A697 Road Safety Review

Final Report

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Executive Summary

In response to safety concerns Northumberland County Council (NCC) commissioned AECOM in October 2014 to undertake a Road Safety Review of the A697. Using a variety of data including collision and speed analysis as well as site observations, the review forms the basis of an evidence based collision led approach with a view to identifying a set of casualty reduction measures to be considered in a future year Local Transport Plan (LTP) programme.

The A697 route as a whole is widely regarded as a dangerous road. Based purely on collision rate analysis this perception is substantiated as the A697 has a significantly higher rate of collisions when compared to the rest of the county and national figures for rural 'A class' roads (**Table 1**).

To demonstrate a robust approach to the review, the 68km route has been split into thirteen 5km long route sections and a single 3km section, each colour coded into high, medium and low risk. Of the route sections, five have been classed as the highest priority due to the recorded collision rate which exceeds a calculated threshold level in terms of number of collisions per 100 million vehicle kilometres.

The priority route sections are:

- Longframlington to Longhorsley (63.8 recorded collisions per 100 million vehicle Kilometres) against a threshold of 30 collisions phmvkms)
- Fenrother to A1(T) (62.0 recorded collisions phmvkms)
- Coeburn to Knogley (37.2 recorded collisions phmvkms)
- Bowchester to Coldgatehaugh (31.9 recorded collisions phmvkms)
- Roseden to Hedgeley (31.9 recorded collisions phmvkms)

Economic analysis has been undertaken to consider collision savings and First Year Rate of Return (FYRR) (Table 12). Those that offer best value are:

- Coeburn to Knogley (2687%)
- Bowchester to Coldgatehaugh (2150%)
- Coldgatehaugh to Roseden (1751%)
- Longframlington to Longhorsley (1153%)
- Barn Owl Cottage to Coldgatehaugh (1054%)

The outcomes of the five priority route sections and those that offer the highest First Year Rates of Return have been combined to show the overall top ranking areas. They are;

1. **Coeburn to Knogley (2687% and 37.2 recorded collisions phmvkms)**
2. **Bowchester to Coldgatehaugh (2150% and 31.9 recorded collisions phmvkms)**
3. **Longframlington to Longhorsley (1153% and 63.8 recorded collisions phmvkms)**

Interrogation of data across the whole route including speed and collision analysis, combined with investigation of route and cluster sections reveals a number of common themes in terms of collisions relating to;

- Driver Error
- Vehicles travelling well in excess of the speed limit
- HGV related collisions
- The condition of the existing signs, road markings and route geometry.

To address these route wide commonalities, the review puts forward a series of intervention measures to be considered in the future years NCC Local Transport Plan. Such measures incorporate high, medium and low priority sections with consideration given to individual accidents as well as emerging clusters. The proposed interventions are summarised below;

- **Signing and lining improvement programme** – develop a prioritised and costed signing and lining improvement programme, focussed on addressing the specific issues identified through this study (see route section summary sheets in **Appendix B)** and ensuring a consistent level of quality of signing and road marking along the full extent of the route. This could include exploring enhanced road markings such as solar powered road studs along the centre line and edge of carriageway through route collision cluster zones and at locations where route geometry needs to be clearly emphasised.
- **Speed reduction measures** – in collaboration with Northumbria Police, identify a package of speed reduction measures, in particular at collision cluster zones. Physical and visual enforcement measures such as the application of an average speed camera system, route wide and/or through localised route sections, should be explored.
- **Physical changes to route geometry** – undertake feasibility studies of localised enhancement scheme options around identified 'hotspots' where route geometry and associated driver visibility are key contributory factors to collision occurrence. An example of this is the need to address the current layby arrangement in the vicinity of Heighley Gate.
- **Address excessive proportion of HGV related collisions** – work with the Freight Transport Association to identify best practice from elsewhere in terms of techniques to reduce the likelihood of HGV related collisions on routes such as the A697. Consideration should be given to the Construction Logistics and Cyclist Safety (CLOCS) programme, a project developed to ensure a road safety culture is embedded into the construction industry in attempts to reduce collisions between HGV's and vulnerable road users. In the medium term, the recently announced proposals to extend the dualling of the A1(T) may help to address this issue by encouraging more strategic HGV traffic to remain on the A1(T).
- **Education / awareness campaign** – reflecting the fact that the salient contributory factor to recorded collisions along the A697 route is a 'failure to look properly' (driver/rider error), it is recommended that consideration is given to developing an education / awareness campaign to encourage route users to be more aware of the hazards along the route. In conjunction with the routine road marking and signing enhancements described above, this campaign could, for example, include static or VMS signing warning drivers to look and to take care. Such signing could be rotated to different sites as required.
- **Maintenance programme** – work with maintenance colleagues within NCC to develop a clear and prioritised maintenance programme focussed on addressing route sections with poor road surface quality, drainage issues and also route sections where vegetation adversely affects driver visibility.

1. Introduction

1.1. Overview

Northumberland County Council (NCC) commissioned AECOM in October 2014 to undertake a Road Safety Review of the A697 from the junction with the A1(T) at Morpeth at the southern extents to the Scottish Border at Coldstream at the northern extents.

The A697 within Northumberland is regarded as being one of the most dangerous roads to travel and this report will explore this theory. The A697 route has been identified in Northumberland County Council's 2011/2026 Local Transport Plan (LTP) as a route where concerns about the speed of traffic have been raised. Consequently, and as part of the 2014/2015 LTP programme, NCC has commissioned this road safety study to identify a package of casualty reduction measures that could be included in the future LTP programme.

The members of the Review Team were:

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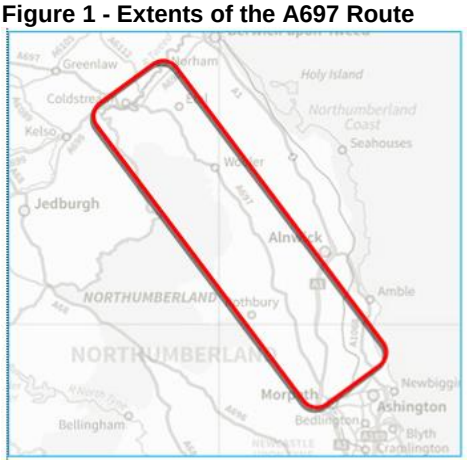
1.2. Study Area

The A697 is a primary grade route between the A1(T) at Morpeth and the Scottish Border at Coldstream and serves as a route for local/regional traffic and more strategically as an alternative to both the A1(T) and A68/A696 routes between Tyneside and Edinburgh. The A697 route is approximately 68km in length and is predominantly rural. The route has a number of intermittent built up sections, notably the small town of Wooler and a number of villages, including Longhorsley, Longframlington, Powburn, Milfield and Cornhill-on-Tweed. The route has a diverse range of geometric standards, roadside hazards and junction types with a variety of traffic signs and road marking improvements implemented over recent years. The extents of the A697 route is shown in **Figure 1** below.

Figure 1 - Extents of the A697 Route



1.3. Approach

An evidenced based approach has been adopted for this commission, focussed on the analysis of the most recent validated collision data covering the 36 month period from July 2011 to July 2014. A review of available speed data has also been undertaken, whilst the study team spent a full day on site observing current operational conditions along the route.

Reflecting route and cluster analysis informed by the above data and site observations, priority areas for improvement have been identified along the route together with a range of proposed intervention measures aimed at improving road safety and reducing the number of casualties.

1.4. Document Structure

This report is structured as follows:

4. **Chapter 2** introduces the collision rate analysis and standard tests performed on the data provided
5. **Chapter 3** contains the route and cluster analysis
6. **Chapter 4** describes the site observations noted during the site visit
7. **Chapter 5** contains a review of the potential scheme options and a section covering speed enforcement
8. **Chapter 6** provides an economic evaluation of the range of potential intervention measures
9. **Chapter 7** highlights the key findings and recommendations.

This report also includes supporting technical appendices.

2. Collision Rate Analysis

A total of 36 months of collision data from 1st July 2011 up to 30th June 2014 has been interrogated. The outputs have been plotted on a series of drawings displaying collision locations, references and collision severity. These can be found in **Appendix A** of this report.

AECOM has discussed recent notable collisions with NCC that have occurred since the validated data was produced. Three fatal collisions occurred, one in Wooler, one south of Wooler and one north of Powburn. Limited information is available to support any intervention measures. However, it is important to note that as the collisions are yet to be validated and fall outside of the 36 month period they cannot form part of the overall collision dataset else the statistical analysis would be skewed.

2.1. Collision Summary

The collision rate for the A697 for the review period peaking at 28 per 100 million vehicle kilometres, as shown in **Table 1** below, is significantly above those for the rest of the County and indeed the National figures for Rural A Class roads.

Table 1 summarises recorded collisions on the A697 study corridor over the three year period. A total of 71 collisions took place with severities of 52 slight, 14 serious and five fatalities.

The total number of killed and seriously injured was seven in the two years 2011/2012 and 2012/2013, but dropped to five in 2013/2014. Looking at all severity types there has been a steady decrease, year on year, of between four and five collisions.

Table 1 - Collision Totals

Collision Totals						
A697					Northumberland (A Class)	National (A Class)
Collisions by Severity	2011-2012	2012-2013	2013-2014	**Total**	2013	2013
Fatal	2	3	0	**5**		905
Serious	5	4	5	**14**		8927
Slight	21	17	14	**52**		54,591
Total	**28**	**24**	**19**	**71**	**371**	64,423
Collision Rate (per 100 million veh kms)	**28**				**20**	**17***

** taken from RAS 10002 Road Casualties Great Britain 2013*

Table 2 - Collision Conditions

Collision Conditions		
	Number	%
Fine	58	82
Dry	46	65
Wet	17	24
Daylight	58	82
Darkness	13	18
Skidding	33	46

Table 3 - Contributory Factors

Contributory Factors		
	Total PIC's	%
Slippery road due to weather	16	23
Poor turn or manoeuvre (Driver/Rider - Error)	12	17
Loss of control (Driver/Rider - Error)	15	21
Failed to judge other person's path/speed (Driver/Rider - Error)	15	21
Failed to look properly (Driver/Rider - Error)	30	42

Table 2 shows that the majority of collisions take place over the three year period under fine, dry and daylight conditions. Those taking place in wet conditions at 24% are under the national average of 30%. There are 46% of collisions where some form of skidding has occurred. Grip data provided shows a consistent level of above 0.4 across the route with some small sections falling below that level in areas near Fenrother, within Longframlington, Powburn and Wooler. Comparing those conditions with the contributory factors in **Table 3** shows that whilst there are slippery road conditions present in 23% of collisions, the majority are down to driver error.

Table 4 Vehicle Type over 3 year period

Vehicle Type over 3 year period		
	Number	%
Pedal Cycle	4	3
PTW*	11	9
Car	89	70
Minibus	1	1
Goods < 3.5 T	8	6
Goods > 3.5 T	13	10
Other	1	1
*Powered Two Wheelers		

As would be expected, **Table 4** shows that the majority of collisions that take place over the three year period along the route involve cars, but what it also highlights is that 9% of all collisions involved Motorcyclists. The comparison with the national average where 24% of killed or seriously injured collisions in rural areas involve motorcyclists suggests 9% is relatively low. However, motorcyclists remain the biggest risk of death as they account for less than 1% of traffic, yet 19% of fatalities in 2013 (taken from Reported Road Casualties Great Britain 2013).

2.2. Standard Tests

To identify sections with a higher than expected frequency, the methodology as set out in the RoSPA Road Safety Engineering Manual has been used. These include calculating the norms, standard deviation, Poisson Test and Chi Squared Test.

Using the 14 sections identified for investigation over the 68km route, a standard deviation test has been conducted. This test calculates whether the significance of the difference between the route and the control data is attributed to random fluctuation or whether there is a real risk to that route. The coefficient of variation calculated is 0.55. As outlined in the RoSPA Manual, a value less than one suggests that the standard deviation is not substantial. However, when comparing collisions against the norm plus the standard deviation, 13 of the 14 sections (92%) warrant detailed investigation.

(Long Term Average) 28+24+19/3 = 24

The probability of getting 28 or more collisions where the long term average is 24 is 0.8225 or 82%.

0.8225 + 0.8679 + 0.9042 + 0.9322 + 0.9533 + 0.9686 + 0.9794 = 6.4281

Therefore the probability of getting 28 or more collisions due to random fluctuation is 64.28%, meaning there's a 35.72% chance that a real increase in collisions has occurred.

The Poisson Test is conducted to identify whether any increase in collisions is likely to persist or whether the increase is due to random fluctuation. However, this type of test is reserved for locations where collision volumes reach beyond the 100 mark, therefore one hasn't been carried out in this instance.

A Chi Squared Test is carried out to determine whether the number of collisions of a particular type is significantly higher against other similar sites.

The proportion of collisions in wet conditions was 24%. When considered against the National average the Chi Squared test showed a significance level of less than 10% therefore it can be discounted as a contributory factor for this particular route.

The proportion of collisions that occurred during darkness was 18%. Its significances was compared against national figures and once again the significance level was less than 10% and therefore it can be discounted as having an impact on the volume of collisions for the route.

Looking at vehicle type, there is a perception that goods vehicles of varying weights have been involved in a number of collisions along the 68km route. 20 collisions in total involved goods vehicles accounting for 28% of all collisions. Performing a chi squared test using these figures revealed a 99% confidence level that the result is significant and warrants further investigation. There were 10 collisions where a Motorcycle was involved yet the results of the Chi Squared Test showed a significance level of less than 10%.

3. Route and Cluster Analysis

3.1 Overview

To aid analysis, the 68km route has been divided into thirteen 5km long route sections and a single remaining 3km route section where the A697 reaches the A1(T). Each route section has been colour coded into high, medium and low risk based upon a comparison of the collision rate against the whole route (as a benchmark) and national rates for similar A-class roads. The results of this cluster analysis have been plotted and are shown within **Appendix A**. **Table 5** below ranks each section in terms of priority from high to low, with collision rate annotated red, amber and green accordingly. The variables used in **Table 5** to derive the collision rate are summarised in the formula below:

$$\frac{\text{Total no. of PIA's x 10\^8 x Days of Year}}{\text{No. of years data x length of road (km) x Annual Average Daily Traffic (AADT) Flow}}$$

Table 5 - Ranking of Route Sections by Collision Rate

Ranking	Section	Route Section No.	No. of Collisions (36 months)			Total No. of PICs	Collision Rate	Collision Rate Threshold	KSI Rate
			Fatal	Serious	Slight				
1	Longframlington to Longhorsley	12	1	2	9	12	63.8	30	3
2	Fenrother to A1	14	1	2	4	7	62.0	30	3
3	Coeburn to Knogley	10	1	1	5	7	37.2	30	2
4	Bowchester to Coldgatehaugh	5	1	1	4	6	31.9	30	2
5	Roseden to Hedgeley	7	0	2	4	6	31.9	30	2
6	Hedgeley to Shawdonhill Cottage	8	0	2	3	5	26.6	30	3
7	Barn Owl Cottage to Bowchester	4	0	1	4	5	26.6	30	1
8	Coldgatehaugh to Roseden	6	0	1	4	5	26.6	30	1
9	Shawdonhill to	9	0	1	4	5	26.6	30	1
10	Coldstream to Crookham Westfield	1	0	0	5	5	26.6	30	0
11	Longhorsley to Fenrother	13	0	0	3	3	15.9	30	0
12	Crookham Westfield to Flodden Cottage	2	0	1	1	2	10.6	30	1
13	Knogley to Longframlington	11	1	0	1	2	10.6	30	1
14	Flodden Cottage to Barn Owl Cottage	3	0	0	1	1	5.3	30	0

Notes: *PIC* = Personal Injury Collision (recorded); *Collision Rate* is measured as the number of collisions per hundred million vehicle kilometres (phmvkms).

Summary sheets have been produced for each of the 14 route sections highlighted above. These summary sheets are contained within **Appendix B** and include a general commentary on the route section characteristics, together with a specific commentary on the nature of collisions and possible causation factors. Supporting photographs from the site visit are also included as appropriate.

Longframlington to Longhorsley is considered the highest priority with a collision rate of 63.8 phmvkms almost double the accepted threshold. Fenrother to the A1(T) is marginally less at 62.0 phmvkms whilst Coeburn to Knogley, Bowchester to Coldgatehaugh and Roseden to Hedgeley all reach slightly above the threshold. Whilst these will be given more weighting in terms of the report, the routes shown in amber and in green will also be considered.

Four cluster sites have also been identified on the basis of four or more collisions including a Killed or Seriously Injured (KSI) rating using a 100m radius as summarised in **Table 6**.

Table 6 - Cluster Analysis

Ranking	Section	Route Section No.	No. of Collisions (36 months)			Total No. of PICs
			Fatal	Serious	Slight	
1	Longhorsley (Linden)	12	1	1	3	5
2	Coe Hill	10	1	1	1	3
3	Heighley Gate	14	1	0	2	3
4	Lilburn	6	0	1	2	3

Both the route section analysis and cluster site analysis are closely aligned in terms of the top three cluster sites (Longhorsley, Coe Hill and Heighley Gate) all sitting within one of the routes apart from Route 6 Coldgatehaugh to Roseden. This is to be expected as the two methods utilise number of collisions as a key variable in the process. However, from a collision reduction perspective they both serve as useful exercises when considering intervention measures. Common trends and possible interventions on a route basis can vary significantly from clusters.

4. Site Observations & Speed Enforcement

4.1 Site Observations

A site visit was undertaken on Monday 24th November 2014 between the hours of 9:00 and 18.00 to assess the overall route, investigate possible causation factors and consider appropriate interventions to reduce the number of collisions taking place. The following salient observations were made during the site visit:

- The road markings for large sections of the route are in poor condition. Centre lines or edge of carriageway markings are either barely visible or none existing
- Road studs delineating the centre lines are often missing
- Signage is either providing incorrect information, at times facing the wrong way, obscured by vegetation or missing entirely with only the poles left in-situ
- Signage on occasion does not accurately describe what is approaching in terms of junctions and bends
- Vegetation can encroach into the carriageway, obscure signage or hamper visibility
- Approaches to junctions are often confusing in terms of lining provision and signing
- The verge sits close to the edge of the carriageway producing a degree of over-run
- Marker posts are damaged or limited in use particularly in exposed areas where weather conditions can obscure the route.

4.2 Speed Enforcement

The speed data analysis provided in **Appendix C** combined with the nature of collisions in terms of rear end shunts, overtaking manoeuvres and the fact that some vehicles come to rest in a field adjacent to the A697 route, indicates that speed reduction measures should be targeted and backed up with effective enforcement. **Table 7** provides a breakdown of the speed surveys undertaken by NCC by route section.

Table 7 - Recorded Speed Readings by A697 Route Sections (between 2012 and 2013)

Route Section	Date Taken	Speed Limit (mph)	24hr 85%ile speed		24hr Mean (mph)	
			South	North	South	North
Coldstream to Crookham (Cornhill)	25/6/2012 - 2/7/2012	30	34.1	33.4	28.9	28.4
Flodden Cottage to Barn Owl (Milfield)	6/5/2013 - 13/5/2013	30	40.6	39.1	34.7	32.9
Bowchester to Coldgatehaugh (Wooler)	1/7/2013 - 8/7/2013	30	39.1	38.6	33	32
Hedgeley to Shawdonhill (Powburn)	3/3/2014 - 10/3/2014	40	48.2	49	39.7	41
Hedgeley to Shawdonhill (Powburn)	3/3/2014 - 10/3/2014	30	42.8	36.5	36.2	30.7
Knogley to Longframlington (Longfram)	6/5/2013 - 13/5/2013	30 SC*	28.4	29.2	23.8	24.3
Longhorsley to Fentrother (Longhorsley)	23/4/2013 – 30/4/2013	30 SC*	44.5	36.7	37.5	31
SC denotes Speed Camera in operation						

The figures show the majority of villages including Milfield, Wooler, Powburn and Longhorsley are subject to high speeds. Longhorsley for example reaches a 24 hour mean speed of 37.5mph heading in a southbound direction beyond the speed camera site.

Northumbria Police were contacted as a request for information that would assist the review of the A697. The Police take an active role in road safety and are often the first to attend a collision taking vital information to inform the nature of collisions. In addition, they have a sound local knowledge of the area and are aware of safety issues that perhaps have not yet resulted in a collision, but could help inform analysis of the route.

The results of speed surveys undertaken by NCC are presented to Northumbria Police and there are various levels of action taken depending on the level of speeds recorded. Interventions include:

- Informing the Neighbourhood Beat Team
- Vehicle patrols
- Mobile camera enforcement
- Provision of static speed cameras.

Capabilities on project:
Transportation

Northumbria Police offered further comments in relation to collisions involving HGV's leaving the A697 carriageway between New Moor House and Powburn. This particular stretch covers two routes identified as high priority, therefore the comments correspond well with the route analysis. Reference is also made to the loss of the edge of carriageway markings due to overhanging vegetation and again the remedial measures suggested would help to address the identified problem.

5. Option Review

5.1 Overview

Based on the desktop study and subsequent site visit, the overriding collision causation factors relate to inadequate signing and lining (road markings). Appropriate measures have been considered on that basis. However, there are problematic areas where physical alterations to the geometry of the carriageway are believed to be the most appropriate option. This chapter provides a breakdown of proposed intervention measures in terms of high, medium and low priority. Supporting drawings in **Appendix D** accompany the ten high and medium route intervention measures as a visual aid to show detail at specific locations. The options have been calculated purely on a collision led basis. This chapter concludes with a section relating to speed as excessive speed is a common theme and a contributory factor to a number of collisions along the study route.

5.2 High Priority Route Sections

Table 8 sets out the high priority routes and includes the three cluster sites at Heighley Gate, Coe Hill and Linden. The interventions are illustrated in **Drawings 60289709_M006_TRA_DR_301 to 305** in **Appendix D**.

Table 8 - High Priority Route Sections for Intervention

Option Ref	Route Section	Problem Identified	Proposed Intervention Measures
5.2.1	12 Longfram to Longhorsley (Inclusive of Cluster Site 1)	Collisions due to driver error, caused by inadequate road signage.	• Refresh junction markings and signs • Replace existing stack type sign with junction destination signs • Replace road studs • Remove tourist information signs • Remove existing side road ahead signs and replace with stack type signs • Remove existing informational direction sign • Liaise with Linden Hall Management regarding signing requirements
5.2.2	14 Fenrother to A1 (Inclusive of Cluster Site 3)	Collisions due to driver error, caused by confusing junction layout	• Reduce length of northbound right turn pocket • Provide ADS for Heighley Gate Garden Centre • Close off southernmost access to layby • Introduce no through road sign • Clear vegetation for turning circle in layby • Provide lining at northernmost access to formalise junction delineation where there is better visibility in both directions
5.2.3	10 Coeburn to Knogley (Inclusive of Cluster Site 2)	Collisions due to excessive speeds and inadequate signing and lining	• Reorganise chevrons at B6341 junction • South of B6341 junction, introduce ‘Reduce Speed Now’ sign on SB approach under existing double bend warning sign for consistency with northbound • Cut back vegetation at cluster site to improve surface run off • Replace all verge marker posts as most are damaged to aid visibility in adverse weather • Refresh road markings
5.2.4	5 Bowchester to Coldgatehaugh	Inadequate signing provision, faded road markings, speeds	• Hatch out from wall edge at Wooler reducing road width from 8.4m to 7.5m • Southbound offside Junction Warning Sign back to back with double bend warning sign on exit from Wooler • Cut back vegetation at Tower Martin junction • Introduce stop sign give way sign and associated markings and realign at Tower Martin
5.2.5	7 Roseden to Hedgeley	Collisions due speed on entry to bends	• Reinstate Double Bend Warning sign at Roseden • Provide Yellow Backed Chevron Arrows on bend North of Wooperton

5.3 Medium Priority Route Sections

Table 9 sets out intervention measures for route sections that have been identified as medium priority which includes the remaining cluster site at Lilburn. The interventions are illustrated in **Drawings 60289709_M006_TRA_DR_306 to 310** in **Appendix D**.

Table 9 - Medium Priority Route Sections for Intervention

Option Ref	Route Section	Problem Identified	Proposed Intervention Measures
5.3.1	8 Hedgeley to Shawdonhill Cottage	Driver error due to excessive speeds and poor decision making	• Provide gateway on entry to village to formalise signing provision and bring 30mph signs back before first cottage heading southbound to emphasise built up area • Address current street lighting provision. Two collisions during darkness. • Use 'P' terminal safety barrier and provide reflectors to aid bend transition • Refresh road markings and replace give way sign • Current bend warning signs do not show the correct direction of travel
5.3.2	4 Barn Owl Cottage to Bowchester	Collisions due to inadequate singing and road makings	• Replace and provide yellow backed double bend warning sign in ditch • Introduce yellow backing to chevron boards to emphasise bend • Provide new southbound Advance Direction Sign to replace stack type and show bend in road • Replenish High Friction Surfacing on bend • Reintroduce road studs
5.3.3	6 Coldgatehaugh to Roseden (Inclusive of Cluster Site 4)	Collisions due to driver error, and right turning	• Move Advance Direction Sign for Lilburn closer to the junction • Provide consistent signing message for place names at Lilburn between ADS and DS • Incorporate tourist information signs into ADS and DS for Lilburn • Southbound ADS is currently facing Northbound traffic and needs reattaching to poles
5.3.4	9 Shawdonhill to Coeburn	Collisions due to driver error and poor weather conditions	• Consider existing vegetation by planting up areas to prevent exposure to weather conditions • Refresh road markings including edge of carriageway markings for HGV's • Provide marker posts on bends exposed to adverse weather conditions
5.3.5	1 Coldstream to Crookham Westfield	Skid Related on bends	• Conduct PSV (Polished Stone Value) Test to check value. Anything less than 50 should be resurfaced.

5.4 Low Priority Route Sections

Table 10 shows the areas that did not reflect highly in terms of collision rates. However, all collisions have been considered as part of the investigation therefore some low priority intervention measures have been included for completeness.

Table 10 - Low Priority Route Sections for Intervention

Option Ref	Route Section	Problem Identified	Proposed Intervention Measures
5.4.1	13 Longhorsley to Fenrother	Collisions due to right turns and driver error	• Cut back vegetation at Fieldhead Lane junction • Provide 'SLOW' road markings on approach to Fieldhead Lane junction
5.4.2	2 Crookham Westfield to Flodden Cottage	Collisions due to driver error, and right turning	• Provide combined Advance Direction Signs to inform drivers of junctions ahead • The existing ADS on the southbound should be refreshed/replaced. • Junction Warning sign should be provided in advance of the ADS>
5.4.3	11 Knogley to Longfram	Collisions due to driver error and poor weather conditions	• Consider 'STOP' sign with associated markings to emphasise the need to take care at Church Road exit
5.4.4	3 Flodden Cottage to Barn Owl Cottage	Loss of concentration	• Interactive signs have recently been provided in both directions at Milfield • No appropriate measures can be considered due to nature of collision

6. Economic Evaluation

A First Year Rate of Return (FYRR) assessment is conducted to ensure value for money. An FYRR has been prepared for the proposed remedial measures to identify the net monetary value of the collision savings expected in the first year of the scheme. This is expressed as a percentage of the estimated total capital cost to implement each option. The aim of route action measures is to achieve a minimum FYRR of 100%.

Table 11 shows the expected collision savings derived from analysis of the collision types for each route. It estimates that unless intervention measures are implemented then the same pattern of collisions will occur over time.

Table 11 – Collision Savings

Option Ref	Route Section			Estimated collision savings per year
		Total	Per year	
5.2.1	Longframlington to Longhorsley	12	4	1.08
5.2.2	Fenrother to A1	7	2.3	0.6
5.2.3	Coeburn to Knogley	7	2.3	0.36
5.2.4	Bowchester to Coldgatehaugh	6	2	0.35
5.2.5	Roseden to Hedgeley	6	2	0.2
5.3.1	Hedgeley to Shawdonhill Cottage	5	1.7	0.36
5.3.2	Barn Owl Cottage to Bowchester	5	1.7	0.8
5.3.3	Coldgatehaugh to Roseden	5	1.7	0.6
5.3.4	Shawdonhill to Coeburn	5	1.7	0.23
5.3.5	Coldstream to Crookham Westfield	5	1.7	0.2
Total		**63**	**21**	**10.55**

Table 12 summarises the predicted collision savings, scheme cost estimates and First Year Rate of Return for each of the recommended schemes. The average financial cost of a collision in Great Britain has been obtained by adjusting the most recent estimates of the costs of road collisions issued by the Department for Transport (DfT) and published in the Transport Analysis Guidance: TAG Unit 3.4.1. In accordance with this document, the 'Average collision cost per injury collision (including an allowance for damage only collisions)' has been calculated as £135,121 for 'non built-up' roads. Each intervention has been priced on the basis of the level of detail created at this stage and for FYRR purposes only.

Table 12 – First Year Rate of Return

Option Ref	Route Section	Scheme Cost	Average Cost per Injury Accident * (£)	FYRR (%)
5.2.1	Longframlington to Longhorsley	12,660	135,121	1153
5.2.2	Fenrother to A1	39,930	135,121	203
5.2.3	Coeburn to Knogley	1,810	135,121	2687
5.2.4	Bowchester to Coldgatehaugh	2,200	135,121	2150
5.2.5	Roseden to Hedgeley	6,200	135,121	436
5.3.1	Hedgeley to Shawdonhill Cottage	12,950	135,121	383
5.3.2	Barn Owl Cottage to Bowchester	10,250	135,121	1054
5.3.3	Coldgatehaugh to Roseden	4,630	135,121	1751
5.3.4	Shawdonhill to Coeburn	28,750	135,121	108
5.3.5	Coldstream to Crookham Westfield	4000	135,121	676
Total		**123,247**	**135,121**	**1157**

** Scheme costs are only approximate at this stage. Detailed design will provide an opportunity to refine the cost estimate.*

7. Key Findings and Recommendations

7.1 Key Findings

- **Collision Totals** – Year-on-year there has been a steady decrease in the number of recorded personal injury collisions along the 68km extents of the A697 study route, reducing from 28 in 20011-12, to 23 in 2012-2013, down to 19 in 2013-2014. However, the number of killed or seriously injured remains variable with seven KSIs recorded in 2011-12, nine in 2012-2013 and five in 2013-2014. It is also recognised that there has been three recent fatalities along the route.
- **Collision Cluster Zones** – Reflecting cluster analysis and collision rate analysis, five route sections have been identified as the highest priority because of a recorded collision rate which exceeds a calculated threshold level in terms of number of collisions per 100 million vehicle kilometres. The priority route sections are:
  - Longframlington to Longhorsley (63.8 recorded collisions phmvkms against a threshold of 30 collisions phmvkms)
  - Fenrother to A1(T) (62.0 recorded collisions phmvkms)
  - Coeburn to Knogley (37.2 recorded collisions phmvkms)
  - Bowchester to Coldgatehaugh (31.9 recorded collisions phmvkms)
  - Roseden to Hedgeley (31.9 recorded collisions phmvkms)
- **Economic analysis** - This has been undertaken to consider collision savings and First Year Rate of Return (FYRR) (Table 12). Those that offer best value are:
  - Coeburn to Knogley (2687%)
  - Bowchester to Coldgatehaugh (2150%)
  - Coldgatehaugh to Roseden (1751%)
  - Longframlington to Longhorsley (1153%)
  - Barn Owl Cottage to Coldgatehaugh (1054%)

The outcomes of the five priority route sections and those that offer the highest First Year Rates of Return have been combined to show the overall top ranking areas. They are;

1. **Coeburn to Knogley (2687% and 37.2 recorded collisions phmvkms)**
2. **Bowchester to Coldgatehaugh (2150% and 31.9 recorded collisions phmvkms)**
3. **Longframlington to Longhorsley (1153% and 63.8 recorded collisions phmvkms)**

- **Contributory Factors** – The most salient contributory factor is a ‘failure to look properly’ (in other words, driver/rider error), occurring in 42% of recorded collisions over the last three year period.
- **HGVs** – A statistically significant 28% of recorded collisions over the last three years involved Heavy Goods Vehicles, yet HGVs consist of only 5.2% of typical traffic volumes.
- **Speeds** – Recorded 85th percentile speeds are significantly above the posted speed limit through the built up areas along the route by between 3-13mph and typically around the 8-10 mph above range.
- **Signing** - Existing signing is generally in poor condition along the study route. The site visit identified a number of instances were roads signs were damaged, obscured or detached from their poles. There is also a general need to enhance sign reflectivity. Inadequate route signing is reflected in the number of collisions related to driver error.
- **Road Markings** – There is a general requirement to refresh road markings, particularly edge of carriageway markings where Goods Vehicles have overrun into the verge resulting in either faded or covered markings.

- **Route Geometry** – Reflecting the rural nature of the route and regular bends in the alignment, a number of recorded collisions occurred at bends where advance warning of the change in direction has not always been provided in the form of signing and road markings.
- **Route Maintenance** – There are issues with the general maintenance of the route in terms of localised inadequate surface quality (reflected in Grip data) and also in terms of encroaching vegetation adversely affecting driver visibility.

7.2 Recommendations

- **Signing and lining improvement programme** – develop a prioritised and costed signing and lining improvement programme, focussed on addressing the specific issues identified through this study (see route section summary sheets in **Appendix B**) and ensuring a consistent level of quality of signing along the full route extents as well as a consistent level of quality of road markings along the full route extents. This could include exploring enhanced road markings such as solar powered road studs along the centre line and also edge of carriageway through route collision cluster zones and at locations where route geometry needs to be clearly emphasised.
- **Speed reduction measures** – in collaboration with Northumbria Police, identify a package of speed reduction measures, in particular at collision cluster zones. Physical and visual enforcement measures such as the application of an average speed camera system, route wide and/or through localised route sections, should be explored.
- **Physical changes to route geometry** – undertake feasibility studies of localised enhancement scheme options around identified 'hotspots' where route geometry and associated driver visibility are key contributory factors to collision occurrence. An example of this is the need to address the current layby arrangement in the vicinity of Heighley Gate.
- **Address excessive proportion of HGV related collisions** – work with the Freight Transport Association to identify best practice from elsewhere in terms of techniques to reduce the likelihood of HGV related collisions on routes such as the A697. Consideration should be given to the Construction Logistics and Cyclist Safety (CLOCS) programme, a project developed to ensure a road safety culture is embedded into the construction industry in attempts to reduce collisions between HGV's and vulnerable road users. In the medium term, the recently announced proposals to extend the dualling of the A1(T) may help to address this issues by encouraging more strategic HGV traffic to remain on the A1(T).
- **Education / awareness campaign** – reflecting the fact that the salient contributory factor to recorded collisions along the A697 route is a 'failure to look properly' (in other words, driver/rider error), it is recommended that consideration is given to developing an education / awareness campaign to encourage route users to be more aware of the hazards along the route. In conjunction with the routine road marking and signing enhancements described above, this campaign could, for example, include static or VMS signing warning drivers to look and to take care. Such signing could be rotated to different sites as required.
- **Maintenance programme** – work with maintenance colleagues within NCC to develop a clear and prioritised maintenance programme focussed on addressing route sections with inadequate road surface quality and also route sections where vegetation adversely affects driver visibility.