Appendix 14 Heavy Vehicle Route Assessment

Port Wakefield Road Heavy Vehicle Route Assessment

North South Motorway on ramp/Northern Expressway interchange to Waterloo Corner Road

Renascor Resources Limited

28 April 2023
Ref: 221294R002B

tonkin

Building exceptional outcomes together

Document History and Status

Rev	Description	Author	Reviewed	Approved	Date
A	Draft	DS	RB	DS	3/04/2023
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Contents

Project: Port Wakefield Road | North South Motorway on ramp/Northern Expressway interchange to Waterloo Corner Road
Client: Renascor Resources Limited
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1 Introduction 4

2 Methodology 4

2.1 General 4

2.2 Prioritisation of Risks 5

3 Proposed Route 5

4 Existing Traffic Data 8

5 Crash Statistics 8

6 Vehicle Turning Movements 12

7 Geometric Constraints 12

8 Route Assessment 14

9 Route Assessment Concluding Statement 17

Tables

Table 1: Traffic data 8

Table 2: Crash Statistics (2017-2021 Port Wakefield Road) 8

Table 3: Crash Statistics (2017-2021 Waterloo Corner Road) 9

Table 4: NHVR Network Classification Guidelines geometric constraints 12

Table 5: Summary of recommendations to reduce the risk associated with the high-risk items 17

Figures

Figure 1: Proposed Route 6

Figure 2: Proposed Route (RAVNET, 2023) 7

Figure 3: Crash Statistics Summary (2017-2021) 11

Figure 4: Single carriageway rural road widths (Austroads Guide to Road Design Part 3) 13

Appendices

Appendix A – Turning Movement Assessments

Appendix B – Turning Movement Assessments (Comparison)

1 Introduction

The Renascor Resources Battery Anode Material (BAM) Project consists of a mine and concentrator near Arno Bay and a downstream Purified Spherical Graphite (PSG) production facility proposed to be located on Robinson Road, Waterloo Corner.

Graphite concentrates from the Arno Bay mine operation, are proposed to be transported to the PSG production facility, using the following vehicle combinations via Waterloo Corner Road and Port Wakefield Road.

- 26 m B-Double (PBS Level 2A)
- 36.5 m AB Triple (PBS Level 3A)
- 40.7m AB Triple (PBS Level 3B)

Renascor Resources have requested Tonkin to undertake a heavy vehicle route assessment along a section of Port Wakefield Road from the North South Motorway on ramp / Northern Expressway interchange to the Waterloo Corner Road intersection, which includes assessing right turns into Waterloo Corner Road. This section of Port Wakefield Road is not gazetted as a PBS Level 3B route, however Waterloo Corner Road is a gazetted PBS Level 3B route between the interchange and Port Wakefield Road. The focus of this route assessment is the assessment of the 40.7 m AB Triple combination, particularly at the Port Wakefield Road / Waterloo Corner Road intersection.

2 Methodology

2.1 General

This heavy vehicle route assessment was undertaken in accordance with the following reference documentation;

- DIT Route Assessment Guidelines (October 2008)
- NHVR Network Classification Guidelines (July 2007)
- Austroads Guide to Road Design Part 3: Geometric design (2021)

The assessment process included undertaking a day-time drive through of the proposed route on 22 March 2023 by Deshitha Senanayake (Senior Engineer, DIT Accredited Heavy Vehicle Route Assessor). The weather conditions were fine at the time of the inspection, and the pavement was dry.

The assessment process included preparing turning movement sketches on aerial backdrop for the 40.7m AB Triple at the intersection of Waterloo Corner Road and Port Wakefield Road. Turn paths for the 26 m B-Double and the 36.5 m AB Triple were not prepared since Port Wakefield Road is currently gazetted as a PBS Level 3A route and Waterloo Corner Road is gazetted as a PB Level 3B route between the interchange and Port Wakefield Road.

Pavement investigations are not included as part of the scope for this assessment, with only the road geometry being assessed based on available information.

2.2 Prioritisation of Risks

The assessment and management process outlined within the DIT Route Assessment Guidelines has been adopted to assess and prioritise risks along the proposed route.

Risk management measures have been prioritised from P1 to P4, as defined below:

Priority	Risk Rating	Definition
P1 (Priority 2)	Very high risk	Required to be treated prior to operation of RAVs on the route.
P2 (Priority 2)	High risk	Required to be treated prior to operation of RAVs on the route.
P3 (Priority 3)	Moderate risk	Road Authority should treat hazards conditional upon the level of risk acceptance
P4 (Priority 4)	Low risk	Risk Acceptable

3 Proposed Route

The proposed route is shown in Figure 1. It is understood that access on Port Wakefield Road will be limited to the southbound direction only. To head north bound, the proposed vehicle will access the North-South Motorway via the interchange roundabout on Waterloo Corner Road, which is gazetted as a PBS Level 3B route.

Observations on site showed an A-Double perform a right turn from Port Wakefield Road (North) into Waterloo Corner Road (West).

Figure 1: Proposed Route

RAVNET (2023) indicates that south of the North South Motorway / Northern Connector interchange, Port Wakefield Road is not gazetted as a PBS Level 3B route.

Between the North South motorway interchange and Port Wakefield Road, Waterloo Corner Road is gazetted as a PBS Level 3B route.

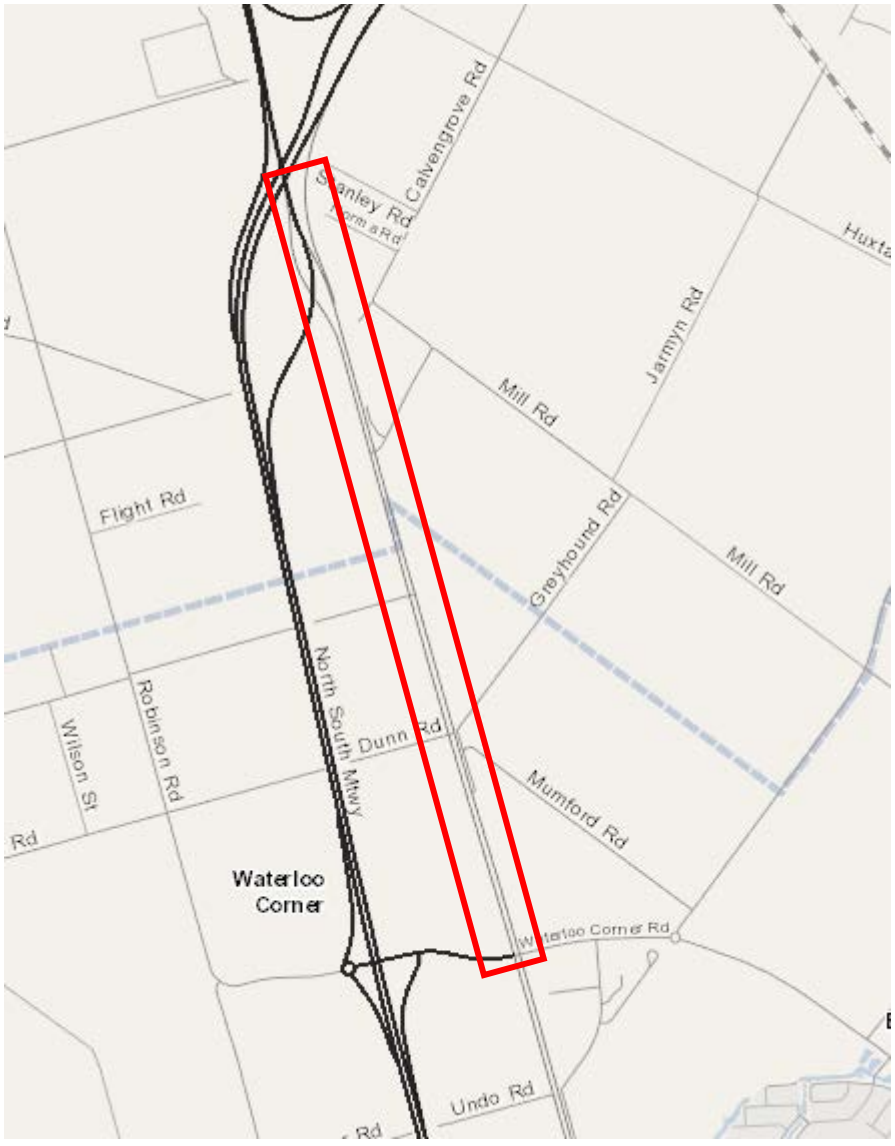

Figure 2: Proposed Route (RAVNET, 2023)

4 Existing Traffic Data

Traffic data for Port Wakefield Road and Waterloo Corner Road is summarised in the table below.

Table 1: Traffic data

Road	Count Year	Count Location	Annual Average Daily Traffic Volume (two-way AADT, vpd)	Commercial Vehicle %
Port Wakefield Road	2020	Unknown	13,400	14.5%
Waterloo Corner Road	2020	Unknown	9,600	19%

5 Post Development Traffic

Tonkin were engaged by Renascor to undertake a traffic impact assessment of the Purified Spherical Graphite facility in Bolivar. The assessment looked at the existing traffic conditions, traffic demands as a result of the development, and traffic impacts during the two-stage construction/operation of the Bolivar facility. Further details can be found in traffic impact assessment (ref. 221875).

6 Crash Statistics

Based on crash data supplied by DIT, there have been 11 crashes on Port Wakefield Road and 22 crashes on Waterloo Corner Road in the last 5-year period (i.e. 2017 – 2021). Crash statistics are summarised in the tables below.

Table 2: Crash Statistics (2017-2021 Port Wakefield Road)

	Fatalities	Serious Injuries	Minor Injuries	Total Casualties
PT WAKEFIELD ROAD	0	1	10	11
Hit Fixed Object	0	1	0	1
D.U.I.	0	1	0	1
Inattention	0	0	0	0
Reverse Without Due Care	0	0	0	0
Rear End	0	0	7	7
D.U.I.	0	0	2	2

Follow Too Closely	0	0	2	2
Inattention	0	0	3	3
Right Angle	0	0	1	1
Disobey - Stop Sign	0	0	1	1
Roll Over	0	0	0	0
Inattention	0	0	0	0
Side Swipe	0	0	2	2
Change Lanes to Endanger	0	0	2	2

Table 3: Crash Statistics (2017-2021 Waterloo Corner Road)

	Fatalities	Serious Injuries	Minor Injuries	Total Casualties
WATERLOO CNR INTERCHANGE CONNECT	1	4	17	22
Hit Fixed Object	0	1	1	2
Inattention	0	1	1	2
Other	0	0	0	0
Inattention	0	0	0	0
Vehicle Fault	0	0	0	0
Rear End	0	0	8	8
Follow Too Closely	0	0	0	0
Inattention	0	0	8	8
Right Angle	1	2	4	7
Disobey - Traffic Lights	1	2	4	7
Fail to Give Way	0	0	0	0
Right Turn	0	1	3	4
Disobey - Traffic Lights	0	1	2	3

Fail to Stand	0	0	1	1
Side Swipe	0	0	1	1
Change Lanes to Endanger	0	0	0	0
DIED, SICK OR ASLEEP AT WHEEL	0	0	0	0
Inattention	0	0	0	0
Incorrect Turn	0	0	1	1
Grand Total	1	5	27	33

All Fatal and Serious Injury crashes occurred at the Waterloo Corner Road / Port Wakefield Road signalised intersection, with the crash types being right angle, right turn or hit fixed object.

Figure 3 provides a summary of the crash statistics including the key road and the cross road where the crash occurred.

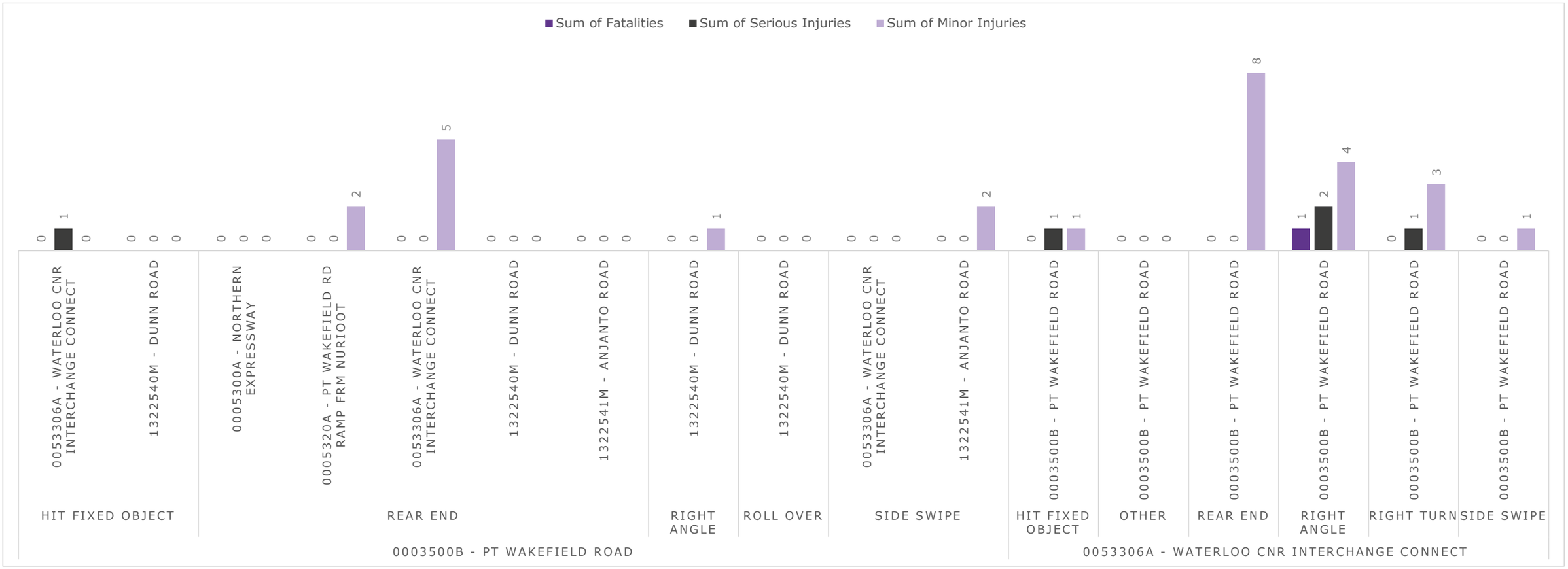

Figure 3: Crash Statistics Summary (2017-2021)

7 Vehicle Turning Movements

A 40.7m AB Triple vehicle combination was modelled in Autoturn based on dimensions provided by Renascor. The modelled parameters are presented in Appendix B along with a comparison with the turning movements of a 39.99 m AB Triple; the comparison shows that there is little difference between the two turn paths for a 12.5 m radius. A turning movement sketch was prepared for the 40.7m AB Triple vehicle for the right turn from Port Wakefield Road into Waterloo Corner Road, and is presented in Appendix A.

8 Geometric Constraints

Assessment of the suitability of the proposed route for PBS Level 3B access has been undertaken based upon a drive through of Port Wakefield Road, preparation of turn path sketches on aerial photography, and assessment against the geometric constraints outlined in the NHVR publication "The Performance Based Standards Scheme – Network Classification Guidelines" (2007) and the Austroads Guide to Road Design Part 3: Geometric Design, as detailed below.

The PBS Network Classification Guidelines provide several geometric constraints for Level 3 vehicles based on the road's AADT. Key constraints are:

Table 4: NHVR Network Classification Guidelines geometric constraints

Constraints	Reference	L3 Road Class
Minimum Lane Widths for Urban and Township Roads	Table 2	3.6 m wide lanes (80-100 km/h)
Minimum Widths for Sealed Rural Roads	Table 3	3.5m wide traffic lanes and 1.3m wide shoulder for L3 vehicles on roads with an AADT > 3000 vehicles per day.
Curve Widening	Table 5	Curve widening required where curve radius is less than 700m.
Bridge Widths	Table 6	7.2m minimum width on rural roads where AADT is less than 500 vehicles per day.
Signalised Intersections	Table 12	Clearance time and stacking distances at signalised intersections at flat grades Intersection width –30 m Min. green plus intergreen (s) - 20.5 s (Access Class B)
Approach Visibility	Table 15	210m Stopping sight distance (0% grade, 90 km/h)

Austroads Guide to Road Design Part 3 - Table 4.5 has also been referenced to assess the route. Austroads minimum requirements are presented in Figure 4 below.

Table 4.5: Single carriageway rural road widths (m)

Element	Design AADT				
	1–150	150–500	500–1000	1000–3000	> 3000
Traffic lanes[1]	3.7 (1 x 3.7)	6.2 (2 x 3.1)	6.2–7.0 (2 x 3.1/3.5)	7.0 (2 x 3.5)	7.0 (2 x 3.5)
Total shoulder	2.5	1.5	1.5	2.0	2.5
Minimum shoulder seal [2],[3],[4],[5],[6]	0	0.5	0.5	1.0	1.5
Total carriageway	8.7	9.2	9.2–10.0	11.0	12.0

1 *Traffic lane widths include centrelines but are exclusive of edge-lines.*
2 *Where significant numbers of cyclists use the roadway, consideration should be given to fully sealing the shoulders. Suggest use of a maximum size 10 mm seal within a 20 km radius of towns.*
3 *Wider shoulder seals may be appropriate depending on requirements for maintenance costs, soil and climatic conditions or to accommodate the tracked width requirements for Large Combination Vehicles.*
4 *Short lengths of wider shoulder seal or lay-bys to be provided at suitable locations to provide for discretionary stops.*
5 *Full width shoulder seals may be appropriate adjacent to safety barriers and on the high side of superelevation.*
6 *A minimum 7.0 m seal should be provided on designated heavy vehicle routes (or where the AADT contains more than 15% heavy vehicles).*

Figure 4: Single carriageway rural road widths (Austroads Guide to Road Design Part 3)

9 Route Assessment

Item	Assessment Findings	Risk Assessment	Recommendations
Road Width			
1.	Port Wakefield Road is a divided, four-lane dual carriageway arterial road with a posted speed limit of 90 km/h. The lane widths are 2x3.5 m wide (typical), with a minimum 2.0 m wide sealed shoulder. The widths generally comply with minimum requirements in Austroads Guide to Road Design for a dual carriageway road, and the NHVR Network Classification Guidelines.	Comment	
Road Geometry			
2.	There is a single horizontal curve in the section of road being assessed. The horizontal curve radius is approximately 650 m based on aerial measurements. Lane widths are 3.5 m wide. The network classification guidelines stipulate lane widening of 0.2 m beyond a minimum lane width of 3.5 m. While the existing lane width is not wide enough, there is a sealed pavement in the gore area in between the outside lane on Port Wakefield Road and the on ramp onto Port Wakefield Road from the Northern Expressway. The width of the gore area at the apex of the curve is 1.70 m and therefore there is sufficient sealed width for the vehicle to track through the curve.	Possibility Conceivable but Very Unlikely Exposure Infrequent Consequence Important Priority P4 – Low Risk	
Sight Lines			
3.	The alignment on approach to the signalised intersection at Waterloo Corner Road is straight, and the grade appears flat. There are	Comment	

Item	Assessment Findings	Risk Assessment	Recommendations
	advance warning signs prior to the intersection to warn motorists of the signalised intersection. Sightlines to the traffic signals are considered appropriate.		
Turning Movement Assessments			
4.	A turning movement assessment was undertaken at the Port Wakefield Road / Waterloo Corner Road intersection for the right turn manoeuvre. This is presented in Appendix A. The intersection can cater for right turn manoeuvres of the 40.7 m AB triple vehicle combination.	Comment	
Intersection Geometry			
5.	The channelised right turn lane on Port Wakefield Road, at the Waterloo Corner Road intersection, has a deceleration + taper length of 148 m. The current gazettal status of Port Wakefield Road allows PBS Level 3A vehicles, which have a maximum length of 36.5 m, to use the road. The length of the proposed vehicle is 40.7 m. The maximum length of PBS Level 3B vehicles is 42 m. The increased length of vehicles in the right turn lane may impact on storage capacity and the length available for deceleration, resulting in traffic impacts on Port Wakefield Road. The concern is the potential for rear end and side swipe crashes.	Possibility Conceivable but Very Unlikely Exposure Infrequent Consequence Serious Priority P4 - Low Risk	Review traffic impacts at the channelised right turn lane on Port Wakefield Road.
Signal Clearance Times			
6.	Based on discussions with DIT and observations made on site, the right turn green time is 5 seconds, with 6 seconds of yellow time. Noting that the clearance distance of the right turn is around 45 m, there is concern	Possibility Possible Exposure Infrequent	Review/modify clearance times at the intersection to ensure the vehicle has sufficient time to clear the intersection and conflict points.

Item	Assessment Findings	Risk Assessment	Recommendations
	that the current clearance time is not sufficient, thereby presenting an increased intersection crash risk.	Consequence Very Serious Priority P2 – High Risk	

10 Route Assessment Concluding Statement

Renascor has engaged Tonkin to undertake a heavy vehicle route assessment of Port Wakefield Road from the North South Motorway/ Northern Expressway interchange to the Waterloo Corner Road intersection.

The assessment has identified one high risk issue associated with clearance times for the right turn at the Waterloo Corner Road / Port Wakefield Road intersection. A summary of recommendations to reduce the risk associated with the use of Port Wakefield Road is provided in Table 5.

Table 5: Summary of recommendations to reduce the risk associated with the high-risk items

Item	Recommendation	Revised Risk Ranking
Item 6 – Signal Clearance Rimes	Review/modify clearance times at the intersection to ensure the vehicle has sufficient time to clear the intersection and conflict points when performing a right turn from Port Wakefield Road (North) to Waterloo Corner Road (West)	Low

Following the implementation of the recommendations for the high risk item (Table 5) the section of Port Wakefield Road assessed (i.e. the southbound lane between the North South Motorway on ramp at the Northern Expressway interchange and Waterloo Corner Road) could be used as a PBS Level 3B route provided a low level of risk is acknowledged and managed.

Appendix A – Turning Movement Assessments

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0 2.5 5 10 15
1:250 (A1); 1:500 (A3)

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SHEET SIZE
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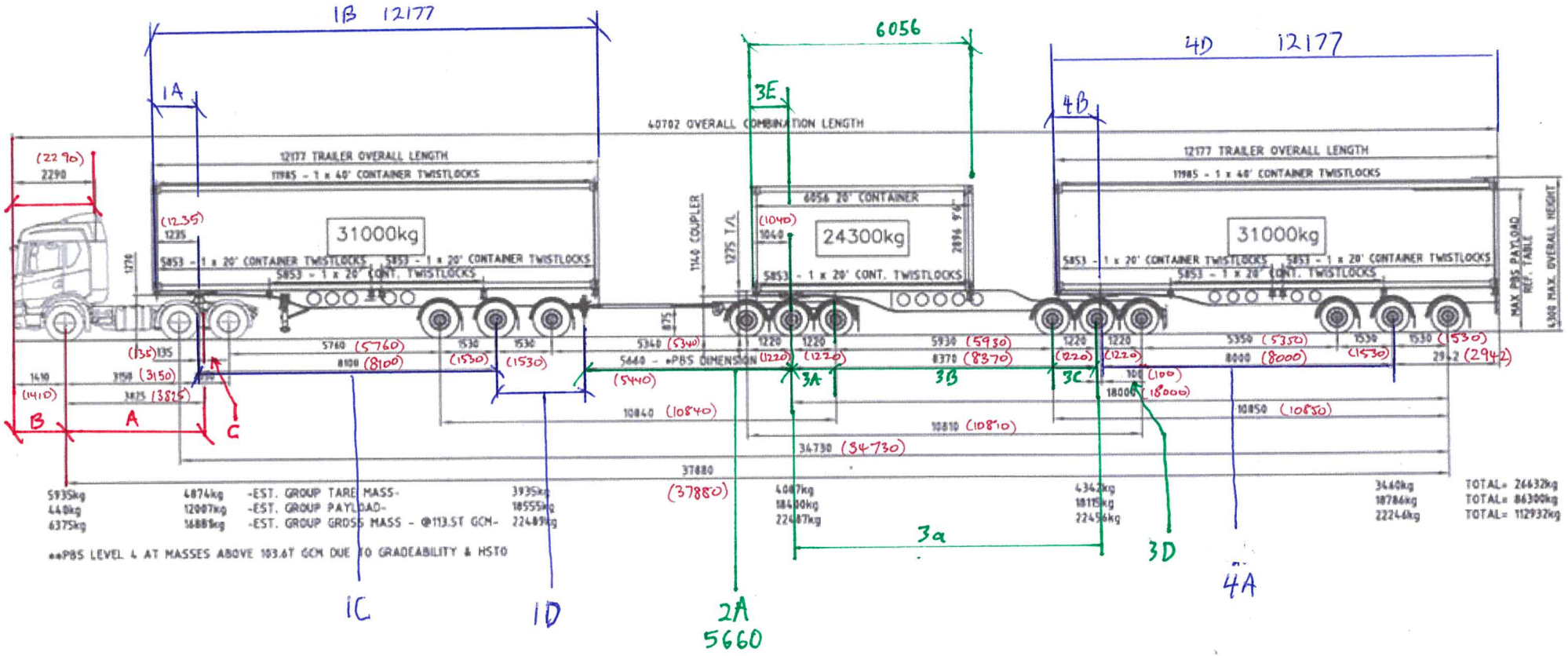
WATERLOO CORNER RD AND ROBINSON RD HEAVY VEHICLE ROUTE ASSESSMENT TURN PATH - 40.7m AB-TRIPLE SKETCH-02

FILENAME:	PROJECT NUMBER	DRAWING NUMBER	REVISION
SK01.DWG	221294	DS111	A

T:\2022\221294 WATERLOO CNR ROAD HVRA - RENASCOR RESOURCES\4_WORKING\6 SKETCHES\SK01.DWG -SK02- (15-03-23 11:24:11AM)

Appendix B – Turning Movement Assessments (Comparison)

FINAL DETAIL DESIGN MAY VARY FROM THE LAYOUT SHOWN; FINAL DESIGN SHOWN ON ENGINEERING LAYOUT



CAB

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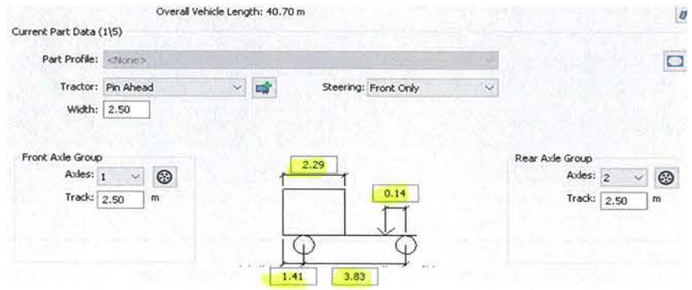
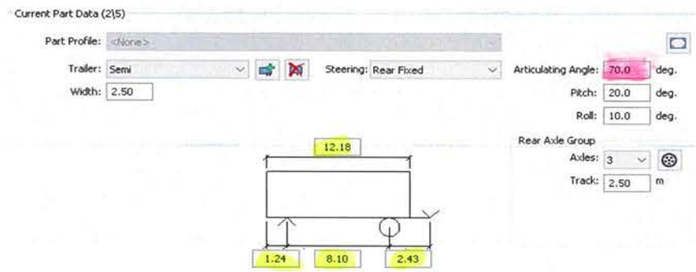
B	1.41
C	0.135
D	2.29



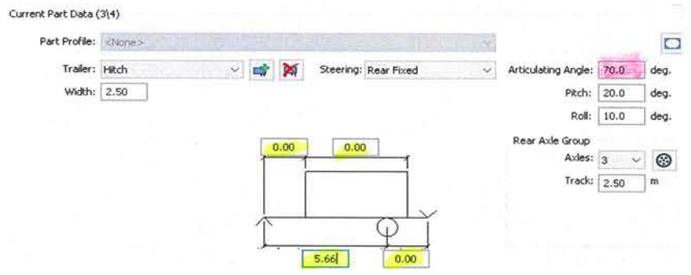
Trailer 1

C		0.135			
1A		1.235			
1B		12.177			
1C		8.1			
1D		2.43			
1a	C+1A	0.135	1.235		1.37
1b	1C-C	8.1	0.135		7.965
1D		10.84	1.53	5.66	1.22 2.43



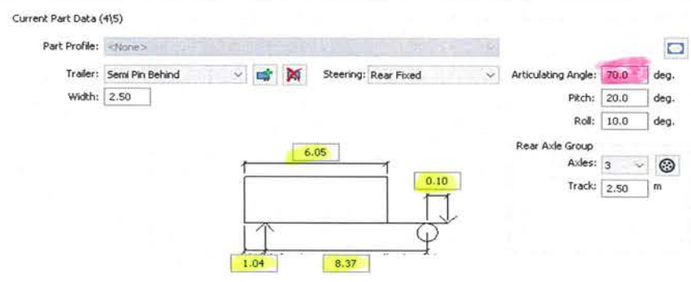
Trailer 2
Hitch

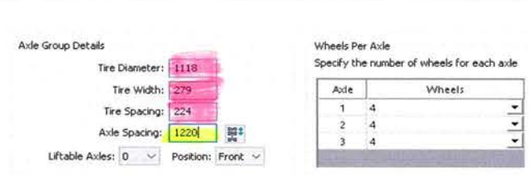
2A	5.66
2B	0
2C	0
2D	0



Trailer 3
Hitch

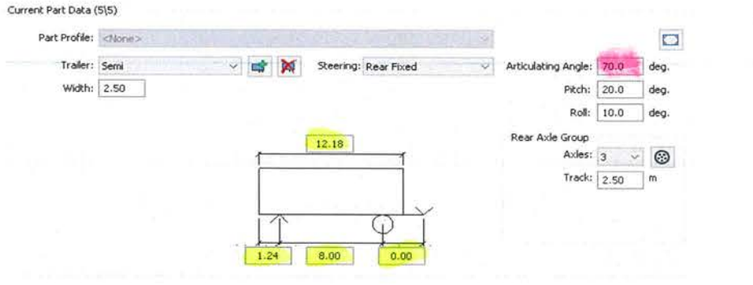
3A		1.22			
3B		5.93			
3C		1.22			
3D		0.1			
3E		1.04			
3F		6.054			
3a	3A+3B+3C	1.22	5.93	1.22	8.37

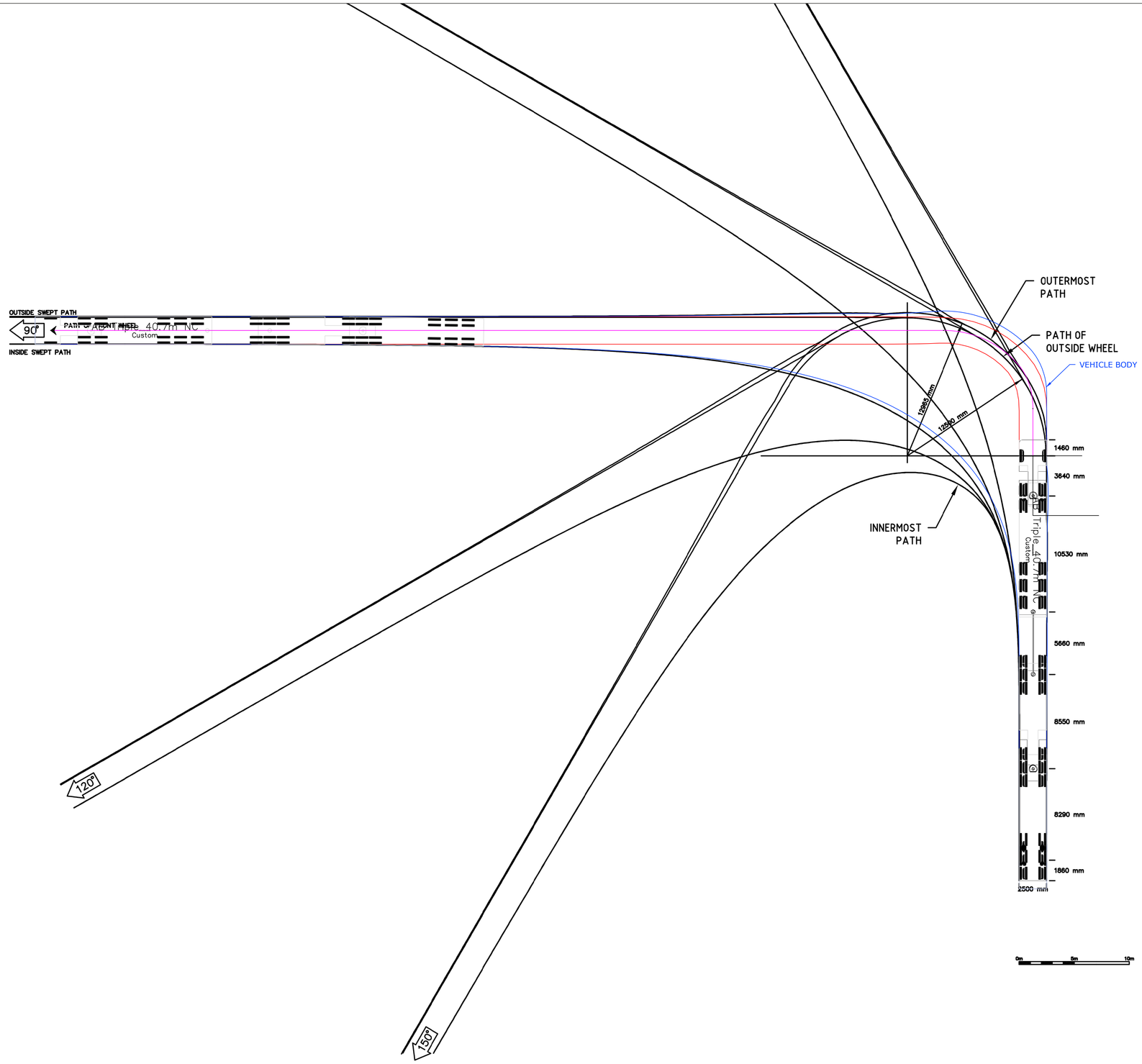




Trailer 4

		1.135			
4A		8			
4B		1.235			
4C		0			
4D		12.177			
4E					
4F					
4B	12.177 5		8	2.942	1.235





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90 Deg TURN
STANDARD AT Radius

FILENAME: AB TRIPLE 40.7M - 90DEG.DWG

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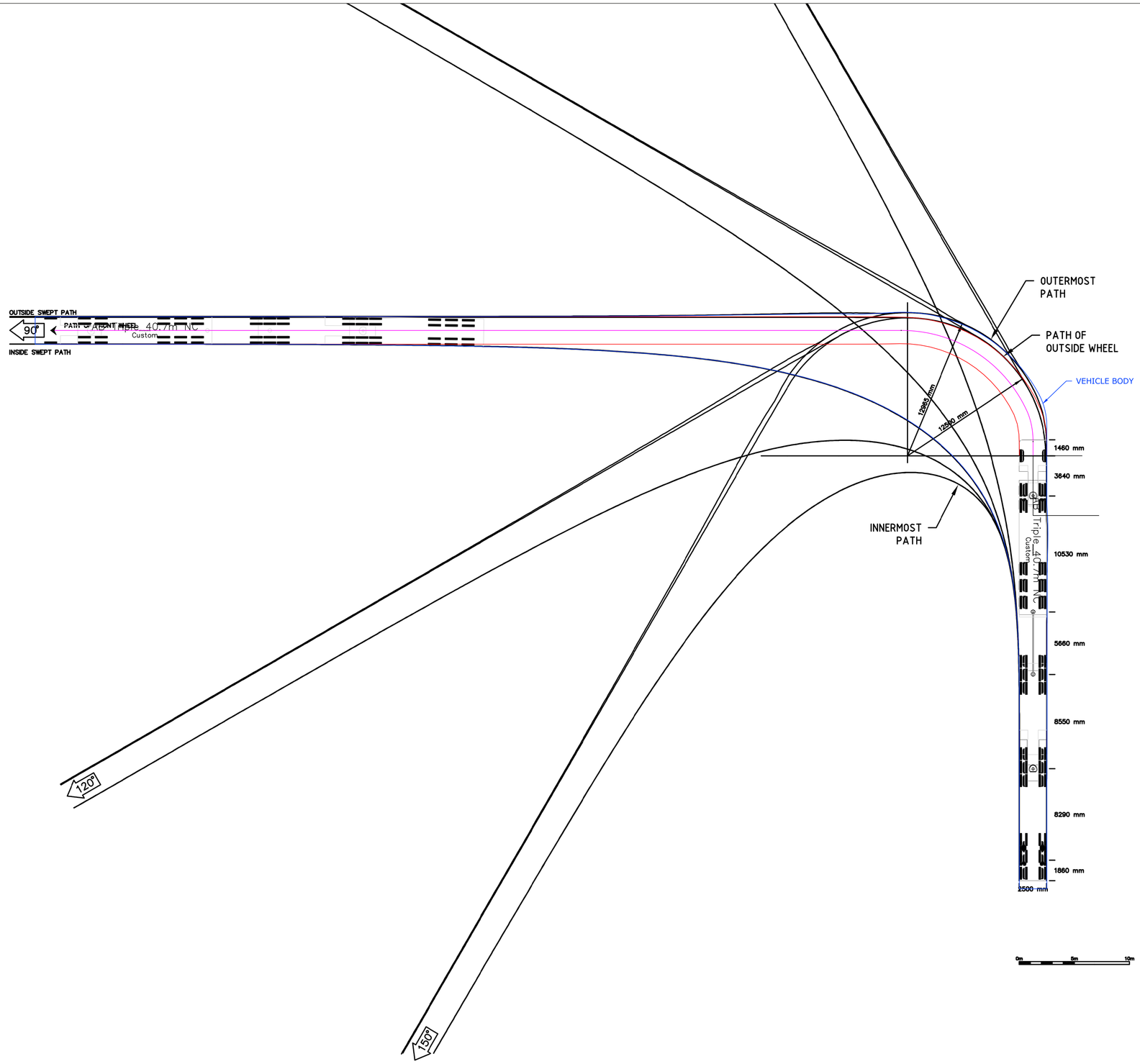

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90 Deg TURN
12.5m CL Radius

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PROJECT NUMBER: 221294
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REVISION:

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