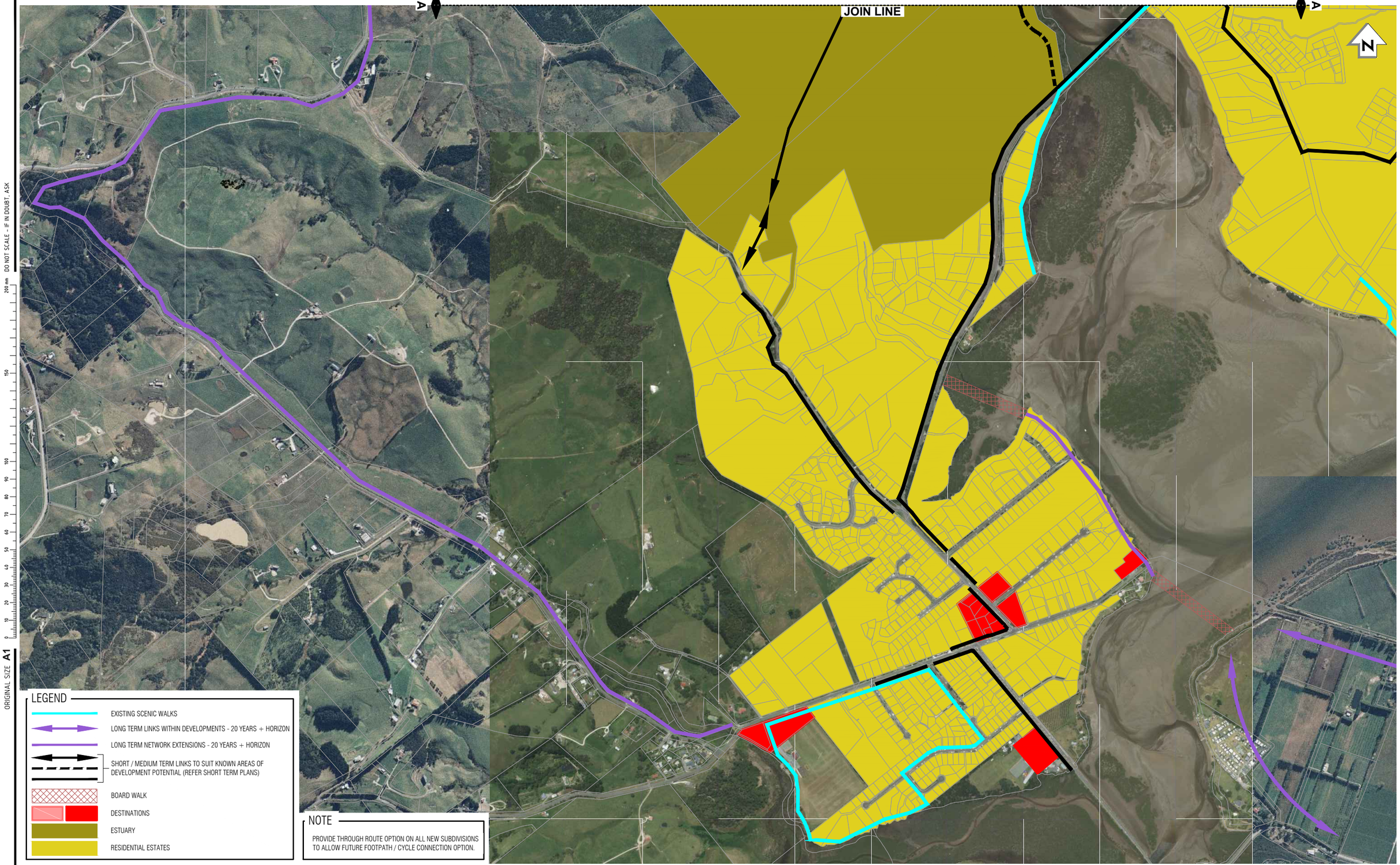

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	CHECKED	APPROVED	DATE
A	CONCEPTIAL	GS			03/2017

	Name	Date
SURVEYED	-	-
DESIGNED	James Caufield	03/2017
DESIGN CHECK	-	-
DRAWN	Gavin Smit	03/2017
DRAWING CHECK	-	-
APPROVED	-	-

MWH now part of Stantec

KAIPARA DISTRICT

KAIPARA DISTRICT COUNCIL
MANGAWHAI TOWN PLAN - TRANSPORTATION

CYCLING INFRASTRUCTURE PLAN
LONG TERM (SHEET 1 OF 2)

Status Stamp: **FOR INFORMATION**

Date Stamp: **23/03/2017**

SCALES (A1) N.T.S

Drawing No.	Sheet No.	Rev.
Z80509594	SK004	A

XREFS : I_Model, Kaipara DC LOGO, orig A1_MWH_logo, X_Legend_SK, X_SK_Model

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LEGEND

- EXISTING SCENIC WALKS
- LONG TERM LINKS WITHIN DEVELOPMENTS - 20 YEARS + HORIZON
- LONG TERM NETWORK EXTENSIONS - 20 YEARS + HORIZON
- SHORT / MEDIUM TERM LINKS TO SUIT KNOWN AREAS OF DEVELOPMENT POTENTIAL (REFER SHORT TERM PLANS)
- BOARD WALK
- DESTINATIONS
- ESTUARY
- RESIDENTIAL ESTATES

NOTE

PROVIDE THROUGH ROUTE OPTION ON ALL NEW SUBDIVISIONS TO ALLOW FUTURE FOOTPATH / CYCLE CONNECTION OPTION.

N

A

JOIN LINE

A

DO NOT SCALE - IF IN DOUBT, ASK

200 mm 150 100 90 80 70 60 50 40 30 20 10 0

ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

REV	REVISIONS	DRAWN	CHECKED	APPROVED	DATE
A	CONCEPTIAL	GS			03/2017

	Name	Date
SURVEYED	-	-
DESIGNED	James Caufield	03/2017
DESIGN CHECK	-	-
DRAWN	Gavin Smit	03/2017
DRAWING CHECK	-	-
APPROVED	-	-

MWH now part of Stantec

KAIPARA DISTRICT

KAIPARA DISTRICT COUNCIL
MANGAWHAI TOWN PLAN - TRANSPORTATION

CYCLING INFRASTRUCTURE PLAN
LONG TERM (SHEET 2 OF 2)

Status Stamp: FOR INFORMATION
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SCALES (A1) N.T.S
Drawing No.: Z80509594
Sheet No.: SK 005
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