

# ATTACHMENT 1

## CONCEPT INTERSECTION DESIGNS



LEGEND	
	NEW ROADMARKING
	EXISTING ROADMARKING
	NEW EDGE OF SEAL
	ISLAND

Rev	Revisions	By	Date

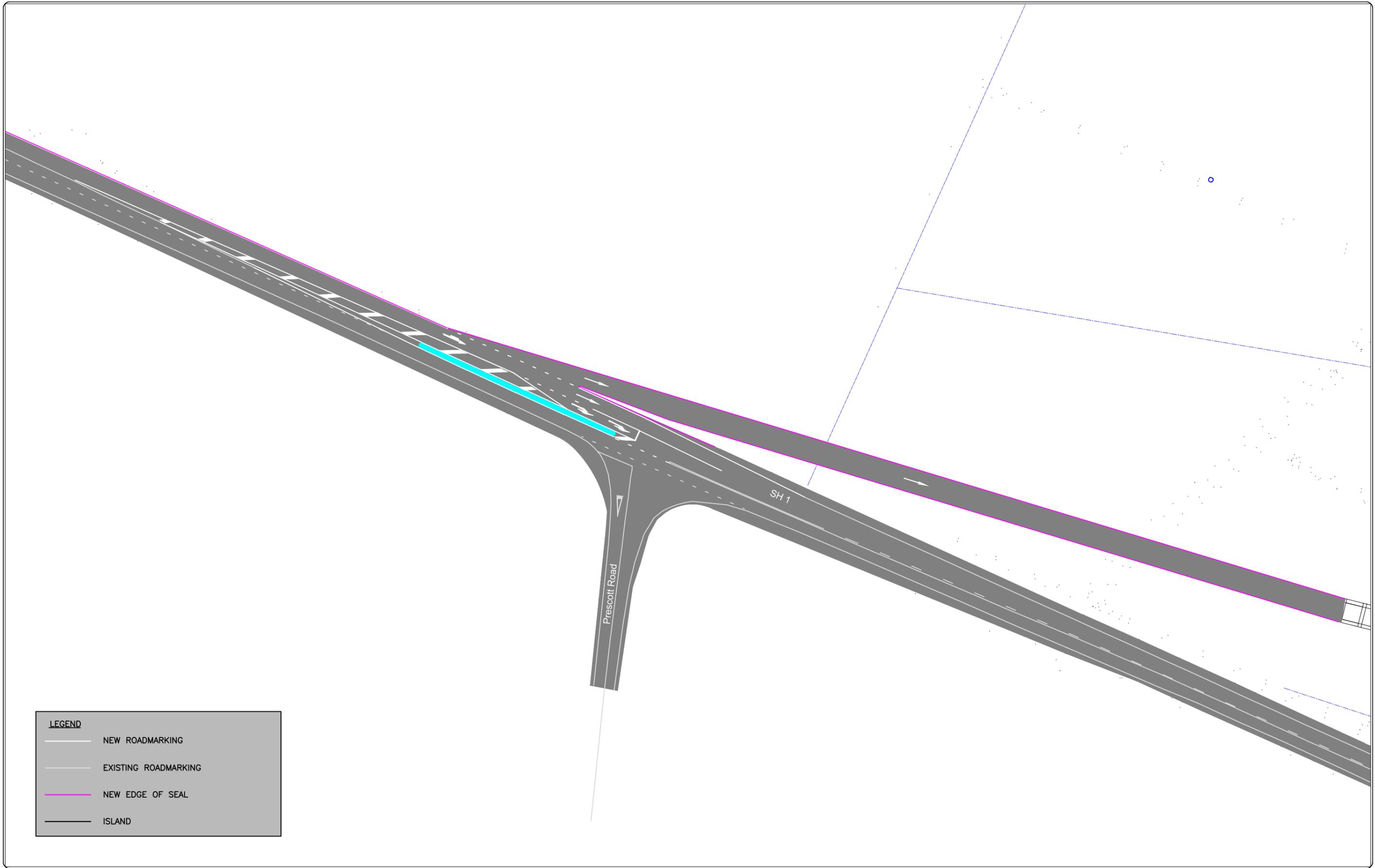
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Project Title  
 Ruakaka Service Centre

Sheet Title  
 Overall Plan

Designed	P Kelly	Drawn	A Zhong	Project No - (Sheet No)	Scales	1:1000 (A3)
Checked	P Kelly	Approved	T Langwell	17101 - G - (7)	Date	27.08.19

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**LEGEND**

	NEW ROADMARKING
	EXISTING ROADMARKING
	NEW EDGE OF SEAL
	ISLAND

Rev	Revisions	By	Date

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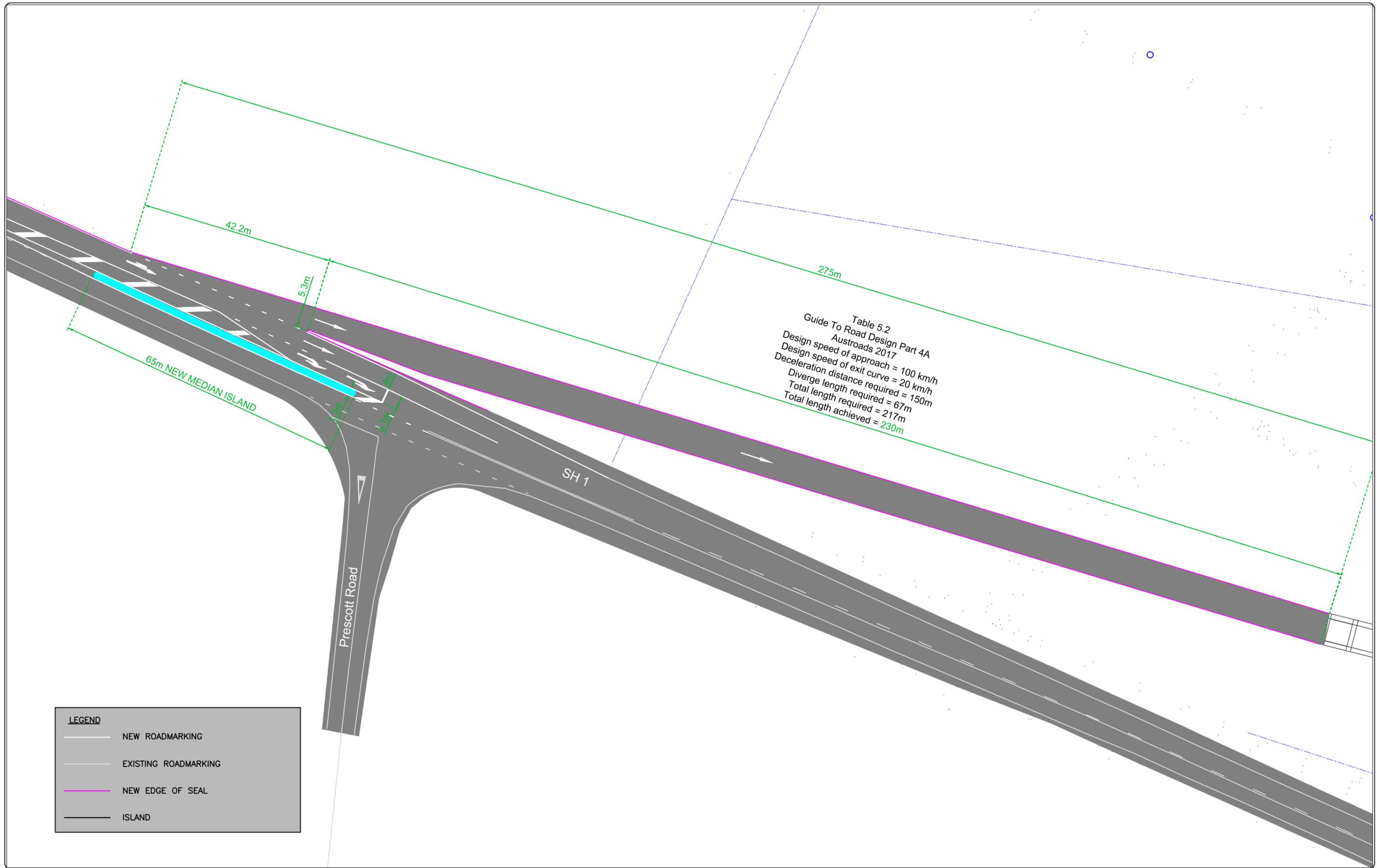
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Project Title  
 Ruakaka Service Centre

Sheet Title  
 Overall Plan

Designed	P Kelly	Drawn	A Zhong	Project No - (Sheet No)	Scales	1:1000 (A3)
Checked	P Kelly	Approved	T Langwell	17101 - G - (8)	Date	27.08.19

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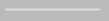
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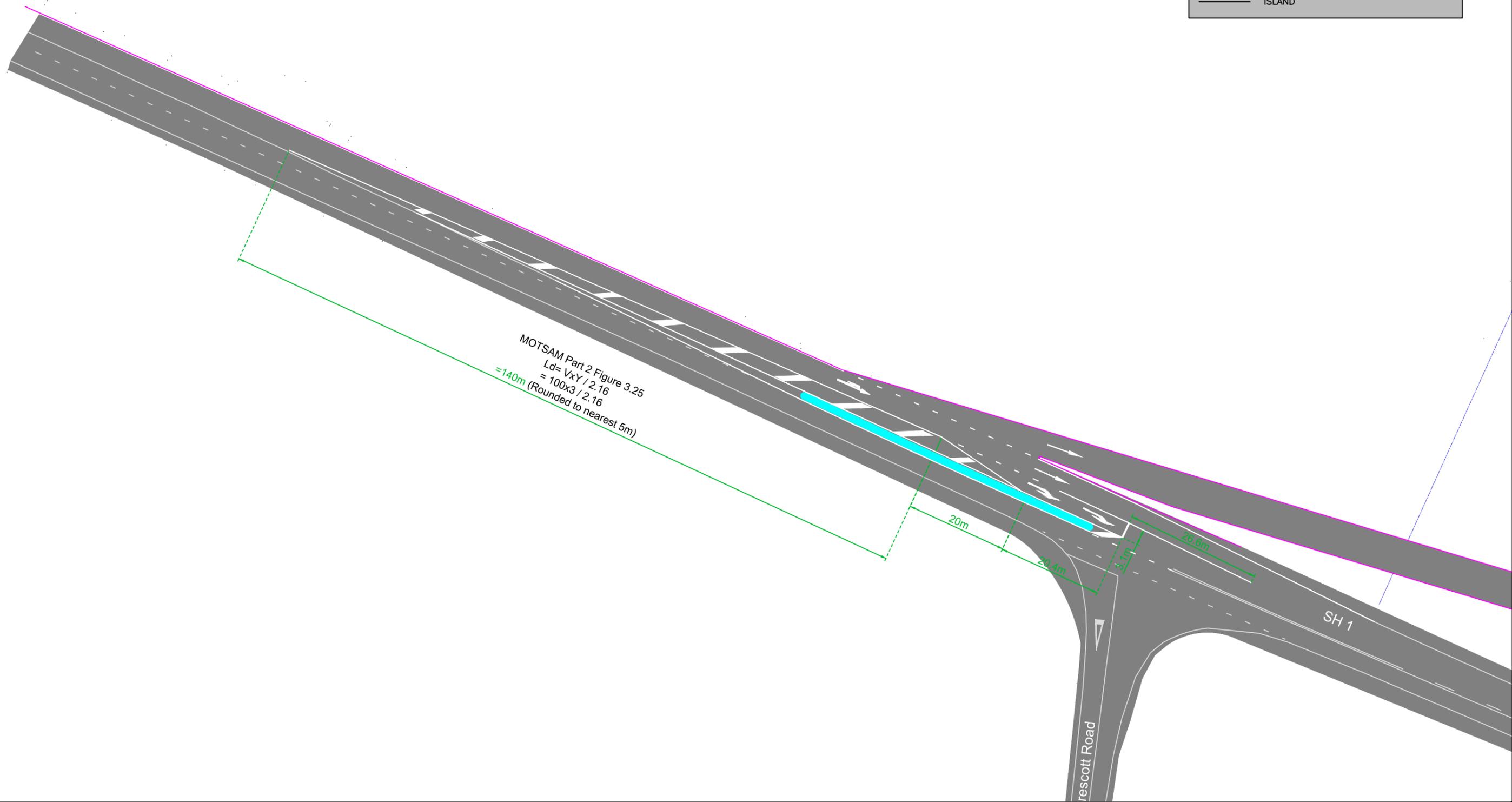
Project Title  
 Ruakaka Service Centre

Sheet Title  
 Dimension Plan

Designed	P Kelly	Drawn	A Zhong	Project No - (Sheet No)	Scales	1:750 (A3)
Checked	P Kelly	Approved	T Langwell	17101 - G - (9)	Date	27.08.19

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	EXISTING ROADMARKING
	NEW EDGE OF SEAL
	ISLAND



Rev	Revisions	By	Date

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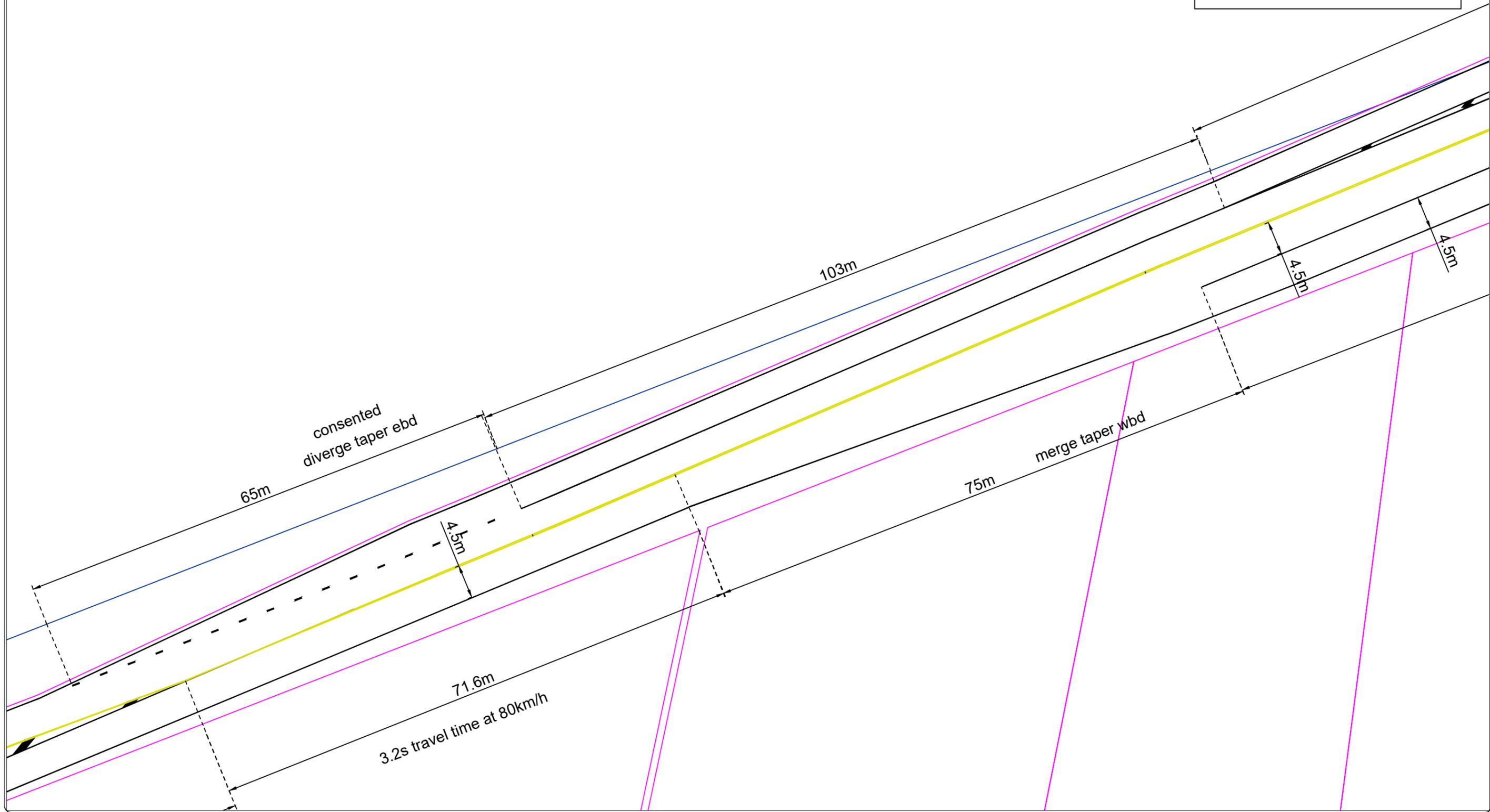
Project Title  
 Ruakaka Service Centre

Sheet Title  
 Dimension Plan

Designed	P Kelly	Drawn	A Zhong	Project No - (Sheet No)	Scales	1:750 (A3)
Checked	P Kelly	Approved	T Langwell	17101 - G - (10)	Date	27.08.19
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**LEGEND**

- NEW ROADMARKING
- NEW EDGE OF SEAL
- NEW ISLAND



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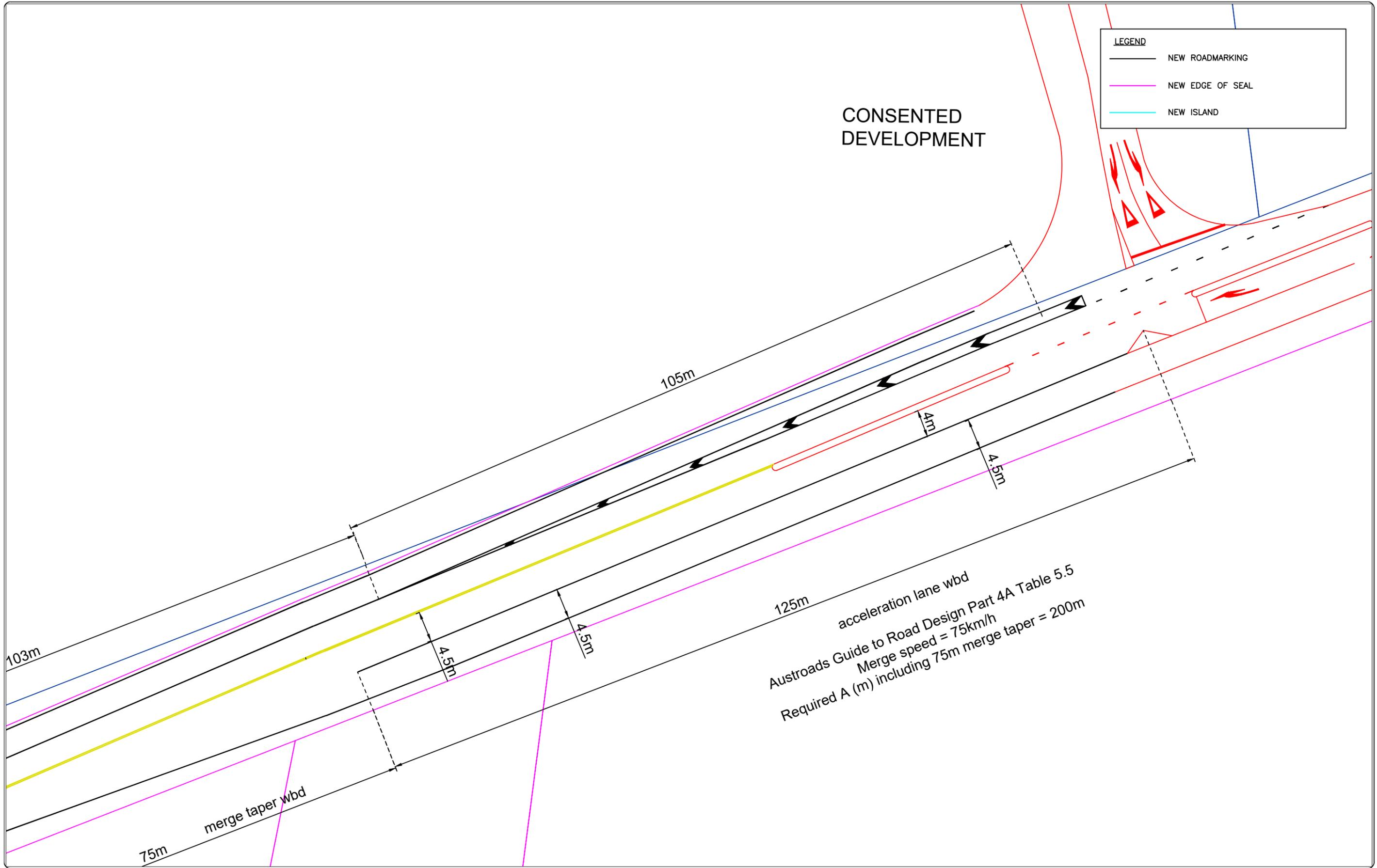
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Project Title  
 Ruakaka Service Centre

Sheet Title  
 Overall Plan

Designed AS	Drawn PJ	Project No - (Sheet No)	Scales 1:500 (A3)
Checked AS	Approved TL	17101 - G2 - (14)	Date 03.02.21

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Project Title  
 Ruakaka Service Centre

Sheet Title  
 Overall Plan

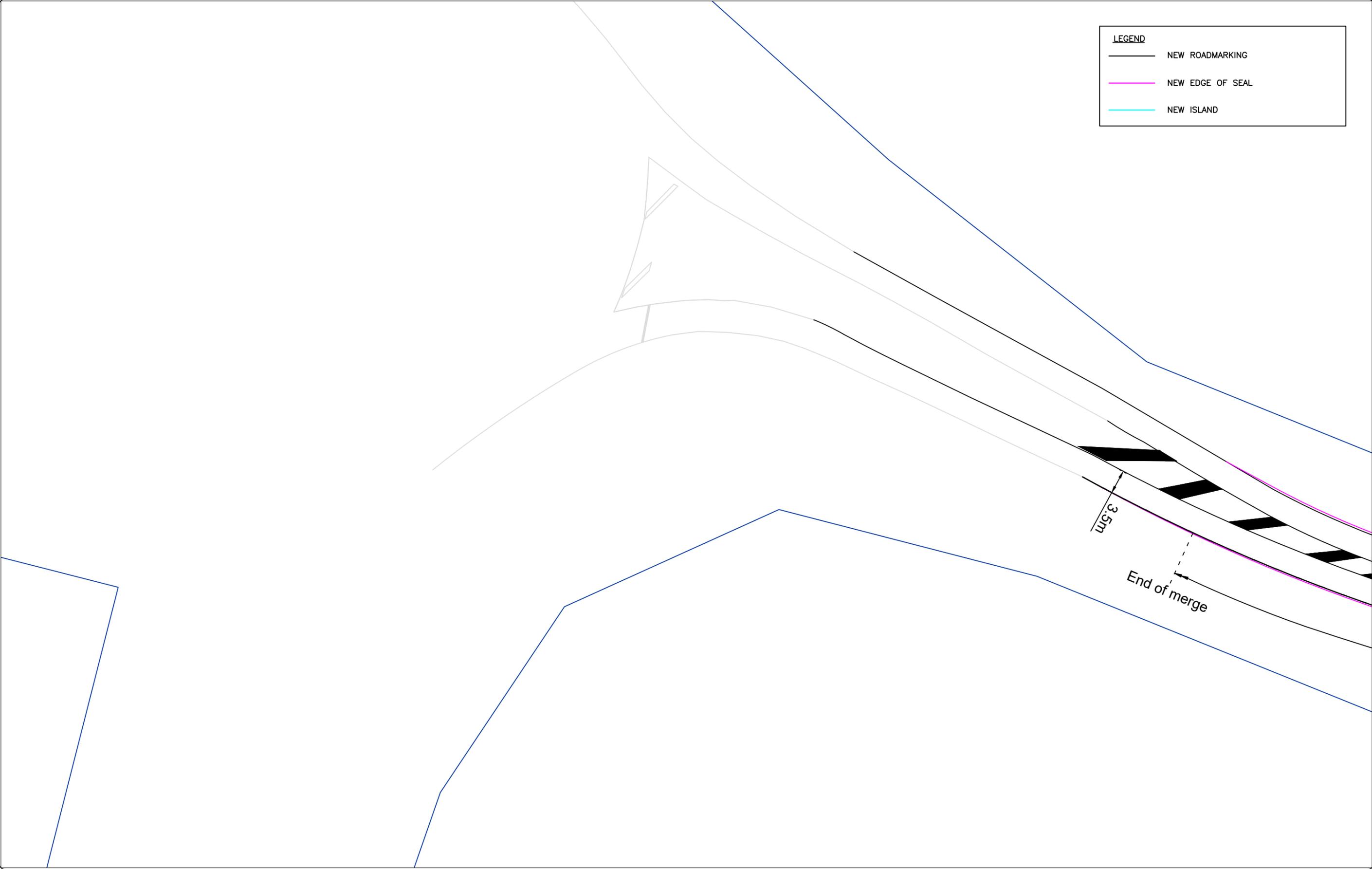
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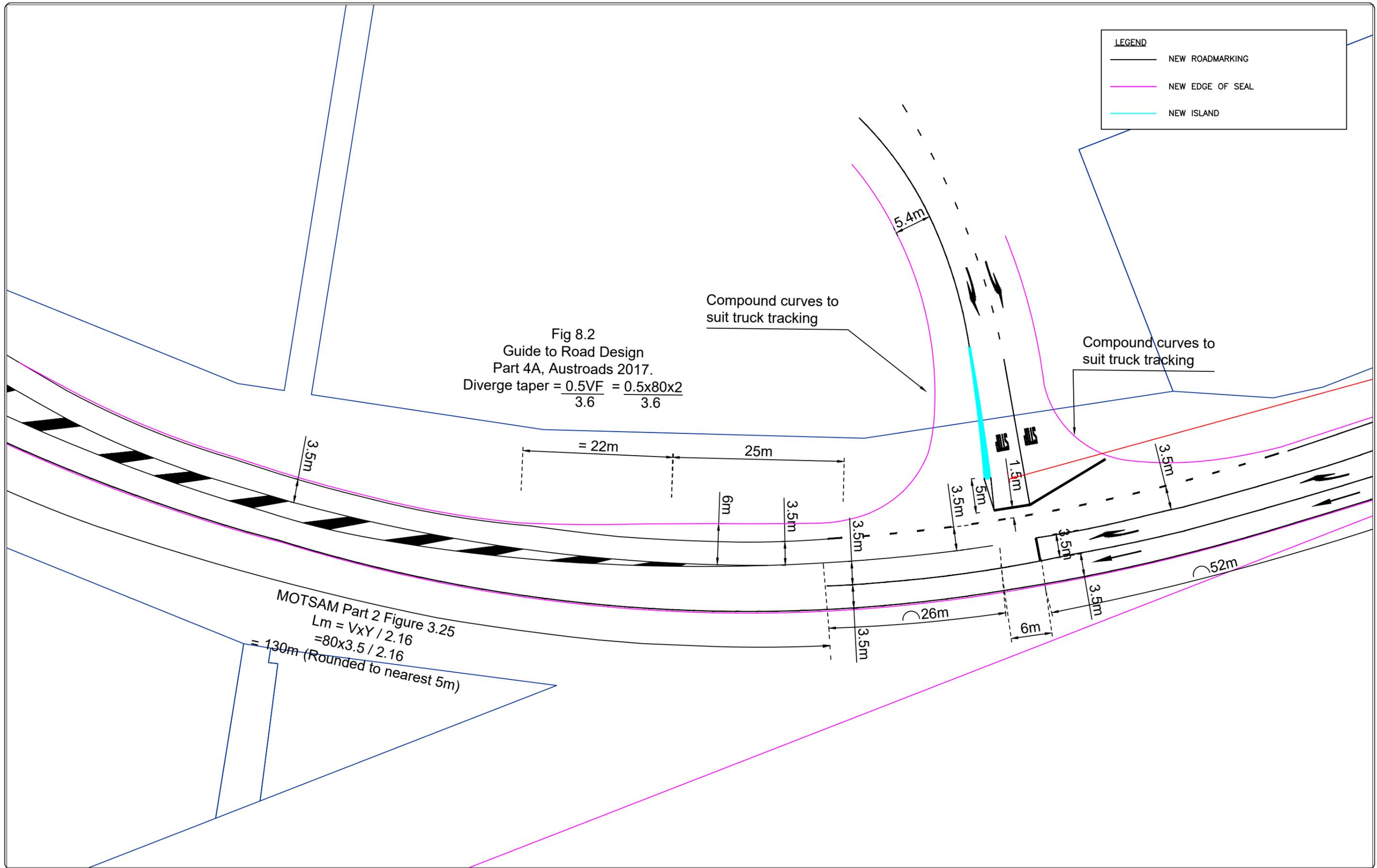
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Project Title  
**Ruakaka Service Centre**

Sheet Title  
**Access Option 1**

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:500 (A3)
Checked AS	Approved TL	17101 - G2-2 - (1)	Date 04.05.21

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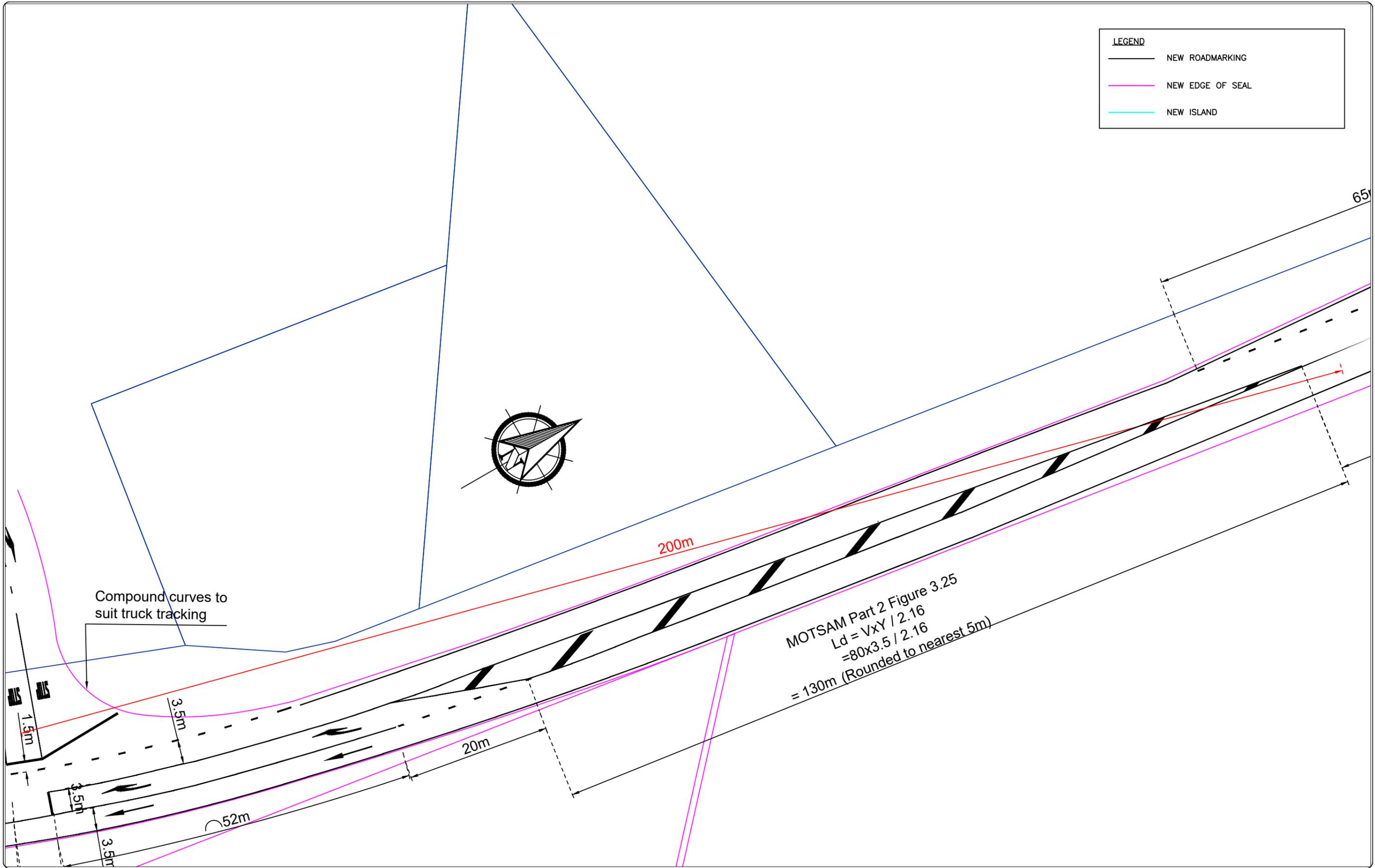
Project Title  
Ruakaka Service Centre

Sheet Title  
Access Option 1

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:500 (A3)
Checked AS	Approved TL	17101 - G2-2 - (2)	Date 04.05.21

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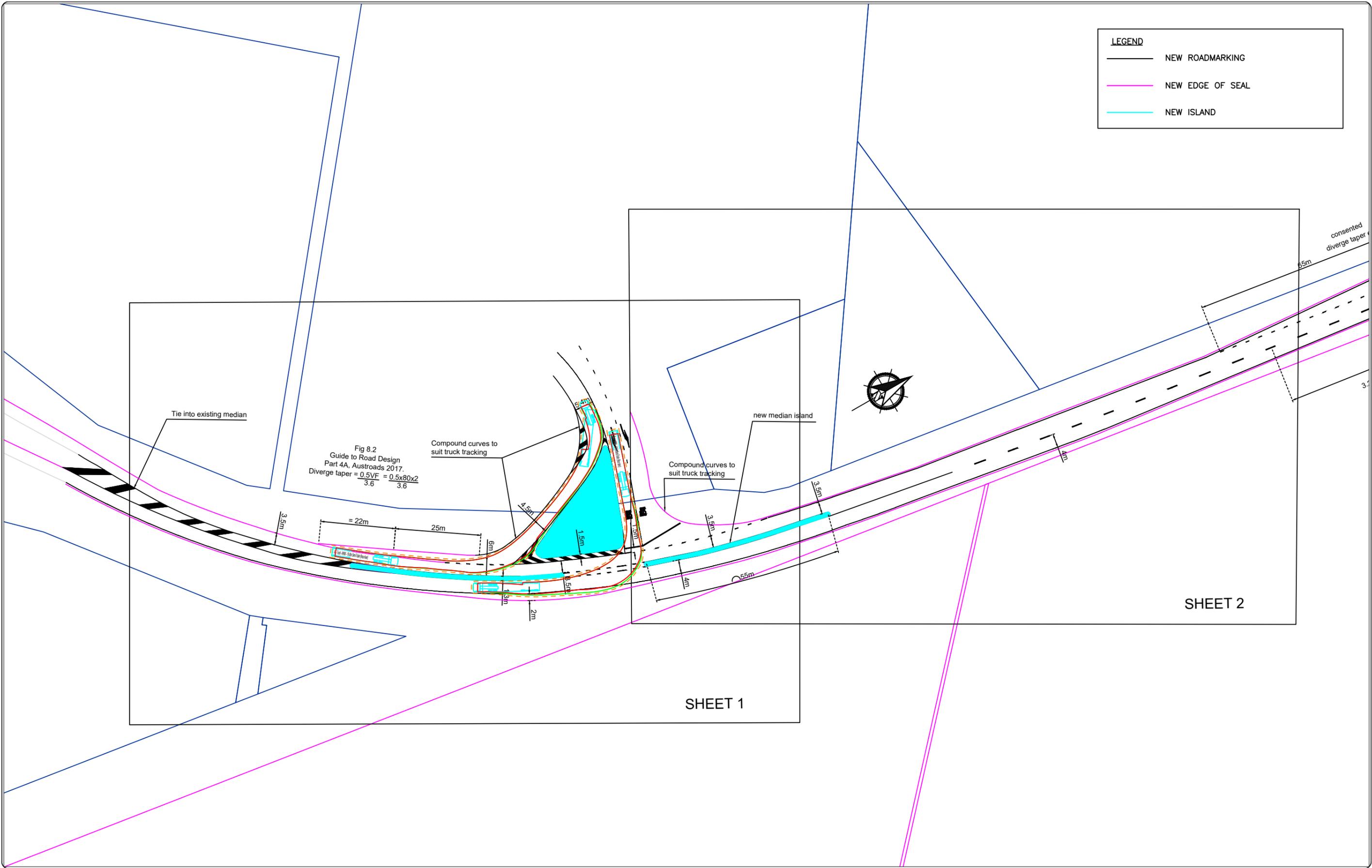
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Project Title	Ruakaka Service Centre
Sheet Title	Access Option 1

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:500 (A3)
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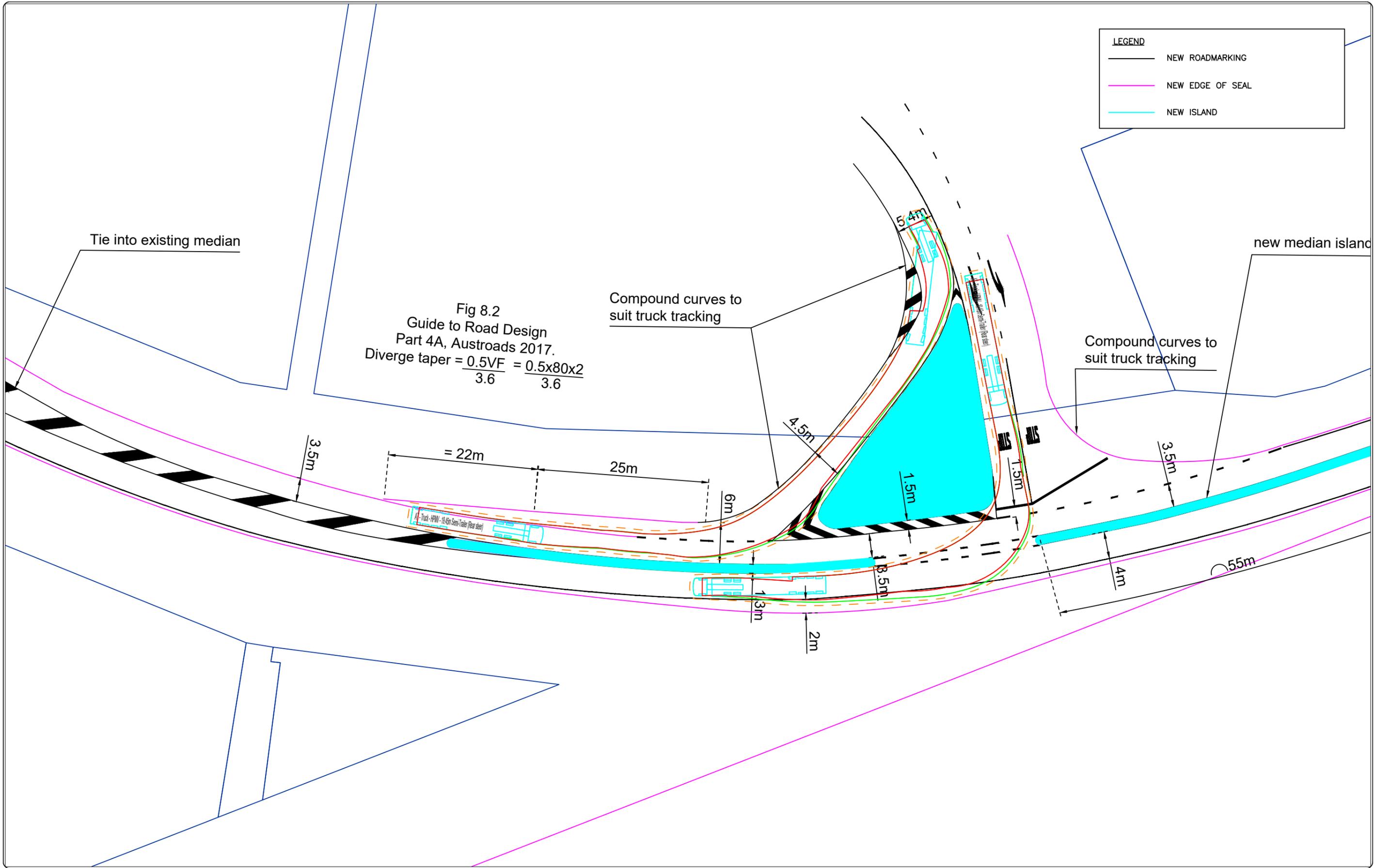


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Project Title	Ruakaka Service Centre
Sheet Title	Access Option 2

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:1000 (A3)
Checked AS	Approved TL	17101 - G2-4 - (0)	Date 04.05.21
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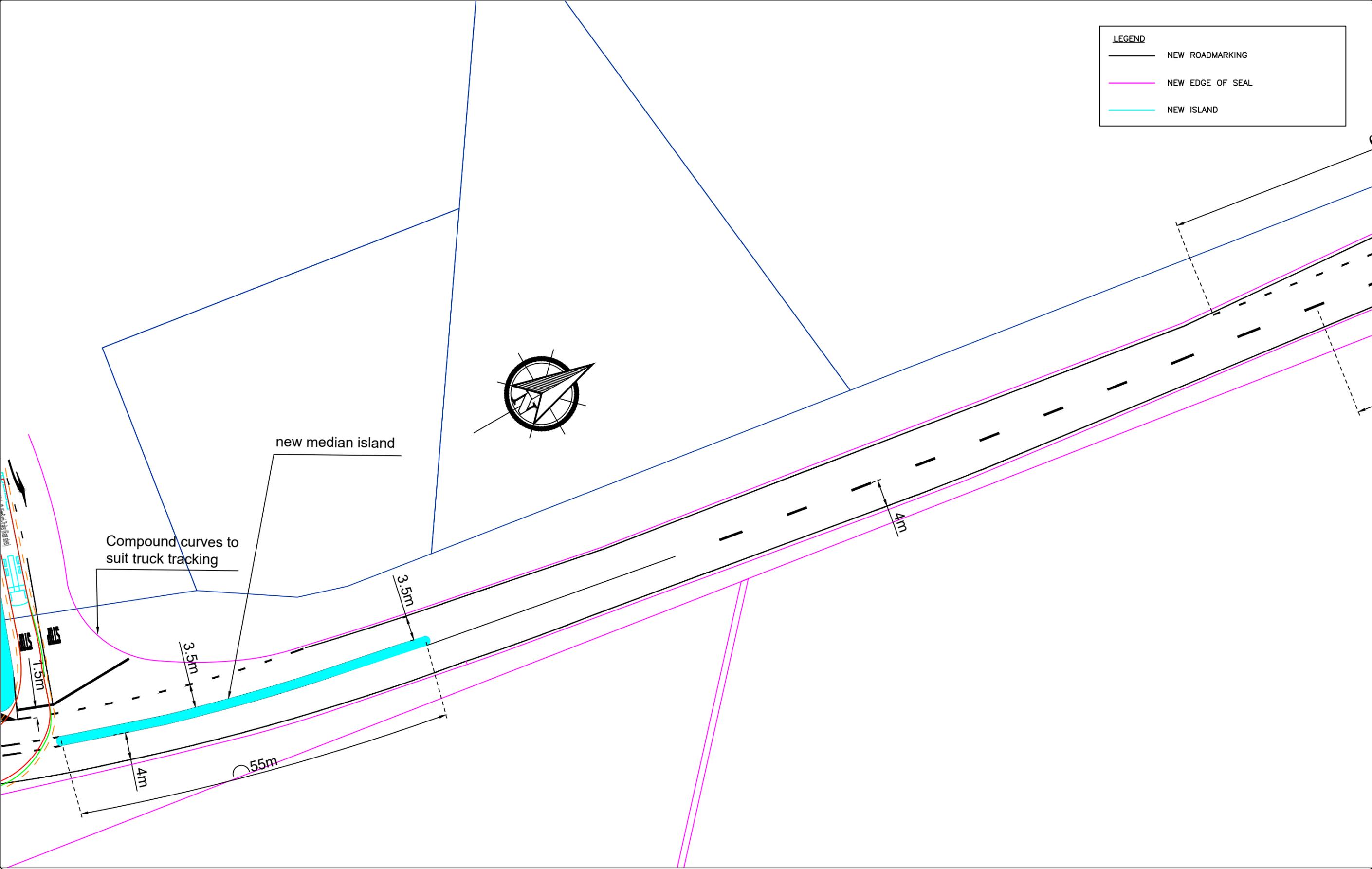
Project Title  
 Ruakaka Service Centre

Sheet Title  
 Access Option 2

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:500 (A3)
Checked AS	Approved TL	17101 - G2-4 - (1)	Date 04.05.21

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Project Title  
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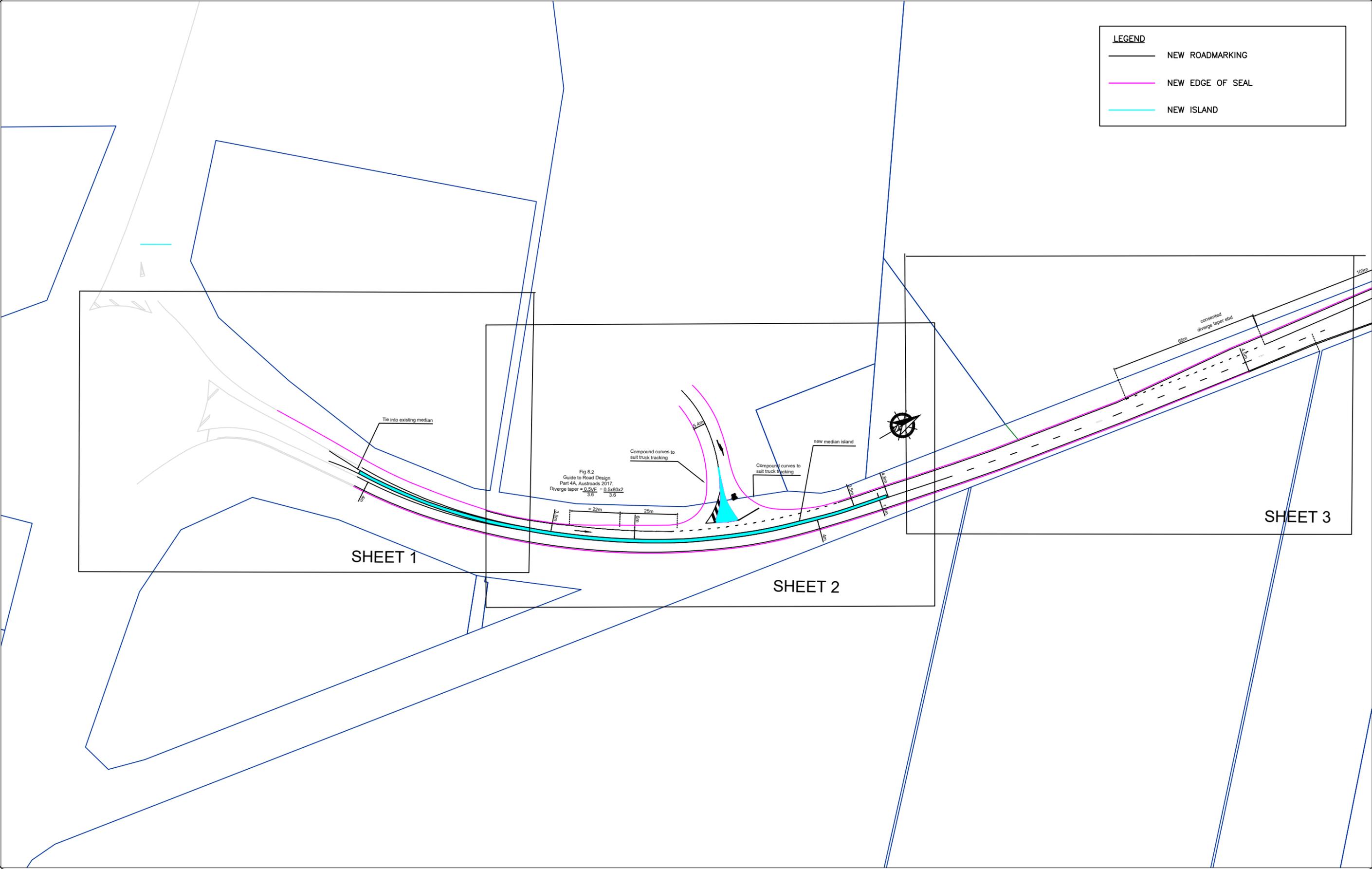
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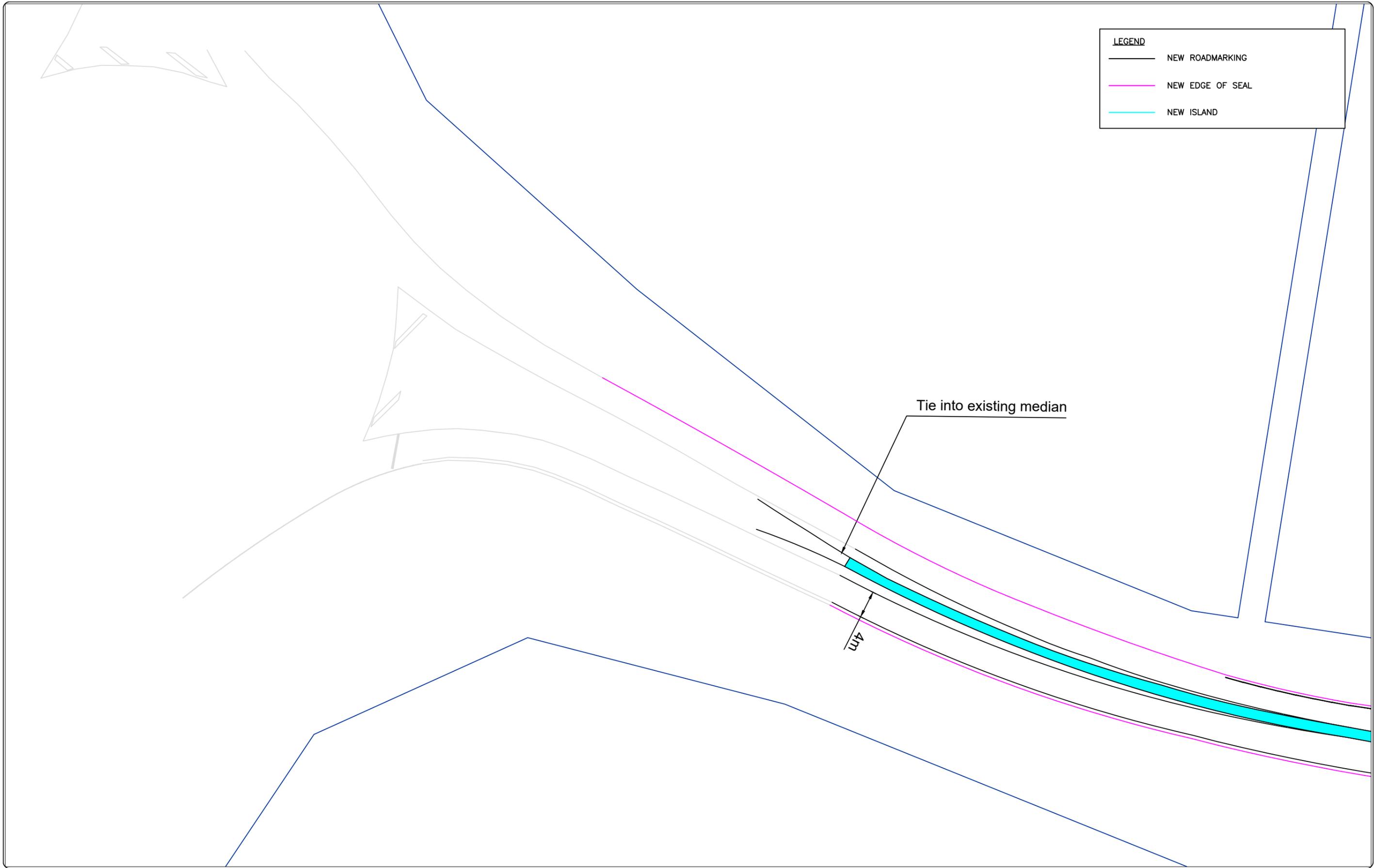
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Project Title  
**Ruakaka Service Centre**

Sheet Title  
**Access Option 3**

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:1500 (A3)
Checked AS	Approved TL	17101 - G2-3 - (0)	Date 04.05.21

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Project Title  
 Ruakaka Service Centre

Sheet Title  
 Access Option 3

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:500 (A3)
Checked AS	Approved TL	17101 - G2-3 - (1)	Date 04.05.21

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	NEW EDGE OF SEAL
	NEW ISLAND

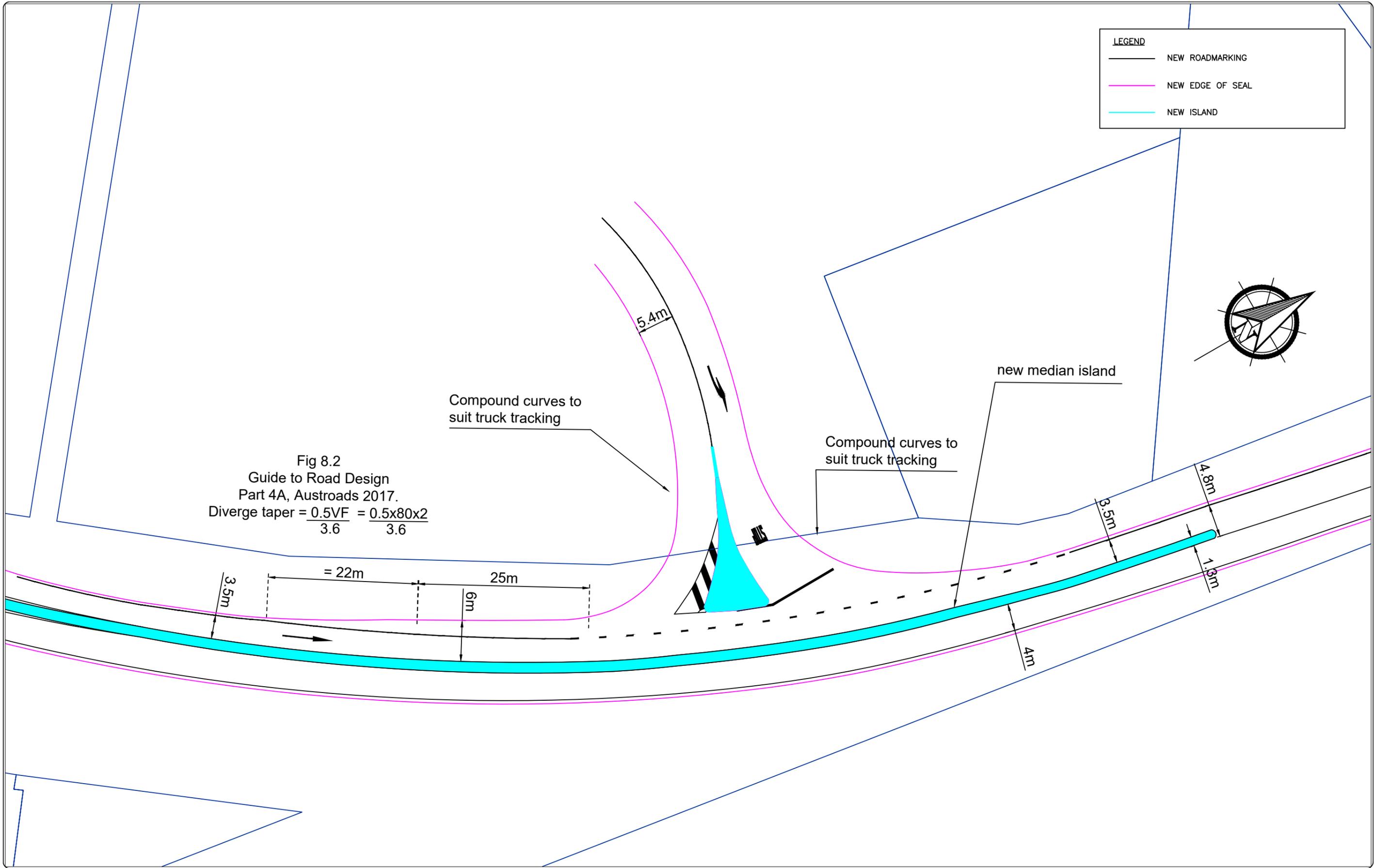
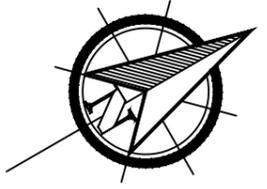


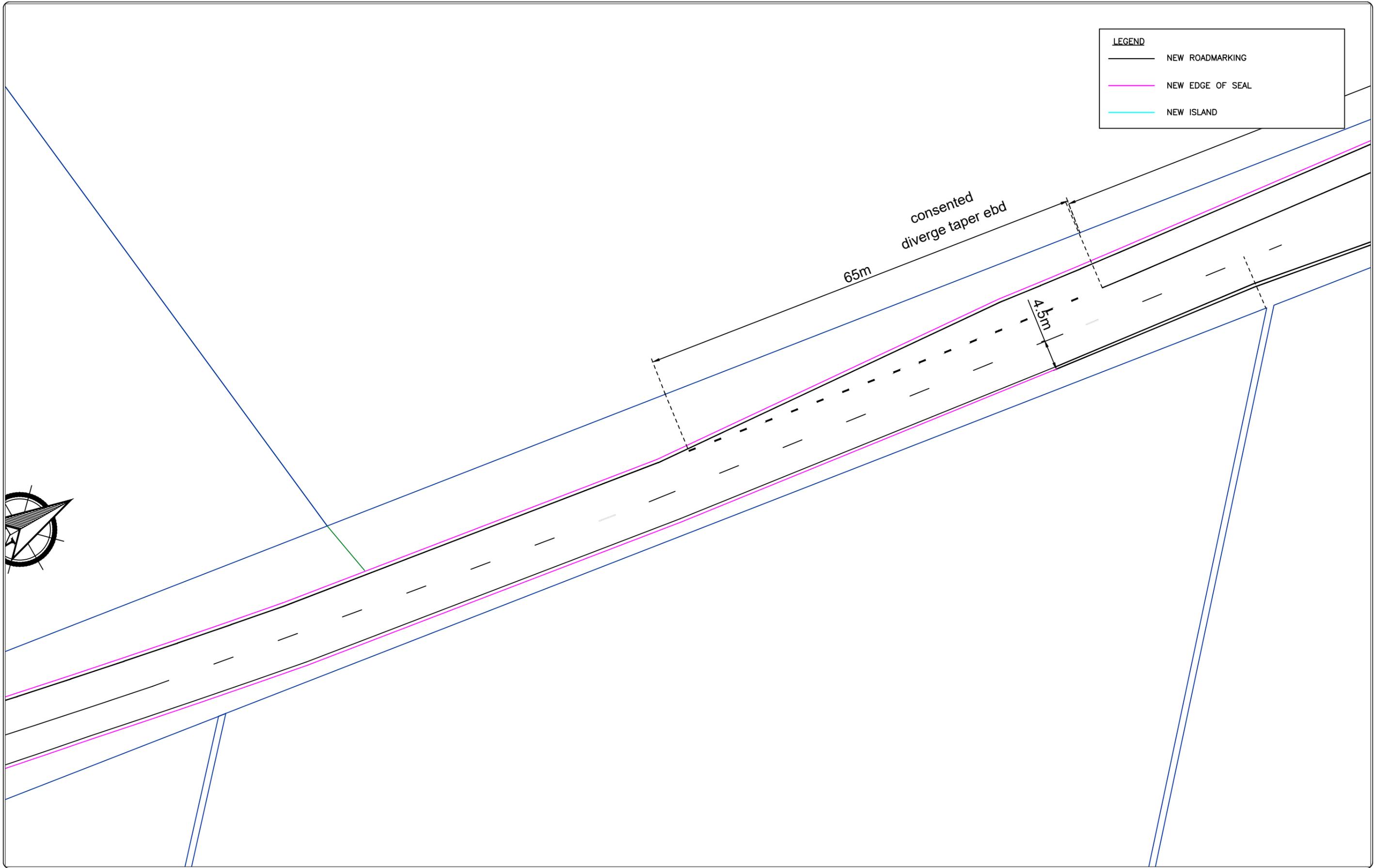
Fig 8.2  
 Guide to Road Design  
 Part 4A, Austroads 2017.  
 Diverge taper =  $\frac{0.5VF}{3.6} = \frac{0.5 \times 80 \times 2}{3.6}$

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Project Title	Ruakaka Service Centre
Sheet Title	Access Option 3

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Checked AS	Approved TL	17101 - G2-3 - (2)	Date 04.05.21
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Project Title  
 Ruakaka Service Centre

Sheet Title  
 Access Option 3

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:500 (A3)
Checked AS	Approved TL	17101 - G2-3 - (3)	Date 04.05.21

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Project Title  
**Ruakaka Service Centre**

Sheet Title  
**Access Option 3**

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:1100 (A3)
Checked AS	Approved TL	17101 - G_2 - (7)	Date 04.05.21

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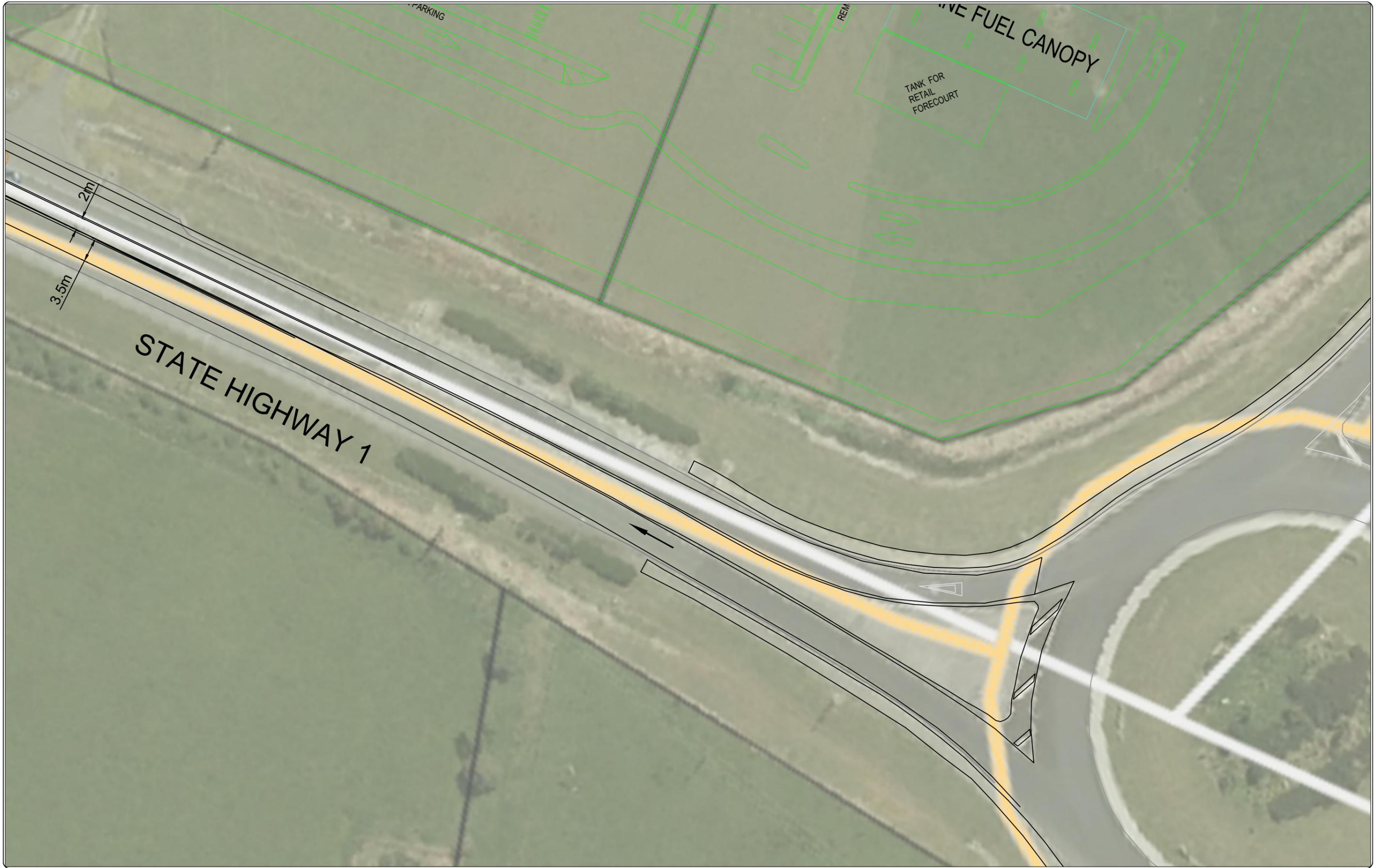
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Project Title  
**Ruakaka Service Centre**

Sheet Title  
**Access Option 3**

Designed	AS	Drawn	PI	Project No - (Sheet No)	Scales	1:500.0001 (A3)
Checked	AS	Approved	TL	17101 - G_2 - 7- (1)	Date	04.05.21

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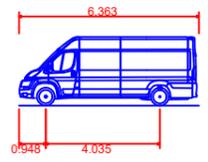
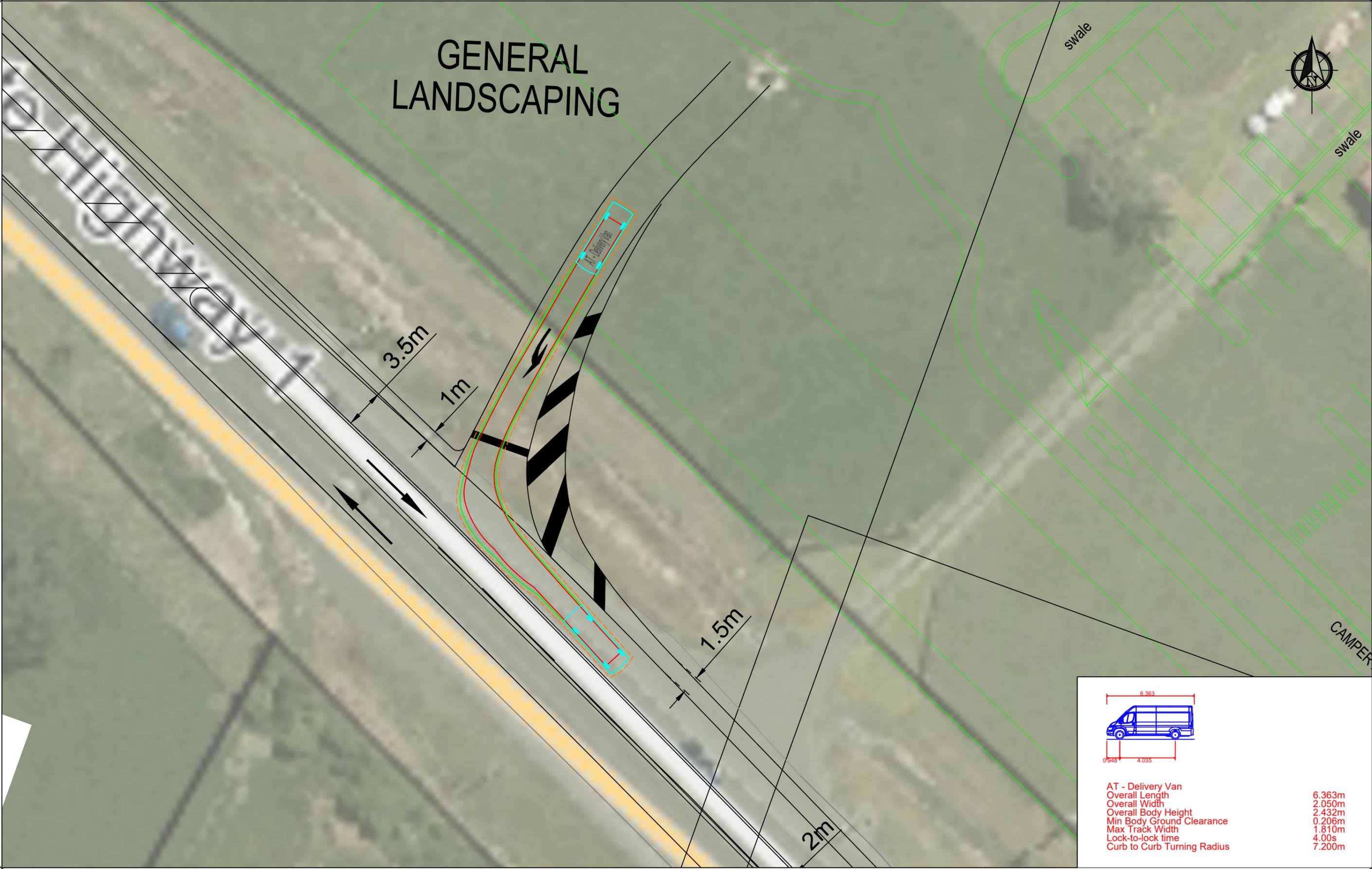
Project Title  
 Ruakaka Service Centre

Sheet Title  
 Access Option 3

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:500 (A3)
Checked AS	Approved TL	17101 - G_2 - 7- (2)	Date 04.05.21

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# GENERAL LANDSCAPING



AT - Delivery Van	
Overall Length	6.363m
Overall Width	2.050m
Overall Body Height	2.432m
Min Body Ground Clearance	0.206m
Max Track Width	1.810m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	7.200m

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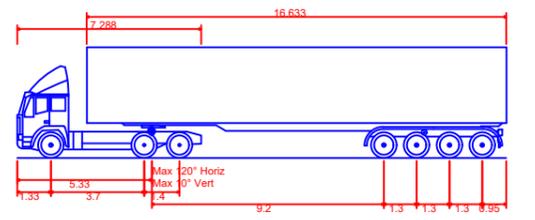
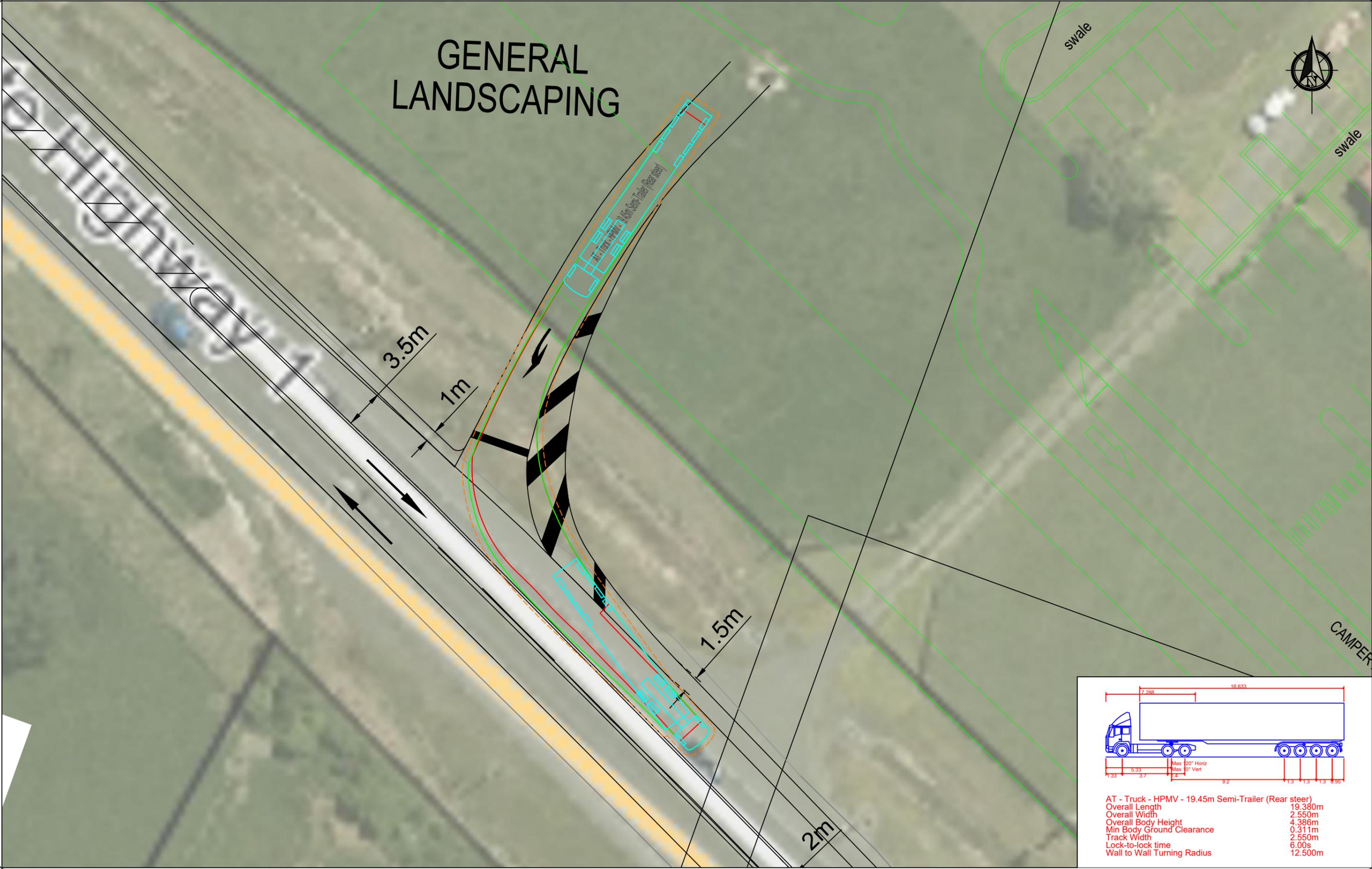
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Project Title Ruakaka Service Centre  
 Sheet Title Access Option 3  
 Vehicle Tracking- Van

Designed AS	Drawn PI	Project No - (Sheet No)	Scales 1:300 (A3)
Checked AS	Approved TL	17101 - G_2 - 7- (3)	Date 04.05.21

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# GENERAL LANDSCAPING



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 Ruakaka Service Centre  
 Sheet Title Access Option 3  
 Vehicle Tracking - Semi-Trailer

Designed AS Drawn PI Project No - (Sheet No) Scales 1:300 (A3)  
 Checked AS Approved TL 17101 - G\_2 - 7- (4) Date 04.05.21  
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## ATTACHMENT 2

### ON-SITE VEHICLE TRACKING DIAGRAMS



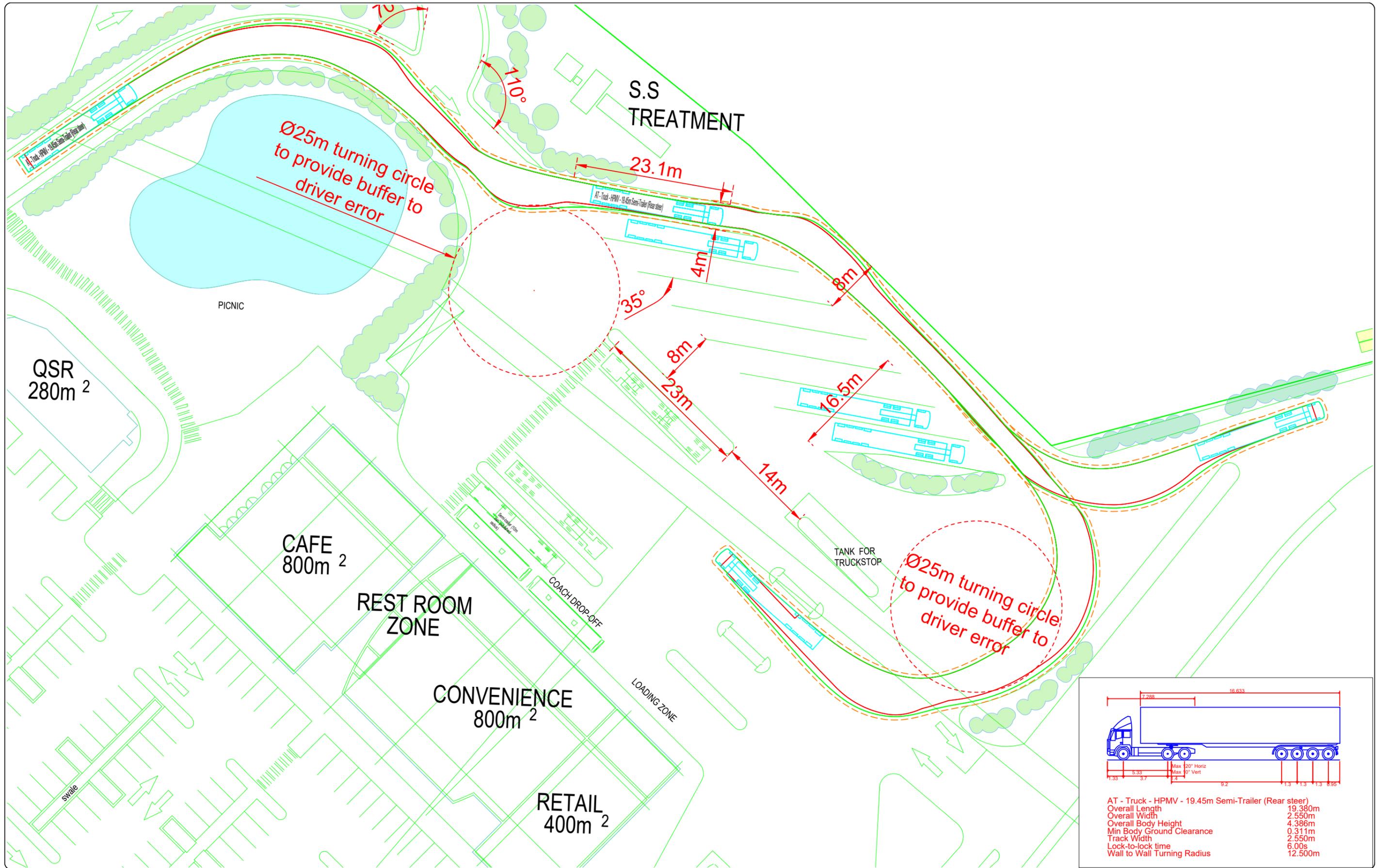
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Project Title Proposed Development Ruakaka Service Centre  
 Sheet Title Overall Plan

Designed AZ	Drawn AZ	Project No - (Sheet No)	Scales 1:1000 (A3)
Checked TL	Approved TL	17101 - L - (1)	Date 24.09.20

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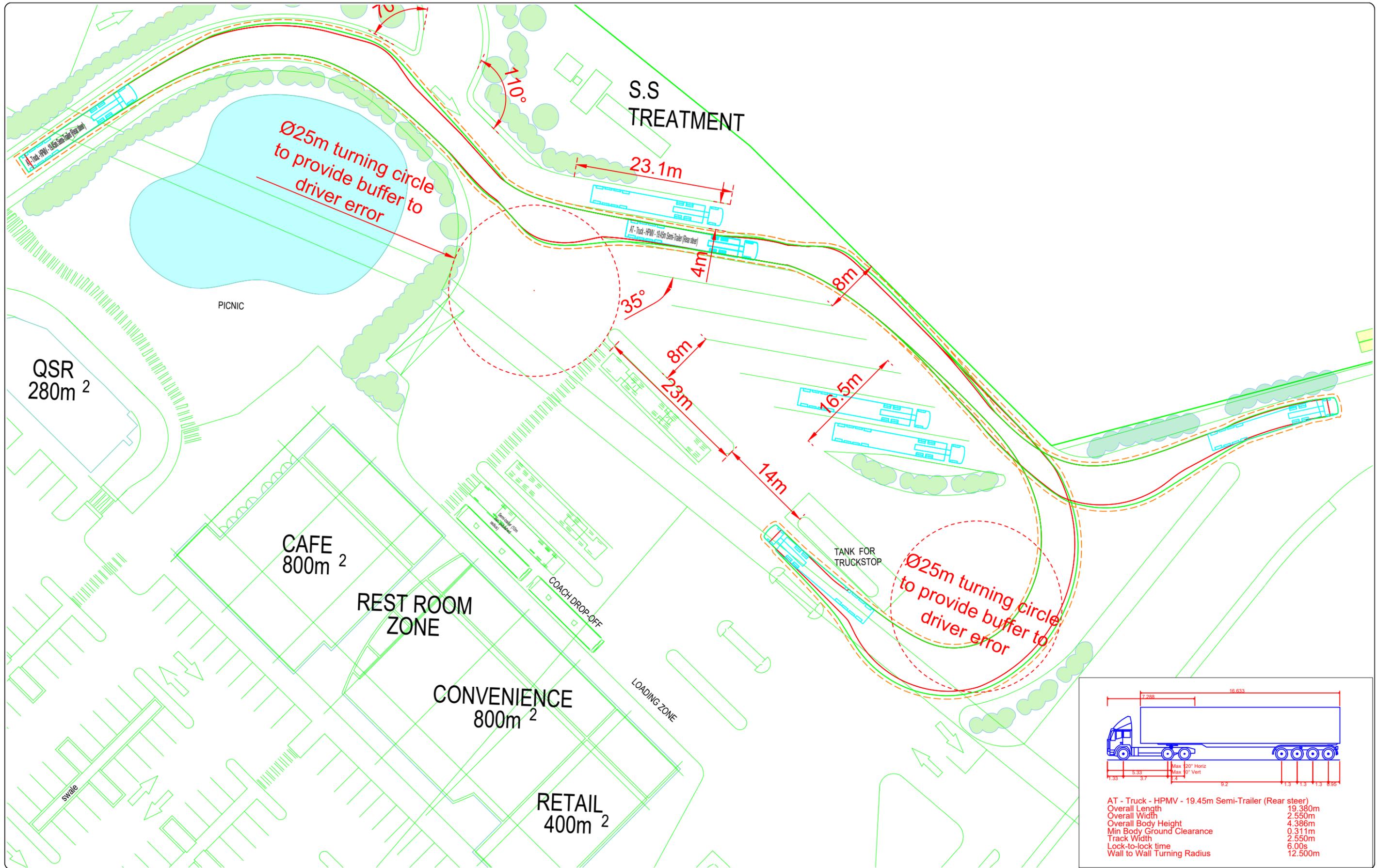
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Project Title Proposed Development Ruakaka Service Centre

Sheet Title Vehicle Tracking - HPMV Semi Trailer

Designed AZ	Drawn AZ	Project No - (Sheet No)	Scales 1:500 (A3)
Checked TL	Approved TL	17101 - L - (2)	Date 24.09.20

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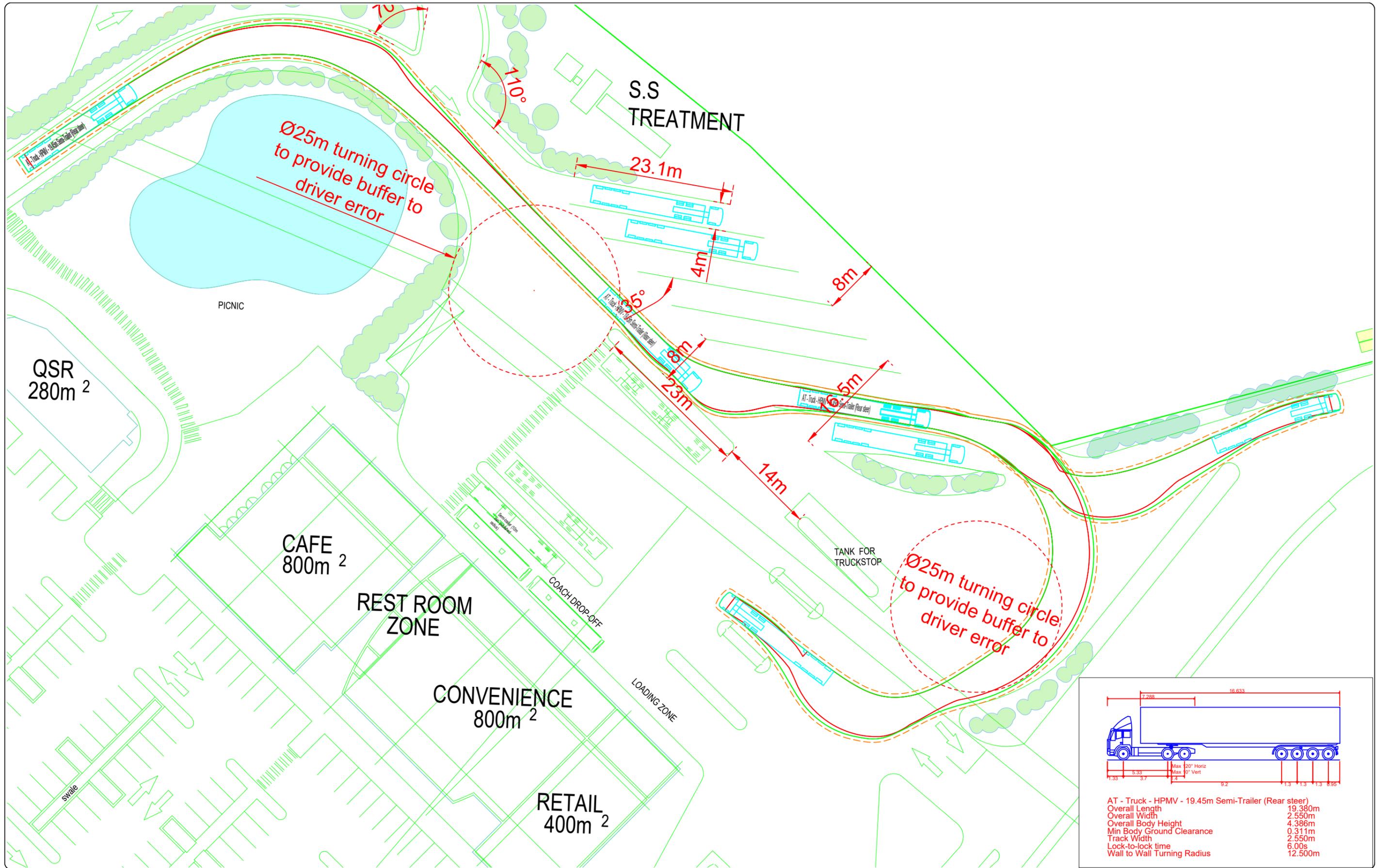
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Project Title	Proposed Development Ruakaka Service Centre
Sheet Title	Vehicle Tracking - HPMV Semi Trailer

Designed	AZ	Drawn	AZ	Project No - (Sheet No)	Scales	1:500 (A3)
Checked	TL	Approved	TL	17101 - L - (3)	Date	24.09.20
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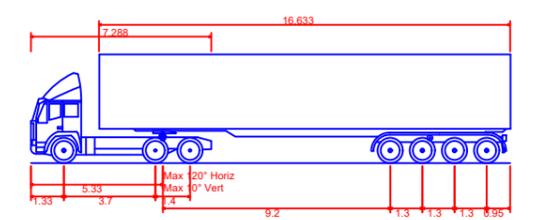
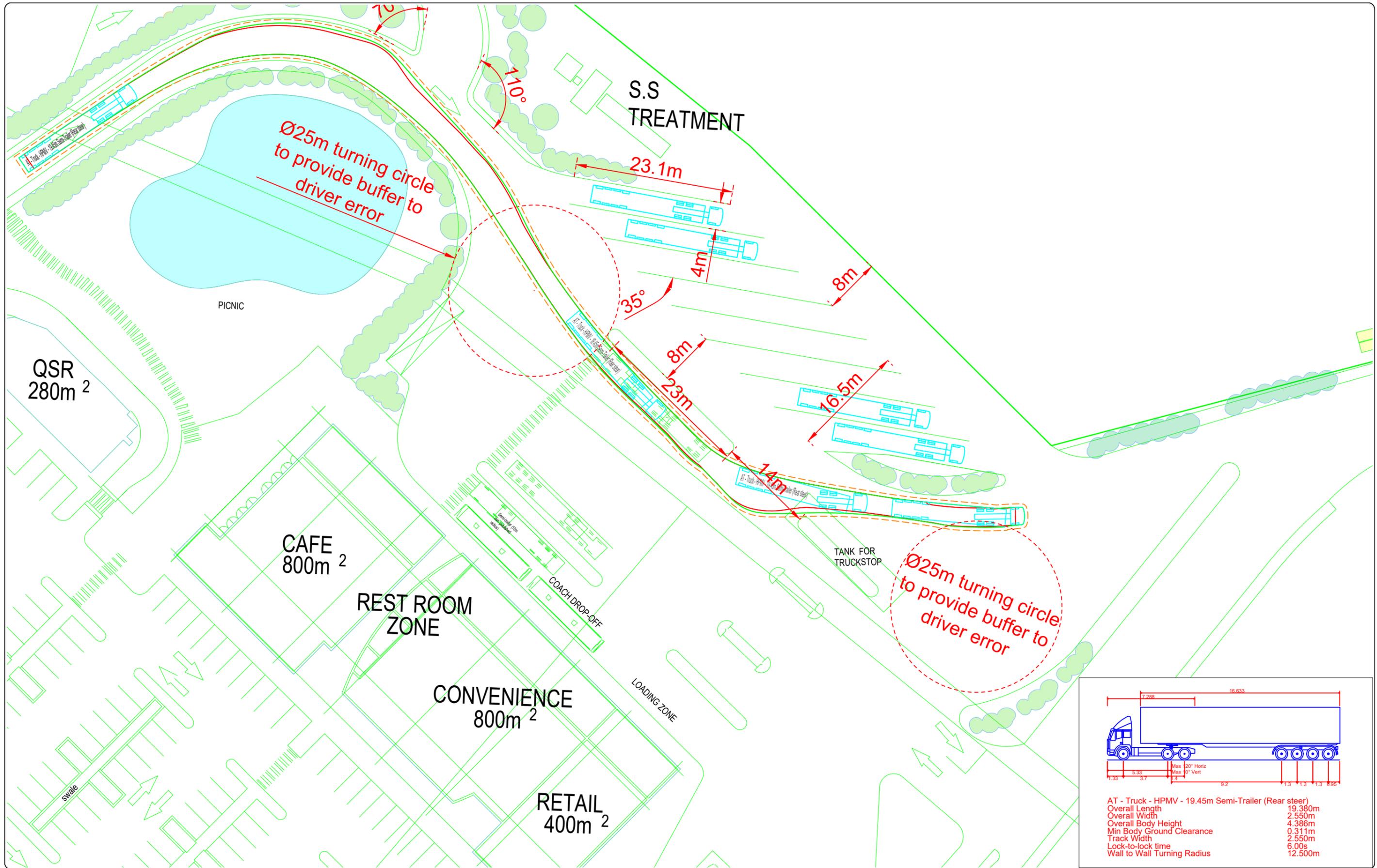
Project Title Proposed Development Ruakaka Service Centre

Sheet Title Vehicle Tracking - HPMV Semi Trailer

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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

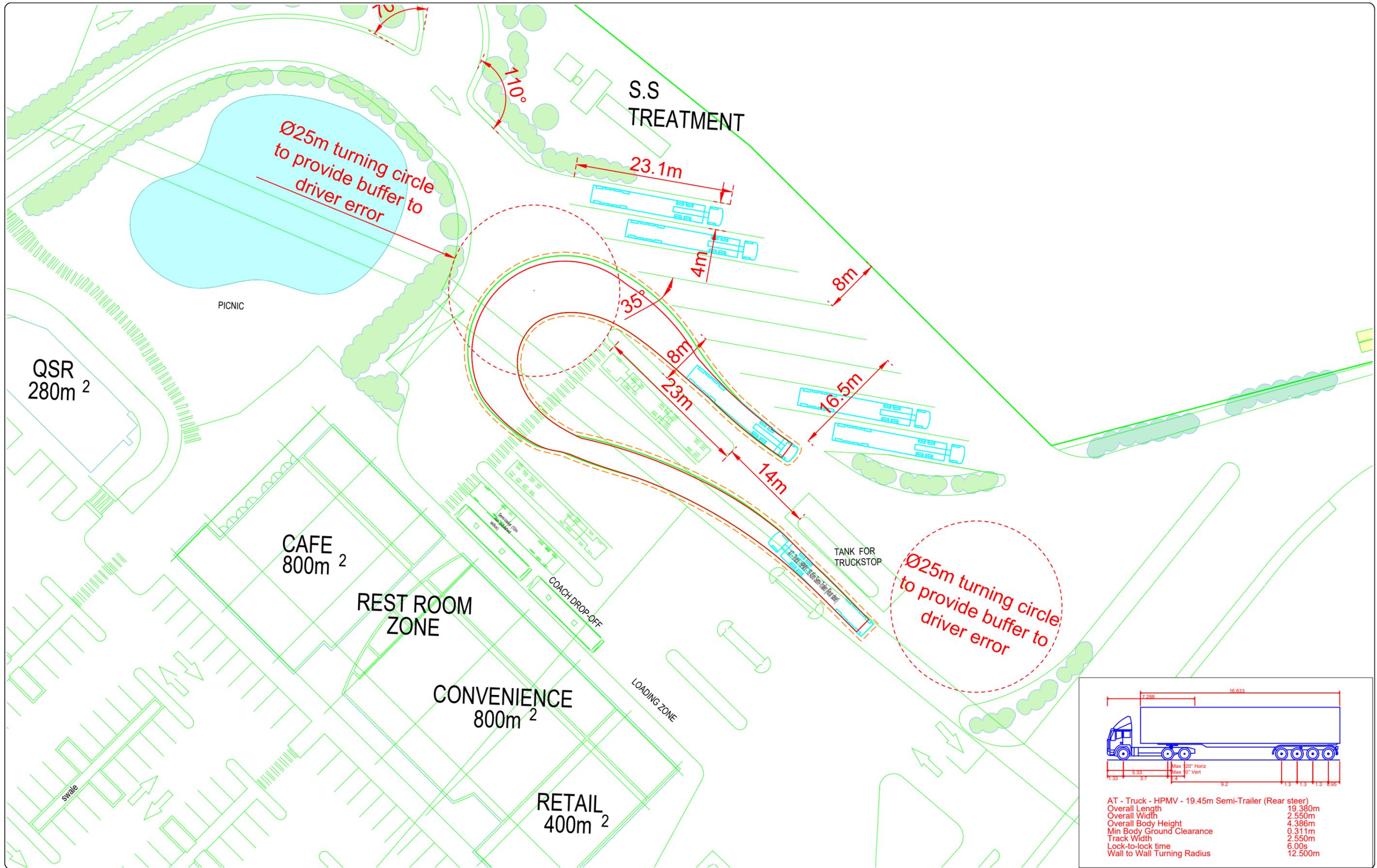
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Project Title Proposed Development Ruakaka Service Centre  
 Sheet Title Vehicle Tracking - HPMV Semi Trailer

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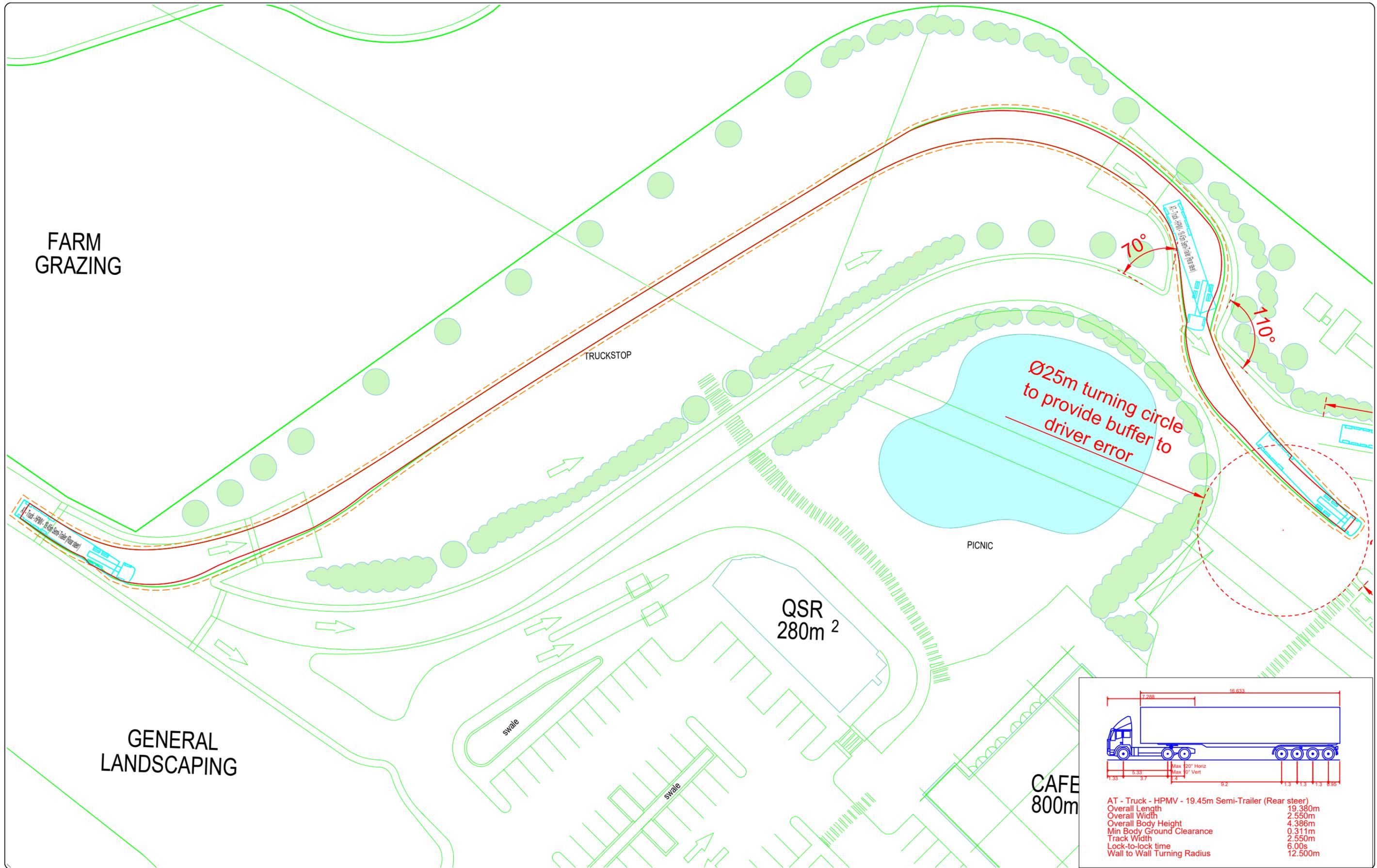
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Project Title Proposed Development Ruakaka Service Centre

Sheet Title Vehicle Tracking - HPMV Semi Trailer

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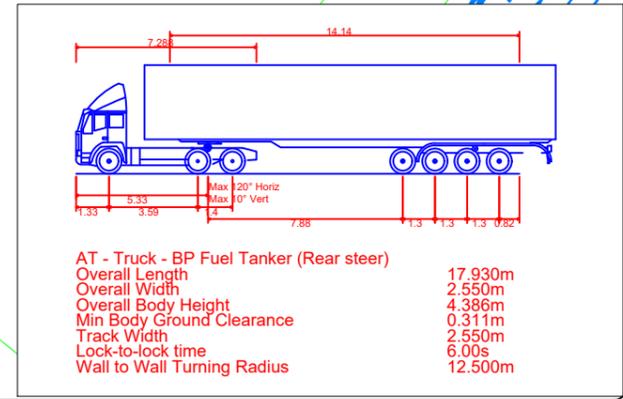
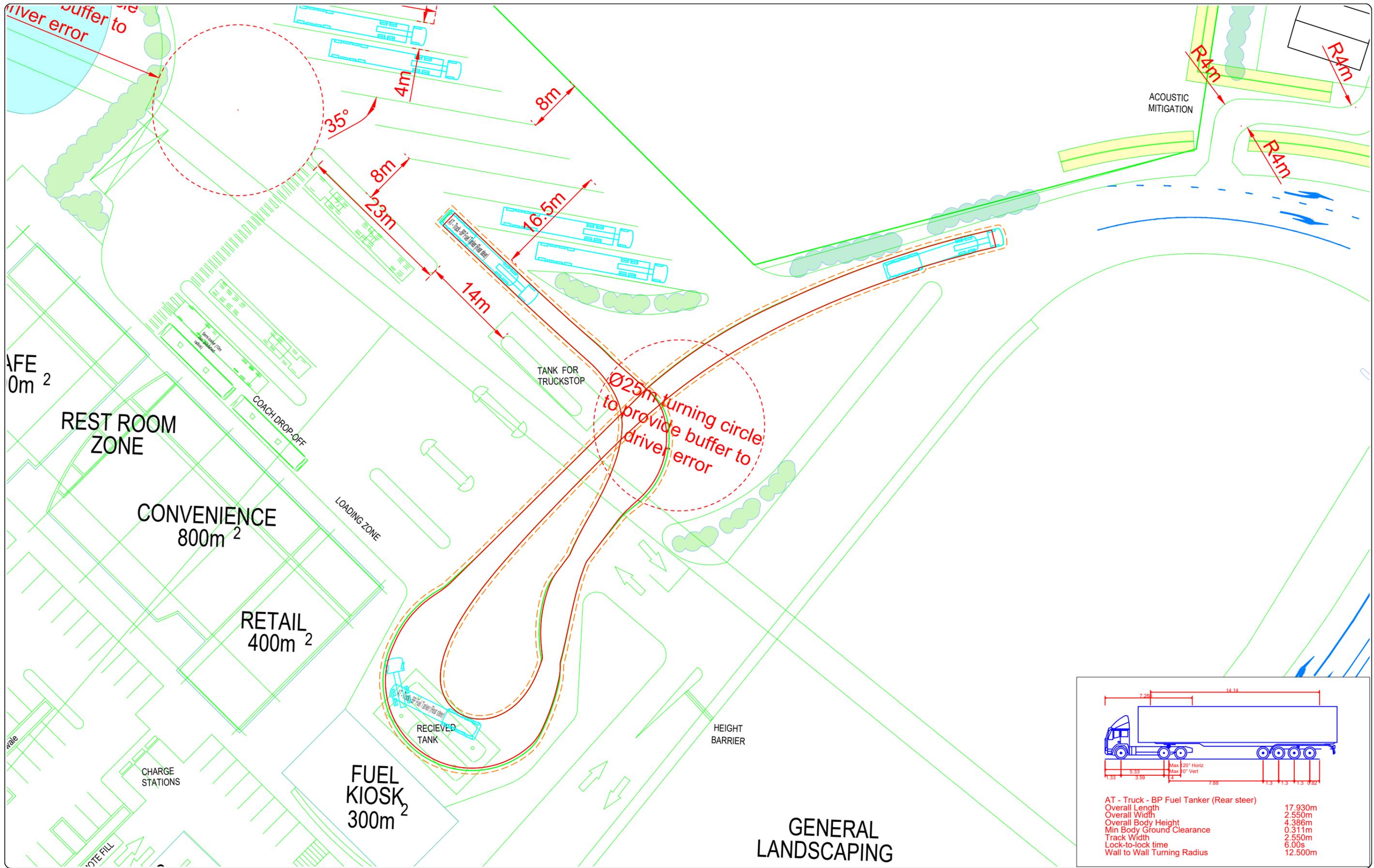
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Project Title **Proposed Development Ruakaka Service Centre**

Sheet Title **Vehicle Tracking - HPMV Semi Trailer**

Designed <b>AZ</b>	Drawn <b>AZ</b>	Project No - (Sheet No)	Scales <b>1:500 (A3)</b>
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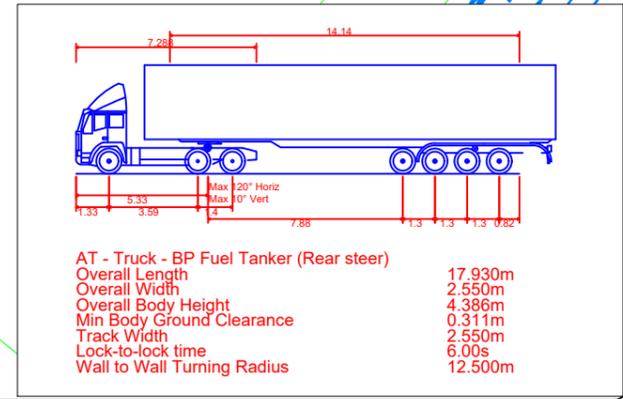
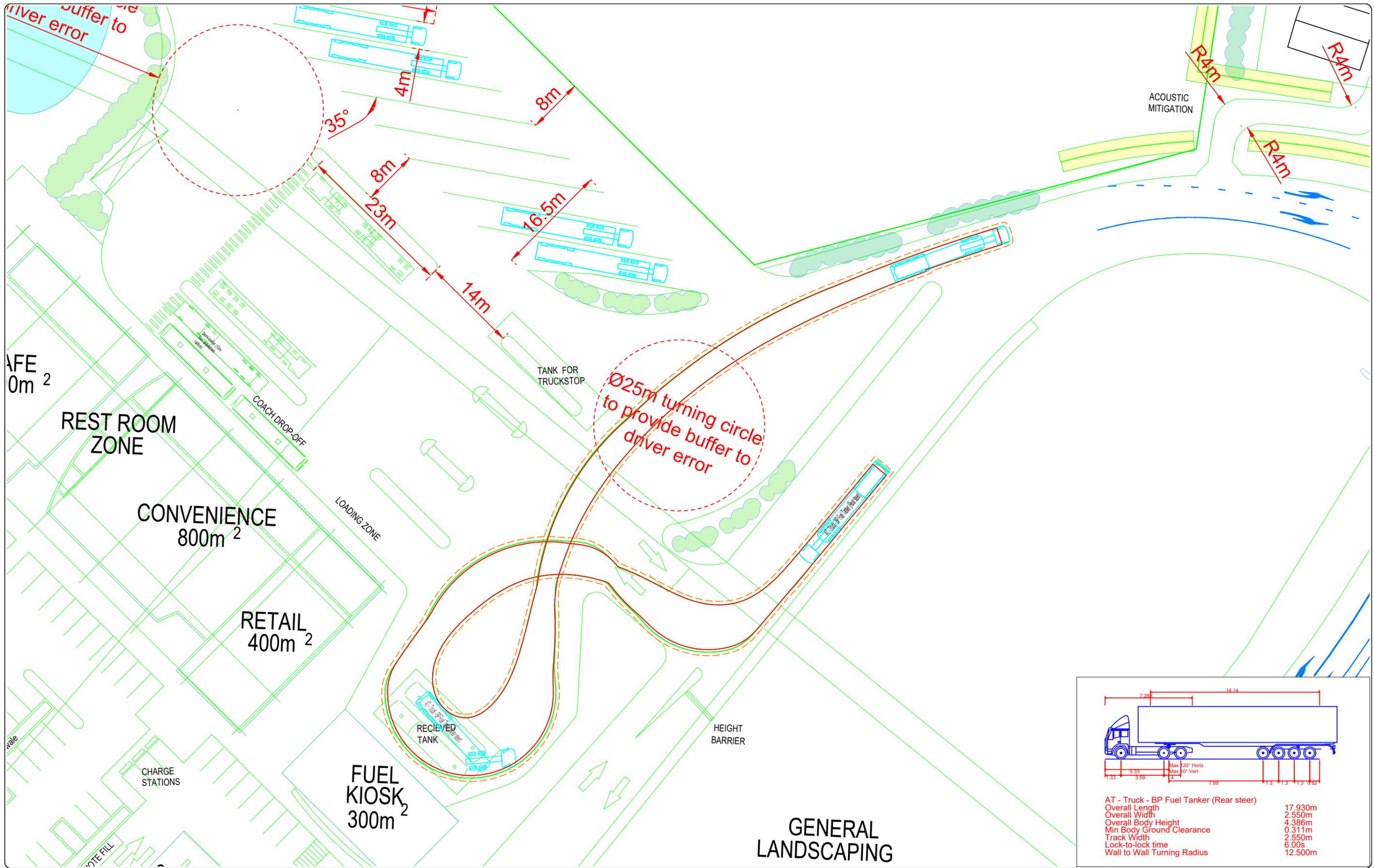
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Project Title Proposed Development  
Ruakaka Service Centre

Sheet Title Vehicle Tracking - 17.9m Tanker

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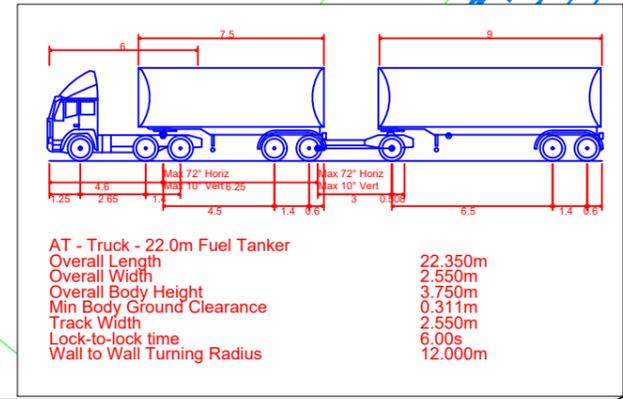
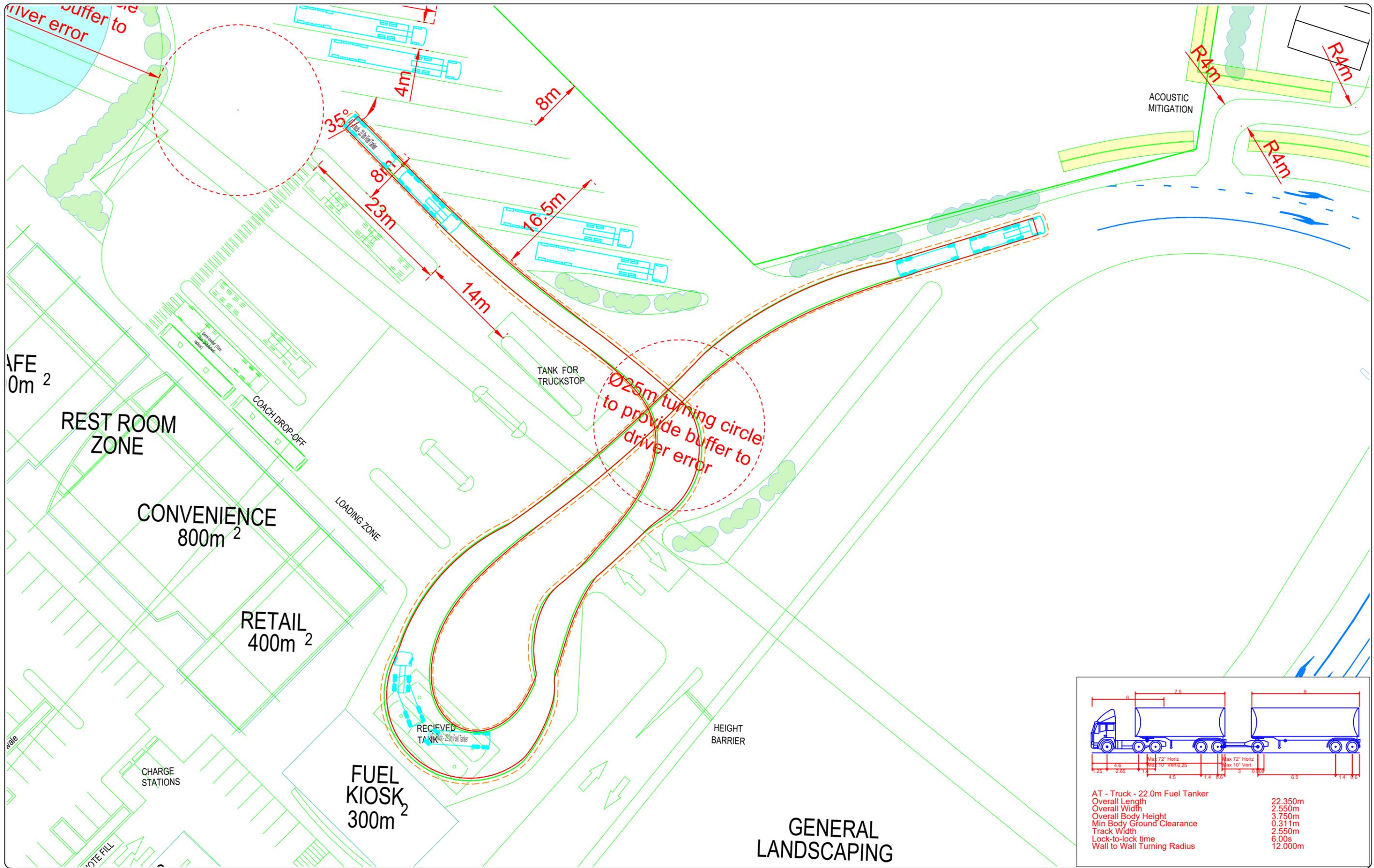
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Project Title Proposed Development  
Ruakaka Service Centre

Sheet Title Vehicle Tracking - 17.9m Tanker

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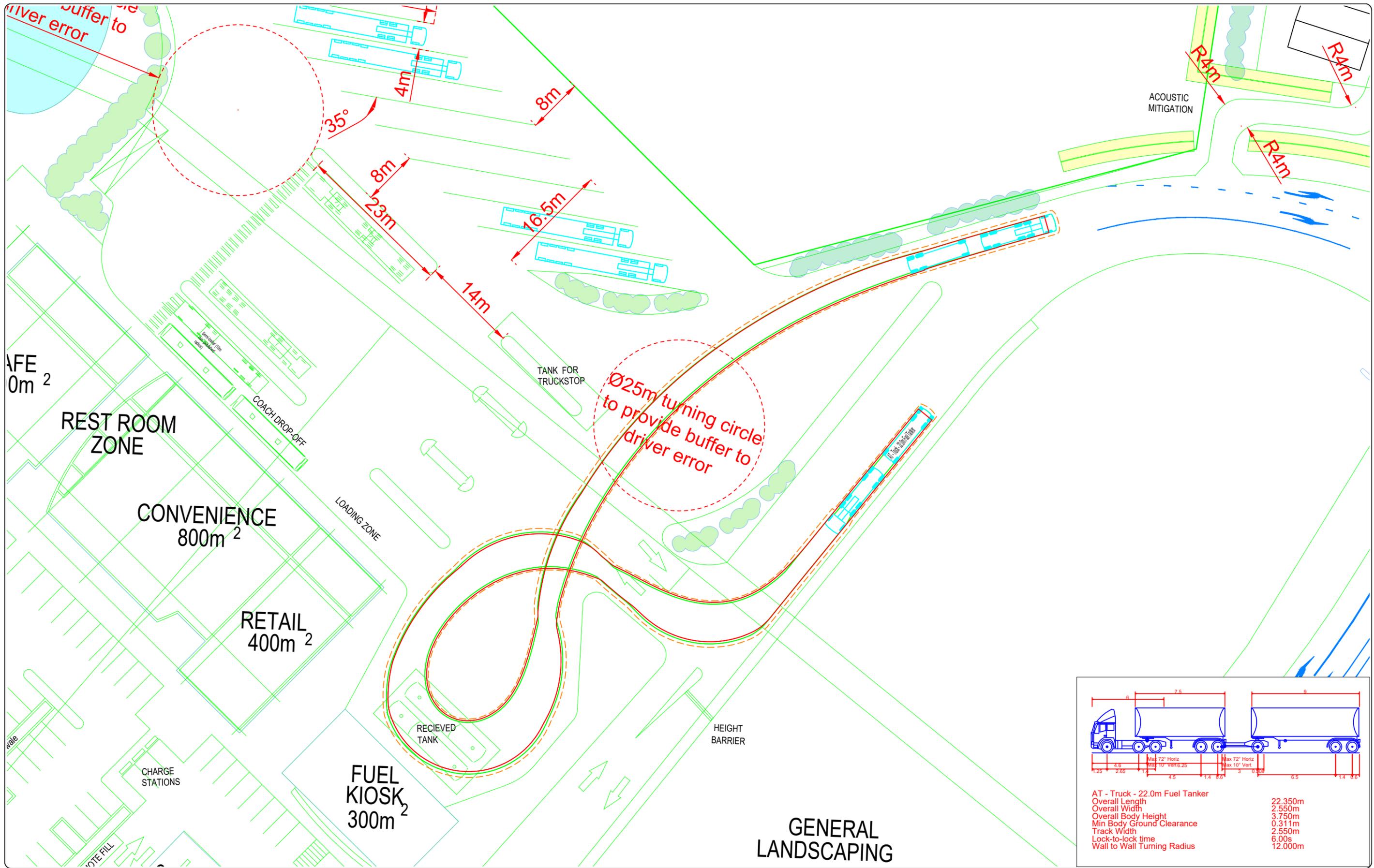
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Project Title Proposed Development Ruakaka Service Centre  
 Sheet Title Vehicle Tracking - 22m Tanker

Designed AZ	Drawn AZ	Project No - (Sheet No)	Scales 1:500 (A3)
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AT - Truck - 22.0m Fuel Tanker	
Overall Length	22.350m
Overall Width	2.550m
Overall Body Height	3.750m
Min Body Ground Clearance	0.311m
Track Width	2.550m
Lock-to-lock time	6.00s
Wall to Wall Turning Radius	12.000m

**GENERAL LANDSCAPING**

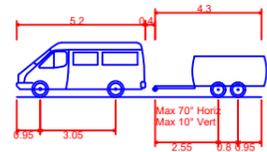
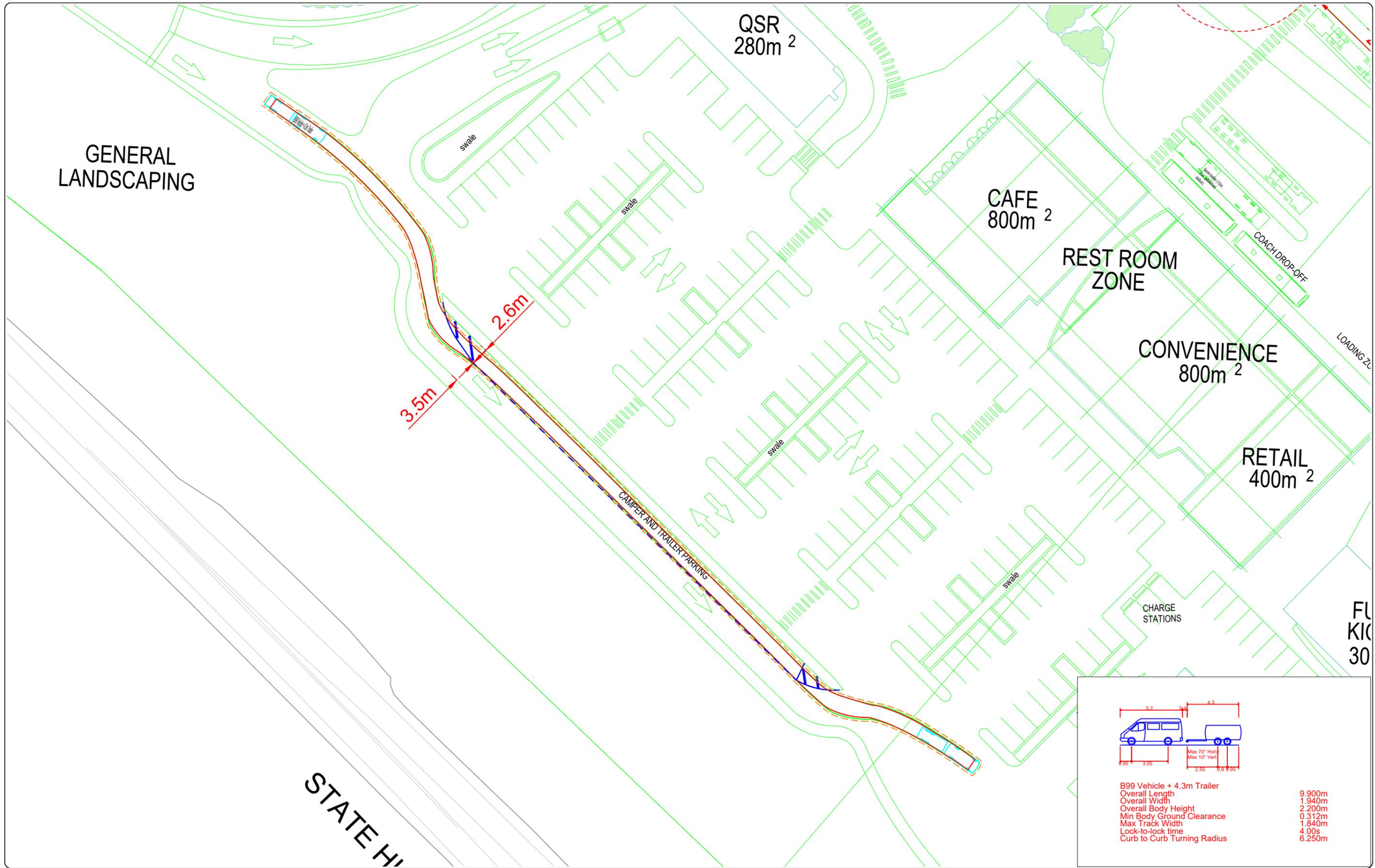
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Project Title	Proposed Development Ruakaka Service Centre
Sheet Title	Vehicle Tracking - 22m Tanker

Designed	AZ	Drawn	AZ	Project No - (Sheet No)	17101 - L - (12)	Scales	1:500 (A3)
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<b>B99 Vehicle + 4.3m Trailer</b>	
Overall Length	9.900m
Overall Width	1.940m
Overall Body Height	2.200m
Min Body Ground Clearance	0.312m
Max Track Width	1.840m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	6.250m

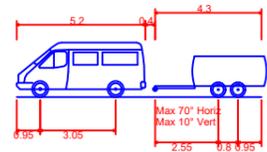
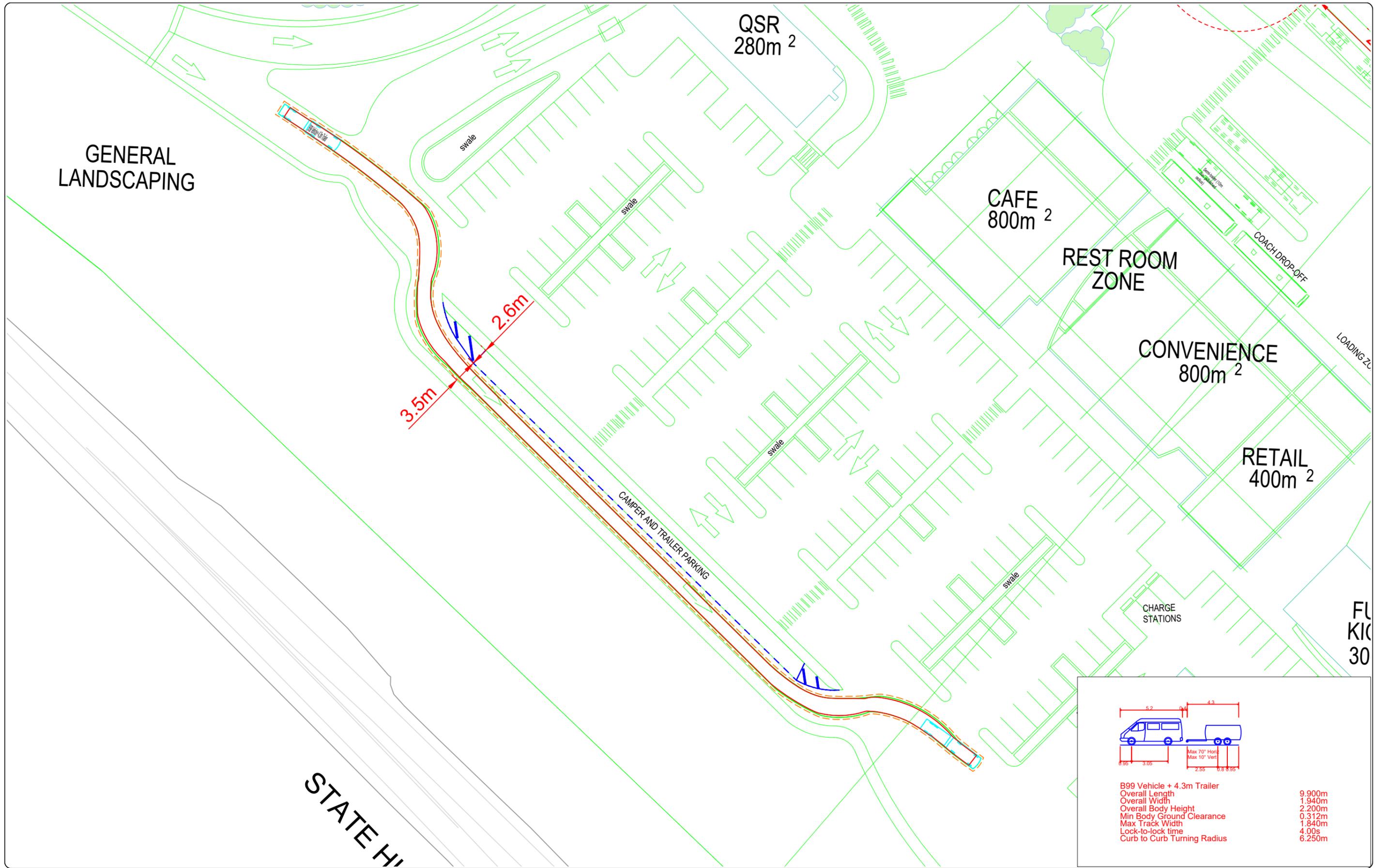
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 Sheet Title: Vehicle Tracking - B99 & Trailer

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<b>B99 Vehicle + 4.3m Trailer</b>	
Overall Length	9.900m
Overall Width	1.940m
Overall Body Height	2.200m
Min Body Ground Clearance	0.312m
Max Track Width	1.840m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	6.250m

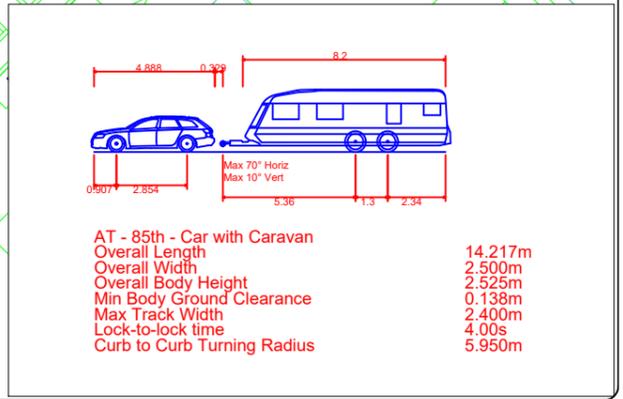
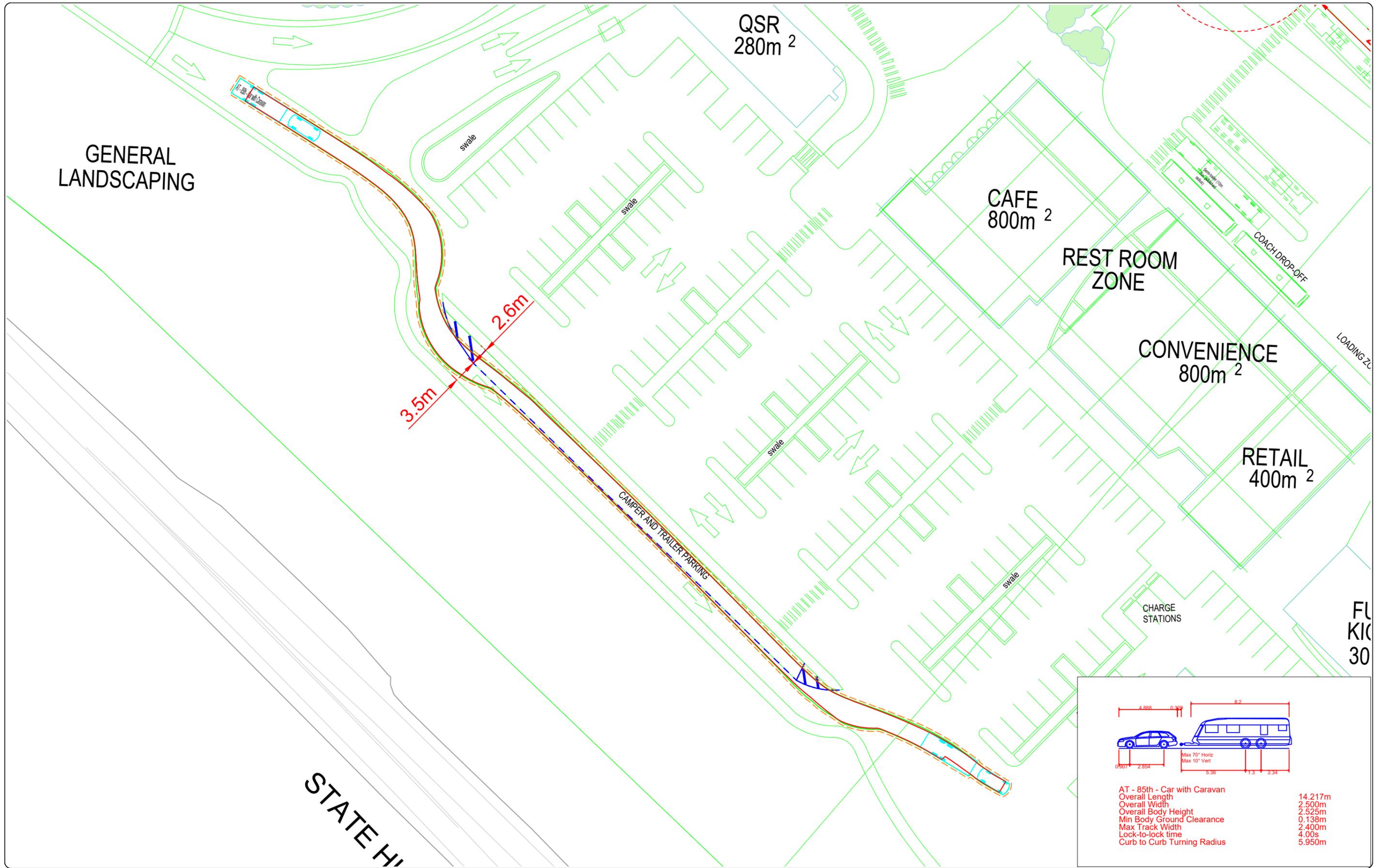
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Project Title: Proposed Development Ruakaka Service Centre  
 Sheet Title: Vehicle Tracking - B99 & Trailer

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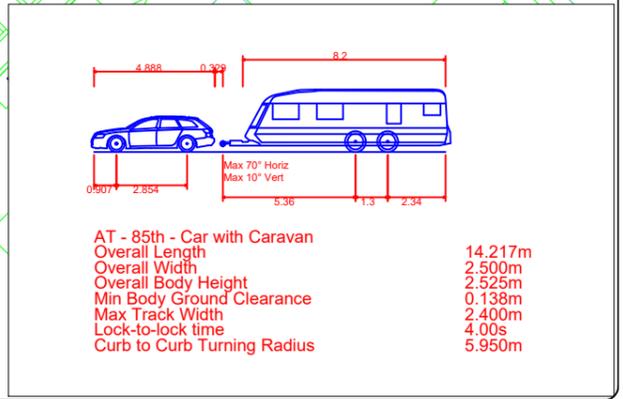
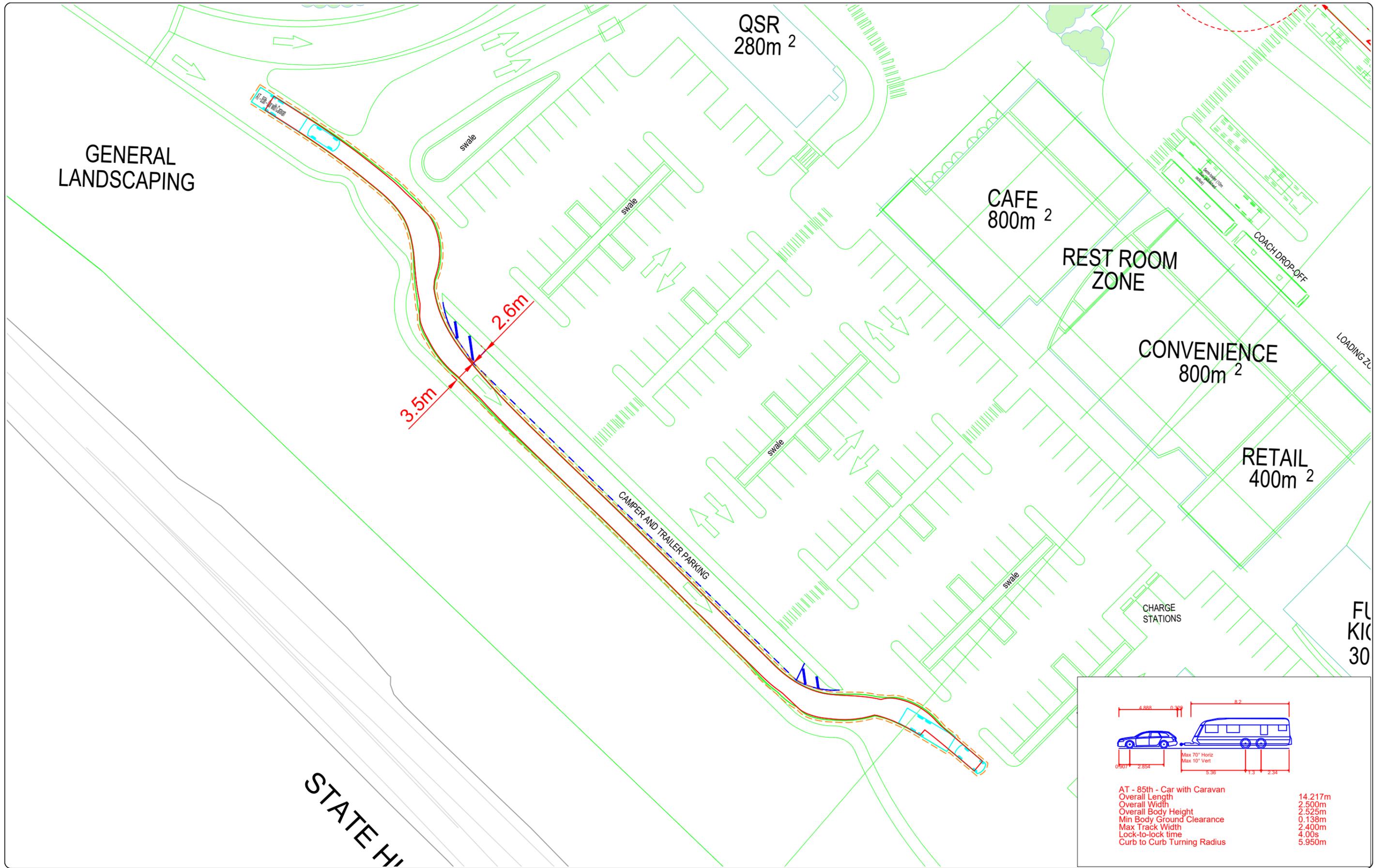
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Project Title Proposed Development Ruakaka Service Centre  
 Sheet Title Vehicle Tracking - Car & Caravan

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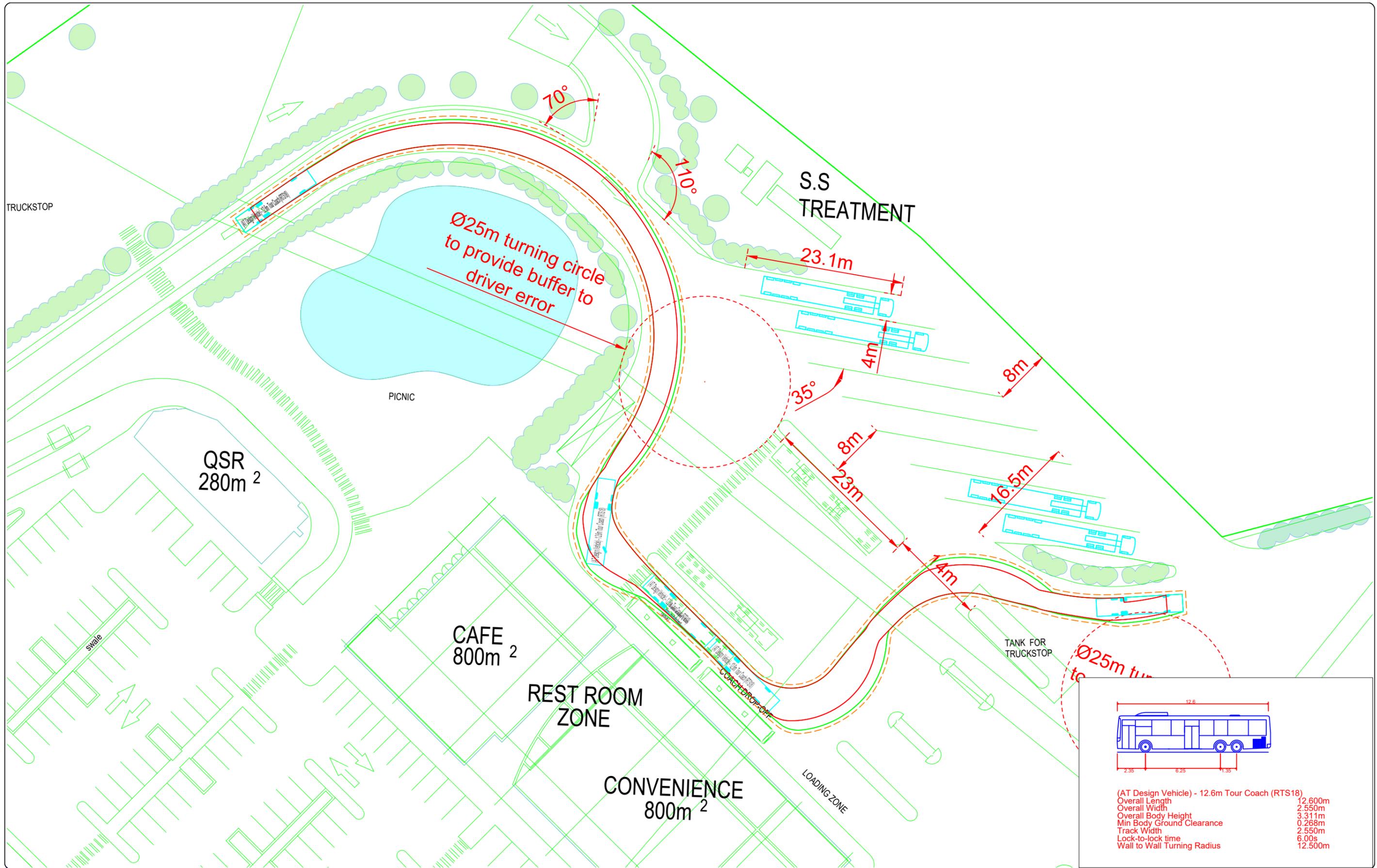
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Project Title Proposed Development Ruakaka Service Centre  
 Sheet Title Vehicle Tracking - Car & Caravan

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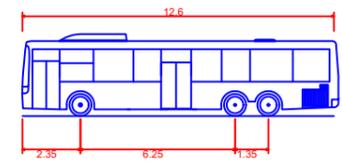
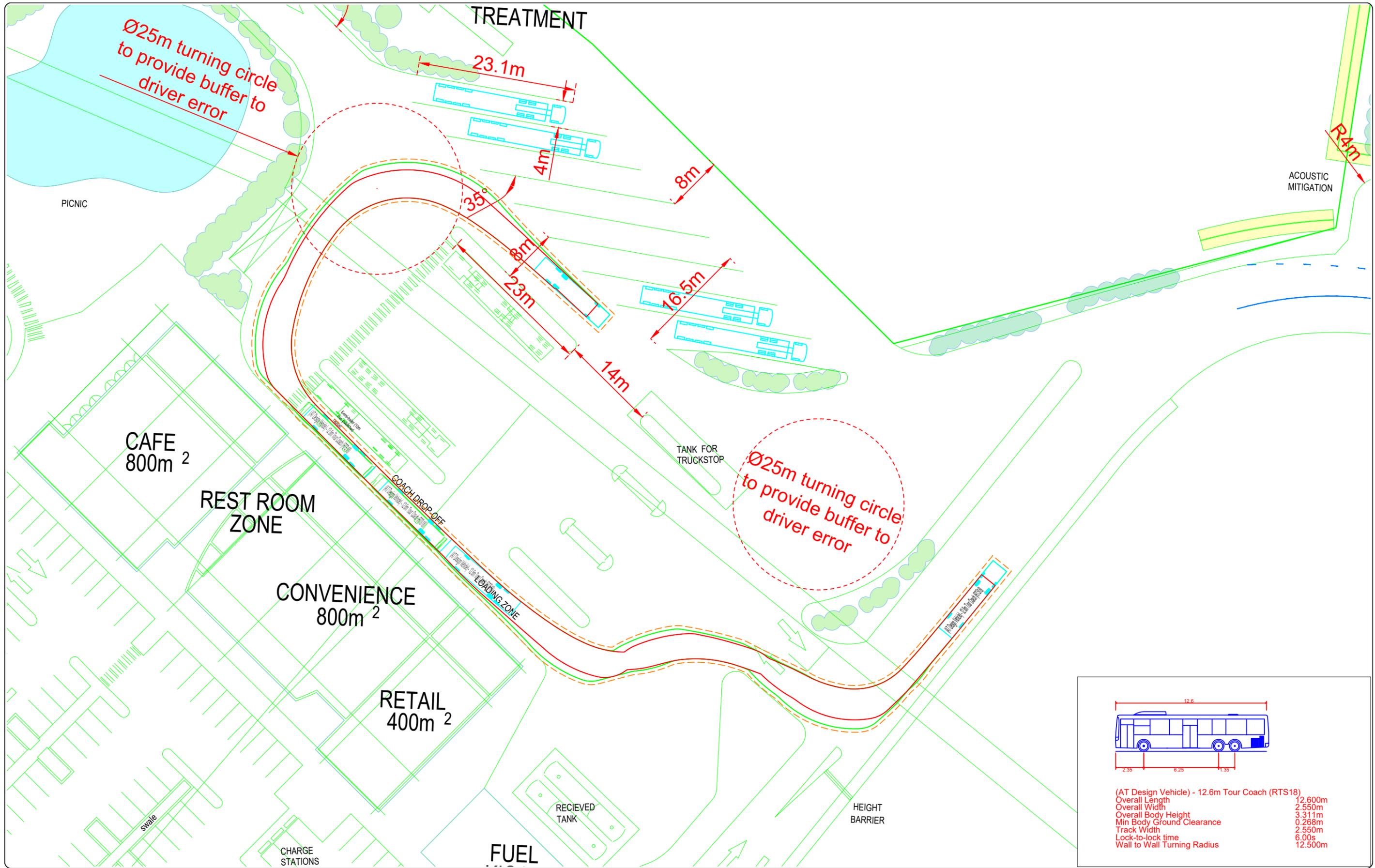
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Project Title Proposed Development Ruakaka Service Centre  
 Sheet Title Vehicle Tracking - RTS Tour Coach

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(AT Design Vehicle) - 12.6m Tour Coach (RTS18)	
Overall Length	12.600m
Overall Width	2.550m
Overall Body Height	3.311m
Min Body Ground Clearance	0.268m
Track Width	2.550m
Lock-to-lock time	6.00s
Wall to Wall Turning Radius	12.500m

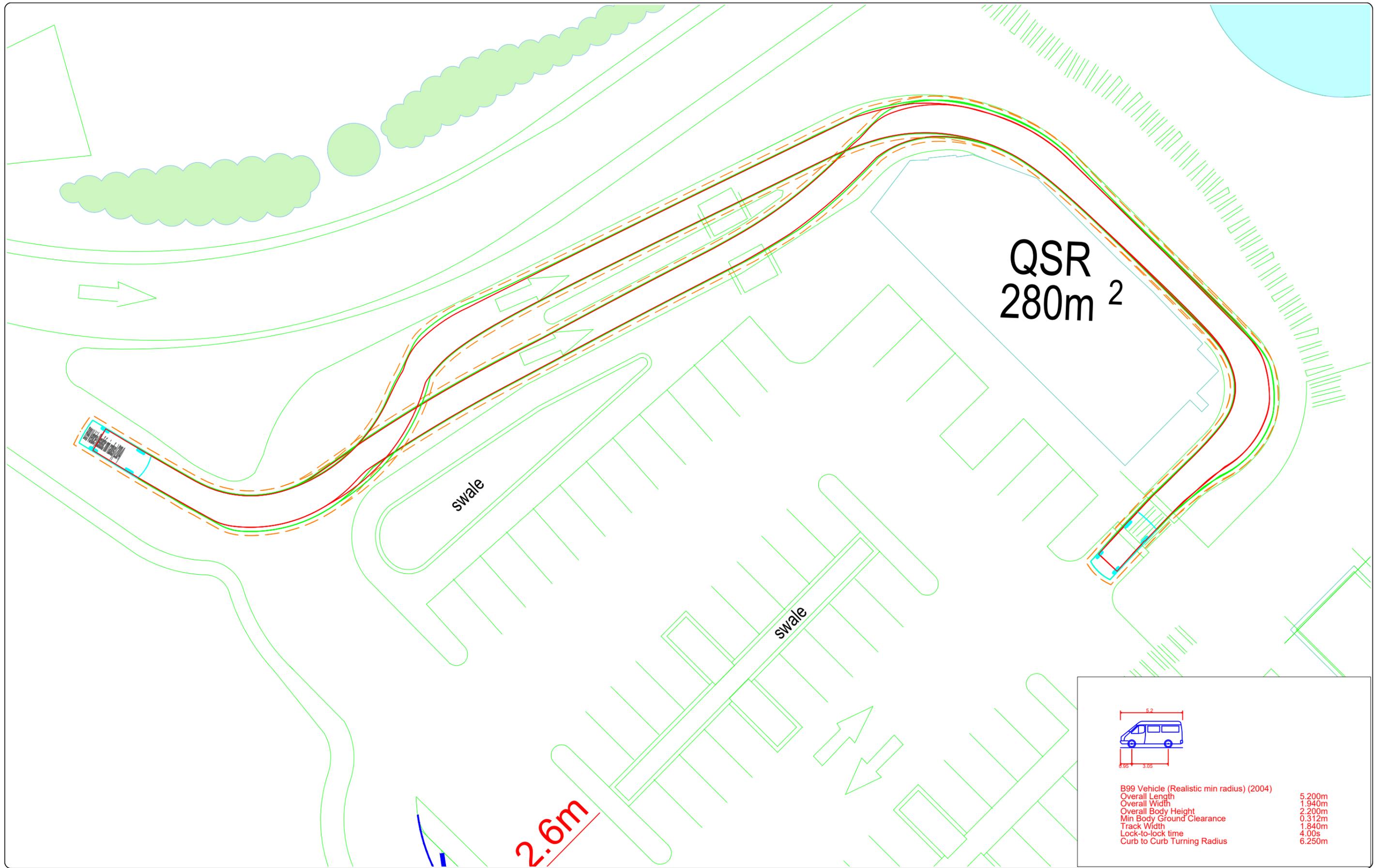
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Project Title Proposed Development Ruakaka Service Centre  
 Sheet Title Vehicle Tracking - RTS Tour Coach

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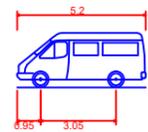
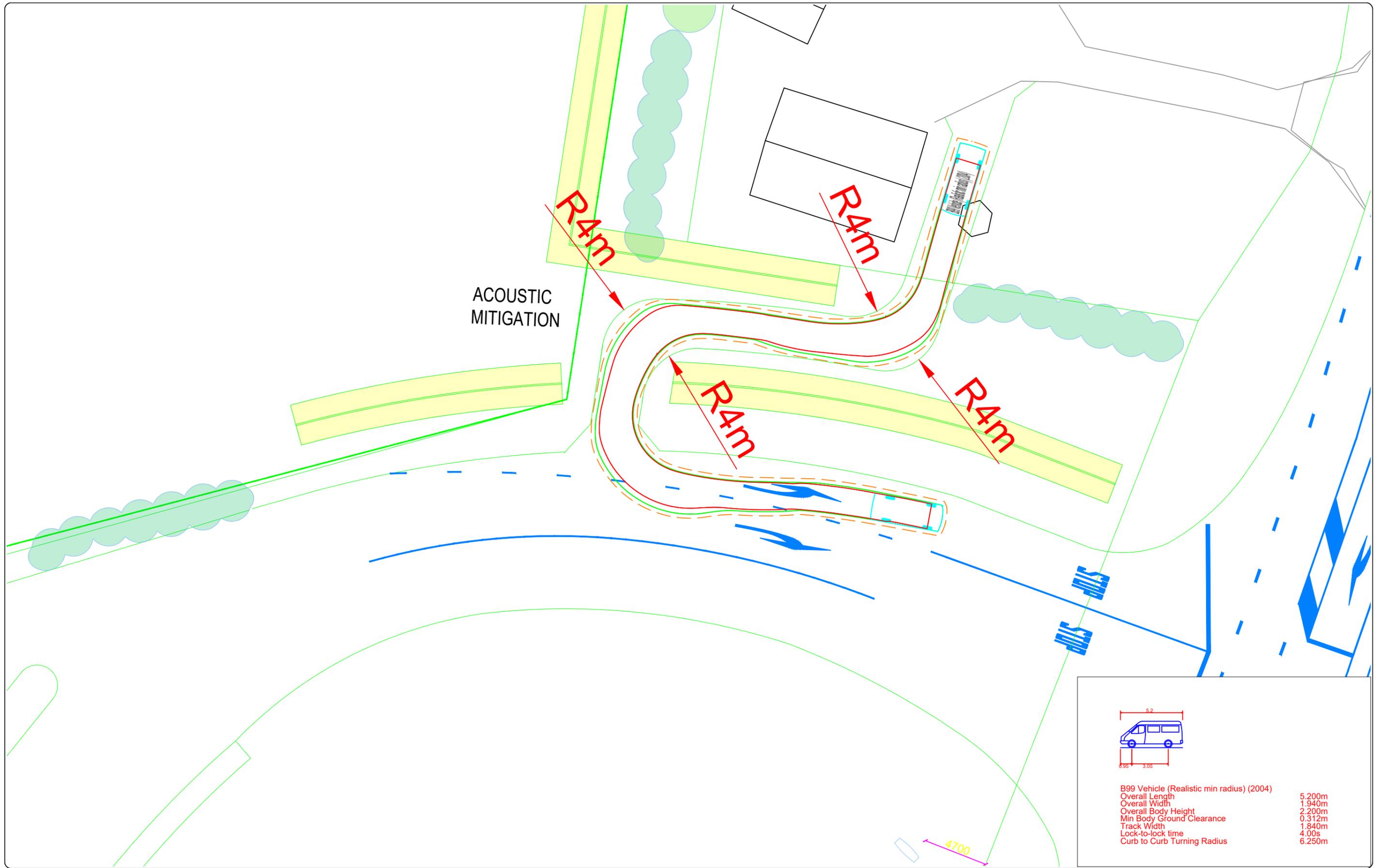
Project Title Proposed Development Ruakaka Service Centre

Sheet Title Vehicle Tracking - B99

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<b>B99 Vehicle (Realistic min radius) (2004)</b>	
Overall Length	5.200m
Overall Width	1.940m
Overall Body Height	2.200m
Min Body Ground Clearance	0.312m
Track Width	1.840m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	6.250m

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Project Title	Proposed Development Ruakaka Service Centre
Sheet Title	Vehicle Tracking - B99

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## ATTACHMENT 3

# INDEPENDENT ROAD SAFETY AUDIT REPORT WITH DESIGNER RESPONSES

PRELIMINARY DESIGN ROAD SAFETY AUDIT  
RUA KĀKĀ SERVICE CENTRE

PREPARED FOR TRAFFIC PLANNING CONSULTANTS

18 March 2021



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This disclaimer shall apply notwithstanding that the report may be made available to Waka Kotahi NZ Transport Agency and other persons for an application for permission or approval to fulfil a legal requirement.

## QUALITY STATEMENT

<b>PROJECT MANAGER</b>		<b>ROAD SAFETY AUDIT TEAM LEADER</b>
Mark Moslin-Thomas		Keith Weale
<b>PREPARED BY</b>		
Keith Weale		18 March 2012
<b>CHECKED BY</b>		
Nick Gluyas		18 March 2012
<b>REVIEWED BY</b>		
Nick Gluyas		18 March 2012
<b>APPROVED FOR ISSUE BY</b>		
Mark Moslin-Thomas		24 March 2021

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# Traffic Planning Consultants

## Ruakākā Service Centre

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# 1 Introduction

## 1.1 Safety Audit Definition and Purpose

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

A road safety audit is therefore a formal examination of a road 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 road safety concerns.

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

The primary objective of a road safety audit is to deliver a project that achieves an outcome consistent with Safer Journeys and the Safe System approach, which is a safe road system free of death and serious injury. The road safety 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 so 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 road safety audit is summarised as:

'to deliver completed projects that contribute towards a safe road system that is free of death and serious injury by identifying and ranking potential safety concerns for all road users and others affected by a road project.'

A road safety audit should desirably be undertaken at project milestones such as:

- concept stage (part of business case);
- scheme or preliminary design stage (part of pre-implementation);
- detail design stage (pre-implementation or implementation); or
- pre-opening or post-construction stage (implementation or post-implementation).

A road safety audit is not intended to be a technical or financial audit and does not substitute for a design check of standards or guidelines. Any recommended treatment of an identified safety concern is intended to be indicative only, and to focus the designer 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 NZTA Road Safety Audit Procedures for Projects Guidelines - Interim release May 2013 the audit report should be submitted to the client who will instruct the designer to respond. The designer 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 will make the final decision and brief the designer to make the necessary changes and/or additions. As a result of this instruction the designer 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 road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations. It is to be completed by the designer, safety engineer, and client for each issue, and should record the designer's response, client's decision (and asset manager's comments in the case where the client and asset manager are not one and the same) and action taken.

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

## 1.2 The Project

The project comprises a proposed service centre for fuel, restrooms, fast food, freedom camping, picnicking etc. located in the northern quadrant of the existing roundabout intersection of SH1 and SH15<sup>1</sup> (Port Marsden Highway) at Ruakākā about 25 km south of Whangārei.

The design and traffic impact assessment has been undertaken by Traffic Planning Consultants on behalf of the developer.

Two accesses are proposed—a southbound left-turn slip lane from SH1 at Prescott Road, and a raised median seagull intersection allowing all turning movements on SH15, 225 m east of the roundabout. The service centre trip generation is estimated to be about 3400 vehicles per day.

The entrance to the southbound deceleration lane has been positioned just north of Prescott Road to avoid drivers turning right out of Prescott Road and then left into the service centre (a weave) across fast-moving southbound traffic approaching the roundabout.



Figure 1: Site location

A second painted seagull intersection with a 220 m eastbound deceleration lane has previously been proposed about 720 m from the roundabout as part of a separate consented service centre development dating back to 2011. This is assumed to be for information only as it is not part of this project.

## 1.3 The Road Safety Audit Team

This road safety audit has been carried out in accordance with the NZTA Road Safety Audit Procedure for Projects Guidelines – Interim release May 2013, by:

- Keith Weale, Stantec, Auckland, and
- Mike Sullivan, Engineering Equilibrium, Whangārei.

## 1.4 Previous Road Safety Audits

The road safety audit team is not aware of any previous road safety audits that have been undertaken for this project.

<sup>1</sup> The supplied drawings and report indicate SH15A throughout, which is incorrect. This road safety audit report therefore refers to the Port Marsden Highway as SH15.

## 1.5 Scope of this Road Safety Audit

This is a preliminary design road safety audit of the project described in Section 1.2. Although the internal circulation of vehicular and pedestrian traffic has been considered in general, the focus of this road safety audit has been on the safety of the proposed accesses to SH1 and SH15.

The proposed painted seagull intersection including a deceleration lane as part of a 2011 consented development further to the east of this project is not included in this road safety audit. However, any changes to the proposed Ruakākā Service Centre seagull should take into consideration any potential safety issues on the consented design and vice versa.

## 1.6 Briefing and Exit Meeting

No formal briefing or exit meeting was held with the designers. The road safety audit team relied on the supplied drawings and traffic impact assessment report listed in Section 1.9.

## 1.7 Safety Audit and Site Visit

The road safety auditors visited the site of this audit on Wednesday 9 December 2020.

The road safety audit team carried out a desk top safety audit via a Teams meeting during COVID-19 Level 3 lockdown on Monday 1 March 2021. The safety auditors also examined the revisions to the drawings supplied on 8 March individually. The amendments related to the removal of the eastbound deceleration lane from the proposed seagull intersection.

## 1.8 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 concern assessment rating matrix in Table 1-1. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

Table 1-1: Concern Assessment Rating Matrix

Severity (likelihood of death or serious injury)	Frequency (probability of a crash)			
	Frequent	Common	Occasional	Infrequent
Very likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very unlikely	Moderate	Minor	Minor	Minor

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide a suggested action for each concern category is given in Table 1-2.

Table 1-2: Concern Categories

Concern	Suggested action
Serious	Major safety concern that must be addressed and requires changes to avoid serious safety consequences.
Significant	Significant safety concern that should be addressed and requires changes to avoid serious safety consequences.
Moderate	Moderate safety concern that should be addressed to improve safety.
Minor	Minor safety concern that should be addressed where practical to improve safety.

In addition to the ranked safety issues, it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication but lie outside the scope of the safety audit. A comment may include items where the safety implications are not yet clear due to insufficient detail for the stage of project, items outside the scope of the audit such as existing issues not impacted by the project or an opportunity for improved safety but not necessarily linked to the project itself. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the auditors.

## 1.9 Documents Provided

Traffic Planning Consultants provided the road safety audit team with the following documents on 8 March 2021 specifically for this audit.

17101 – G – (7)	Overall Plan SH1	4 February 2021
17101 – G – (8)	Overall Plan SH1	4 February 2021
17101 – G – (9)	Dimension Plan SH1	4 February 2021
17101 – G – (10)	Dimension Plan SH1	4 February 2021
17101 – G2 – (12)	Overall Plan SH15	5 February 2021
17101 – G2 – (13)	Overall Plan SH15	3 February 2021
17101 – G2 – (14)	Overall Plan SH15	3 February 2021
17101 – G2 – (15)	Overall Plan SH15	3 February 2021
17101 – G2 – (16)	Overall Plan SH15	5 February 2021
17101 – G2 – (17)	Vehicle Tracking SH15	3 February 2021
17101 – G2 – (18)	Vehicle Tracking SH15	3 February 2021
Rukākā Service Centre 2581 State Highway 1 Traffic Impact Assessment		February 2021

In addition, the following drawings were supplied on 30 November 2021. These internal service centre plans are deemed to be for information only.

17101 – L – (1)	Overall Plan Service Centre	24 September 2020
17101 – L – (2 - 21)	Vehicle tracking Service Centre	24 September 2020

## 1.10 Disclaimer

The findings and recommendations in this report are based on an examination of available relevant plans, the specified road and its environs, and the opinions of the road safety audit team. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe and no warranty is implied that all safety issues have been identified in this report. Safety audits do not constitute a design review nor are they an assessment of standards with respect to engineering or planning documents.

Readers are urged to seek specific technical advice on matters raised and not rely solely on the report.

While every effort has been made to ensure the accuracy of the report, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the safety audit team or their organisations.

## 2 Safety Concerns

### 2.1 SH1 Access

#### 2.1.1 Southbound left-turn deceleration slip lane

Comment

A southbound left-turn deceleration lane from SH1 at Prescott Road is proposed as shown in Figure 2.



Figure 2: Proposed high-speed left -turn deceleration lane

The high-speed southbound left-turn deceleration slip lane would have been a safety concern were it not for the proposed raised table speed calming measure at the threshold of the internal road layout and forecourt arrowed in Figure 3. This is an essential safety measure and must not be omitted.<sup>2</sup> Furthermore, the slope and height of the raised table must be enough to limit speeds to about 30 km/h regardless of tour bus and heavy vehicle comfort requirements.

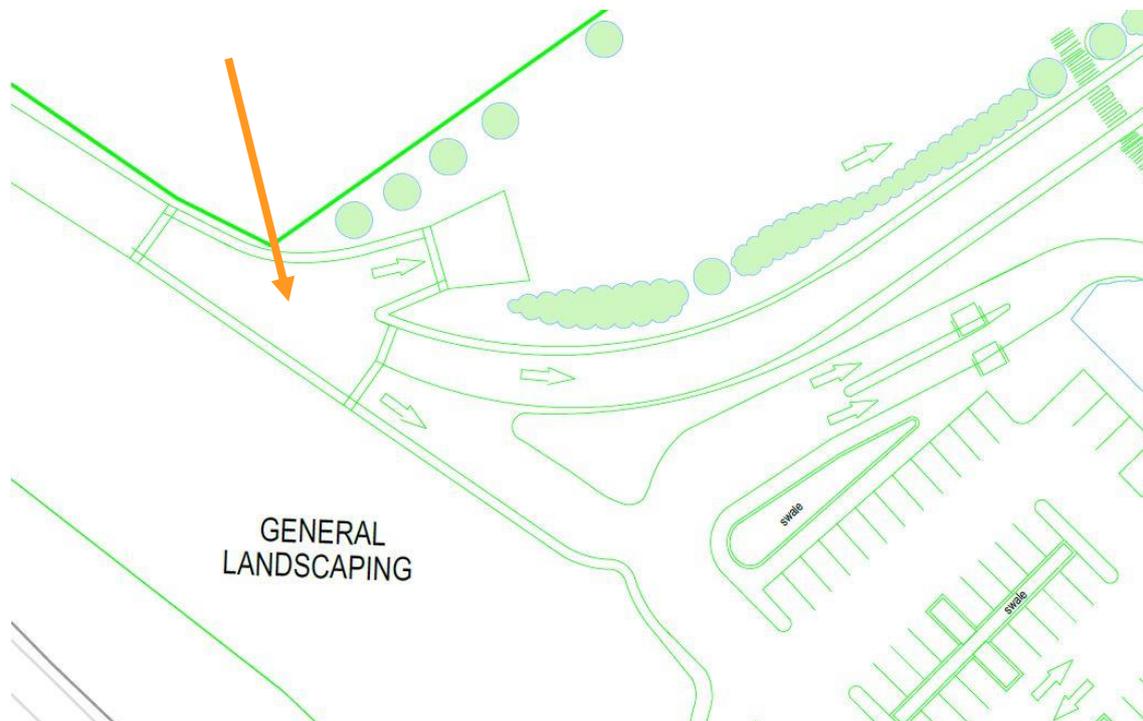


Figure 3: Proposed raised table intersection at service centre threshold

<sup>2</sup> The road safety audit team assumes that the arrowed section in Figure 3 is indeed a raised table. If it is not, then it should be.

Designer response	The arrowed section in Figure 3 is indeed a proposed raised table and will not be omitted.
Safety Engineer comment	Insert comment
Client decision	Insert comment
Action taken	Insert comment

## 2.2 Service Centre Internal Layout

### 2.2.1 Pedestrian zebra crossings and speed control

Moderate

A layout of islands and walkways within the greater car parking area is proposed as shown in Figure 4, however only one appears to be shown as a raised table crossing. Since the car park is large, speeds can creep up. The distance from the entrance threshold at the northern end of the service centre to the fuel pumps is 170 m and from the eastern end it is realistically about 140 m after the sharp left turn.

It would be safer to place all zebra crossings on raised tables in case someone e.g. a child runs across a zebra crossing unseen from behind a car. This would also save having to install speed humps as is so often the case in such service centres as shown in Figure 5 and Figure 6.

The access from the east (SH 15) has little speed control other than its two ninety degree curves, but the carriageway width is up to 11 m wide for a two-lane road.



Figure 4: Pedestrian crossings in car park



Figure 5: Typical retrofitted speed hump on entrance (Google, 2009)



Figure 6: Typical retrofitted speed hump on internal road layout in service centre (Google, 2009)

### Recommendation(s)

1. Place all zebra crossings on raised tables to protect the zebra crossing and to reduce speed in the service centre generally.
2. Add entrance threshold speed control to the eastern entrance possibly near the fuel kiosk.

Frequency Crashes are likely to be infrequent	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agree with Road Safety Auditors - all zebra crossings should be on raised tables and physical speed control should be added to the eastern entrance possibly near the fuel kiosk. These can be required as consent conditions.	
Safety Engineer comment	Insert comment	

Client decision	Insert comment
Action taken	Insert comment

## 2.3 SH15 Access

### 2.3.1 Seagull intersection form

**Serious**

A raised median seagull layout has been proposed for the access off SH15. The traffic impact assessment report suggests that the position has been chosen due to prescribed spacings (about 200 ) between the intersection and the roundabout. This has placed the intersection on the inside of a reasonably sharp horizontal curve where the sight distance, particularly to the east, is limited.



Figure 7: Proposed seagull intersection

While the reasoning for spacing requirements between normal T-intersections is reasonable, the same reasoning may not necessarily apply to roundabouts where everyone has to slow down to negotiate the intersection i.e. there is no highspeed through traffic passing through both intersections.

The designers have compensated for the reduced sight distance to the east by proposing a seagull layout so that drivers turning right out of the service centre do not have to give way to through traffic approaching from the east—only a lower volume of traffic turning right into the service centre.

Unfortunately, a Waka Kotahi study a few years ago found that, at best, seagull intersections are only as safe as a normal T-intersection. Poorly designed seagull intersections, those with only painted markings and with short deceleration and acceleration lengths, were significantly less safe.

The main safety issue is that drivers entering the main road from the minor road have difficulty in determining whether they need to give way to the left or not. They *do* need to give way to *slower* vehicles turning right, but not to *faster* vehicles heading *straight through*. This is counter intuitive. Also, drivers generally cannot see, from their low observation angle, what lane the approaching vehicle is in and whether it is going to turn right. Not everyone signals well in advance. Raised medians do help in this regard, but the right-turn bay needs to be long enough so that straight through drivers cannot suddenly change their minds and decide to turn right. This sudden change of mind is a distinct possibility as they will not be able to see the service centre until they reach the intersection. In this respect the proposed seagull intersection is particularly bad as the start of the right-turn bay is only about 60 m from the entrance, and it is this aspect that has ranked the safety concern with a common frequency coupled with a T-bone crash that has resulted in a serious safety concern.

With all this indecision going on, drivers forget to recheck that there is no one approaching from their right, or they start to cross and then hesitate or stop as they suddenly realise they have to give way to a right-turning vehicle and they get T-boned—one of the worst safety outcomes, especially as the approaching driver from their right is completely taken by surprise and has no time to react to the vehicle pulling out in front and therefore crashes at high speed.

### Recommendation(s)

1. If a seagull intersection is to be constructed, then ensure that the kerbed right-turn bay is considerably (hundreds of metres) longer than proposed so that there is no chance of sudden last-minute decision to turn right into the service centre, and so that drivers exiting the service centre have a clear view of which vehicle is in which lane. Note the residential property access requirements discussed in Section 2.4.1 and note any the potential effects on the consented seagull intersection to the east.
2. Improve the sight distance to the east by shifting the intersection to another position so that drivers exiting the service centre have a clear view of which vehicle is in which lane.
3. Preferably, consider a safer alternative left-in and left-out access arrangement as discussed in Section 2.3.3.

Frequency Crashes are likely to be common	Severity Death or serious injury is very likely	Rating The safety concern is serious
Designer response	We have prepared three alternatives for consideration by NZTA – the first is a slight moving forward of the SH15A site egress to provide 200 metres safe intersection sight distance to the east, and replacing the seagull layout with a standard right turn bay. The second is a variation on this, providing a right turn out from the site and a central median island to prohibit right turns into the site from SH15A (westbound motorists on SH15A can go around the roundabout and turn left into the site). The third option is to physically prohibit right turns at the SH15A access with a solid central median island and provide a left turn site egress onto SH1.	
Safety Engineer comment	Insert comment	
Client decision	Insert comment	
Action taken	Insert comment	

### 2.3.2 Downstream weave

Moderate

The proposed seagull intersection places all traffic exiting the service centre in the right-only lane (presumably this will be marked straight ahead as well) and all traffic from Marsden Point in the left-only lane. The distance between the end of the acceleration lane and the start of the solid lane line at the roundabout is only 100 m. This is far too short to be able to find a gap and change lanes, especially for visitors and tourists whom the service centre is intended to serve, and the weave would take place in a right-hand curve.

There are likely to be lane changing crashes.

The traffic impact report discussed the reasoning for the proposed arrangement based on eliminating the need to merge then diverge before the roundabout, but it is doubtful whether the proposed solution improves the identified merge issue. Instead, it swaps a merge issue for a weave issue, which is potentially more confusing and requires more time to execute.

If the seagull intersection is definitely to be constructed, a mitigating measure might be to provide a double right turn to Whangārei considering the future four-lane widening of SH1. This may partially eliminate some of the weave, but the roundabout would have to be redesigned to eliminate any double right turn conflicts at the exits to the roundabout. Safe pedestrian crossing would also have to be considered across two lanes. Refer to Section 2.5.1.



Figure 8: Downstream weave from seagull intersection to roundabout

**Recommendation(s)**

1. Preferably do not construct a seagull intersection arrangement.
2. If the seagull intersection does need to be constructed, then consider a double right turn or a double left turn depending on the dominant movements and consider also that the merge from right to left is more difficult to undertake than from left to right.

Frequency Crashes are likely to be common	Severity Death or serious injury is unlikely	Rating The safety concern is moderate
Designer response	We have prepared three alternatives for consideration by NZTA – the first is a slight moving forward of the SH15A site egress to provide 200 metres safe intersection sight distance to the east, and replacing the seagull layout with a standard right turn bay. The second is a variation on this, providing a right turn out from the site and a central median island to prohibit right turns into the site from SH15A (westbound motorists on SH15A can go around the roundabout and turn left into the site). The third option is to physically prohibit right turns at the SH15A access and provide a left turn site egress onto SH1. All options omit the need for a downstream weave.	
Safety Engineer comment	Insert comment	
Client decision	Insert comment	
Action taken	Insert comment	

**2.3.3 Alternative left-in and left-out arrangement**

**Comment**

Bearing in mind that traditionally prescribed intersection spacings may not necessarily apply to roundabouts or to left-in and left out arrangements, the designers could consider a left-in and left-out access on both SH1 and SH15 instead of the proposed southbound slip lane on SH1 and seagull intersection on SH15. The roundabout would provide a safe turnaround facility for all returning right-turn movements.

The stated weave reason for the left-turn deceleration lane starting north of Prescott Road would fall away once Prescott Road becomes left-in and left-out when SH1 is widened to four lanes, or even earlier if incorporated into the short-term SH1 safety improvements.

There would need to be good wayfinding signposting within the service area so that drivers chose the correct exit. The internal road and parking layout would also have to be amended to suit.

Designer response	We have prepared three alternatives for consideration by NZTA – the first is a slight moving forward of the SH15A site egress to provide 200 metres safe intersection sight distance to the east, and replacing the seagull layout with a standard right turn bay. The second is a variation on this, providing a right turn out from the site and a central median island to prohibit right turns into the site from SH15A. (Westbound motorists on SH15A can go around the roundabout and turn left into the site). The third option is to physically prohibit right turns at the SH15A access and provide a left turn site egress onto SH1.
Safety Engineer comment	Insert comment
Client decision	Insert comment
Action taken	Insert comment

### 2.3.4 Fifth roundabout leg

### Comment

The road safety audit team is not sure if a fifth roundabout to serve as the only access to the service centre was considered. Roundabouts are the safest form of intersection, but due consideration would need to be given to approach signage.

Considering that the widening of SH1 to four lanes at some stage in the future is envisaged, there may be opportunity to incorporate a fifth leg along with the reconstruction of the roundabout to accommodate the future four SH1 lanes.

## 2.4 Property Access

### 2.4.1 Incorporation into service centre access

The traffic impact assessment report states that the property access shown in Figure 9 would be closed and incorporated into the service centre access. Presumably, this arrangement would apply only the western property closest to the seagull intersection, which would be blocked by the raised median shown in light blue.

There would be no safety concern with that arrangement, but the road safety audit team is doubtful that such a right-of-way, which would be shared with a public access, could actually be achieved: or it is just wishful thinking?

If the proposed access cannot be made to work in law, then the designers will have to rethink the seagull intersection as the residents would not be able to turn around the end of the raised medians safely.

If the seagull intersection is constructed and the median island is extended as recommended in Section 2.3.1, then the same left-in and left-out issue would apply to the residential property to the east, which is assumed is not intended to be accesses via the service centre.



Figure 9: Property accesses off SH15

<p>Designer response</p>	<p>We confirm that it is only the western property that will have its SH15A access blocked and instead share the service centre access. The proposed layout is shown below:</p>  <p>We do not understand the safety auditors' concern. Both the service centre and the adjacent property are private property, and it is a routine matter to provide shared right of way between two adjacent private properties.</p>
<p>Safety Engineer comment</p>	<p>Insert comment</p>

Client decision	Insert comment
Action taken	Insert comment

## 2.5 Pedestrians

### 2.5.1 Pedestrians crossing between service centres

Moderate

It is likely that there will be some demand for pedestrians to cross between the G.A.S. service centre and the retailers at the proposed Ruakākā service centre, for example for lunch.

The existing roundabout has wide paved median islands for refuge and footpaths all around the perimeter. There are dropped kerb crossings across SH1 and SH15, but they are narrow, almost invisible, and too far from the roundabout. It is possible that the original designers placed the dropped kerbs to coincide with lighting columns for good reason, but approach speeds will be higher than at the roundabout and the existing positions will probably not coincide with the new pedestrian crossing desire lines between the two service centres.

Figure 8 shows a two-lane approach to the roundabout on SH15. This is likely to be on the desire line for pedestrians, who would probably cross two lanes of traffic in preference to following the longer route around the western side of the roundabout.



Figure 10: Missing connection G.A.S. forecourt and footpath to Ruakākā service centre (Google, 2009)

#### Recommendation(s)

1. When connecting the proposed Ruakākā service centre footpaths to the existing footpaths, ensure that they follow pedestrian desire lines and that they direct pedestrians to the safest points to cross the roundabout, generally about two vehicle lengths back from the perimeter of the roundabout and where the median refuges are wider.
2. Provide additional dropped crossings to coincide with the desire lines, as necessary.
3. Provide a short path through the flower bed to connect the G.A.S. forecourt with the existing footpath as suggested in Figure 10.
4. Ensure that the pedestrian crossing points are adequately lit and supplemented with pedestrian level lighting as required.
5. Avoid routing pedestrians to cross two-lane approaches.

Frequency Crashes are likely to be infrequent	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	There is no existing demand for pedestrians in this rural area, and no need for footpaths. It is our understanding that the formed strips behind the kerb on the roundabout approaches are off-road cycle lanes, not footpaths. Providing footpaths connecting to the proposed service centre and pedestrian crossing points as suggested by the Road Safety Auditors may have unintended safety consequences, viz. that such facilities encourage passing motorists who would otherwise drive into the site to park on the State Highway shoulder opposite the service centre instead and use the footpaths and crossing points to cross the highway to the service centre and back again. It is our proposal that a fence be constructed along the Service Centre site boundary between the two site access points, meaning that a person would need to walk 500 metres or more through the site and along the highway to get from the proposed Ruakaka Service Centre to the existing GAS service station. Given the few people that would wish to travel between the two sites, and the potential adverse safety consequences, it would be most appropriate for anyone going from one site to the other to do so in a vehicle rather than walking.	
Safety Engineer comment	Insert comment	
Client decision	Insert comment	
Action taken	Insert comment	

## 2.6 Lighting

### 2.6.1 Extent of lighting

**Comment**

The existing roundabout and its approaches are lit, but the existing lighting along SH1 and SH15 would not extend as far as the proposed new accesses.

Ensure that the existing lighting is extended to include Prescott Road and the proposed seagull intersection site.

Ensure that pedestrian paths are adequately lit.

Designer response	All proposed site intersections and traffic islands will be adequately lit as per standard specifications.
Safety Engineer comment	Insert comment
Client decision	Insert comment
Action taken	Insert comment

### 3 Audit Statement

We declare that we remain independent of the design team and have not been influenced in any way by any party during this road safety audit.

We certify that we have used the available plans, and have examined the specified roads and their environment, to identify features of the project we have been asked to look at that could be changed, removed, or modified in order to improve safety.

We have noted the safety concerns that have been evident in this audit and have made recommendations that may be used to assist in improving safety.

Signed 

Date 18 March 2021

Keith Weale, BSc(Eng), BEng(Hons), MSc, CMEngNZ, CPEng  
Principal Transportation Engineer, Stantec, Auckland

Signed 

Date 18 March 2021

Mike Sullivan, BE (Civil), CMEngNZ  
Director, Engineering Equilibrium, Whangarei

## 4 Response and Decision Statements

System designers and the people who use the roads must all share responsibility for creating a road system where crash forces do not result in death or serious injury.

### 4.1 Designer's Responses

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report and I have responded accordingly to each safety concern with the most appropriate and practical solutions and actions, which are to be considered further by the safety engineer (if applicable) and project manager.

Signed 

Date 7 May 2021

Anatole Sergejew, Senior Associate, Traffic Planning Consultants Ltd

### 4.2 Safety Engineer's Comments (if applicable)

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report together with the designer's responses. Where appropriate, I have added comments to be taken into consideration by the project manager when deciding on the action to be taken.

Signed 

Date

[Safety Engineer's name, qualification, position, company]

### 4.3 Project Manager's Decisions

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report, together with the designer's responses and the comments of the safety engineer (if applicable) and having been guided by the auditor's ranking of concerns have decided the most appropriate and practical action to be taken to address each of the safety concerns.

Signed 

Date

[Project Manager's name, qualification, position, company]

### 4.4 Designer's Statement

I certify that the project manager's decisions and directions for action to be taken to improve safety for each of the safety concerns have been carried out.

Signed 

Date

[Designer's name, qualification, position, company]

### 4.5 Safety Audit Close Out

The project manager is to distribute the audit report incorporating the decisions to the designer, safety audit team leader, safety engineer, and project file.

Date:.....

## 5 References

Google. (2009, December). Street View.

**Auckland**

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