ScotlandTranServ
A Balfour Beatty Mouchel Joint Venture

A78 Montfode to Monktonhead Road Safety Investigation

Pennyburn Roundabout to Eglinton Interchange

18/SW/0801/035

August 2020

Document Control Sheet

Project Title:	A78 Montfode to Monktonhead
Report Title:	Road Safety Investigation
Revision:	0
Status:	DRAFT

Record of Issue

Revision	Status	Author	Date	Check	Date	Authorised	Date
	Draft	Redacted - Regulation 11(2)	10/8/20	Redacted - Regulation 11(2)	10/8/20	Redacted - Regulation 11(2)	10/8/20

Distribution

Organisation	Contact	Copies
Transport Scotland		1 electronic

1. Contents

2. Introduction

This report is a detailed investigation of the A78 between Montfode to Monktonhead and should be read in conjunction with the Project Plan for this scheme.

The route was identified in the 2018 Annual Road Safety Review (2018 ARSR) for investigation and combines several Links and Cluster sites, which were recognised in 2018 ARSR, and this report incorporates these into a review of accidents over the whole section.

To review the accidents effectively the route has been broken into several sections that are determined by road type, junctions or environment.

The accident data from the 2018 ARSR was for the three year period 1/1/14 to 31/12/16. However, this report has been updated for a 5 year investigation over the period 1/1/15 to 31/12/19, utilising the updated accident statistics available.

The intention of the report is to determine common accident causation factors and provide remedial measures for these, providing an estimate of installation cost and First Year Rate of Return (FYRR).

In line with Transport Scotland Road Safety Action Plan 2017 this report will look at other works that are possible on route within the Action Points of the Plan.

3. Location

The A78 begins in Greenock in the local authority area of Inverclyde and is a continuation of the A8 road at the Bull Ring roundabout, and runs in a southerly direction through Spango Valley, Inverkip, Wemyss Bay, Largs, Seamill and then bypasses the major towns of Ardrossan, Irvine in North Ayrshire and Troon amongst others before terminating at Monktonhead Roundabout near Prestwick, South Ayrshire, where it forms a junction with the A77.

The A78 is extremely diverse in nature as it makes its way southwards, encapsulating urban, coastal and rural road environments. This in turn leads to the driver encountering a numbers challenges whilst journeying south, such as changes in speed limits, road geometry and the presence of a variety of vulnerable road users.

Accordingly, this has led to various sections of the A78 featuring prominently in Scotland TranServ's Annual Road Safety Reports in relation to an above average number of collisions.

One section that has been highlighted is the section from Montfode south of Seamill to where the road terminates at Monktonhead, a stretch of road of around 15 miles. (See Figure 3.1 below).

For the purposes of this report, due to the length of road involved, this section of the A78 was divided into fourteen separate sections and then each was investigated individually. This next report covers the seventh section of the investigation - Pennyburn Roundabout to Eglinton Interchange a length of carriageway of around 3km. This section of the A78 connects the strategic Ayrshire towns of Saltcoats and Ardrossan to Irvine.

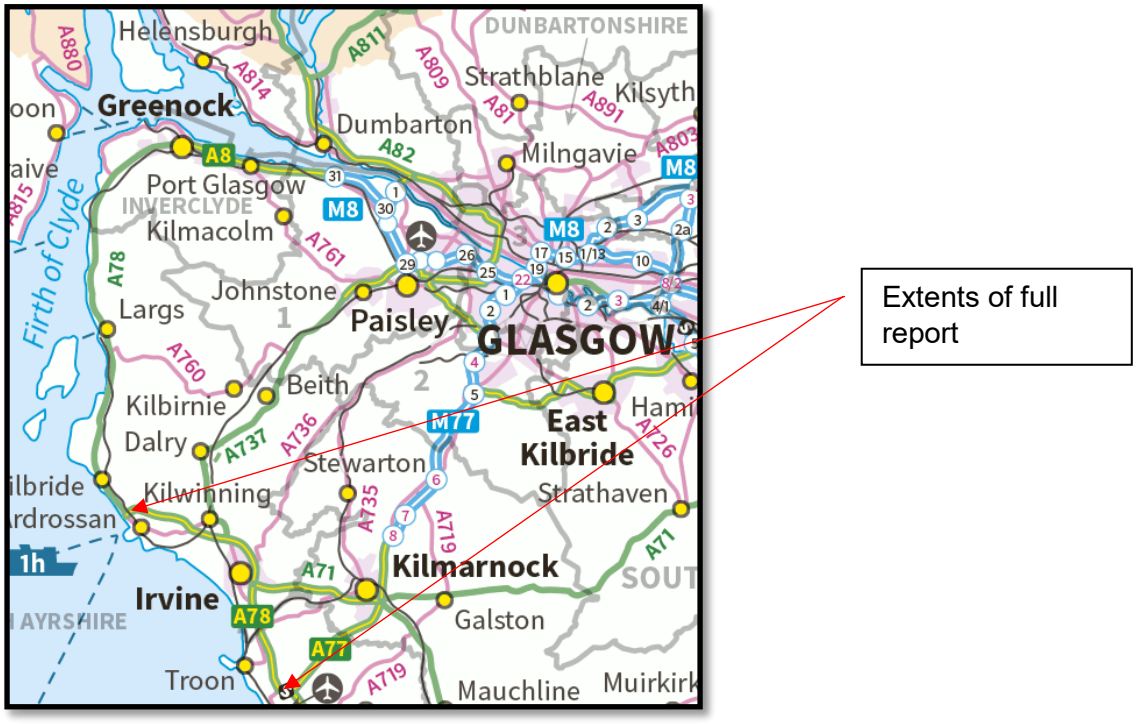

Figure 3.1 – Location Plan

4. Pennyburn Roundabout to Eglinton Interchange (Section 7)

4.1 Location

This section of the A78 is dual carriageway, is approximately 3kms long and starts off with a 40mph speed limit at Pennyburn roundabout until approximately 100m east where the speed limit changes to National Speed Limit.

A Vehicle Restraint System (VRS) is in place over the full length of this section.

The carriageway is bordered on both sides by wide grass verges and is predominantly street lit. The unlit section is between Pennyburn Roundabout and the first rail bridge to the east.

The A78 at this point is relatively straight between the two interchanges and travels in an easterly direction towards the Eglinton Interchange, by-passing Kilwinning to the north and connecting Saltcoats and the ferry port of Ardrossan to the commercial important town of Irvine.

4.2 Accident Locations and Description.

Over the five year period investigated (2015/2019) fourteen accidents occurred on this section of the A78. During early 2020, the Integrated Road Information System (IRIS) collision severity categories were changed. For the purposes of this investigation the three pre-existing classifications of fatal, serious and injury accidents will be used.

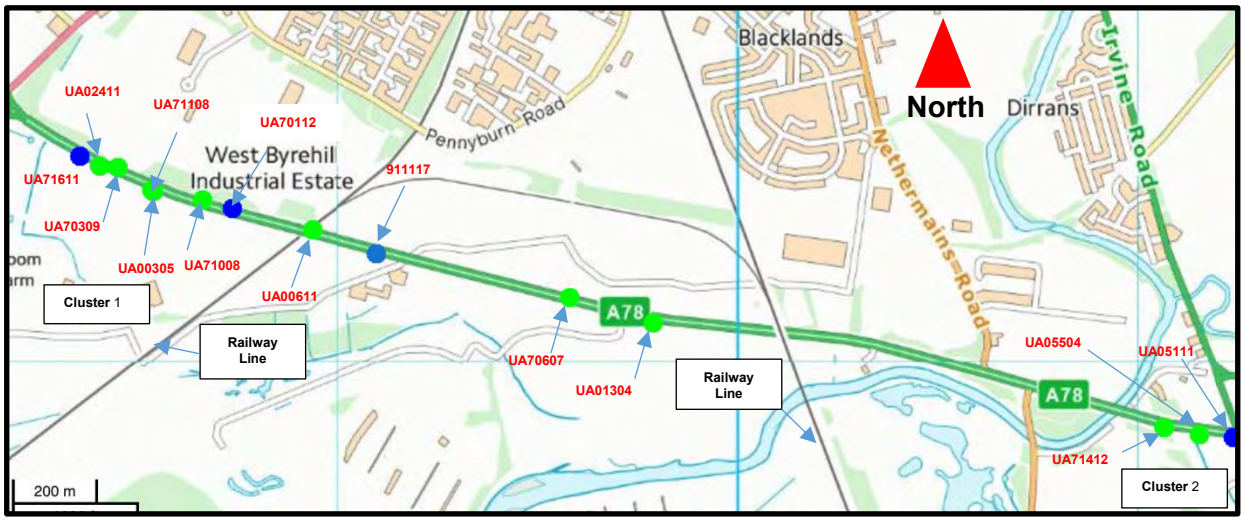

Figure 4.2. Accident Locations

Of the 14 accidents there were three Serious and nine Slight injury.

1. Redacted
2. Redacted
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4. Redacted
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13. Redacted

14. Redacted

4.3 Accident Summary

Reviewing the accidents it can be seen that there are-

- Four accidents that involve external contributory factors that cannot be addressed by engineering measures– Redacted
- One pedestrian accident. Contributory factor given as Redacted so difficult to understand any cause.
- Seven single vehicle accidents.
- 65% of the collisions involved wet or icy roads.
- Almost half (6/14) were in the dark.

The accidents are in three distinct accident sections

- Between Pennyburn Roundabout and the first rail bridge east.
- On the main line.
- On the approach to Eglinton Interchange.

These will be investigated individually in Section 5. First the overall accidents will be investigated in Section 4.4 for any common factors.

4.4 Full Section Investigation

4.4.1 Contributory Factors

In order to understand the situation in relation to the collisions over this full section of the route, the contributory factors were analysed, see Table 4.4.1 below. This analysis will enable us to fully understand if there is a common factor over the whole route or if it is localised to certain parts of the route.

Contributory Factor	Number	%age	RRCS 2018
Failed to judge path/speed	2	**8.7%**	9.00%
Failed to look	3	13%	16.00%
Rain sleet snow	1	**4.35%**	1.00%
Spray	1	**4.35%**	0.00%
Loss of control	2	**8.7%**	7.00%
Slippery road	1	4.35%	5.00%
Following too close	2	**8.7%**	2.00%
Illness	1	**4.35%**	1.00%
Fatigue	1	**4.35%**	1.00%
Careless/reckless in a hurry	1	4.35%	7.00%
Alcohol/drugs	5	**21.8%**	1.00%
Dangerous action in c/way	1	**4.35%**	1.00%
Pedestrian wearing dark clothing at night	1	**4.35%**	1.00%
Other	1	**4.35%**	1.00%
Total	**23**	100.00%	53.00%

Table 4.4.1 Contributory Factors

It can be seen that several contributory factors are over represented, when compared to RRCS 2018, however, as some factors only appear once it is considered more appropriate to look at groups of factors relating to behaviours to understand if they are truly representative of the accident situation.

Also over one fifth of the accidents involve drugs and alcohol. This contributory factor cannot be addressed through engineering measures, however may wish to be considered for data led enforcement campaigns in the area by Police Scotland in the future.

It is also noted that in several instances speed and weather related factors contributed to the collisions. We now go on to look in more detail at these factors below.

4.4.2 *Speed Related Contributory Factors*

First looking at contributory factors relating to vehicle speed over the five year period in Table 4.4.2 below:

Contributory Factor	Number	%age	RRCS 2018
Failed to judge path/speed	2	**8.7%**	9.00%
Failed to look	3	13%	16.00%
Loss of control	2	**8.7%**	7.00%
Following too close	2	**8.7%**	2.00%
Total	9 out of 23	**39.1%**	34.00%

Table 4.4.2 Speed Related Contributory Factors

It can be seen that these are all over represented against RRCS 2018 factors from Table T and that this type of accident accounts for more than 1 in 3 of all accidents on this section of the A78.

4.4.3 *Speed Surveys*

To better understand the speed of vehicles on this section speed surveys were carried out at three locations (Figure 4.4.3) from 20 March 2019 for seven days and the results are shown below in Table 4.4.3.

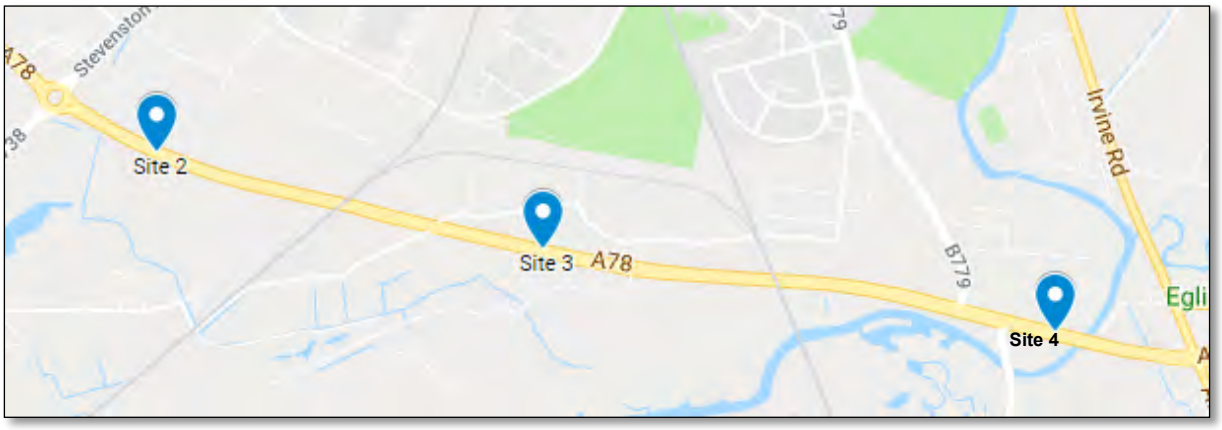

Figure 4.4.3 Speed Survey Locations

Site	Direction	7-Day Average Speed (mph)	7-Day 85th %ile Speed (mph)	%age vehicles speeding
2*	Eastbound	56.2	62.3	2.40%
	Westbound	53.7	61.1	1.60%
	Combined	54.8	61.7	1.90%
3	Eastbound	68.8	79.2	44.20%
	Westbound	64.9	72.8	25.60%
	Combined	66.9	76.2	34.80%
4	Eastbound	60.5	69.5	13.40%
	Westbound	61.5	68.9	11.60%
	Combined	61	69.2	12.50%

*Table 4.4.3 Speed Survey Results *It should be noted that this survey site is not far from the 40mph speed limit Westbound and the return to National Speed Limit Eastbound.*

It can be seen from the results in Table 4.4.3 above that the speeds at Site 3, the long straight middle section between the two railway lines, are a cause for concern with the 85%ile speed being above the National Speed Limit (NSL), and over 34% of all vehicles above the NSL. Further investigation was undertaken of the survey results to understand the speeds by vehicle class.

Whilst the accidents have 22 of 23 vehicles coded as cars, it was decided to understand if the levels of speeding varied across all vehicle types, as with this being a National Speed Limit, different vehicle classes have a different speed limit.

This analysis is shown below in Tables 4.4.5 a, 4.4.5b and 4.4.5c.

Site 2 – 150m South of Pennyburn Roundabout

Table 4.4.3a below highlights the details by direction at this location

	Full Week				
	Aggregate Class	PSL (Posted Speed Limit)	Average Speed	85th Percentile	%Speeding
Eastbound	MC/Car/LGV	70	56.9	62.8	3%
	HGV	50	53.9	60.4	70%
	Bus	60	44.9	-	0%
Westbound	MC/Car/LGV	70	53.9	61.3	2%
	HGV	50	51.3	57.5	58%
	Bus	60	49.9	55.0	1%

Table 4.4.3a – Site 2 Speeds by Class

Site 3 – Between the Rail Bridges

Table 4.4.3b below highlights the details by direction at this location

	Full Week				
	Aggregate Class	PSL (Posted Speed Limit)	Average Speed	85th Percentile	%Speeding
Eastbound	MC/Car/LGV	70	69.3	79.5	46%
	HGV	50	61.6	71.4	94%
	Bus	60	56.3	60.4	16%
Westbound	MC/Car/LGV	70	65.4	73.0	27%
	HGV	50	58.8	67.1	90%
	Bus	60	54.7	58.0	10%

Table 4.4.3b – Site 3 Speeds by Class

Site 4 – Approach to Eglinton Interchange

Table 4.4.3c below highlights the details by direction at this location

	Full Week				
	Aggregate Class	PSL (Posted Speed Limit)	Average Speed	85th Percentile	%Speeding
Eastbound	MC/Car/LGV	70	60.9	69.7	14%
	HGV	50	55.1	63.4	75%
	Bus	60	51.7	56.2	4%
Westbound	MC/Car/LGV	70	61.9	69.1	12%
	HGV	50	57.1	64.7	87%
	Bus	60	54.4	58.8	8%

Table 4.4.3c – Site 4 Speeds by Class

N.B. For consistency and clarity northbound and southbound have been noted as vehicle direction from police reports. Speed surveys used westbound (north in police reports) and eastbound (south in police reports).

4.4.3.1 Speed Survey Summary

It can be seen from the above results the confirmation of the higher speeds in and around Site 3, which is as expected given there are junctions in the vicinity of the other sites.

What is apparent is the high level of speeds and speeding is most prevalent amongst the vehicles that are restricted to a 50mph speed limit (HGV's – 90% and 94% at Site 3 and 75% and 87% at Site 4).

4.4.4 Weather and Light Related Contributory Factors

Looking at the contributory factors that relate to weather conditions.

Contributory Factor	Number	%age	RRCS 2018
Rain/sleet/snow	1	**4.35%**	1.00%
Spray	1	**4.35%**	0.00%
Slippery road	1	4.35%	5.00%
Total	**3**	**13.05%**	**6.00%**

Table 4.4.4a Weather Condition Contributory Factors

Given the low number of contributory factors above, whilst these are over represented against the RRCS 2018 factors it doesn't give a full picture of the weather conditions impact on the accidents.

The tables below (4.4.4b & 4.4.4c) show this comparison. With Table 4.4.4b showing the percentage of accidents in weather conditions compared against the RRCS 2018 percentages, and Table 4.4.4c doing the same for the light conditions reported. By looking at both weather and light statistics we can have a full picture of the impact of these conditions on the accidents.

Road Conditions	%age	RRCS 2018
Wet	**57%**	41.5%
Ice	**7%**	6.6%
Dry	36%	51.9%

Table 4.4.4b Road Condition

Light Conditions	%age	RRCS 2018
Light	57%	74%
Dark	**43%**	26%

Table 4.4.4c Light Condition

It can be seen from the above the level of Wet/Ice and Dark accidents are over represented against the levels set out in RRCS 2018.

4.4.5 Section Conclusion

From the above investigation it is concluded that the accidents are occurring as a result of vehicles travelling at an inappropriate speed, usually in the dark and wet weather conditions.

This is highlighted by 9 of 23 (39.1%) contributory factors relate to inappropriate speed, compared to 34% for the corresponding RRCS 2018 factors.

Actual vehicle speeds are shown to be at the highest level in the section between the rail bridges, where the 85th%ile speeds are above the relevant speed limits and the levels of speeding can be up to 94%, depending on the vehicle class and speed limit.

It is considered that measures to manage this speeding issue should be implemented. This is detailed in Section 4.4.6 – Recommendations.

Dark and wet conditions are both over represented against RRCS 2018 percentages, highlighting the impact of these conditions on the accidents here.

Impairment would also appear to be an issue, however this type of illegal driver behaviour is beyond the sphere of engineering measures and should be considered as a part of police enforcement measures in the area in the future.

The reported collisions appear to be concentrated around the three particular areas identified

- Between Pennyburn Roundabout and the first rail bridge east.
- On the main line between the rail bridges.
- On the approach to Eglinton Interchange

These are further investigated in Section 5 – Section Investigation.

As part of this investigation, and to understand the driving ‘environment’ better on this section of the A78, a review of the existing road markings, road signs, and lighting provision will be included in the following individual sections in Section 5.

4.4.6 Recommendations

Given the above, it is recommended that measures are introduced to mitigate the accidents involving inappropriate vehicle speeds. In particular a measure that can target vehicles by their class.

It is proposed to introduce speed/class Vehicle Activated Signs (VAS) on this section of the A78 route, as detailed below.

VAS have been utilised successfully on the A75 and A701 in 2018 and 2019. However due to the nature of the route being a two lane dual carriageway, consideration has to be given to the ability to sign more than one lane at any one time.

Previous experience on the A82 with a scheme of a similar type, has shown that verge side VAS can display for both lanes if they are showing the same message.

Taking cognisance of this it is proposed to introduce the signs with a National Speed Limit Symbol (Diag 571) and SLOW DOWN logo, see Figure 4.4.6 below. The signs will be activated by detection loops on approach and will display only when a vehicle is above its relevant speed for its classification.

It is proposed to provide VAS in at the locations below:

- Site located eastbound between Pennyburn roundabout and the first rail bridge east.
- Site located each direction in the vicinity of Site 3 and the accidents on the mainline here.
- Site located westbound between Eglinton Interchange and the rail bridge.

***Each site will comprise of two signs, one for each lane*

Figure 4.4.6

4.4.7 Costs and Estimated First Year Rate of Return

The table 4.4.7 below uses the accident saving of £179,648.00 per injury accident from RRCS 2018 Table 10, and an estimated accident saving of 40% from RoSPA Road Safety Engineering Manual.

It is estimated that the above proposals for vehicle activated signs would cost - £200,000

Measure	No. of accidents Treated	Potential Saving	FYRR
VAS	8	£ 114,974.72	57.49%

Table 4.4.7 First Year Rate of Return and Accident Saving

It can be seen that these measure are estimated to return a 57% First Year Rate of Return. There is also an expected risk reduction benefit to be achieved by reducing the levels of vehicles over the speed limits, particularly among those restricted to 50mph.

5. Section Investigation

5.1 Sub-Section 7a – Pennyburn Roundabout to First Railway Bridge East

As identified previously the collisions on this section of the A78 were concentrated in three areas starting with Section 1 shown below:

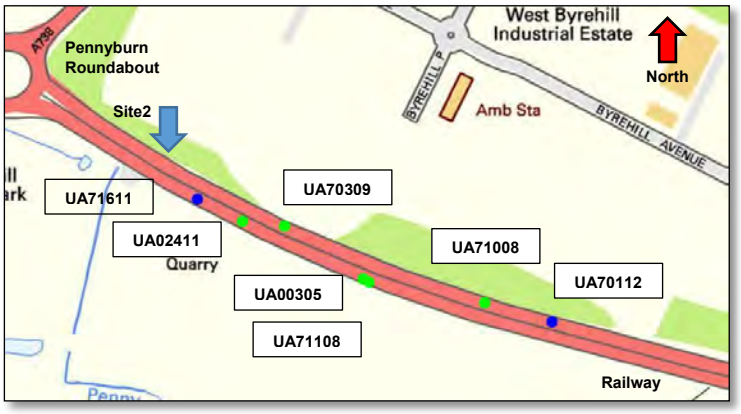

Figure 5.1 Sub-Section 7a Location

Sub-Section 7a above, recorded seven reported road accidents during the five year period investigated. This equated to 50% of all accidents over the whole section, three southbound and four northbound. As previously detailed the accidents were as follows:

2) Redacted

3) Redacted

5) Redacted

8) Redacted

4) Redacted

11) Redacted

13) Redacted

Summary of accidents –

- Three Southbound and four Northbound
- Five in the wet (three SB and two NB)
- Two in the dark (both also in the wet) (one NB and one SB)
- Three of the northbound accidents are shunt accidents.

5.2 Detailed Investigation

5.2.1 Weather and Light conditions

As discussed in Section 5.1 there were five wet accidents and two dark accidents. These are reviewed in Tables 5.2.1 and 5.2.1a below, against the RRCS 2018 statistics for accidents in these conditions.

Road Conditions	%age	RRCS 2018
Wet	**57%**	41.5%
Ice	0%	6.6%
Dry	43%	51.9%

Table 5.2.1 Road Condition

Light Conditions	%age	RRCS 2018
Light	71%	74%
Dark	**29%**	26%

Table 5.2.1a Light Condition

It can be seen from the above tables that accidents in Wet and Dark conditions are both over represented against the same statistics in the RRCS 2018.

Whilst this is consistent for both sides of the A78 Dual carriageway at this location, further investigation of the accidents and their details are undertaken below in section 5.2.2 and 5.2.3.

Given this section is reviewing accidents in dark and wet conditions, below is a review of the street lighting for this section of the A78.

- Street lighting is provided from Pennyburn Roundabout to within the extents of the 40mph speed limit.
- No street lighting is in place between the beginning/end of the Pennyburn 40mph limit and the rail overbridge some 2km to the south.
- Street lighting is then provided from the rail overbridge to Eglinton Interchange (Sub Sections 7a and 7b).

5.2.2 Southbound-(Eastbound)

As discussed above three of the seven accidents were on the southbound carriageway.

A review of these showed the following;

- All happened in the wet
- One in the dark
- One pedestrian accident
- One single vehicle loss of control accident
- One accident discounted– Redacted

Looking at the accidents there is no common pattern between the accident types and manoeuvres. Whilst there is a shunt and a loss of control the results from the speed survey

here has highlighted that both the mean and 85th%ile speeds are significantly below the speed limit, with a very low level of speeding in general. HGV's show a high level of speeding (70%) however this issue is included within the measures proposed in Section 4.4.6 above for the whole section.

It can be concluded that there are no other issues, beyond the identified weather and light conditions identified in section 5.2.1.

5.2.3 Northbound – (Westbound)

As discussed above four of the seven accidents were on the northbound carriageway.

A review of these showed the following;

- Two in the wet
- One in the dark
- Three shunt type accidents
- One single vehicle accident

It can be seen from the above that there is a common pattern associated with shunt type accidents. These accidents are plotted below, with the 3 shunt accidents shown (by accident reference), and the fourth which is discounted also highlighted.

Figure 5.2.3 Sub-Section 7a - Northbound/Westbound accident locations.

It can be seen from the accident locations that all of the shunt accidents are on approach to the 40mph speed limit. Looking at this the road environment and the upcoming 40mph limit followed by the roundabout can result in vehicles slowing down and different rates.

Combining this with the high vehicle speeds in sub section 7b (Speed Survey Site 3) east of the railway bridge, and the high speeds (related to the 40mph) taken just east of the change in speed limit, it can be concluded that the shunts are occurring with vehicles travelling at high speed approaching the speed limit change and colliding with those vehicles in front of them.

Below is a review of the traffic behaviour on this section to understand if there are any queues etc. that may influence the accidents.

5.2.3.1 Traffic Behaviour

With the upcoming roundabout it was felt prudent to look at the levels of queues that can develop. This has been done using Google Maps Traffic. Below is an image (Figure 5.2.3.1) that highlights the estimated average length of queue during peak hours on this approach.

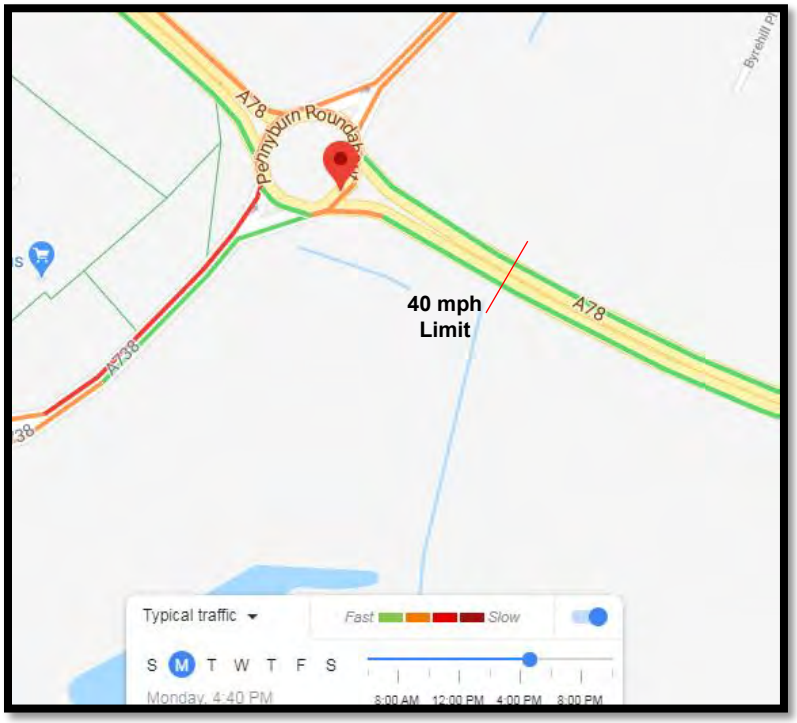

Figure 5.2.3.1 Queue on approach to roundabout.

It can be seen from the above that the typical queue is not beyond the 40mph limit, and this concurs with the accidents happening beyond this is not resulting from queueing vehicles.

This would coincide with vehicles slowing down on approach to the speed limit change in conflict with vehicles approaching from behind at higher speed.

5.2.3.2 Existing Infrastructure – Signs, markings and lighting

A review was undertaken of the existing signs and markings to determine how this impacts on traffic behaviour, and to determine any changes/additions that could be made to mitigate the personal injury accidents here, or act as risk reduction improvements.

The full level extent of the anomalies are shown on Drawings 18/SW/0801/035/I/01, 03 and 05 in Appendix A – Existing Signs and Markings. Below is a summary of key issues;

- Advance Warning sign for Pennyburn Roundabout sited too close to roundabout (LTN 1/94 refers).
- 40 mph signs are at different heights, and insufficient size for the approaching speed limit.
- Roundabout warning signs are not at the correct distance from the hazard (TSM Chapter 4).
- Initial sign is a ‘Get in Lane’ sign, the initial sign should be an ADS.

- The lane markings on approach are lane line markings as opposed to a warning line.
- There are several anomalies regarding the design standards.
    - Right turn arrows on approach to a roundabout (not permitted in DMRB).
    - Signs not passively safe.

It can be seen that the deficiencies in the signs and markings can be portraying an incorrect message to approaching drivers of the upcoming hazards.

5.2.4 Summary of Sub-Section 7a.

From the preceding review of the section it can be seen that of the seven accidents in the section.

- Five are wet and two are dark accidents. Over represented against RRCS 2018 statistics.
- This section is not street lit.
- Three were on the southbound carriageway.
    - All were in wet conditions, with one also in the dark.
    - There was no further common pattern other than the over representation of dark and wet accidents.
- Four were on the northbound carriageway
    - Three were shunt accidents.
    - All were out with the 40mph speed limit on approach to it.
    - One accident is a single vehicle accident that has been discounted due to external contributory factors.
    - Reviewing the infrastructure showed several sign anomalies associated with the signing of the speed limit and roundabout.
    - Vehicles travelling northbound are potentially slowing at different rates to adjust to the 40mph.
    - The speeds before the rail bridge are high, whilst just prior to the 40 they are below the NSL, but still in the 60mph bracket.
    - However data from speed monitoring Site 2, indicates an average speed in excess of 50mph both west and eastbound. This is particularly significant as westbound is the approach to the 40mph speed limit some 125m to the east of Pennyburn Roundabout and will lead to sharp deceleration and sudden braking not only to observe posted speed limit but also to slow down for the approaching roundabout

5.2.5 Sub-Section 7a Conclusion

From the above study it can be concluded that;

- Wet and Dark accidents are over represented and should be mitigated.
- Shunt accidents on the northbound approach are a result of a combination between vehicles speeds, changing for the speed limit change and inaccurate signing.

5.2.6 Recommendations

Given all of the above the following recommendation are proposed to target the issues specific to the seven accidents in this section;

- Introduction of solar road studs throughout the section/unlit area of the A78. (40mph speed limit to first rail bridge east)
- Upgrading the signage to be in line with appropriate standards.

- Given the northbound accidents are occurring between approximately 300 – 450m of the roundabout, it is proposed to introduce Transverse Yellow Bar makings on the approach. This will give additional warning of the roundabout and further assist in reducing approach speeds.
    - This however does not fully meet the requirements of Traffic Signs Manual Chapter 5 so a non-prescribed sign application for this use is required.
- It is noted that several of the road markings are not to standard and require upgrading to meet standards. This could be done as a risk reduction measure.

5.2.7 Costs and Estimated First Year Rate of Return

Table 5.2.7 below uses the accident saving of £179,648.00 per injury accident from RRCS 2018 Table 10, and an estimated accident saving per measure shown is taken from RoSPA Road Safety Engineering Manual.

Measure	No of accidents Treated	Estimated Cost	Accident Saving %	Potential cost benefit	FYRR
Solar Road Studs	5	£22,000	20%	£ 35,929.60	163.32%
Upgrading Existing Signs Westbound	3	£50,000	30%	£ 32,336.64	64.67%
New Transverse Yellow Bars	3	£20,000	20%	£ 21,557.76	107.79%
Overall – Combination of All Measures	6	£92,000	42%	£ 90,542.59	98.42%

Table 5.2.7 Proposed Measures and First Year Rate of Return

Note: RoSPA gives a 21% reduction for street lighting in dark accident, however as the studs are to treat wet and dark accidents and provide improved alignment, and are permanently illuminated. We have reduced this to an estimated 20%

It is recommended that all measures are introduced at a cost of £92,000 giving a first year rate of return of 98.42%.

Cost of upgrading road markings to standard - £10000.

These proposals are shown in Appendix B – Proposed Measures.

5.3 Sub-Section 7b – Mainline between Rail Bridges

Sub-Section 7b is that part of the A78 between the two rail bridges.

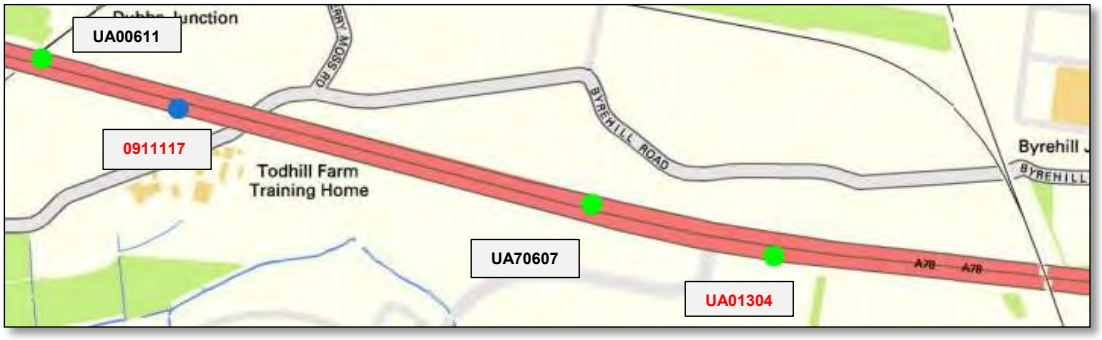

Figure 5.3 Sub-Section 7b accident locations

Sub-Section 7b above, recorded four reported road accidents during the five year period investigated. As previously detailed the accidents were as follows:

9) Redacted

10) Redacted

12) Redacted

14) Redacted

Summary of accidents –

- Two of the accidents can be discounted due to external contributory factors
- Both remaining accidents were southbound/eastbound
- One was in the dark
- Both involved what have been considered as potentially speed related contributory factors

5.3.1 Conclusion.

Given the low number of treatable accidents it is considered that these will be mitigated by the introduction of the Vehicle Activated Signs recommended in Sections 4.4.6 and 4.4.7

5.4 Sub-Section 7c – Approach to Eglinton Interchange

Figure 5.4. Sub-Section 7c Accident Locations

Sub-Section 7c above, recorded three reported road accidents during the five year period investigated. As previously detailed the accidents were as follows:

As previously detailed the accidents were as follows:

1) Redacted

6) Redacted

7) Redacted

Summary of accidents –

- One of the accidents can be discounted due to external contributory factors.
- Both remaining accidents were northbound/westbound
- Both occurred on a wet/ice road surface.
- One was in the dark.
- One involved a speed related contributory factor.
- One was a single vehicle.
- One involved a vehicle colliding with parked vehicles.

5.4.1 Conclusion.

Given the low number of treatable accidents and the lack of a common pattern there are no further recommended measures. It is considered that these accidents will likely receive some mitigation by the introduction of the Vehicle Activated Signs recommended in Sections 4.4.6 and 4.4.7

6. Summary

This section of the A78 from Pennyburn Roundabout to Eglinton Interchange recorded 14 personal injury accidents in the 5 year period (1/1/15 to 31/12/19).

An overall study of all the accidents revealed that there was an over representation of accidents

- In wet and dark conditions.
- Involving speed related contributory factors.

Speed survey results showed that there was an element of speeding and high mean/85th%ile speeds on the route. In particular relating to HGV's.

It was also found that there were three discernible accident sites that could be investigated further and independently

- Sub-Section 7a – Pennyburn Roundabout to First Rail Bridge East.
- Sub-Section 7b – Main line between Rail bridges.
- Sub-Section 7c – Approach to Eglinton Interchange.

Investigating these further it was found that seven of the fourteen accidents were in Sub-Section 7a, with three Southbound/Eastbound and four Northbound/Westbound. Further investigation revealed the following;

- SB were over represented in dark and wet conditions in a non-street lit area.
- NB– three of the four accidents were shunt type accidents on approach to the 40mph limit and roundabout.
- Reviewing the signage here, found several inaccuracies were noted that could impact on this.
- The high speeds from the speed survey could have an impact on the accidents.

Investigating Sub-Sections 7b and 7c revealed that neither had any common patterns that would not be benefited from the overall proposals for the route.

The recommendations for this section include;

Vehicle Activated Signs that are operated by speed and class. The proposal is that there will be four sets of signs, located as detailed below;

  - One site located eastbound between Pennyburn Roundabout and the first rail bridge east.
  - Two sites located one in each direction in the vicinity of Site 3 at the locus of the accidents.
  - One site located westbound between Eglinton Interchange and the rail bridge.

The provision of these signs has been estimated at a cost of £200,000 giving a First Year Rate of Return = 57.49%

- A package of measures are proposed for Sub-Section 7a, including
  - Solar Road studs from Pennyburn Roundabout to the Rail Bridge where there is no street lighting.
  - Upgrading the existing signs and road markings to meet current standards.
  - Introduction of yellow perception bar markings on approach to Pennyburn roundabout.
- This is estimated at a total cost of £92,000 giving a First Year Rate of Return = 98.42%

7. Appendix A – Existing signs and markings.

18/SW/0801/035/I/001 - Westbound Approach to Pennyburn Roundabout Road Sign Anomalies to Standard

18/SW/0801/035/I/003 - Westbound Approach to Pennyburn Roundabout Road Markings Anomalies to Standard

18/SW/0801/035/I/005 - Westbound Approach to Pennyburn Roundabout Existing Road Sign and Marking Layout

8. Appendix B – Proposed Measures

18/SW/0801/035/I/002 - Westbound Approach to Pennyburn Roundabout Proposed Road Signs

18/SW/0801/035/I/004 - Westbound Approach to Pennyburn Roundabout Proposed Road Markings

18/SW/0801/035/I/006 - Westbound Approach to Pennyburn Roundabout Proposed Road Signs and Markings

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