BEFORE AN INDEPENDENT HEARINGS PANEL OF WHANGAREI COUNCIL

IN THE MATTER	of the Resource Management Act 1991 (the **Act**)
	AND
IN THE MATTER	of resource consent application **(SL2300006)** for a commercial and rural services development at **7 Millbrook Road, Waipu**

EVIDENCE OF TODD JAMES LANGWELL ON BEHALF OF VACO INVESTMENTS (WAIPU PROJECT) LIMITED IN SUPPORT OF ITS APPLICATION FOR RESOURCE CONSENT

TRANSPORT

25 September 2024

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1. INTRODUCTION

1.1 My full name is Todd James Langwell. I am a Director and Principal Traffic Engineer at Traffic Planning Consultants Limited ("**TPC**").

1.2 I am authorised by Vaco Investments (Waipu Project) Limited to give this statement of evidence on its behalf.

2. QUALIFICATIONS AND EXPERIENCE

2.1 I hold a Certificate of Transport Planning, Management & Control ("TPM&C") from the University of New South Wales (1995) and a New Zealand Certificate in Engineering ("NZCE") in 1992.

2.2 I have been with TPC for the past 27 years and a director of the company for the past 16 years. Prior to that, I gained seven years of experience as a Traffic Engineer for Auckland City Council. During my time with TPC, I have been engaged by local authorities and the private sector for advice on many matters covering traffic engineering, road safety, design and network management.

2.3 I have extensive experience in assessing traffic and transport effects of land use activities. Throughout my career, I have assessed or overseen the assessment of the traffic effects of more than 2,000 development proposals across New Zealand. Some of these developments are similar in scale and in a similar location.

3. CODE OF CONDUCT

3.1 I have read the Code of Conduct for Expert Witnesses outlined in the Environment Court's Practice Note (2023) (**Code**) and have complied with it in preparing this evidence. I also agree to follow the Code when presenting evidence to the Independent Hearing Commissioners. I confirm that the issues addressed in this brief of evidence are within my area of expertise, except where I state that I rely upon the evidence of other expert witnesses. I also confirm that I have not omitted to consider material facts known to me that might alter or detract from my opinions.

4. SCOPE OF EVIDENCE

4.1 TPC was engaged by the Applicant in October 2021 to provide independent traffic planning and design services to assist with the proposal. Working with other specialists and the Applicant, we assessed the proposed site layout, and we considered the transport effects on the surrounding road network.

4.2 My colleague John Burgess prepared an Integrated Transport Assessment dated 2 March 2023 which was lodged with an application for resource consent.

4.3 I oversaw the preparation of two further information responses dated 4 October 2023 and 20 March 2024, following requests from Council.

4.4 I also oversaw the preparation of an updated Integrated Transport Assessment ("**ITA**") dated 9 August 2024.

4.5 I have visited the site and its immediate surrounds twice since October 2023 and am familiar with the surrounding road network.

4.6 The purpose of my evidence is to provide an overview of the traffic environment relevant to the proposal and its potential traffic effects.

4.7 My evidence will cover the following matters:

(a) A summary of the key traffic characteristics of the proposal and assessment of its design (Section 6);
(b) Comment on the s42A hearing report relevant to my area of expertise (Section 7);
(c) Comment on issues raised by submitters relevant to my area of expertise (Section 8); and
(d) Conclusions.

5. TRANSPORT ENVIRONMENT

Existing Transport Environment

5.1 The context of the surrounding transport environment is described in detail in the ITA. By way of summary the following aspects are highlighted.

5.2 The site is located on the western side of SH1, immediately to the south of the intersection with Millbrook Road. The intersection of SH1 with The Braigh is located some 40 metres to the north of Millbrook Road.

5.3 This section of SH1 operates as a two-lane road with narrow sealed shoulders along both sides. The road widens at the intersections with Millbrook Road and The Braigh to form side-by-side opposing right turn pockets for traffic turning right into each side road. A southbound passing lane begins on SH1 near the southern boundary of the site.

5.4 There are no dedicated cycling or walking facilities provided on SH1 or the road immediately surrounding the site including Millbrook Road and The Braigh.

5.5 The section of SH1 past the site is straight and level, with good sight lines for a considerable distance in both directions. The only existing vehicle access adjacent to the site on SH 1 is on the eastern side of the road, serving three rural properties: 3781, 3783 and 3785 SH1.

5.6 The intersections of Millbrook Road with SH1 and The Braigh with SH1 are controlled by a Stop sign and markings.

5.7 With regards to road safety, there have been 20 traffic crashes reported on SH1 from 1km north of the SH1/The Braigh intersection to 1.4km south of the Millbrook Road intersection between 2019 and 2024 (some 2024 crashes may be subject to reporting delay). None of the reported crashes concern pedestrians or cyclists, and none occurred at the SH1 intersection with The Braigh. A single crash involving minor injury occurred at the SH1 intersection with Millbrook Road involving a

tourist driver from Germany. Therefore, I consider that there is no pattern in the reported crashes that is relevant to the proposed development.

5.8 The traffic flows used for the transport assessment for the proposal have been estimated from traffic data from 2019 that has been provided by the New Zealand Transport Agency ("**NZTA**") and turning count surveys undertaken by TPC at the Millbrook Road and The Braigh intersections.

5.9 Since 2019, SH1 flows past the site have been influenced by various factors including Covid 19 restrictions and road closures for repair works relating to cyclone damage. 2019 data is considered the most appropriate for the assessment of this proposal.

5.10 Based on the 2019 NZTA data the average peak hour volume on SH1 south of Millbrook Road was recorded as 805 vehicles per hour ("**vph**"). The holiday shoulder peak (95th percentile) peak hour volume typically occurred on a Sunday from 2:00pm to 3:00pm and was estimated as 1,165 vph.

Future Transport Environment

5.11 With regards to the future transport environment, I understand that NZTA has proposed various measures to address safety concerns on SH1 through the Whangarei to Wellsford Safety Improvements project.

5.12 The proposal included introduction of a flexible wire median along the centre of the road to physically separate opposing traffic flows. Within the immediate vicinity of the subject site, NZTA initially proposed to close the existing intersection with The Braigh, provide for right turn entry movements into Millbrook Road, retain left turn movements to and from Millbrook Road, and eliminate right turn exit movements out of Millbrook Road. To replace the route to and from Waipu that is currently provided by The Braigh, a new roundabout was proposed at the intersection with Shoemaker Road, some 1km to the north of Millbrook Road.

5.13 However, I understand that following consultation with the wider public, these proposals will no longer be pursued and that alternative improvements were proposed, to retain all movements the at SH1/Millbrook Road/The Braigh intersection with minimal change to the existing layout. Consequently, for the purposes of my assessment, it has been assumed that the current layout of the SH1/Millbrook Road/The Braigh intersection will remain much as it is at present, with all turning movements into and out of the side roads retained.

5.14 The government has also identified a priority Roads of National Significance project to provide SH1 with an alternative to the Brynderwyn Hill, but I understand that at present no details are available.

5.15 For the transport assessment set out in the ITA and the s92 responses, all associated SIDRA traffic modelling has been based on a design year of 2032. To account for the future year, a traffic growth of 3% per annum has been applied to the 2019 daily average peak hour flows as well as a holiday peak period. I consider modelling based on a holiday peak period to be a conservative position given that this represents what is experienced for a limited number of days and hours each year and is generally not seen to be sufficient justification for increasing road capacity.

5.16 The details of the SIDRA modelling for each intersection have been set out in the updated ITA report. The results indicate that the Millbrook Road and The Braigh intersections with SH1 cannot accommodate 2032 holiday peak traffic even without the proposed service centre in place. The modelling indicates delays on the side road right turns of 139s and 158s and LOS F.

5.17 It is worth noting that the modelled delays for right turning traffic onto SH1 from Millbrook Road and The Braigh affects a small number of vehicles: 10 vehicles and 15 vehicles respectively in the peak hour.

5.18 In addition, the SIDRA modelling of the two intersections has been very conservative. It overstates the congestion that can be

expected. In congested peak periods, there will be some "let in" behaviour and right turns being made in two stages. Thus, the actual delay for traffic turning out onto SH1 from Millbrook Road and The Braigh in the holiday peak is likely to be significantly less than what the SIDRA modelling suggests. It is perhaps for the above reasons that NZTA have not themselves proposed any means to assist traffic turning out onto SH1 from Millbrook Road or The Braigh in the Whangarei to Wellsford Safety Improvements project.

6. KEY TRANSPORT CHARACTERISTICS OF THE PROPOSAL & ASSESSMENT

6.1 A full description of the proposal is described in Mr Hamish Firth's evidence and within the updated ITA. In terms of the aspects of the proposal relevant to my evidence, key features comprise as follows.

Proposal Description

6.2 The proposal is to provide for a range of activities that are compatible with the travelling public and the wider rural Waipu community, including a service station and truck stop, marine/vehicle sales, drive-through fast food outlets and cafes, farming and agricultural supplies, and light industrial activities such as vehicle and marine servicing, and warehousing and storage.

6.3 The proposed layout of the site is detailed in the plans accompanying the resource consent application. All vehicle access to the Service Centre is through a new roundabout on SH1. This provides easy access and egress for larger trucks using the truck stop. An internal roundabout is located sufficiently clear of the main SH1 roundabout to ensure that vehicles do not queue back from this roundabout onto SH1. The site is then divided into smaller areas containing the different activities, all fed from a central driveway through the site. On-site car parking is proposed to serve each of the activities, together with servicing/loading areas as required.

6.4 A few access options were considered during the development of the site layout and were discussed with NZTA. The proposal to establish a new roundabout on SH1 was specifically designed to provide access to the proposed Service Centre well clear of the existing Millbrook Road intersection. Agreement was reached with NZTA that a roundabout and its location was the best option to provide access to the proposed Service Centre.

6.5 The proposed roundabout Is located some 300 metres to the south of Millbrook Road and has excellent visibility from both the north and the south. The design is based on providing a roundabout that is as large as possible within the constraints of the existing road reserve (to the east) and the applicant's site (to the west), resulting in an island that is about 45 metres in diameter. The latest roundabout design, prepared by Traffic Planning Consultants Limited, is shown in the Attachments to my evidence, is in concept form only and will be subject to more detailed design.

6.6 To assist both the hearing and other experts, I have also provided a concept design report that details the geometric design aspects of the proposed roundabout and its compliance with the necessary standards.

6.7 The proposal involves the provision of 303 car parking spaces spread around the site to serve the various activities. Whilst there are no minimum or maximum car parking requirements in the District Plan, it is considered that this provision will be sufficient to properly serve the various activities on the site. Based on the total GFA of all of the activities within the Service Centre, this would be equivalent to an overall parking provision of 1 space/29m^2 GFA, which is fairly typical of larger comprehensive developments where car parking is shared amongst a number of different activities.

6.8 Within the site, each activity is provided with its own delivery area. The loading areas for the fast food and small service tenancies are designed predominantly for large rigid trucks, whilst the larger buildings in the northern part of the site have loading areas that are designed to accommodate larger semi-trailers and B-trains.

Trip Generation Characteristics

6.9 The proposal involves establishing a Service Centre that is clearly focused on providing services to the travelling public on SH1. The vast majority of vehicles that will visit the facilities will be private vehicles, and commercial vehicles including large, heavy trucks.

6.10 As for most service centres on motorways and main arterial routes, specific access for cyclists and pedestrians is not anticipated, and the location of this particular site in relation to surrounding development and activities in Waipu suggests that very few cyclists and pedestrians will visit the site.

6.11 The predicted vehicle trip generation levels for the proposed service centre have been set out in the original ITA and the s92 responses. The most up to date predictions are set out in the updated ITA dated 9 August 2024. The peak hour trip generation is expected to be around 796 vehicle movements either entering or exiting the site via the proposed roundabout. The predicted turning volumes at the proposed roundabout are illustrated in the updated ITA.

6.12 This prediction considers linked internal trips, where visitors to the site might visit more than one use. For example, refuelling the vehicle, visiting a café, or picking up a takeaway order from the fast-food drive-through are all activities that could be combined in a single visit.

6.13 The prediction also allows for a proportion of customers to be drawn from traffic that is already passing the site along SH1 and will not be new trips on the road network. Pass-by rates for service stations and fast-food restaurants tend to vary between 35% and 65% of total customers. This location is quite remote from the nearest urban development, other than the Waipu township, and consequently it is not anticipated that the service station and fast-food restaurants will be particularly attractive as a primary destination.

Assessment of Trip Generation Effects

6.14 The predicted peak hour trip generation set out above has been modelling using the SIDRA 9 software and the results set out in the updated ITA dated 9 August 2024. It includes performance of the proposed roundabout as well as intersections of Millbrook Road and The Braigh where they intersect with SH.1

6.15 The modelling results indicate that the roundabout will be able to satisfactorily accommodate the forecast traffic generated by the service centre in the 2032 holiday peak hour with the service centre in place, with the worst movement being the right turn out from the site onto SH1 having an average delay of 19s and LOS B.

6.16 The assessed performance of the roundabout in 2032 with development traffic included indicates average delays to through traffic on SH1 of 8.4 to 9 seconds in the average peak hour and 9.5-11.8 seconds in the holiday peak hour

6.17 With service centre traffic included, the Millbrook Road and The Braigh intersections cannot accommodate 2032 holiday peak traffic with delays on the side road right turns of 869s and 932s and LOS F. This result is not surprising given that the existing intersections are predicted to have a LOS F and high delays for right turn movements even without the proposed service centre. The delays (14-16 minutes) are because of near constant flows on SH1 in both directions and insufficient gaps in traffic for vehicles to cross two lanes of traffic.

6.18 Notwithstanding the high levels of modelled delay for the right turning traffic, I consider that it is very unlikely that right turning vehicles using the Millbrook Road and The Braigh intersections will experience delays of this magnitude. The SIDRA modelling of the Millbrook Road and The Braigh intersections has been very conservative and typically overstates the congestion that can be experienced. I note the following points:

a) The peak hour demands for right turning traffic is very small with only 10 vph at the Millbrook Road intersection and 15 vph at The Braigh intersection.

b) I anticipate there will be some "let in" behaviour for left turning vehicles, especially when demands on SH1 are high and speeds reduced through congestion.

c) Right turns can be completed in two stages where motorists turning onto SH1 will give way to one direction of SH traffic at a time, using the turning onto the "double width" right turn bay area on SH1, and then waiting for a gap to merge with SH traffic in the other direction.

d) Right turning vehicles will also have the option of turning left and finding an alternative movement to completing a right turn. In the case of The Braigh, motorists would instead turn left and use the proposed roundabout to complete a U-turn and proceed north. Similarly, to turn right from Millbrook Road, motorists would instead turn left and then right into The Braigh or make a 3-to-4-minute detour via Nova Scotia Road and The Braigh to turn left onto SH1 to head south. Either of these alternatives would add significantly less time to the journey than the 14-16 minutes predicted by the modelling. A series of turns across single lanes and using the roundabout to complete a U-turn would be safer than attempting right turns from the two side roads across two directions of SH1 traffic.

Assessment of Road Safety Effects

6.19 Whilst the roundabout design that has been included in the Attachment to my evidence is a concept layout only, subject to further detailed design, I consider it is an intersection that can provide safe and efficient access and egress for the Service Centre. It is located sufficiently clear of the existing Millbrook Road and The Braigh intersections to avoid any potential conflict between the various turning movements.

6.20 The proposed roundabout has been subject to an independent Safe System road safety audit. This audit was undertaken by Commute Transportation Consultants, and I have attached a copy of the report to my evidence.

6.21 The report raised six matters with the design categorised as either significant or minor safety matters. The enclosed report details these as well as provides a response from Traffic Planning Consultants Limited as the designers.

6.22 In summary, I consider each of the matters raised can be addressed during any detailed design stage and in liaison with NZTA. Furthermore, I note that the draft conditions of consent require further road safety audits and submission of the designs to NZTA as the designs process.

6.23 The roundabout could also have additional safety benefits in relation to the options available to NZTA for any changes/upgrades to the existing Millbrook Road and The Braigh intersections. For example, should NZTA install a flexible central barrier along SH1, right turns out of The Braigh and right turns into Millbrook Road could be eliminated, with the roundabout providing a safe and convenient U-turn option.

6.24 Internal to the site, circulating areas and parking areas are generally separated and give a clear direction to motorists on how to behave. Pedestrian connections are included both within each parking area and across the main driveway to link the different activities. Ongoing detailed design of each area as it develops will refine the site layout as necessary to ensure that a safe and convenient pedestrian environment is created throughout.

6.25 Overall, I conclude that the proposed Service Centre will have less than a minor impact on the existing and future transport environments along this section of SH1 and will have positive benefits in terms of serving the travelling public along this key transport corridor.

Assessment of construction traffic effects

6.26 Although not provided in the submission from NZTA, subsequent discussions with NZTA have revealed that further assessment be provided relating to construction traffic effects. Furthermore, NZTA is seeking a condition to mitigate the effects relating to the construction of the roundabout on the travelling public on SH1.

6.27 I am of the view that until such time as a contractor is engaged and a clear methodology of construction is developed, it is challenging to assess accurately the traffic effects of construction.

6.28 A common practice is to ensure that a suitable condition of consent is presented that the consent holder provides a Construction Traffic Management Plan ("**CTMP**") that consider traffic related effects and sets out appropriate measures to ensure effects on the travelling public are minimised. Any such CTMP can be reviewed and approved by NZTA to ensure their concerns are addressed.

6.29 One such way measure within the CTMP may include a condition, for example, requiring road capacity for through traffic on SH1 be the equivalent to one through-lane of traffic in each direction is maintained during construction and if a lane does need to be closed that it is done during off-peak times when through traffic volumes are lower and delays to through traffic can be minimised.

6.30 I note that a draft condition of consent has been provided in the evidence of Mr Firth in this regard. I consider this condition will be sufficient to ensure that effects of any construction activity are minimised.

7. COMMENTS ON THE S42A HEARING REPORT

7.1 The Council s42A hearing report included a Memorandum from the Council's Development Engineer, Mr Eric Gau dated 25 March 2024 and further notes added by Ms Jo Floyd with regards to the revised proposal on 13 September 2024.

7.2 Mr Gau and Ms Floyd, together with Council's reporting planner, Mr Alistair Hartstone are satisfied with the proposal from a traffic perspective. This is on the proviso that if there is agreement

between the applicant and NZTA that the proposed roundabout is acceptable to address the potential traffic generation and will provide safe and efficient vehicle access, then the conclusion will be that the traffic effects will be minor.

7.3 I have reviewed the recommended conditions of consent in the Council's hearing report and identified no matters that relate to traffic.

7.4 Notwithstanding, the evidence of Mr Hamish Firth's sets out various draft conditions relating the traffic. I can confirm that they will adequately address adverse traffic effects generated by the proposal.

8. COMMENTS ON ISSUES RAISED BY SUBMITTERS

8.1 There are several submissions that are relevant to traffic matters. Rather than deal with each individual submission, I have commented on each key topic relevant to my expertise and where I consider it will assist the hearing.

Location of Roundabout on SH1

8.2 Section 4.3 of the ITA sets out the process that was followed in determining the site access strategy and the location of the roundabout. This involved regular meetings with NZTA to discuss the proposal, including the results of various traffic models for the site access and the existing intersections of SH1 with Millbrook Road and The Braigh. General agreement was reached with NZTA to explore this proposed new roundabout and its location relative to the Millbrook Road/The Braigh intersections to be included in the application.

8.3 Other options were discussed Including how to integrate both the Millbrook Road and The Braigh intersection and minimise effects on existing traffic flows and optimise safety including introducing a roundabout at that junction. However, these options were not preferred by NZTA.

8.4 The roundabout is to be located some 300 metres to the south of Millbrook Road and has excellent visibility from both the north and

the south. This provides sufficient opportunity to warn approaching drivers of the need to slow down. The slowing of the vehicles can be seen as a positive impact in reducing the risk of collisions in this part of SH1.

Increased traffic flows and delays on SH1

8.5 Some submitters have raised concerns regarding increases in traffic flows and congestion in the surrounding road network highlighting impacts on freight movement.

8.6 I have covered the effects of vehicle trip generation on the surrounding road network in Section 6 above. The trip generation assessment for this proposal has been extensive and considered the holiday peaks and future year traffic demands.

8.7 The modelled delays are what is anticipated at one of the busiest times for passing traffic and the site activity. This is a worst-case scenario and likely to only occur a few days of the year. For the balance of the time, flows on SH1 will be much less, as will be the turning movements to and from the site.

8.8 I therefore consider that any traffic flows relating to the proposal can be readily accommodated on the road network without compromising its function or capacity.

Safety concerns at Millbrook Road and The Braigh intersections

8.9 Several submitters have raised concerns regarding the safety of the Millbrook Road and The Braigh intersections with SH1 should the proposal go ahead.

8.10 The matter of safety has been addressed in the updated ITA dated 9 August 2024. Based on its current road safety record, where there has been only one reported crash between 2019 and 2023 inclusive, and the first half of 2024, and that crash involved an overseas driver on holiday from Germany, I do not consider that the intersection has a safety problem.

8.11 There is no pattern in the reported crashes that is relevant to the proposed development. However, I note that the proposed

roundabout would provide a safe location for motorists to undertake U-turns in lieu of some turning movements from The Braigh.

8.12 Furthermore, the safe systems audit attached to my evidence included the Millbrook Road and The Braigh intersections with SH1 and did not identify any safety concerns with these intersections.

8.13 I am also aware that NZTA is considering other safety improvements to address the crash history on SH1, including these two intersections.

Impact of proposed NZTA safety improvements

8.14 Several submitters raised concerns relating to the proposed NZTA safety improvements and how combined with the proposed roundabout will have a cumulative effect on flows on SH1.

8.15 It is my understanding that NZTA are no longer pursuing the safety improvements describe by submitters and are considered alternative options. The Council in their assessment has therefore disregarded any cumulative effects relating to the proposal.

8.16 The proposed NZTA safety improvements are not part of the proposed development. I recommend any concerns relating to their design and implementation should be referred to NZTA.

8.17 Notwithstanding, I believe the proposed roundabout can be integrated into the SH1 network and will contribute to addressing safety concerns in this section of SH1.

Impact on future four-lane proposal for SH1

8.18 Several submitters have raised concerns that the proposed roundabout will impact on a future proposal by NZTA to "four-lane" SH1.

8.19 I am not aware of any firm proposal to increase lanes on the section of SH1 through Waipu.

8.20 The New Zealand Government recently released their Government Policy Statement with regards to Transport and identified the section of SH1 between Whangarei and Port Marsden as a priority for upgrading. I understand this is expected to largely involve the four-laning of SH1.

8.21 A second priority in the northland area was developing an alternative route to the Brynderwyn Hill. No details of this area provided, but if an alternative route is developed, I anticipate that further assessments and consenting will be necessary.

8.22 Notwithstanding, any significant upgrade to SH1 is likely to be subject to various consents and potential land purchase. As such, I do not consider it would be appropriate to consider any upgrade project as part of the receiving environment.

Removal of passing lane on SH1

8.23 Some submitters have raised concerns with the removal of the passing lane, suggesting that it is important to ensure vehicles have an opportunity to overtake slower vehicles.

8.24 The proposed roundabout is anticipated to reduce the length of the existing passing lane by about 300 metres. The impact of this reduction has been addressed in the concept design report I have attached to my evidence.

8.25 The existing southbound passing lane is some 1km long excluding tapers which corresponds to the desirable length of a passing lane specified in the NZTA Traffic Control Devices Manual for the existing southbound operating speed entering the passing lane of 100km/h. With the roundabout in place, the southbound speed through the roundabout will be limited to 30km/h and one kilometre further on (past the end of the passing lane) the speed will be some 75km/h. The desirable length of a passing lane in an 80km/h speed environment specified in the NZTA Traffic Control Devices Manual is 650 metres, some 350 metres shorter, which is less than what is proposed. The shortened passing lane will therefore continue to be the desirable

length for the reduced speed environment, and thus is expected to maintain its current level of service.

8.26 I also note that there are passing lanes provided on SH1 about 4.0 km to the north and 5.0 km to the south of this passing lane. This provides other opportunities to pass vehicles only a short travel time away.

No Allowance for pedestrian and cycling access to the site

8.27 Some submitters raised concerns that the proposal needs to provide for walking and cycling facilities from Waipu Town centre to the site as there is anticipated to be an increased demand. This matter was also addressed in the in the s92 response dated 4 October 2023.

8.28 With the proposed service centre being a distance of 1.4 kms from the edge of the Waipu town centre, it would be well beyond a convenient walking distance. The Ministry for the Environment publication People + Places + Spaces – A Design Guide for Urban New Zealand notes that "a five-minute walk (400 metres walk) to convenience shops, bus stops and other daily facilities is considered reasonable.

8.29 Also, there is no obvious reason for pedestrians or cyclists who are already at the Waipu town centre, to leave its cafes and retail shops and walk or cycle to the proposed service centre.

8.30 At present cyclists must share the carriageway with other road users through the Waipu Town Centre and along The Braigh and there are no dedicated or off-road cycle facilities on any roads leading to the existing Waipu town centre. I do not anticipate that this would be any different with the proposed service centre in operation.

8.31 Notwithstanding, I note the matter of cyclists accessing the site has been raised in the road safety audit I have enclosed in my evidence. My company has undertaken some initial design tests to see if off-road cycle paths can be provided between The Braigh and the site access on SH1. I can confirm that there is sufficient

width to provide a shared path and crossing point on SH1. I consider that any such facility will be subject to further design reviews and road safety audits that would be required as set out in the draft conditions of consent.

Use of out-of-date traffic flows and crash statistics

8.32 Some submitters raised concerns that the turning counts surveys and crash statistics used within the ITA are out of date. This too has been addressed in the s92 responses and updated ITA report with updated traffic flows and traffic modelling to take account of peak holiday flows and future traffic demands on SH1.

8.33 I consider this to be a very conservative position for assessment and expect that peak flow to and from the site will be much lower for the majority of the site and only experiencing peak demands when holiday traffic is high and passing volumes are high.

8.34 While there are variations in the turning movements and the detail of the SIDRA outputs, the fundamental finding remains the same as per the original ITA.

Impact on Millbrook Road

8.35 One submitter was concerned with the increase in traffic flow on Millbrook Road because of the proposal.

8.36 I can confirm that no additional traffic demands related to the proposed service centre will be using Millbrook Road to travel to and from the site unless they originate from Millbrook Road.

Impact on property access

8.37 One submitter was concerned about the impact of the proposal on access to their property on SH1. The proposed concept roundabout as shown in the Attachments would provide an updated solid median island that will now allow vehicles using the shared driveway for 3781, 3783 and 3785 SH1 to turn right into this driveway from SH1. Motorists turning right out from this driveway onto SH1 can also complete this manoeuvre or choose to turn left and then make a U-turn around the roundabout. In

both cases the driveway access movements would be safer than the existing right turns, with negligible inconvenience. Left turns at this driveway would not be affected.

8.38 The proposed concept roundabout would retain all movements at the shared driveway for 3817, 3819 and 3821 SH1, and provide a flush median which would make right turns in and out of these properties easier and safer.

9. CONCLUSIONS

9.1 Based on the analyses described in the ITA report, and the further information responses provided, the following conclusions can be made in respect of the proposal.

9.2 I consider that vehicle access to the site is designed to a suitable standard, such that the proposal will not have any significant adverse effect on the surrounding road network, or to the safety of vehicles using SH1 and the site.

9.3 The estimated traffic generated by the proposal can be accommodated on the existing road network both under today's conditions and in future holiday peak periods.

9.4 I have reviewed the conclusions regarding traffic effects in the Hearing Report and the concerns raised in submissions. There is no new information that has changed my conclusions on this matter.

9.5 I consider that the recommended draft set of conditions set out in the evidence of Mr Hamish Firth will address and manage any adverse traffic effects that may occur because of the proposal.

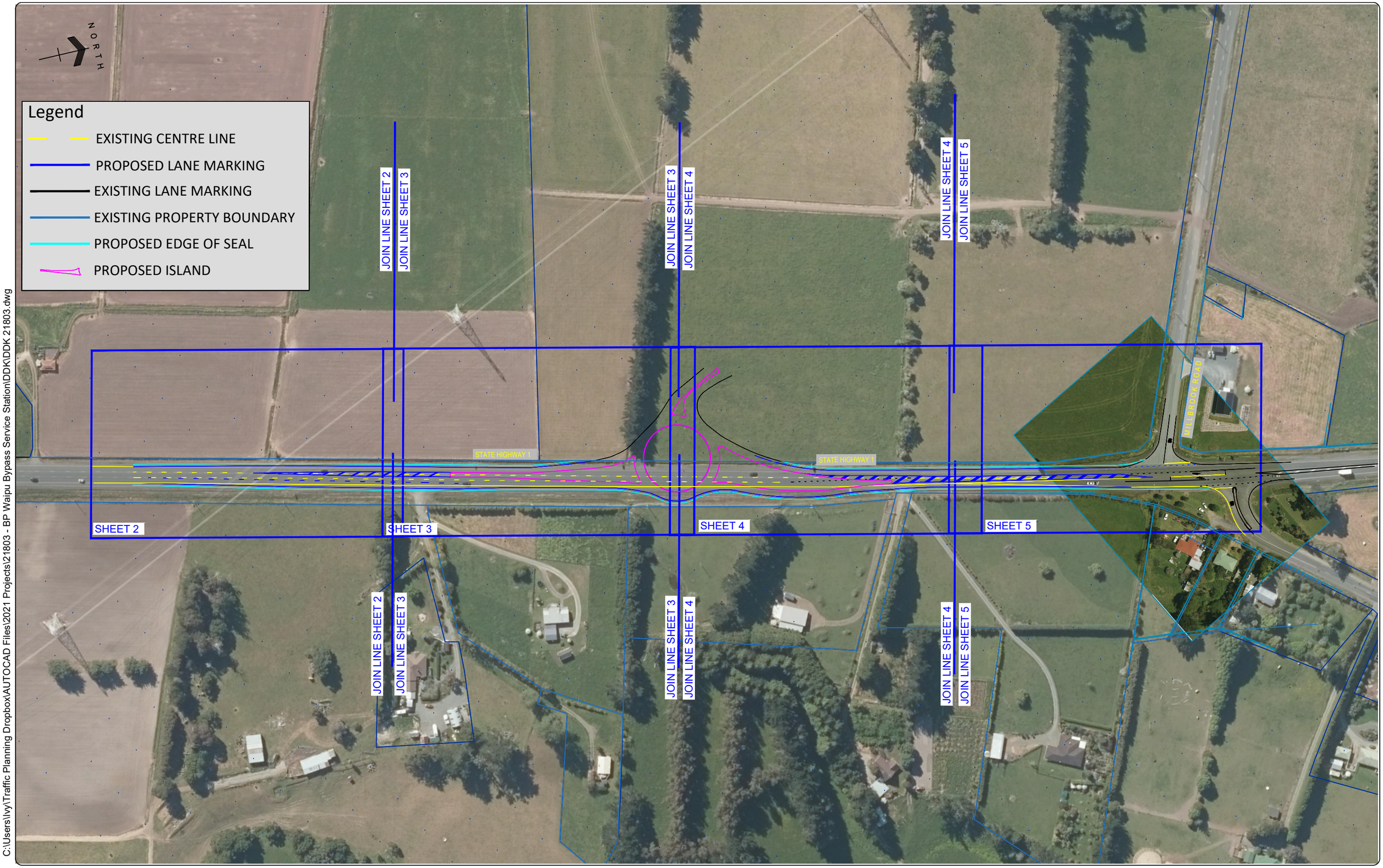
9.6 Overall, I consider that the traffic effects of the proposal can be accommodated on the road network without compromising its function, capacity, or safety.

Todd James Langwell

25 September 2024

ATTACHMENT 1

Proposed Roundabout Concept Design



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Rev	Revisions	By	Date

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Project Title: Waipu Bypass Service Centre

Sheet Title: Overview of Roundabout & Lane arrangements

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Checked	TL	Approved	TL	DDK 21803 - (1)	Date 30.08.24

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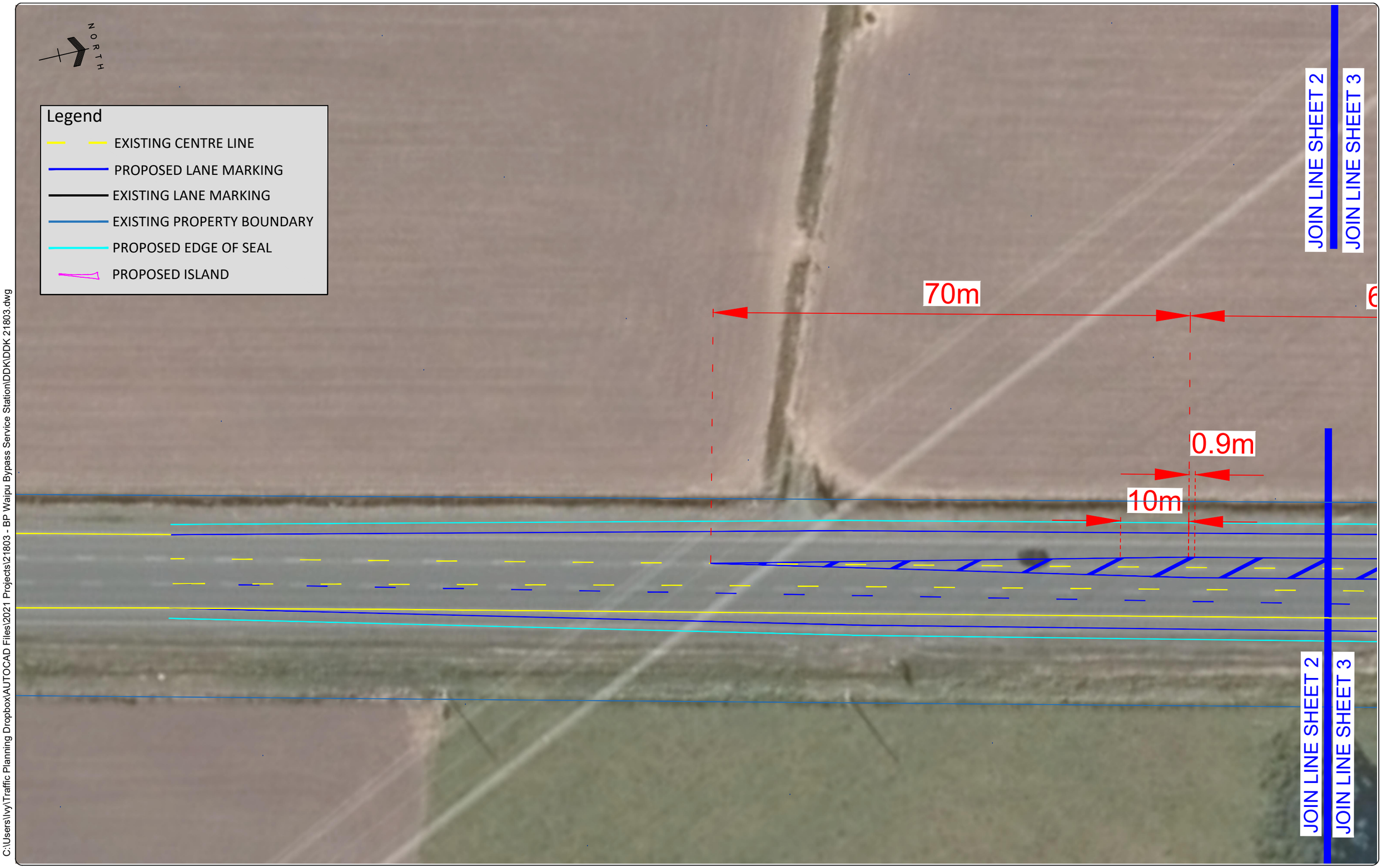

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Project Title: Waipu Bypass Service Centre

Sheet Title: Detail of Roundabout and lane arrangements

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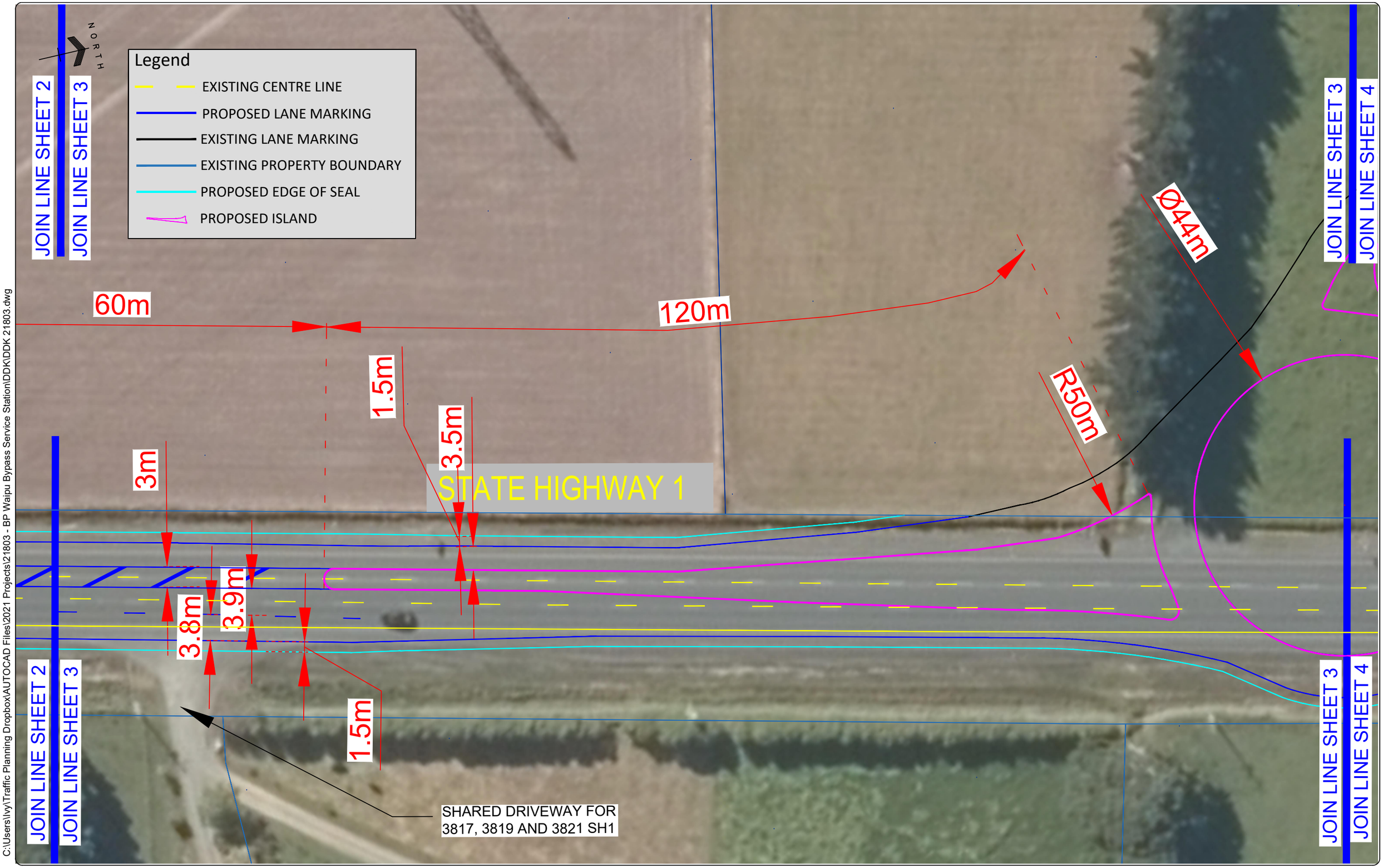

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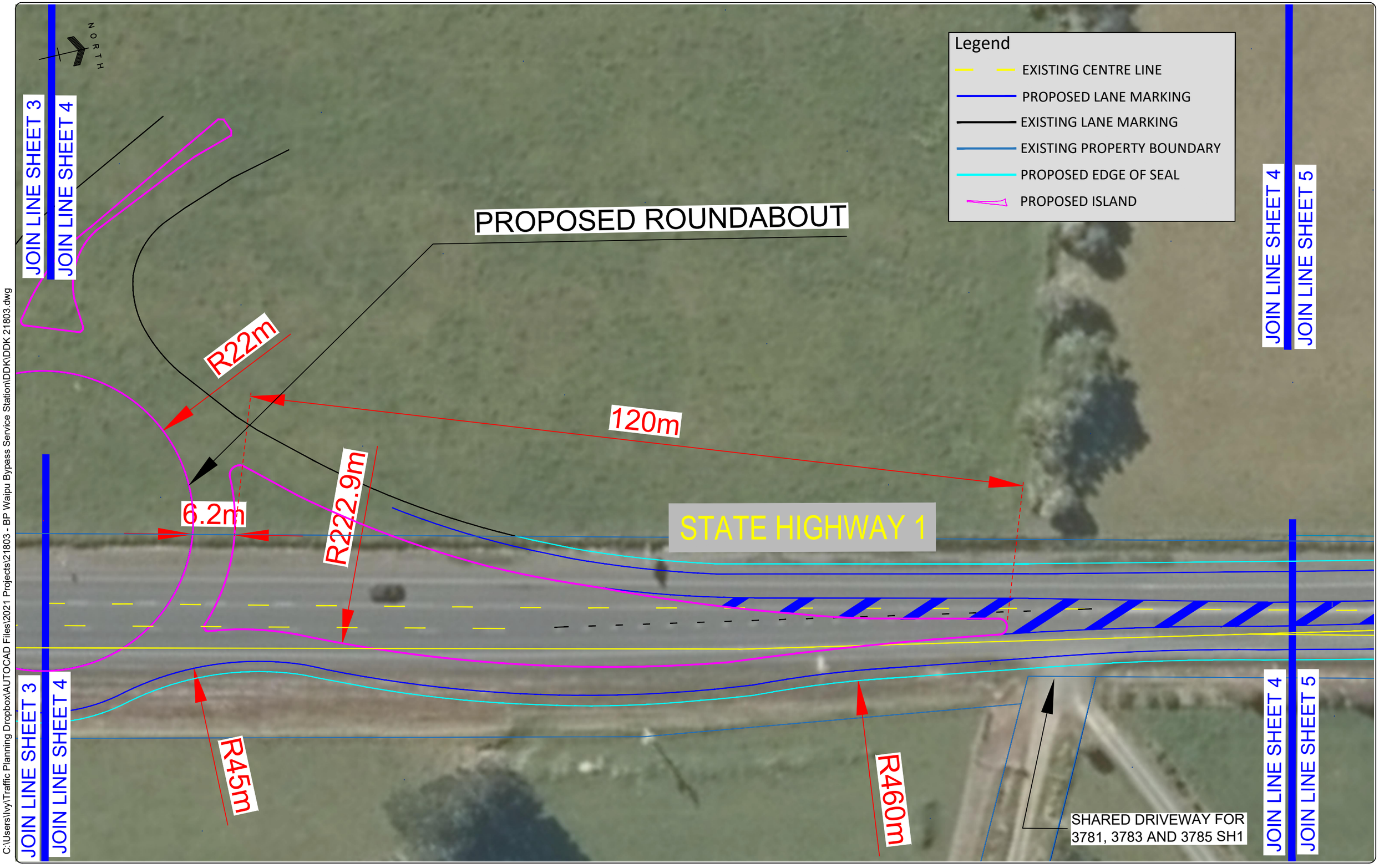

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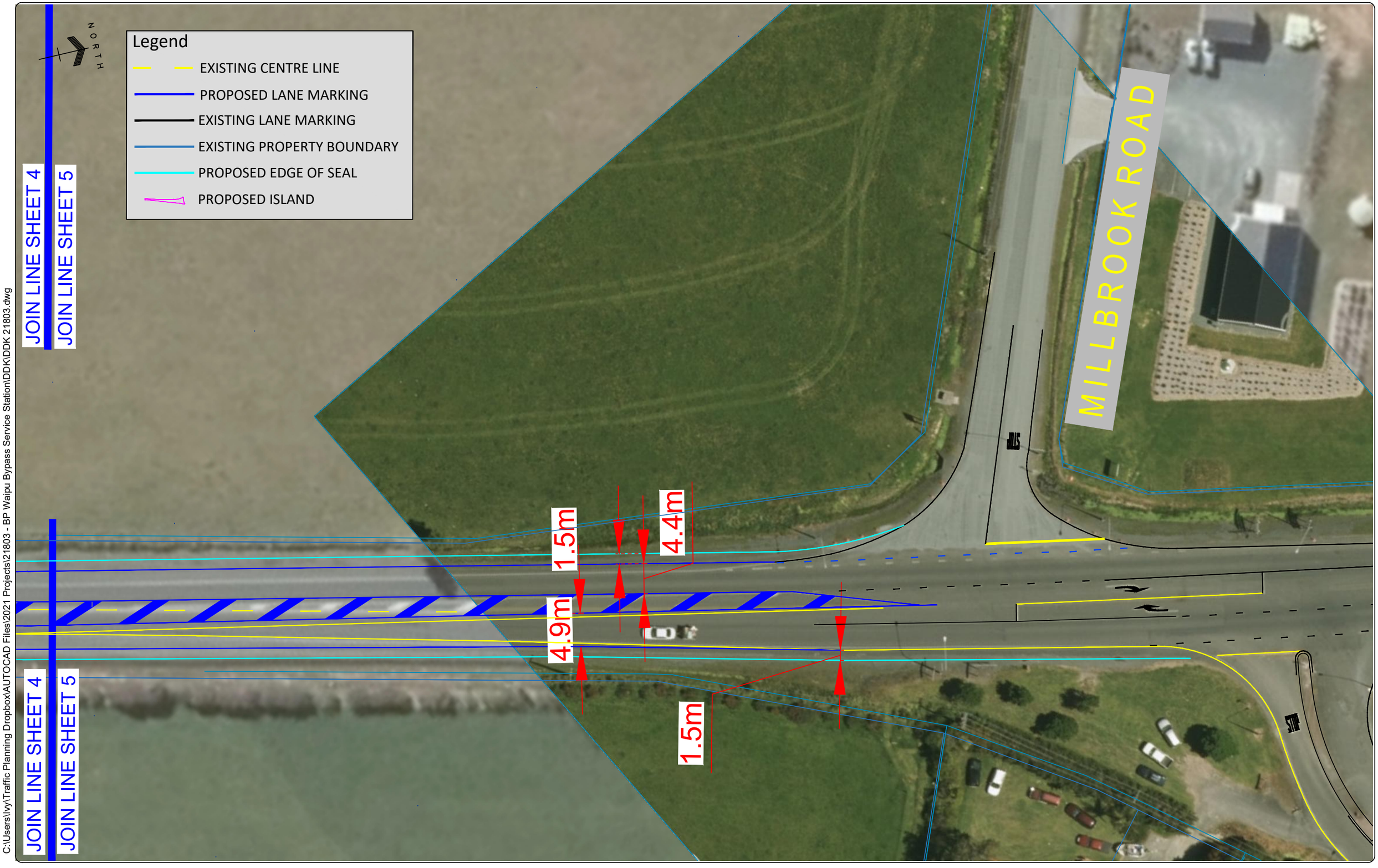

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Project Title: Waipu Bypass Service Centre

Sheet Title: Detail of Roundabout and lane arrangements

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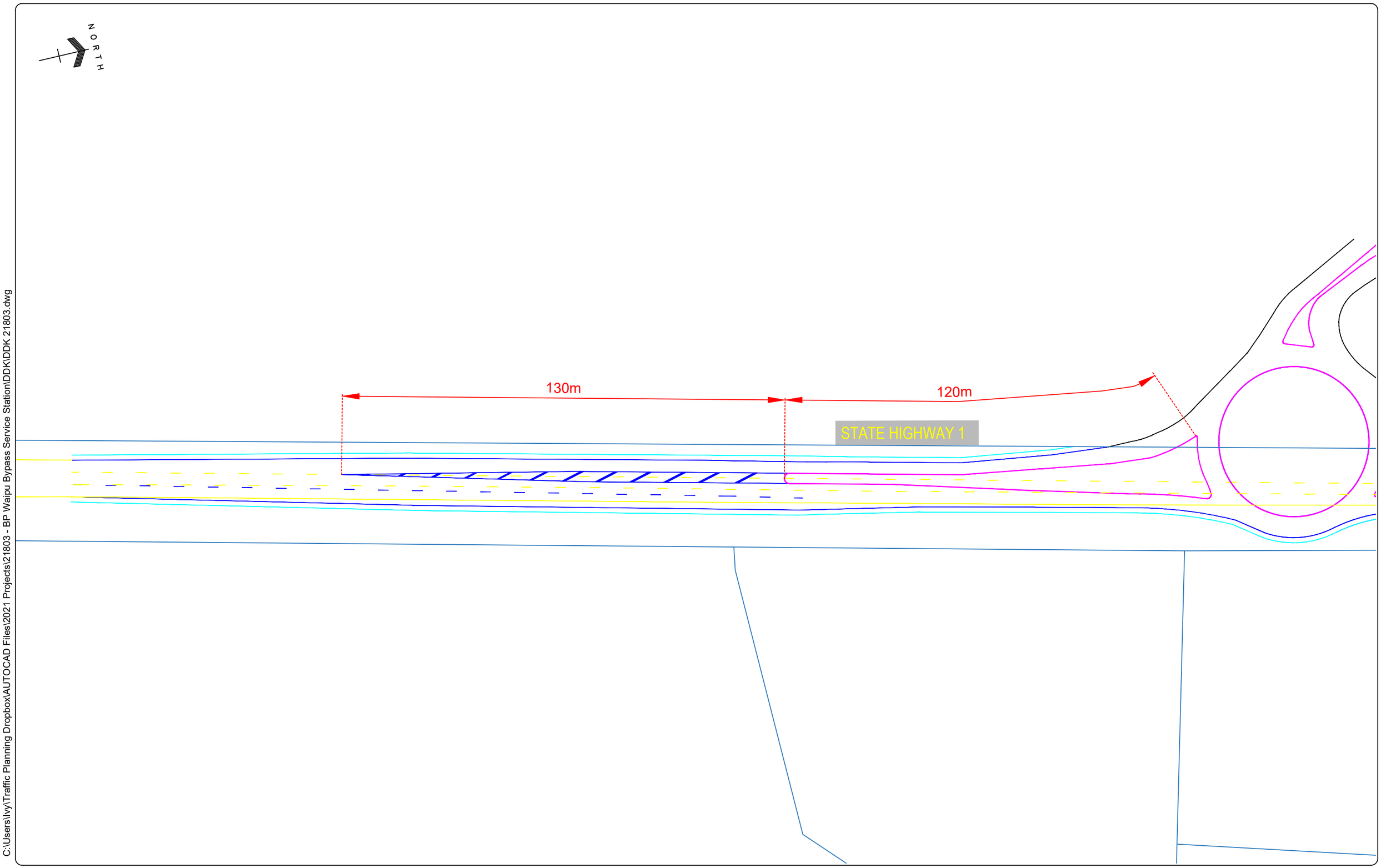

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Project Title: Waipu Bypass Service Centre

Sheet Title: Lengths of Northbound approach markings and splitter island

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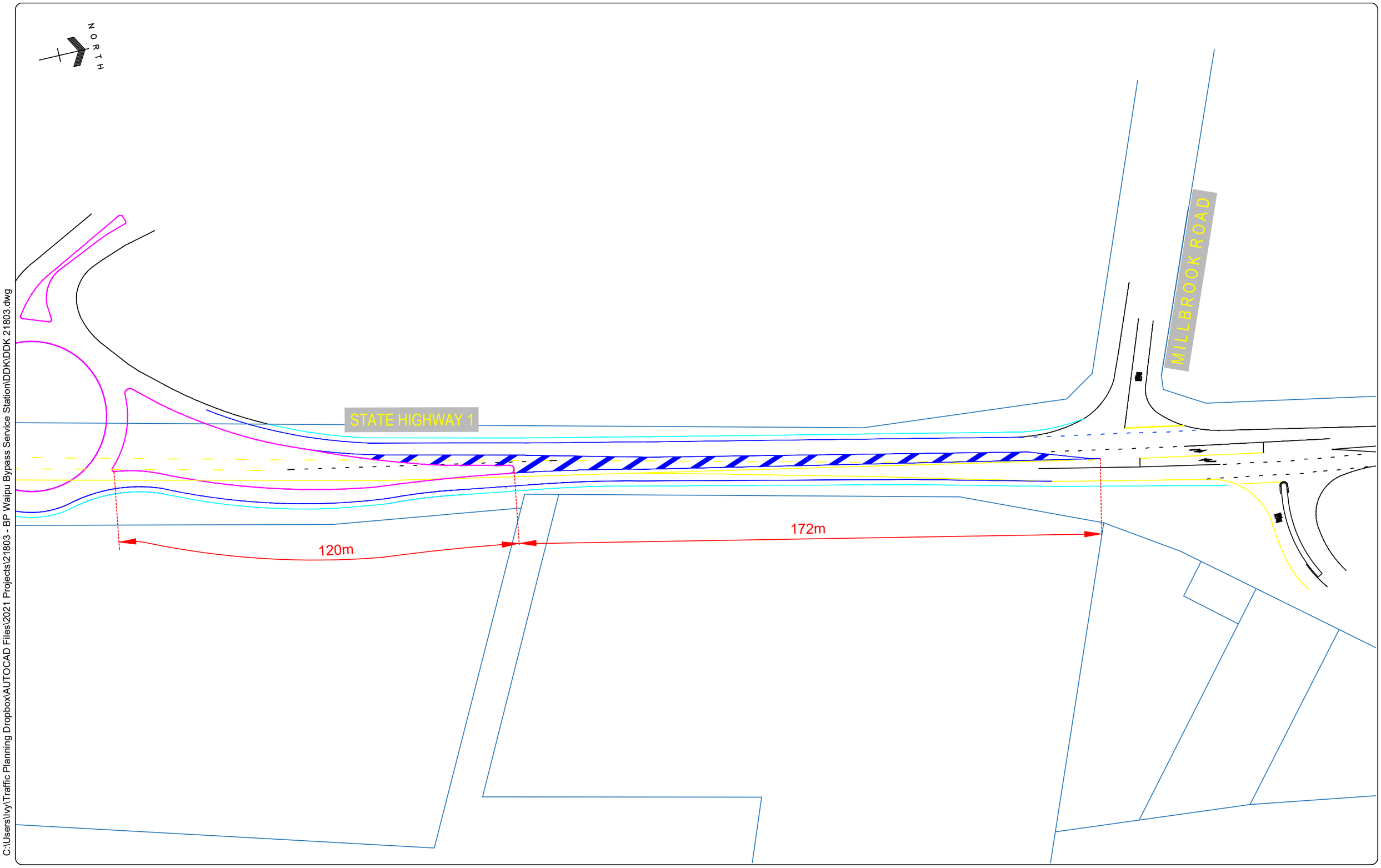

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Project Title: Waipu Bypass Service Centre

Sheet Title: Lengths of Southbound approach markings and splitter island

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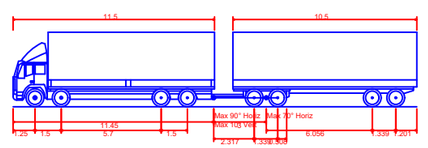
NORTH

STATE HIGH

AT - Truck - HPMV - 23.0m Truck and Trailer



AT - Truck - HPMV - 23.0m Truck and Trailer	
Overall Length	23.046m
Overall Width	2.550m
Overall Body Height	4.250m
Min Body Ground Clearance	0.373m
Track Width	2.550m
Lock-to-lock time	6.00s
Wall to Wall Turning Radius	12.500m

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Project Title: Waipu Bypass Service Centre

Sheet Title: Vehicle Tracking - 23.0m Truck and Trailer

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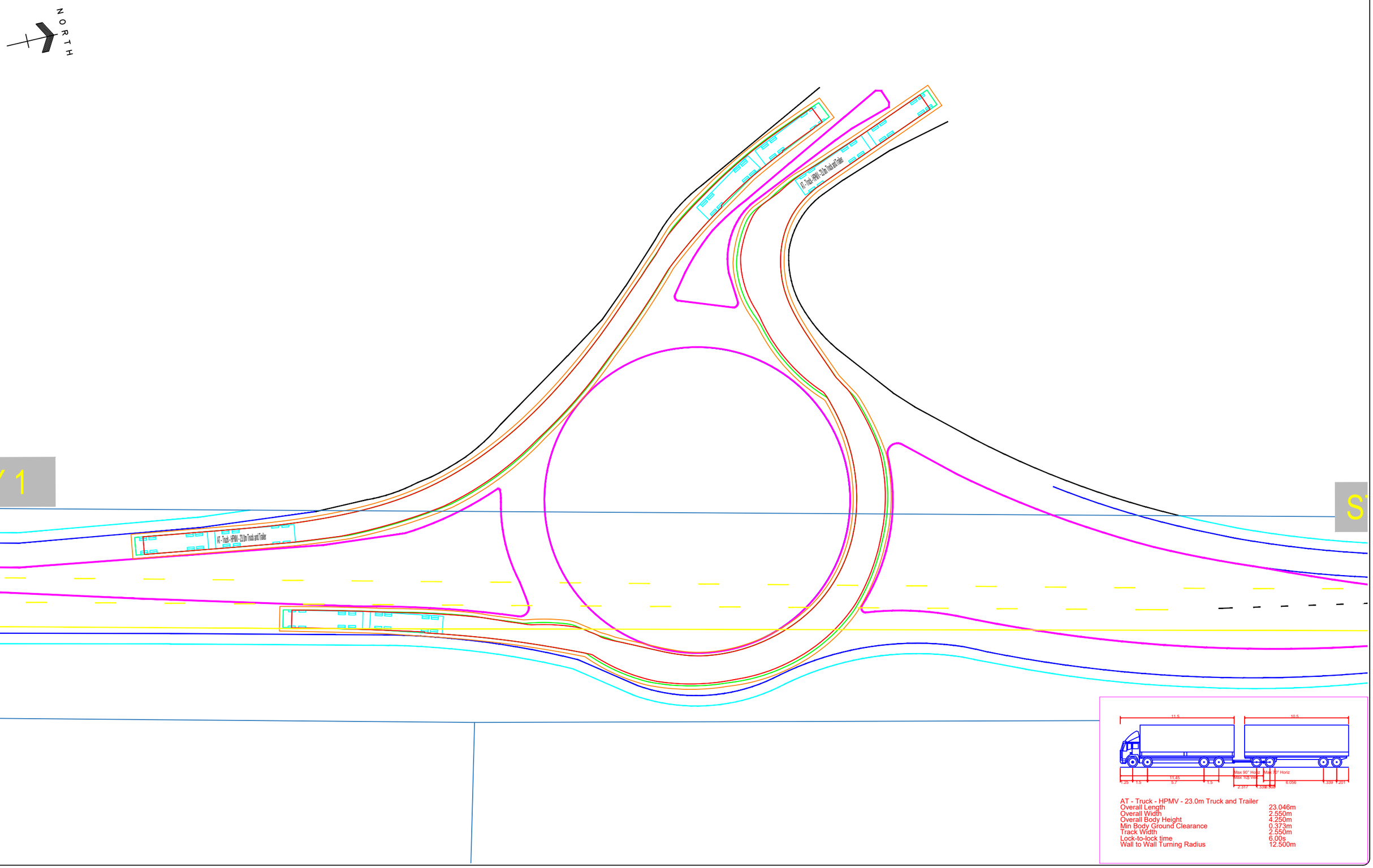

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Project Title: Waipu Bypass Service Centre

Sheet Title: Vehicle Tracking - 23.0m Truck and Trailer

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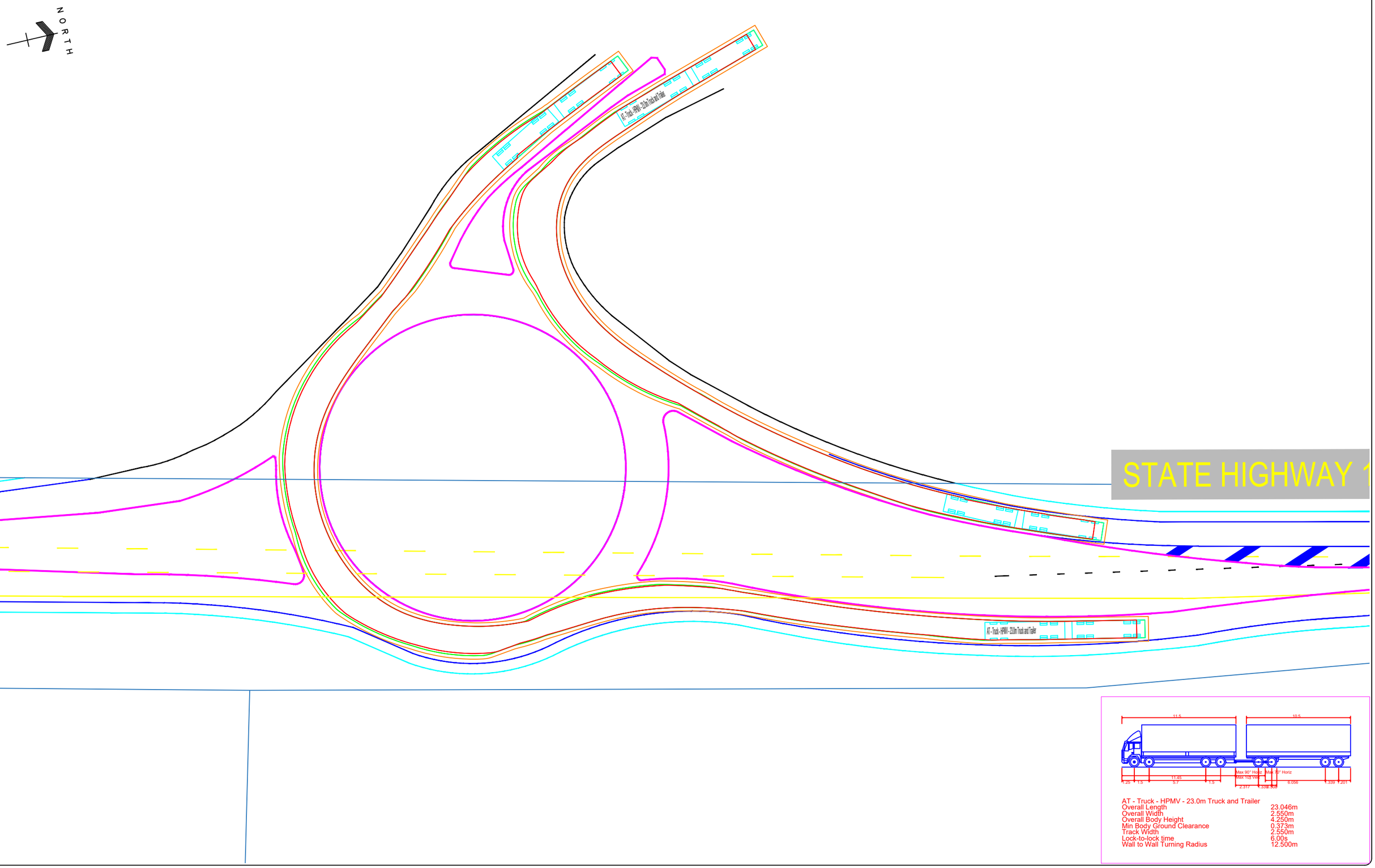

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Sheet Title: Vehicle Tracking - 23.0m Truck and Trailer

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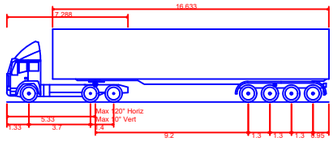
NORTH

1

STATE HIGHWAY 1



AT - Truck - HPMV - 19.45m Semi-Trailer (Rear steer)

Overall Length	19.380m
Overall Width	2.550m
Overall Body Height	4.386m
Min Body Ground Clearance	0.311m
Track Width	2.550m
Lock-to-lock time	6.00s
Wall to Wall Turning Radius	12.500m

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Project Title: Waipu Bypass Service Centre

Sheet Title: Vehicle Tracking - 19.45m Semi-Trailer

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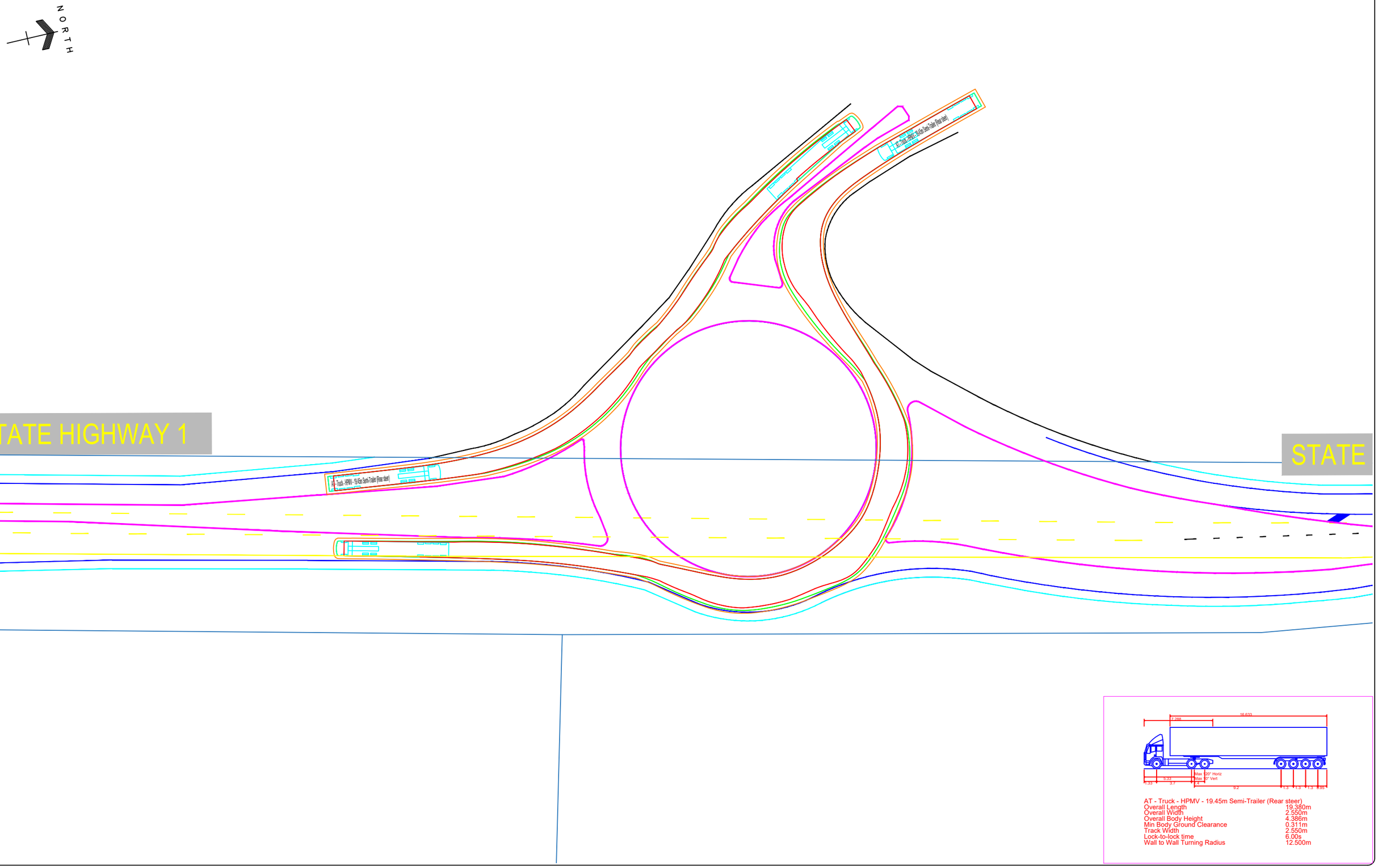

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Project Title: Waipu Bypass Service Centre

Sheet Title: Vehicle Tracking - 19.45m Semi-Trailer

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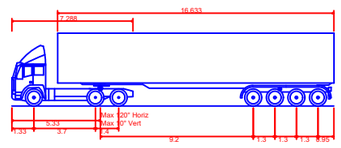
NORTH

1

STATE HIGHWAY 1

AT - Truck - HPMV - 19.45m Semi-Trailer (Rear steer)



AT - Truck - HPMV - 19.45m Semi-Trailer (Rear steer)

Overall Length	19.380m
Overall Width	2.550m
Overall Body Height	4.386m
Min Body Ground Clearance	0.311m
Track Width	2.550m
Lock-to-lock time	6.00s
Wall to Wall Turning Radius	12.500m

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Sheet Title: Vehicle Tracking - 19.45m Semi-Trailer

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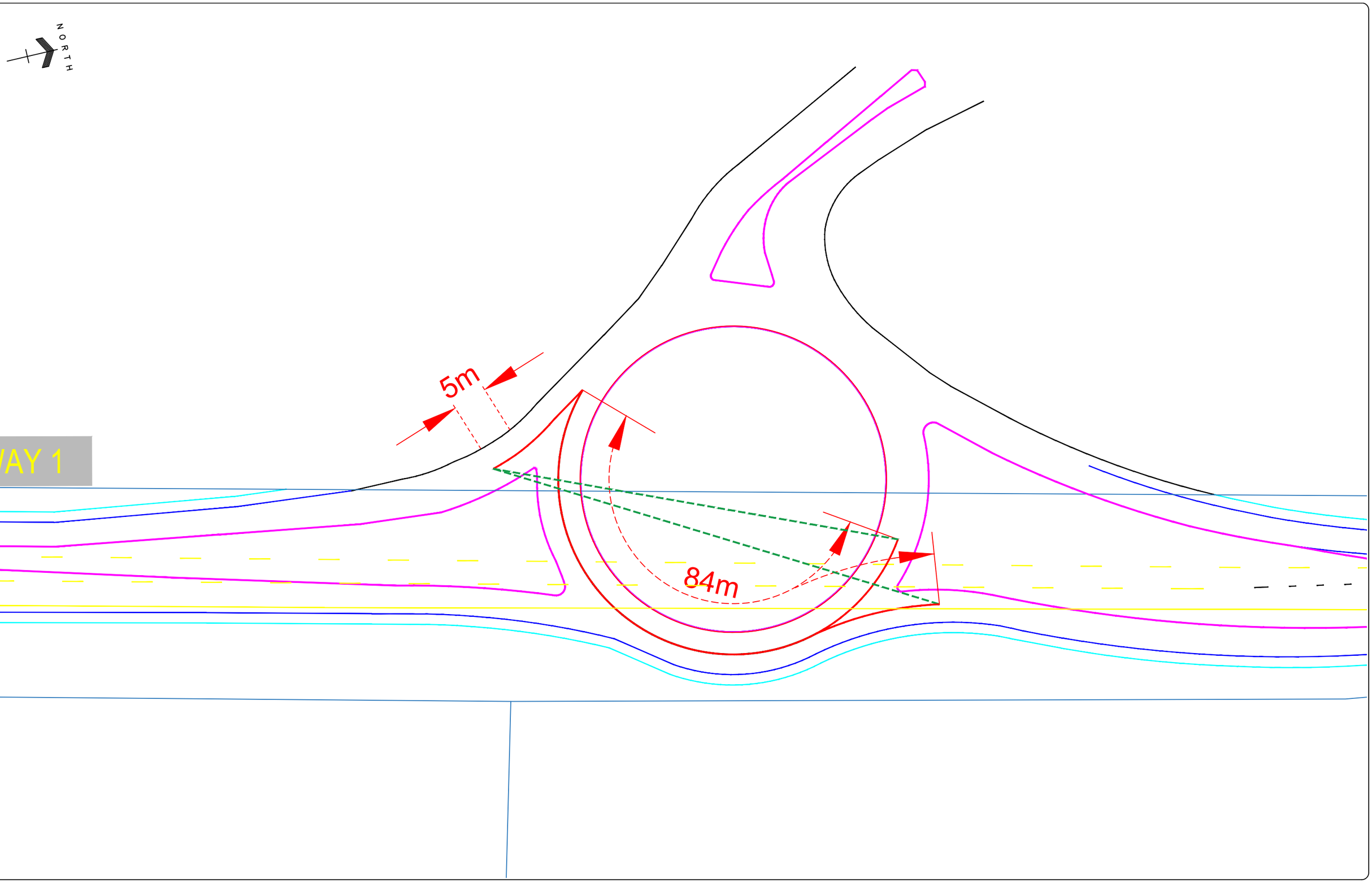

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Project Title: Waipu Bypass Service Centre

Sheet Title: SH1 Northbound Criterion 2 Sight Distance

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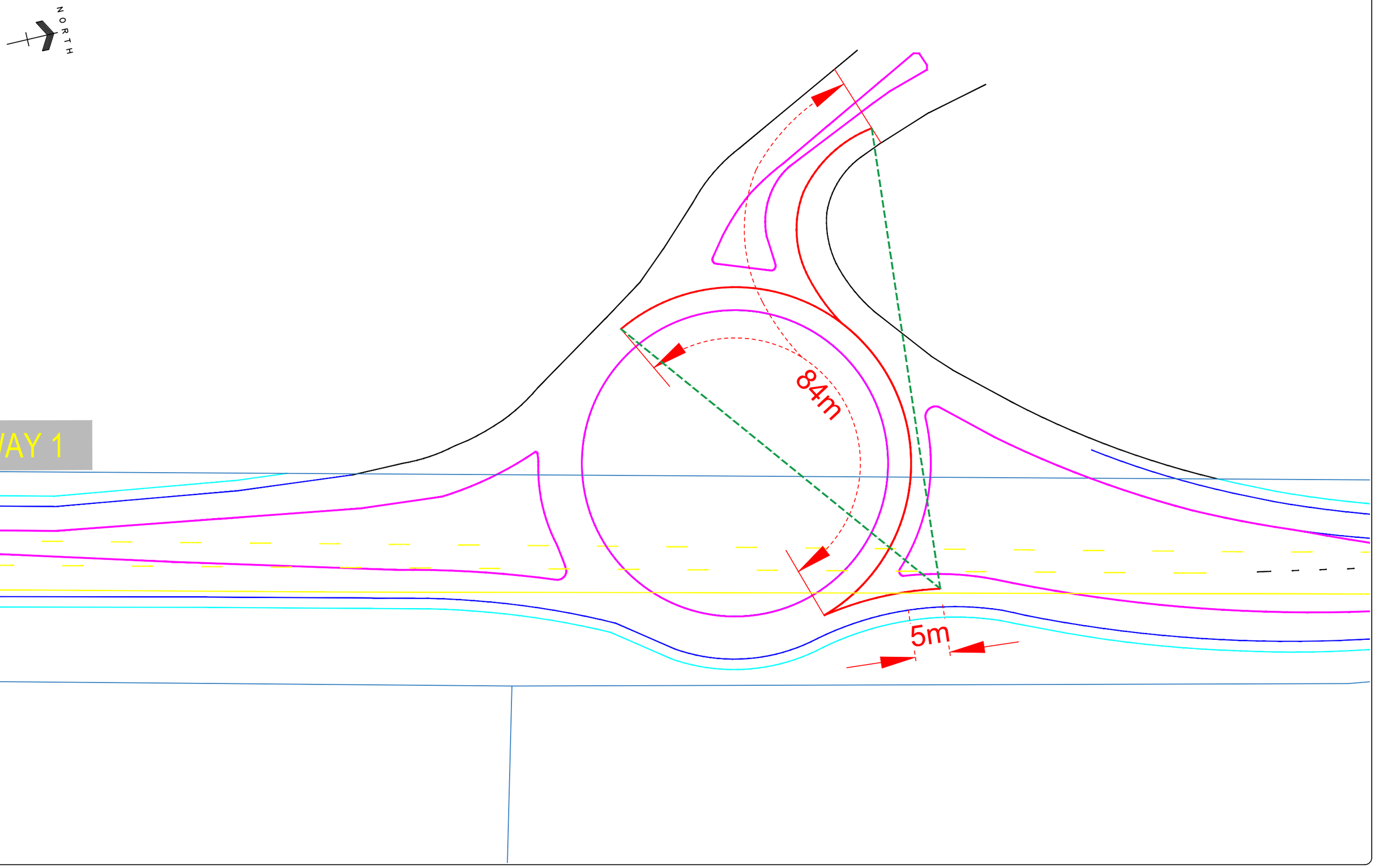

WAY 1

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Project Title: Waipu Bypass Service Centre

Sheet Title: SH1 Southbound Criterion 2 Sight Distance

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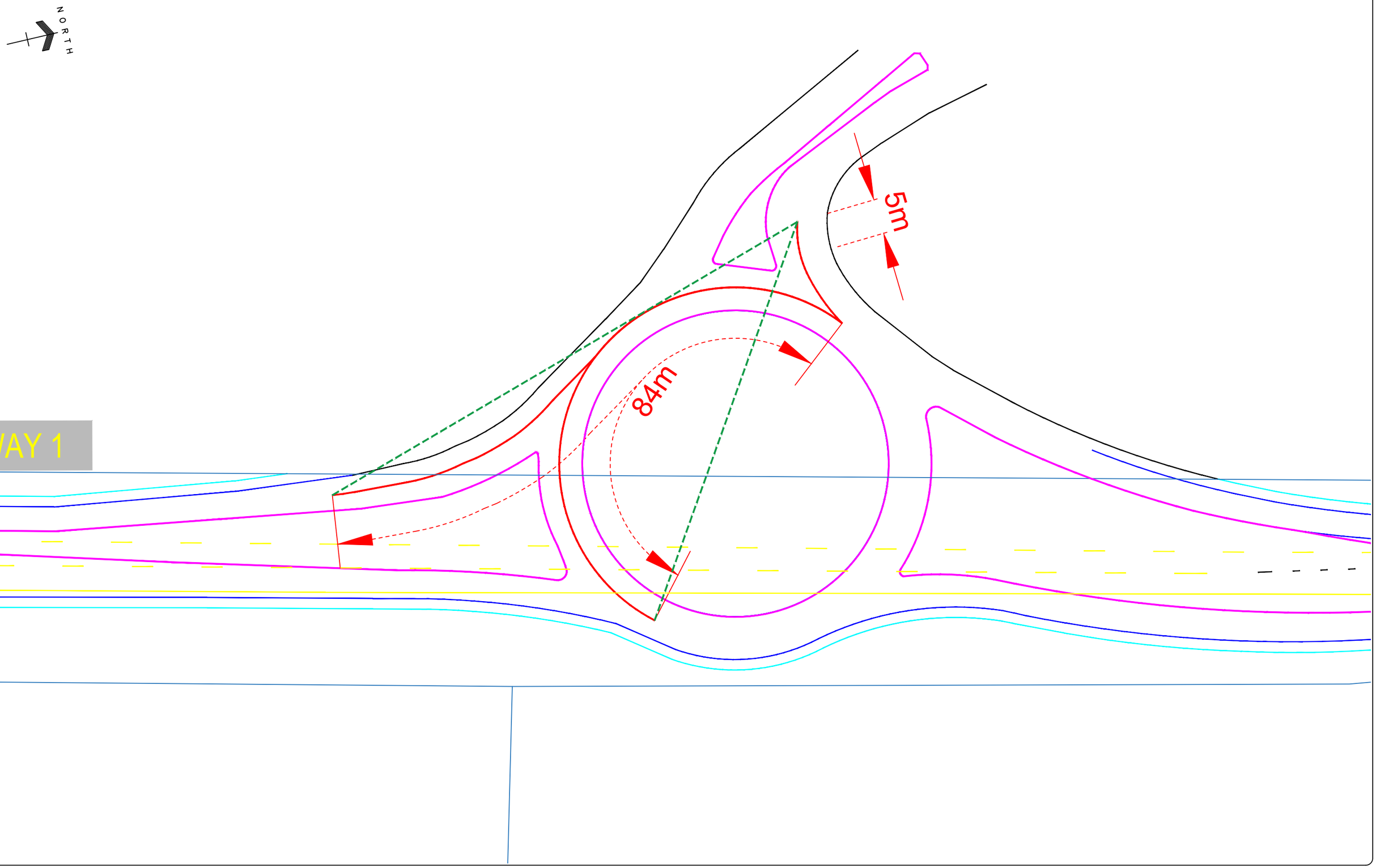

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Project Title: Waipu Bypass Service Centre

Sheet Title: Service Centre Exit Criterion 2 Sight Distance

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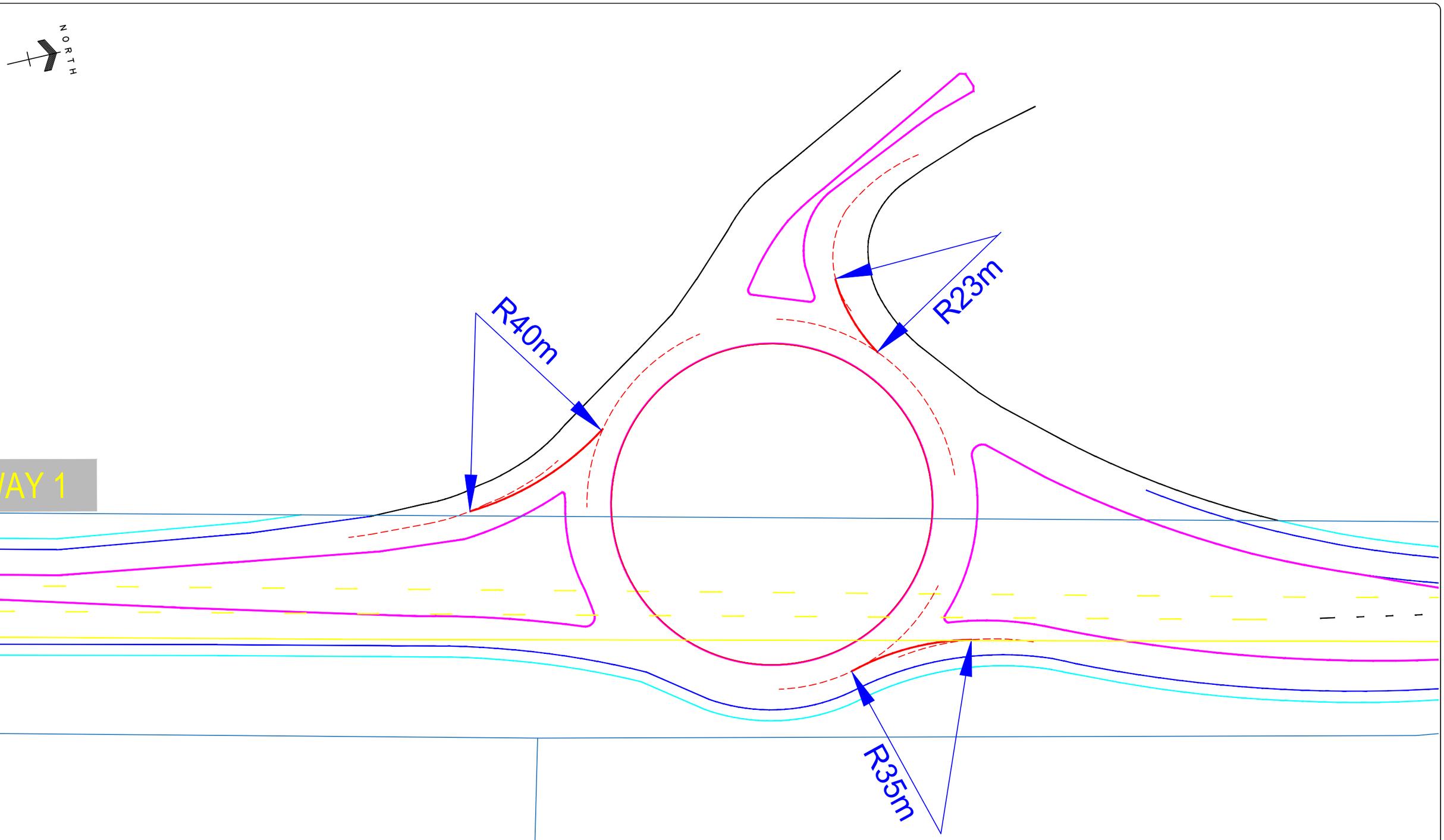

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Project Title: Waipu Bypass Service Centre

Sheet Title: Roundabout entry path radii

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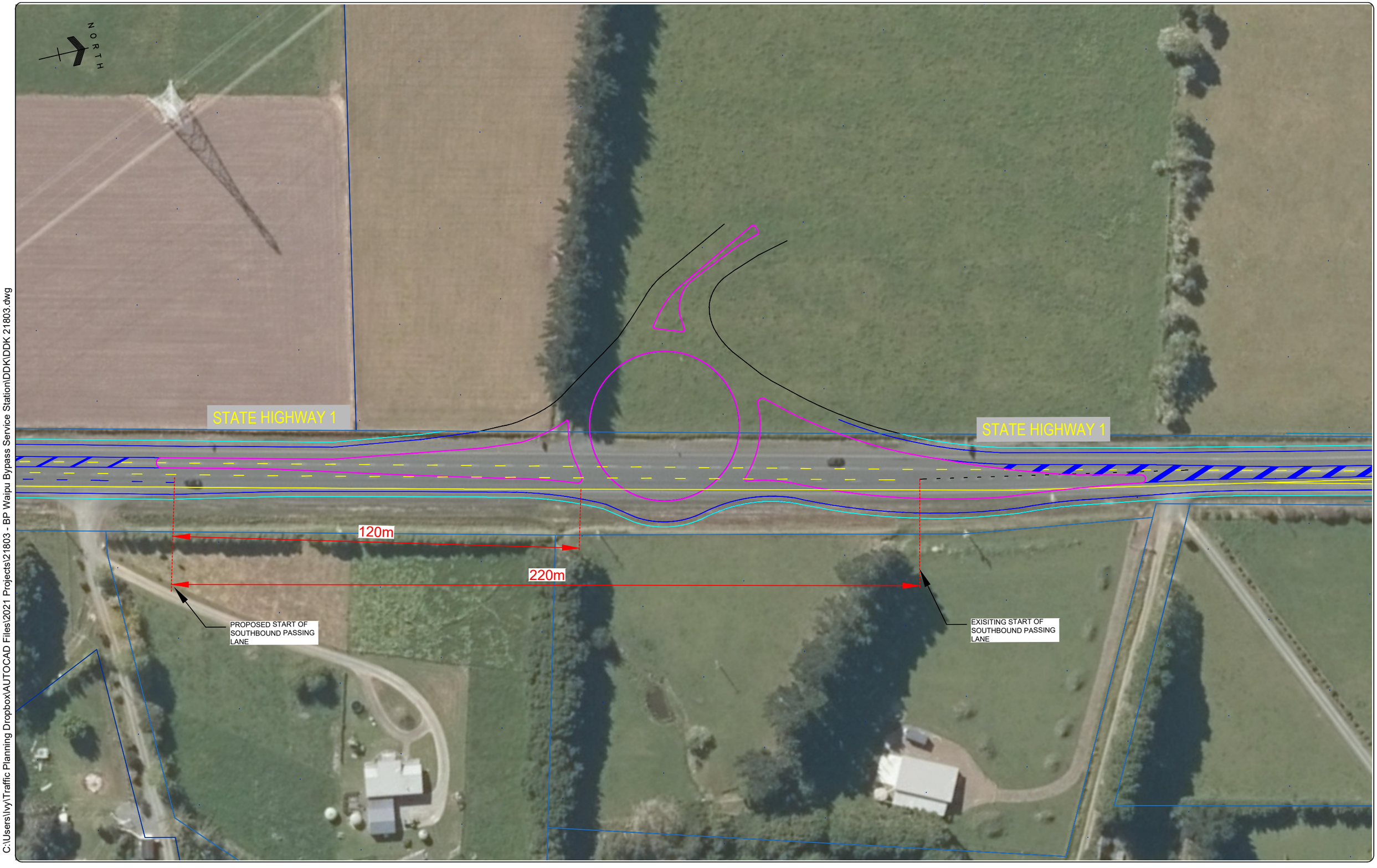

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Project Title: Waipu Bypass Service Centre

Sheet Title: Change in length of southbound passing lane

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ATTACHMENT 2

Proposed Roundabout Concept Design Report

CONCEPT SH1 ACCESS DESIGN REPORT FOR PROPOSED SERVICE CENTRE 47 MILLBROOK ROAD, WAIPU RESOURCE CONSENT APPLICATION REFERENCE: SL2300006

1. ROUNDABOUT

The access to the service centre is proposed to be a roundabout, located on SH1 some 300 metres south of Millbrook Road.

The concept roundabout layout has been designed against the design criteria set out in the 2023 AUSTROADS "Guide to Road Design Part 4B, Roundabouts" (AGRD Part 4B).

There are two mandatory requirements for the sight distance, the first being the Approach Sight Distance (Criterion 1) and the second being Gap Sight Distance (Criterion 2).

Approach Sight Distance

Approach Sight Distance (Criterion 1) is a minimum requirement to provide the driver of a vehicle adequate distance to observe the roadway layout in sufficient time to react and stop, if necessary, before entering a conflict area. It is measured from driver eye height (1.1m) to the road surface.

According to Table 3.1 of the 2023 AUSTROADS "Guide to Road Design Part 4A, Unsignalised and Signalised Intersections" (AGRD Part 4A), with a 2.5 second reaction time and a 110 km/h approach speed, the required approach sight distances is 209 metres. SH1 is straight and flat in the vicinity of the site, and the approach sight distance meets this requirement.

Section 3.3 of AGRD Part 4B advises that to ensure that trucks approaching the roundabout are able to stop safely, the stopping sight distance for trucks (SSDT) should also be provided at intersections used by a significant volume of large or special vehicles.

According to Section 5.3.2 of the 2021 AUSTROADS "Guide to Road Design Part 3, Geometric Design", Truck stopping sight distance is measured from driver eye height of 2.4 metres, and with a 2.5 second reaction time and a 110 km/h approach speed, the required approach sight distance for trucks is 241 metres. Again, as SH1 is straight and flat in the vicinity of the site, and the approach sight distance would easily meet this requirement.

Gap Sight Distance

Gap Sight Distance (Criterion 2) relates to a car driver entering a roundabout having adequate sight distance to two potentially conflicting movements, viz. a vehicle entering from the approach immediately to the right, and a vehicle travelling on the circulating roadway within the roundabout. It is measured from a driver eye height of 1.1 metres at a point 5 metres back from the limit line to an

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object height of 0.65 metres. Section 3.2.2 of AGRD Part 4B indicates that the required gap sight distance for large rural roundabouts on arterial roads is 84 metres.

The 84-metre Criterion 2 sight distances for the northbound SH1 approach to the roundabout are shown in drawing **DDK 21803 – (14)**, for the southbound SH1 approach to the roundabout in drawing **DDK 21803 – (15)**, and for the approach to the roundabout from the proposed service centre in drawing **DDK 21803 – (16)**. Provided the area within the green lines is kept clear of vegetation or any object that would obscure sight distance, the Criterion 2 gap sight distances will be met.

Size of Central Island

The critical determining parameter for the recommended size of the central island of the roundabout is the driver speed on the fastest leg prior to the roundabout. Table 4.1 of AGRD Part 4B indicates that for single-lane roundabouts with the fastest approach speed being 90km/h or more, the desirable central island radius is 22 metres. The concept roundabout design has a central island radius of 22 metres.

Circulating Carriageway

Table 4.3 of AGRD Part 4B indicates that for a single-lane roundabout with a 23-metre central island radius, an initial width of circulating carriageway of 6.2 metres should be selected to accommodate a 19 metre semi-trailer. The concept roundabout design has a circulating carriageway 6.2 metres wide.

Tracking analysis has been undertaken to ensure that the roundabout can accommodate both a 23-metre long HPMV truck and trailer unit (drawings **DDK 21803 – (8)** to **(10)**) and a 19.45m HPMV semi-trailer (drawings **DDK 21803 – (11)** to **(13)**). The tracking analysis indicates that the circulating carriageway shown in the concept design will accommodate these design vehicles.

Entry Path Radius

Table 4.2 of AGRD Part 4B requires the entry path radius for a single lane roundabout to be a maximum of 55 metres. The entry path radii on the approaches to the roundabout are shown in in drawing **DDK 21803 – (17)**. The entry path radii into the roundabout from SH1 northbound and southbound are 40 metres and 35 metres respectively, while the entry path radius into the roundabout from the service centre is 23 metres. Thus, the concept roundabout design complies with the entry path radius requirement.

Splitter Islands

Section 4.5.4 of AGRD Part 4B advises that kerbed splitter islands should be provided on all roundabouts as they assist in controlling entry speed, guide traffic onto the roundabout and deter right-turners from taking dangerous 'wrong way' short cut movements through the roundabout, and that the kerbing should be semi-mountable.

AGRD Part 4B advises that it is desirable that the splitter island kerb cuts across the prolongation of the approach lane so that drivers perceive a physical constraint at the entry. The splitter islands and kerb lines of the concept roundabout design have been designed to cut across the prolongation of the approach lanes so that drivers perceive a physical constraint approaching the roundabout.

For high-speed areas, the splitter island should be long enough to:

- give early warning to drivers that they are approaching an intersection and must slow down; and
- enable drivers to easily recognise the degree of curvature on the right side of the entry.

AGRD Part 4B therefore advises that the splitter island and its approach pavement markings should preferably extend back to a point where drivers would be expected to start to reduce their speed. As a guide, in a high-speed rural situation the distance between the start of approach line marking and the holding line should be equal to the distance required to decelerate from the approach speed to a stop, as specified in Figure 4.3 (a) and Table 5.2 of AGRD Part 4A. In a 110 km/h environment an overall length of 185 metres is required, with a splitter island about 60 to 70 metres long.

As shown in drawing **DDK 21803 – (6)**, on the northbound SH1 approach to the roundabout the splitter island is 122.5 metres long and the splitter island approach pavement markings are 130 metres long, meeting this requirement.

As shown in drawing **DDK 21803 – (7)**, on the southbound SH1 approach to the roundabout the splitter island is 120 metres long and the splitter island approach pavement markings are 172 metres long, also easily meeting this requirement.

Speed Reduction Treatments

Table 4.1 of AGRD Part 4B indicates that roundabouts with the fastest approach speed being 90km/h or more require speed reduction treatments prior to the entry curve. Various types of speed reduction treatments are described in Section 4.5.2 of AGRD Part 4B.

For the northbound approach on SH1, the speed reduction effect of the long median island will be supplemented with a kerb on the left side of the approach to provide the perception of a narrowing of the road and 'funnelling' of traffic. This could be further enhanced by creating a lower desired speed on the approach by the use of local treatments giving the impression of a restriction to the driver, such as dense planting close to the edges of the approach carriageway (sight lines must not be impeded), narrower total cross-section (only on horizontal straights) and/or guide posts at decreasing spacing towards the roundabout. Whether such measures are desirable could be decided during the detailed design, but should be checked any subsequent road safety audits.

For the southbound approach, the concept design uses approach reverse curves. As shown in Figure 4.4 of AGRD Part 4B, it is desirable to achieve a stepped reduction in design speed of the approach curves of 100 km/h, then 80 km/h, then 60 km/h. As shown in drawing **DDK 21803 – (4)**, the concept design first has a curve to the left of 460 metres radius. Figure 4.4 of AGRD Part 4B indicates that, with a 3% superelevation, this curve will have a design speed of 100km/h. The concept design then has a curve to the right of 223 metres radius, which with a 3% superelevation and a friction factor of 0.19 (refer Table 7.5 of AGRD Part 3) will have a design speed of 80km/h. Finally, the concept design has a curve to the left of 45 metres radius, which Figure 4.4 of AGRD Part 4B indicates that, with a 3%

superelevation, will have a design speed of 60km/h. This speed reduction effect will be supplemented with a kerb on the left side of the approach.

It is therefore considered that the concept design can provide adequate speed reduction treatments prior to the entry curves on SH1.

2. SH1 LANE AND SHOULDER WIDTHS

The proposed lane widths on SH1 are shown in drawing **DDK 21803 – (3)** and **(5)** and are tabulated below:

Direction	Location	Traffic Lane Widths
Northbound	South of Roundabout	3.5m
	North of Roundabout	4.4m
Southbound	North of Roundabout	4.5m
	South of Roundabout	3.8m and 3.9m

Section 4.2.6 of AGRD Part 3 advises that the desirable lane width on rural roads is 3.5 metres. The lane widths in the concept design are based on existing lane widths, however they could be reduced in width to 3.5 metres during the detailed design if required by NZTA.

A 1.5-metre-wide sealed shoulder is proposed on each side of the carriageway. This is consistent with the minimum sealed shoulder width for single carriageway rural roads with a design AADT of more than 3,000 vehicles per day specified in Table 4.5 of AGRD Part 3.

3. IMPACT ON AFFECTED PROPERTY ACCESSES

No changes are proposed on Millbrook Road and thus there will be no direct impacts on property accesses on Millbrook Road.

As shown in drawing **DDK 21803 – (3)**, the concept roundabout would provide a painted flush median past the shared driveway for 3817, 3819 and 3821 SH1. This would provide a refuge clear of northbound traffic on SH1 for motorists turning right into the shared driveway. It would also give motorists turning right out of the shared driveway the option of giving way to southbound SH1 traffic, turning onto the median, and then waiting for a gap in northbound SH1 traffic. Thus, the proposal would improve property access for the shared driveway for 3817, 3819 and 3821 SH1.

As shown in drawing **DDK 21803 – (4)**, the concept roundabout would also provide a painted flush median past the shared driveway for 3781, 3783 and 3785 SH1, with the same advantages for property access as above. In the concept design about 60 metres of flush median is provided from the start of the diverge off the traffic lane to the point where vehicles would turn into the shared driveway. This can provide a 42-metre taper (as specified in the NZ Manual of Traffic Signs and Markings for a 30km/h approach speed and a 3-metre lateral shift) and an 18-metre storage area, or a 15-metre taper, 27

metre diverge length and an 18-metre storage area as per section 5.2.1 of AGRD Part 4A. There is room to modify these provisions in the detailed design if required.

4. IMPACT ON SOUTHBOUND PASSING LANE

The existing SH1 southbound passing lane is some 1km long excluding tapers. Drawing **DDK 21803 – (18)** indicates that with the concept roundabout in place, the southbound passing lane (excluding diverge taper) will start some 120 metres south of the southbound roundabout departure, and some 220 metres south of the existing start of the passing lane. Thus, the concept roundabout would reduce the length of the southbound passing lane to about 880 metres.

The roundabout will also reduce the speeds of all vehicles approaching the southbound passing lane. With a 22-metre central island radius, and assuming a 2% adverse camber on the circulating lane, the circulating speed on the roundabout will be about 30km/h.

As indicated in drawing **DDK 21803 – (18)**, the southbound passing lane will begin some 120 metres south of the roundabout departure. From Figure 3.6 of AGRD Part 3, it is evident that a car accelerating from an initial speed of 30km/h will reach a speed of 40 km/h after travelling 200 metres, and after travelling 1 kilometre (past the end of the passing lane) the car will have accelerated to a speed of some 75 km/h.

Table 9.2 of AGRD Part 3 indicates that while the desirable length of an overtaking lane with a 110km/h operating speed is 1070 metres, the desirable length of an overtaking lane with an 80km/h operating speed is 650 metres.

Thus, with the roundabout in place, the 880-metre-long SH1 southbound passing lane will be more than adequate to provide the passing opportunities the existing passing lane currently provides.

5. DISTANCES BETWEEN TRAFFIC DEVICES

Traffic management devices should be separated in space (and thus in time) so that motorists leaving one device have time to perceive what is next, and decide what action to take.

The proposal would locate the southbound exit of the roundabout some 120 metres to the north of the shortened southbound passing lane. As discussed in the previous section, the circulating speed on the roundabout will be some 30km/h. Extrapolating from Figure 3.6 of AGRD Part 3, a car accelerating from a speed of 30km/h as it leaves the roundabout will reach a speed of some 35 km/h after travelling 120 metres. Assuming constant acceleration, this would take some 13 seconds, which is more than enough time for motorists leaving the roundabout to perceive the passing lane ahead, and decide what action to take.

There is a distance of some 290 metres between the northbound roundabout departure and the Millbrook Road intersection. From Figure 3.6 of AGRD Part 3, a car accelerating from a speed of 30km/h as it leaves the roundabout will reach a speed of some 45 km/h after travelling 290 metres. Assuming constant acceleration, this would take some 27 seconds, which is more than enough time

for motorists leaving the roundabout to perceive the Millbrook Road intersection, and decide if they wish to turn into it.

Safe Intersection Sight Distance is the distance required to provide for a driver of a vehicle on the major road to observe a vehicle on a minor road approach moving into a collision situation (e.g., in the worst-case stalling across the traffic lanes), and to decelerate to a stop before reaching the collision point. Extrapolating from Table 3.2 of AGRD Part 4A, the Safe Intersection Sight Distance with a reaction time of 2 seconds and a design speed of 45km/h is 85 metres. Thus, the sight distance between the roundabout and Millbrook Road will exceed the Safe Intersection Sight Distance by a considerable margin.

The critical acceptance gap is the time required for a motorist turning out of a minor road to safely commence the desired manoeuvre. Table 3.5 of AGRD Part 4A indicates the critical acceptance gap for a right turn off a major road into a minor road across one traffic lane is 4 seconds, to turn right from a minor road onto a major road is 5 seconds, and to turn left from a minor road onto a major road is 5 seconds (the latter causing some interference with the through traffic.)

To avoid interfering with through traffic on the major road, the critical acceptance gap for a left turn is 14 to 40 seconds. The sight distance from Millbrook Road to the roundabout equates to 27 seconds of travel time, and thus is well in excess of the critical acceptance gap, albeit that left turning traffic out of Millbrook Road will cause some interference to northbound traffic on SH1 (not allowing this traffic to accelerate as quickly as it would otherwise after leaving the roundabout).

As The Braigh is further from the roundabout than Millbrook Road, the sight distance from The Braigh to the roundabout will also exceed the critical acceptance gap. However, to avoid interfering with through traffic on the major road, the critical acceptance gap for a right turn out of a minor road onto a major road is 14 to 40 seconds, and thus traffic turning right out of The Braigh will cause some interference to northbound traffic on SH1 (not allowing this traffic to accelerate as quickly as it would otherwise after leaving the roundabout).

Overall, no issues arise with the spacings proposed on SH1 between the southbound passing lane, the roundabout, and the intersections with Millbrook Road and The Braigh.

6. CONCLUSION

Overall, it is considered that the proposed access arrangements on SH1 at Waipu for the proposed service centre are consistent with Austroads standards.

TRAFFIC PLANNING CONSULTANTS LTD

Anatole Sergejew
Senior Associate

ATTACHMENT 3

Proposed Roundabout Road Safety Audit Report

Waipu Service Centre

Safe System Audit Report

Detailed Design Stage

9 September 2024

Contents

1. Safe System Auditing for Transport Projects

A Safe System audit is an independent review of a future transport project to identify any safety concerns that may affect the safety performance and alignment to a Safe System. The audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement.

A Safe System audit is therefore a formal examination of a transport project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc), carried out by an independent competent team who identify and document Safe System alignment and road safety concerns.

A Safe System audit is intended to help deliver a safe road system and is not a review of compliance with standards.

1.1. Safe System Audit Procedure

The primary objective of a Safe System audit is to deliver a project that achieves an outcome consistent with the Safe System approach, that is, minimisation of death and serious injury. The Safe System audit is a safety review used to identify all areas of a project that are inconsistent with a safe system and bring those concerns to the attention of the client in order that the client can make a value judgement as to appropriate action(s) based on the risk guidance provided by the safety audit team.

The key objective of a Safe System audit is summarised as:

> *To deliver completed projects that contribute towards a Safe System by identifying and ranking potential safety concerns for all road users and others affected by a transport project*.

A Safe System audit should be undertaken at project milestones such as:

- Concept Stage (part of Business Case);
- Scheme or Preliminary Design Stage (part of Pre-Implementation);
- Detailed Design Stage (Pre-implementation / Implementation); and
- Pre-Opening / Post-Construction Stage (Implementation / Post-Implementation).

A Safe System audit is not intended as a technical or financial audit and does not substitute for a design check on standards or guidelines.

Any recommended treatment of an identified safety concern is intended to be indicative only, and to focus the design team on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of improving the road safety or operational problems identified should also be considered.

In accordance with the procedures set down in the *"Waka Kotahi NZ Transport Agency Safe System Audit Guidelines"* the audit report should be submitted to the client who will instruct the design team to respond. The design team should consider the report and comment to the client on each of any concerns identified, including their cost implications where appropriate, and make a recommendation to either accept or reject the audit report recommendation.

For each audit team recommendation that is accepted, the client shall make the final decision and brief the design team to make the necessary changes and/or additions. As a result of this instruction the design team shall action the approved amendments. The client may involve a safety engineer to provide commentary to aid with the decision.

Decision tracking is an important part of the Safe System audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations to be completed by the design team, safety engineer and client for each issue documenting the design team's response, client decision and action taken.

A copy of the report including the design team's response to the client and the client's decision on each recommendation shall be given to the Safe System audit team leader as part of the important feedback loop. The Safe System audit team leader will disseminate this to team members.

1.2. Report Format

The potential road safety problems identified have been ranked as follows:-

The expected crash frequency is qualitatively assessed on the basis of expected exposure (how many road users will be exposed to a safety issue) and the likelihood of a crash resulting from the presence of the issue. The severity of a crash outcome is qualitatively assessed on the basis of factors such as expected speeds, type of collision, and type of vehicle involved.

Reference to historic crash rates or other research for similar elements of projects, or projects as a whole, have been drawn on where appropriate to assist in understanding the likely crash types, frequency and likely severity that may result from a particular concern.

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the Safety concern risk rating matrix below. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

		Severity outcome				
		Non-injury	**Minor**		**Serious**	**Fatal**
		Property damage only (PDO)	Injury which is not 'serious' but requires first aid, or which causes discomfort or pain to the person injured.	**Safe System injury threshold**	Injury (fracture, concussion, severe cuts or other injury) requiring medical treatment or removal to and retention in hospital.	A death occurring as the result of injuries sustained in a road crash within 30 days of the crash.
Probability of a crash	**Very likely**	Minor	Moderate		Serious	Serious
	Likely	Minor	Moderate		Serious	Serious
	Unlikely	Minor	Minor		Significant	Serious
	Very unlikely	Minor	Minor		Significant	Significant

Figure 1 Safety concern risk rating matrix

2. Safe System Audit Details

2.1. Type of Audit

The audit is part of the detailed design stage of works. The audit is for a new roundabout which provides access to a new Service Station on the corner of SH1 and Millbrook Road at 47 Millbrook Road, Waipu. The roundabout is located on SH1, south of the intersections with Millbrook Road and The Braigh.

2.2. Audit Team

The safe system safety audit was carried out by the Safety Audit Team (SAT):

- Leo Hills, Director, Commute Transportation Consultants Ltd
- Josh Brajkovic, Principal Transport Consultant, Commute Transportation Consultants Ltd

2.3. Meetings and Site Inspections

A site inspection of the existing road environment was undertaken by the SAT on Wednesday 4 September 2024.

3. Project Description

3.1. Project Background and Objective

The audit is for a new roundabout which provides access to a new Service Station on the corner of SH1 and Millbrook Road at 47 Millbrook Road, Waipu. The roundabout is located on SH1, south of the intersections with Millbrook Road and The Braigh.

The location of the site is shown in Figure 2 below. The proposed roundabout is shown in Figure 3 below.

Figure 2 Site Location

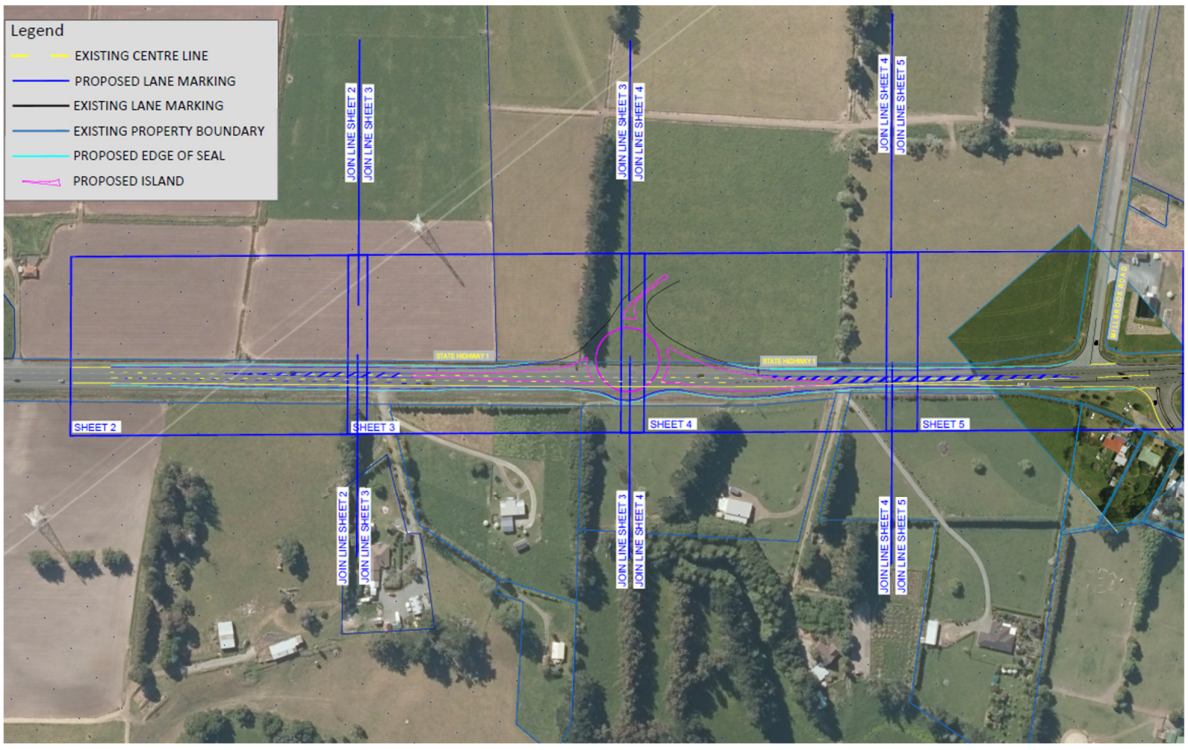

Figure 3 Proposed Roundabout

3.2. Existing Conditions and Context

This section of SH1 operates as a two-lane road with narrow sealed shoulders along both sides. The road has been widened at the intersections with Millbrook Road and The Braigh to form side-by-side opposing right turn pockets for traffic turning right into each side road.

Millbrook Road is a two-lane road with no shoulders or footpaths along either side, with a carriageway width of 8 metres.

The posted speed limit is 100km/h on SH1 and Millbrook Road, and 60km/h on The Braigh.

The existing SH1 intersection with Millbrook Road and The Braigh are shown in Photograph 1 below.

Photograph 1 SH1 intersection with Millbrook Road and The Braigh – Looking North

3.3. Safe Systems Matrix Assessment Scenarios

The three scenarios to be assessed are detailed below:

- **Scenario 1:** existing road layout with existing traffic;
- **Scenario 2:** existing road layout with year 2033 traffic flows; and
- **Scenario 3:** proposed road layout with year 2033 traffic flows.

The year 2033 traffic flows are detailed in the Integrated Transportation Assessment prepared by TPC, dated 1 August 2024.

3.4. Audit Scope

The safety audit scope includes the proposed SH1 roundabout, the adjacent SH1 intersections with The Braigh and Millbrook Road, and the two shared driveway connections to SH1.

The following drawings and documents were provided for audit:

- *Drawing: Waipu Bypass Service Centre DDK 21803 (1) – (18);*
- *Concept SH1 Access Design Report; and*
- *Integrated Transport Assessment (including Appendices A – H).*

The drawings are provided in Appendix A of this audit report.

4. Assessment of Safe System Alignment

4.1. Safe System Assessment Summary

The Safe System Assessment Matrix scores for the three assessment scenarios are shown in Figure 4. The detailed assessments are presented in Section 4.2.

Table 1 Safe System assessment score summary table

Option	Score
Scenario 1	110 / 448
Scenario 2	152 / 448
Scenario 3	116 / 448

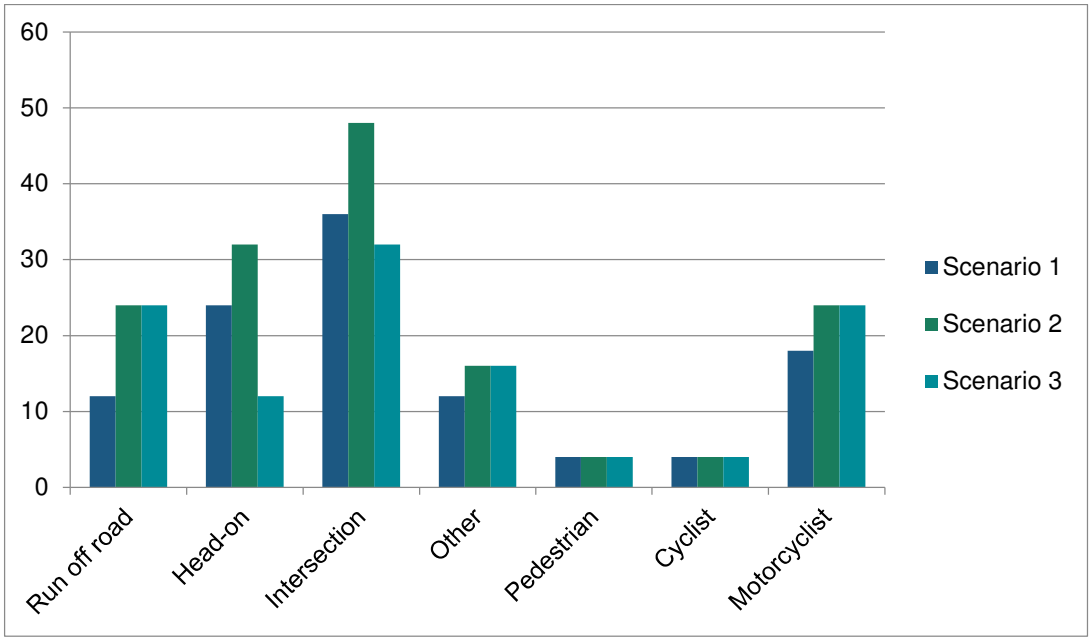

Figure 4 Safe System assessment score summary table

4.2. Safe System Assessment Matrix

Scenario 1 - existing road layout with existing traffic

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	High AADT (State Highway)	High AADT (State Highway)	High AADT (State Highway)	High AADT (State Highway)	Low pedestrian volumes	Low cycle volumes	High AADT (State Highway)
Exposure Score:	3/4	3/4	3/4	3/4	1/4	1/4	3/4
Likelihood Comments:	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • Straight and flat alignments • Shoulders	Factors that increase the likelihood include: • No median barriers Factors that decrease the likelihood include: • Straight and flat alignments	Factors that increase the likelihood include: • Offset priority intersections Factors that decrease the likelihood include: • Straight and flat alignments	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • N/A	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • N/A	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • N/A	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • Straight and flat alignments • Shoulders
Likelihood Score:	2/4	2/4	3/4	2/4	1/4	1/4	2/4
Severity Comments:	Factors that increase the severity include: • High speed Factors that decrease the severity include: • N/A	Factors that increase the severity include: • High speed Factors that decrease the severity include: • N/A	Factors that increase the severity include: • High speed Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A
Severity Score:	3/4	4/4	4/4	2/4	4/4	4/4	3/4
Product (multiply scores above for crash type)	**12/64**	**24/64**	**36/64**	**12/64**	**4/64**	**4/64**	**18/64**
						TOTAL	**110/448**

Scenario 2 - existing road layout with year 2033 traffic flows

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	High AADT (State Highway)	High AADT (State Highway)	High AADT (State Highway)	High AADT (State Highway)	Low pedestrian volumes	Low cycle volumes	High AADT (State Highway)
Exposure Score:	4/4	4/4	4/4	4/4	1/4	1/4	4/4
Likelihood Comments:	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • Straight and flat alignments • Shoulders	Factors that increase the likelihood include: • No median barriers Factors that decrease the likelihood include: • Straight and flat alignments	Factors that increase the likelihood include: • Offset priority intersections Factors that decrease the likelihood include: • Straight and flat alignments	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: N/A	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • N/A	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • N/A	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • Straight and flat alignments Shoulders
Likelihood Score:	2/4	2/4	3/4	2/4	1/4	1/4	2/4
Severity Comments:	Factors that increase the severity include: • High speed Factors that decrease the severity include: • N/A	Factors that increase the severity include: • High speed Factors that decrease the severity include: • N/A	Factors that increase the severity include: • High speed Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A
Severity Score:	3/4	4/4	4/4	2/4	4/4	4/4	3/4
Product **(multiply scores above for crash type)**	**24/64**	**32/64**	**48/64**	**16/64**	**4/64**	**4/64**	**24/64**
						TOTAL	**152/448**

Scenario 3 - proposed road layout with year 2033 traffic flows

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	High AADT (State Highway)	High AADT (State Highway)	High AADT (State Highway)	High AADT (State Highway)	Low pedestrian volumes	Low cycle volumes	High AADT (State Highway)
Exposure Score:	4/4	4/4	4/4	4/4	1/4	1/4	4/4
Likelihood Comments:	Factors that increase the likelihood include: • Curved alignment Factors that decrease the likelihood include: • Shoulders	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • Roundabout	Factors that increase the likelihood include: • Offset priority intersections • Roundabout increases conflicts Factors that decrease the likelihood include: • N/A	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: N/A	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • N/A	Factors that increase the likelihood include: • N/A Factors that decrease the likelihood include: • N/A	Factors that increase the likelihood include: • Offset priority intersections • Roundabout increases conflicts Factors that decrease the likelihood include: • N/A
Likelihood Score:	3/4	1/4	4/4	2/4	1/4	1/4	3/4
Severity Comments:	Factors that increase the severity include: • N/A Factors that decrease the severity include: • Roundabout reduces speed	Factors that increase the severity include: • N/A Factors that decrease the severity include: • Roundabout reduces speed	Factors that increase the severity include: • N/A Factors that decrease the severity include: • Roundabout reduces speed	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • N/A	Factors that increase the severity include: • N/A Factors that decrease the severity include: • Roundabout reduces speed
Severity Score:	2/4	3/4	2/4	2/4	4/4	4/4	2/4
Product **(multiply scores above for crash type)**	**24/64**	**12/64**	**32/64**	**16/64**	**4/64**	**4/64**	**24/64**
						TOTAL	**116/448**

5. Safety Concerns

5.1. Southern shared driveway location **Significant**

The shared driveway for 3817, 3819 and 3821 SH1 is located where the southbound passing lane begins, and where the roundabout splitter island begins. The audit team is concerned that an overtaking vehicle may be shielded from view by a second vehicle in the curbside line. An exiting vehicle from the shared driveway may not see the overtaking vehicle, which could lead to a conflict.

A right turning vehicle from the shared driveway onto SH1 also has potential to conflict with the splitter island, particularly at night. The splitter island should be appropriately signed to ensure vehicles are aware of its presence.

The audit team recommends investigating whether the overtaking lane can commence further south of the shared driveway. It is noted that the proposed passing lane is already below the recommended width, and therefore this also needs to be considered as part of the shared driveway design.

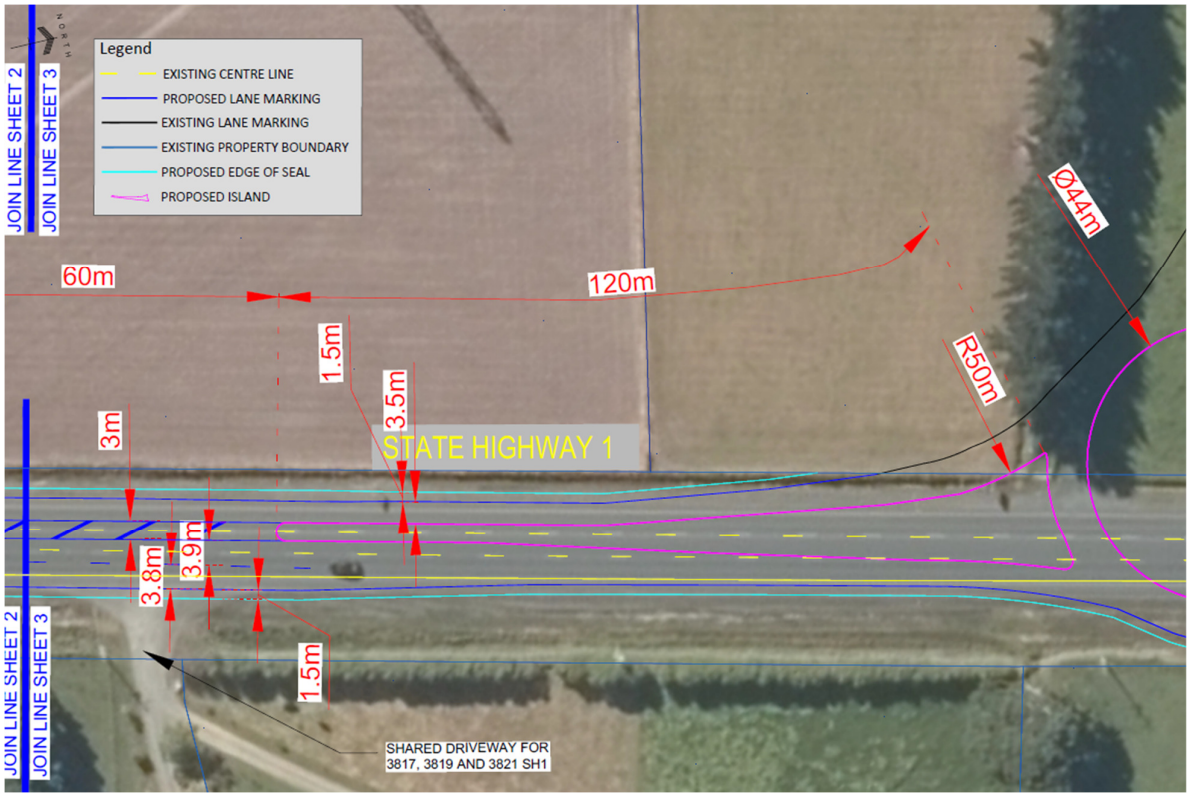

Figure 5 Southern Shared Driveway Location:

Recommendation:

- The designer should investigate whether the overtaking lane can commence further south of the shared driveway.
- The designer should ensure splitter islands are correctly signed.

Probability Rating:	***Severity Outcome Rating:***
Crashes are likely to be **Unlikely**	*Death or serious injury is* **Serious**
Design Team Response: *Agree with audit recommendations. Beginning the passing lane a further 50m south would still leave 830m of passing lane, which is still well in excess of the 650m desirable length of passing lane for a 80km/h operating speed.*	
Safety Engineer: Click here to enter text.	
Client Decision: Click here to enter text.	
Action Taken: Click here to enter text.	

5.2. Criterion 2 sight distance **Significant**

The audit team notes that Criterion 2 is required for a driver entering a roundabout having adequate sight distance to two potentially conflicting movements within the roundabout, namely a vehicle entering from the approach immediately to the right and a vehicle travelling on the circulating roadway.

According to the Austroads Guide, the Criterion 2 sight distance should be 84m for a vehicle entering from the approach immediately to the right for an arterial roundabout with a 60km/h 85th percentile speed. The Criterion 2 sight distance for a vehicle on the circulating roadway should be calculated based on the speed a vehicle can realistically circulate.

With the above in mind, the audit team has the following comments on the Criterion 2 drawings provided for the subject roundabout:

- Drawing DDK 21803 - (14)
    - Shows an 84m sight distance for the opposing approach. This is not considered to be required, as this approach is not *immediately* to the right. The audit team considers that a driver approaching the roundabout should not be focused on this opposing approach before making a decision.
    - Shows an 84m sight distance to a circulating vehicle. The audit team suggests this sight distance should be calculated based on the 85th percentile circulating speed, which will likely be less than 60km/h.

- Drawing DDK 21803 - (15)
    - Shows an 84m sight distance for the approach immediately to the right. This is considered appropriate.
    - Shows an 84m sight distance to a circulating vehicle. The audit team suggests this sight distance should be calculated based on the 85th percentile circulating speed, which will likely be less than 60km/h.

- Drawing DDK 21803 - (16)
    - Shows an 84m sight distance for the approach immediately to the right. This is considered appropriate.
    - Shows an 84m sight distance to a circulating vehicle. The audit team suggests this sight distance should be calculated based on the 85th percentile circulating speed, which will be less than 60km/h.

The audit team suggests the designer should calculate the likely 85th percentile speed for a circulating vehicle, and then reassess the Criterion 2 sight distance. The audit team considers that a driver approaching a roundabout should be focused on the vehicle immediately to the right approaching or circulating, rather than a vehicle on the opposite side of the roundabout. This aligns with the Austroads Guide to roundabout design.

Following the reassessment as described above, the designer should ensure that the Criterion 2 visibility triangles are not obstructed by signage, planting, or the vertical geometry of the central island. Any shortfalls in visibility could lead to conflicts.

Recommendation:

The designer should reassess the Criterion 2 visibility as described above. The designer should ensure that this visibility is not obstructed by signage, planting, or the vertical geometry of the central island.

Probability Rating:	***Severity Outcome Rating:***
Crashes are likely to be **Unlikely**	*Death or serious injury is* **Serious**
Design Team Response: *We agree that with a lower speed for the circulating lane, the criterion 2 sightline can be less onerous, and therefore the central area could be planted and/or landscaped. Such landscaping would mean that drivers can be focussed on the roadway immediately to the right and the circulating lane, rather than across the roundabout at other vehicles. We understand that both American and NZ research papers on roundabout sight distance indicate that providing more than the minimum required intersection sight distance can lead to higher speeds that reduce intersection safety. Landscaping on the central island based on a reduced criterion 2 sightline can be further developed in discussion with NZTA for the detailed design.*	
Safety Engineer: Click here to enter text.	
Client Decision: Click here to enter text.	
Action Taken: Click here to enter text.	

5.3. Northern shared driveway location **Significant**

The shared driveway for 3781, 3783 AND 3785 SH1 has been designed to allow a merge area adjacent to the splitter island for right turning vehicles into the driveway.

The audit team recommend vehicle tacking of this right turn into the shared driveway is shown, to understand how the vehicle will merge into the right turn area, how a second vehicle will pass, and on what angle the right turning vehicle will be on before turning into the driveway. The audit team is again concerned that northbound vehicle may be shielded from view by a vehicle merging into the right turn area. An exiting vehicle from the shared driveway may not see the northbound vehicle, which could lead to a conflict.

The audit team also recommends visibility of right turning out vehicles to northbound vehicles is considered, when signage is being installed on the splitter islands. These signs need to be located so a full view of northbound traffic is available.

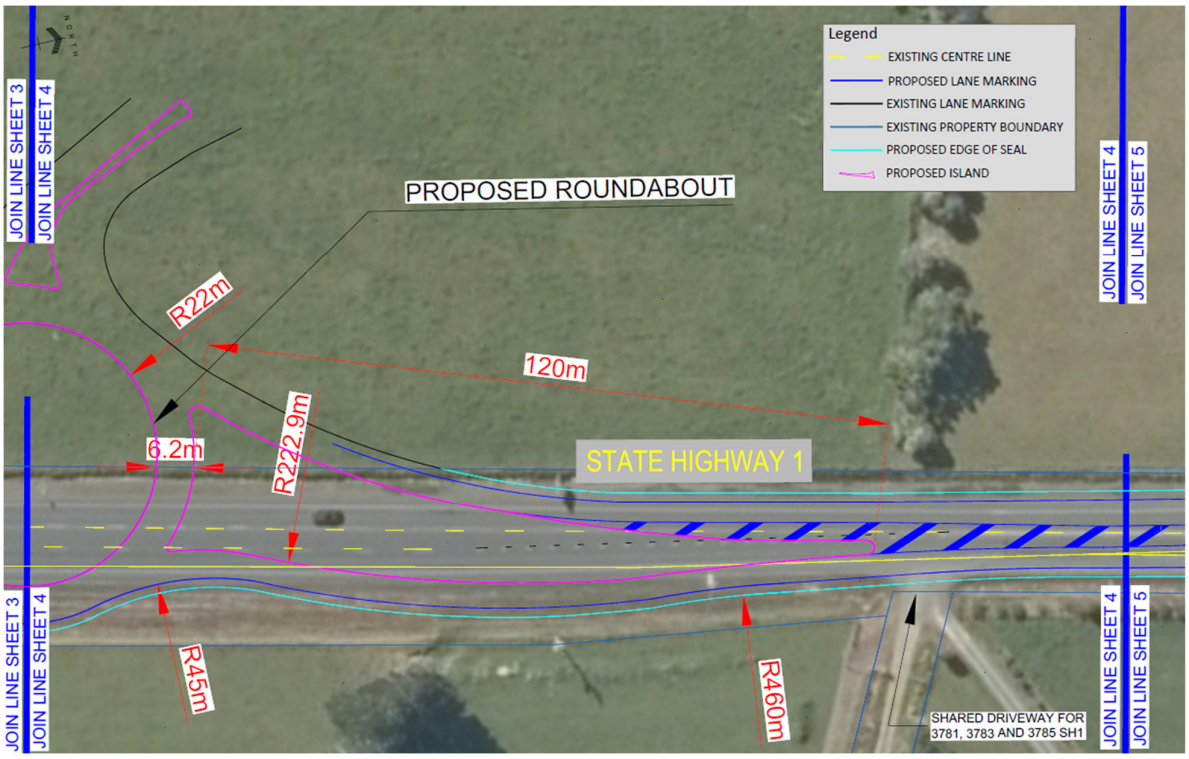

Figure 6 Northern Shared Driveway Location

Recommendation:

- The designer should show vehicle tracking into the northern shared driveway.
- The designer should ensure visibility to northbound vehicles is maintained for right turning vehicles out of the northern shared driveway.

Probability Rating:	***Severity Outcome Rating:***
Crashes are likely to be **Unlikely**	*Death or serious injury is* **Serious**
Design Team Response: *Agree – this can be incorporated in the detailed design.*	
Safety Engineer: Click here to enter text.	
Client Decision: Click here to enter text.	
Action Taken: Click here to enter text.	

5.4. Signs and markings **Minor**

The audit team note that detailed signage and markings plans have not been provided. As part of detailed design, these need to be reviewed to ensure they do not pose any additional safety issues, and to enable designers to include any additional signage that may improve safety.

Recommendation:

Ensure signage and markings plans are reviewed as part of detailed design.

Probability Rating:	***Severity Outcome Rating:***
Crashes are likely to be **Unlikely**	*Death or serious injury is* **Minor**
Design Team Response: *Agree.*	
Safety Engineer: Click here to enter text.	
Client Decision: Click here to enter text.	
Action Taken: Click here to enter text.	

5.5. Lack of pedestrian and cycle facilities **Minor**

The audit team notes that no pedestrian and cycle facilities are provided at the roundabout. It is noted that no existing pedestrian or cycling infrastructure exists in the area and therefore none is considered to be required.

The audit team recommends that any future plans for the area are reviewed, to understand if any future active mode infrastructure is proposed, as it will be difficult to retrofit the roundabout if required. A pedestrian / cycle crossing across the site access in particular should be investigated.

Recommendation:

Consideration of future pedestrian and cycling infrastructure in roundabout design.

Probability Rating:	***Severity Outcome Rating:***
Crashes are likely to be **Unlikely**	*Death or serious injury is* **Minor**
Design Team Response: *This can be considered in conjunction with NZTA in the detailed design.*	
Safety Engineer: Click here to enter text.	
Client Decision: Click here to enter text.	
Action Taken: Click here to enter text.	

5.6. Lighting provision **Minor**

It is unclear whether, or how the roundabout will be lit. The concern is road users may not be provided with sufficient visibility at night or in low visibility conditions. This therefore will increase potential for intersection and run off road crashes.

Recommendation:

Review proposed lighting provisions, and/or provide lighting plans for review.

Probability Rating:	***Severity Outcome Rating:***
Crashes are likely to be **Unlikely**	*Death or serious injury is* **Minor**
Design Team Response: *It is intended that the roundabout and approach islands will be lit as per NZTA requirements, and that lighting plans will be included with the detailed design drawings.*	
Safety Engineer: Click here to enter text.	
Client Decision: Click here to enter text.	
Action Taken: Click here to enter text.	

5.7. Comment – Vehicle tracking

The audit team note that no legend has been provided along with the vehicle tracking plans. It can be assumed that the outermost line is a clearance envelope, however this should be confirmed. If this line is the vehicle body, then sufficient clearance may not be provided to kerbs and islands.

Design Team Response: *The outermost line is indeed a clearance envelope. A legend explaining what each tracking line represents will be included in the detailed design drawings.*	
Safety Engineer:	Click here to enter text.
Client Decision:	Click here to enter text.
Action Taken:	Click here to enter text.

6. Conclusions

The audit is part of the detailed design stage of works. The audit is for a new roundabout which provides access to a new Service Station on the corner of SH1 and Millbrook Road at 47 Millbrook Road, Waipu. The roundabout is located on SH1, south of the intersections with Millbrook Road and The Braigh.

The recommendations as detailed in Section 5 above should be considered by the design team in order to improve the safety of the proposal.

7. Safe System Audit Statement

We certify that we have used the available plans, and have examined the specified roads and streets to assess the Safe System alignment and identified any safety concerns that could be changed, removed or modified in order to improve road safety outcomes. The safety concerns identified have been noted in this report.

Signed: …….. Date: 9 September 2024

Leo Hills, BE, ME, CMEngNZ, CPEng, IntPE
Director, Commute

Signed: …… Date: 9 September 2024
Josh Brajkovic, BE, CMEngNZ, CPEng, IntPE, Safe Systems Auditor
Principal Transport Consultant, Commute

Design Team:	*Name……*	*Position……..*
	Signature…….	*Date……*
Safety Engineer:	*Name……*	*Position……..*
	Signature…….	*Date……*
Project Manager:	*Name……*	*Position……..*
	Signature…….	*Date……*
Action Completed:	*Name……*	*Position……..*
	Signature…….	*Date……*

Project Manager to distribute audit report incorporating decision to design team, Safety Audit Team Leader, Safety Engineer and project file.

Date: ……