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Petition PE1236 – A90 Laurencekirk junctions

Thank you for your letter of 18 June to David Middleton, Chief Executive, about Petition PE1236 concerning the Laurencekirk junctions of the A90 trunk road. I have been asked to respond and I have set out below our responses to your questions.

When will the results of the Accident Investigation and Prevention study taking place at Laurencekirk be known ?

The Accident Investigation and Prevention (AIP) report has now been finalised and the recommendations accepted. A copy of the report is attached.

What are the next steps following the completion of this study ?

The recommendations will be programmed for the current financial year to allow early design work to commence. It is intended that all construction elements will be completed within 12 months.

What changes are to be made to this stretch of road as a result of this study ?

The following recommendations have been made :

- Designs for a northbound merge taper at the north junction will be progressed in the current financial year.
- Vehicle activated signs to be installed on the A90 approaches activated by local road and crossing traffic at the A90/B9120 junction (north and south bound) and also the A90/A937 north junction northbound only.
- 'Cross With Care' signs opposite both legs at the A90/B9120 junction.

- Surface treatment measures on both A90 carriageways at the B9120 and A937 north junctions to improve skid resistance.
- Relocate the existing advance direction sign a further 100 metres southwards at the B9120 junction to improve visibility from the junction.
- Upgrade pedestrian warning signs and install new safety camera warning sign at the B9120 junction.
- Refresh road markings and replace existing studs with high visibility alternatives at all junctions.
- Cut back shrubbery adjacent to the northbound advance direction sign for the A90/A937 north junction.

What were the findings of the investigation into speed limit compliance at existing camera locations ?

Speed limit compliance at the southernmost junction is considered good. A survey was undertaken at the southern junction during the week commencing 19 June 2009, which recorded vehicle speeds. A mean speed of 42 mph northbound and 50 mph southbound was recorded.

What factors were used during the Strategic Transport Projects Review to conclude that there should be no graded junction at Laurencekirk ?

The STPR appraisal process gave specific consideration to the case for the grade separation of the Laurencekirk south junction. Further to the road safety measures introduced in 2005 at the south junction which resulted in improved accident statistics at this location, it was not considered that grade separation was necessary at this time.

The Review concluded that it would not address or make a significant contribution to the STPR objective established for the corridor of a 'continual reduction in accident rates and severity rates across the strategic transport network' and the safety record at this junction will continue to be monitored.

Further information on the development of the STPR is available on the Transport Scotland website at www.transportscotland.gov.uk/stpr, in particular:

- Report 1 (Network Performance), section 7.5 on the Dundee to Aberdeen corridor;
- Report 2 (Determine Expectations, Gaps and Shortfalls), section 3.3.6 on the Dundee to Aberdeen corridor; and
- Report 3 (Option Generation and Appraisal), Appendix B, page 25, Intervention 892 on the A90 Grade Separation of Laurencekirk/Marykirk junction.

Accident rates at the Laurencekirk junctions have increased in total since the introduction of the 2005 safety measures. What is being done to address this increase in numbers ?

The total number of injury accidents recorded over the three junctions in the last ten years is given in the table below. As a result of the recent rise in accident numbers at the middle and north junctions, Transport Scotland instructed BEAR Scotland Ltd to carry out a comprehensive study of all three junctions, which resulted in the recent report.

Injury accidents on the A90 in vicinity of Laurencekirk, including the 3 junctions:

	Fatal	Serious	Slight	Total
1999	0	1	1	2
2000	0	0	3	3
2001	2	2	2	6
2002	0	0	2	2
2003	1	1	0	2
2004	0	0	2	2
2005	0	4	2	6
2006	0	2	2	4
2007	0	2	2	4
2008	0	1	4	5
Total	3	13	20	36

Yearly injury accident figures for the A90/A937 (southern) junction only :

	Fatal	Serious	Slight	Total
1999	0	0	1	1
2000	0	0	2	2
2001	2	2	1	5
2002	0	0	1	1
2003	0	0	0	0
2004	1	0	1	2
2005 *	0	1	1	2
2006	0	0	1	1
2007	0	0	0	0
2008	0	0	2	2
Total	3	3	10	16

* Cameras and reduced speed limit effective from October 05. Injury accidents occurred prior to that date.

Following the recent tragic fatal accident at the north junction on 8 September 2009, representatives of Transport Scotland's road safety team and BEAR Scotland Ltd met with the Police to determine the circumstances of the accident and review the site. It was concluded that there were no significant problems with the road layout. Planned works will help highlight the junction and alert drivers to turning traffic.

Will the 50 mph speed limit be adopted at all 3 Laurencekirk junctions as an interim measure to address growing congestion ?

It is not thought that reducing speed limits will help in reducing traffic congestion. There are no plans to reduce the existing limit at this time, although Transport Scotland will continue to monitor the situation in conjunction with the Police and the North East Safety Camera Partnership.

Are the safety measures made in 2005 suitable to cope with the steadily increasing volume of traffic using the junction ?

The accident reduction measures introduced at the south junction in 2005 have contributed to a reduction in both severity and frequency of accidents. Provided no significant changes in population take place and there are no adverse driver behaviour problems, the junction should continue to cope.

What were the traffic flows at the Laurencekirk junctions over the last 10 years ?

A permanent traffic counter site is situated between the middle and north junctions to Laurencekirk. The latest available average annual daily flow figures through the site have been calculated as follows:

Year	AADF	Yearly Growth
1999	16549	
2000	16694	0.9%
2001	17060	2.2%
2002	17380	1.9%
2003	17613	1.3%
2004	18198	3.3%
2005	17802	-2.2%
2006	19137	7.5%
2007	19569	2.3%
2008	19752	0.9%

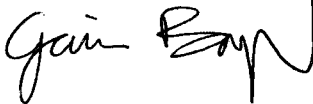
(AADF = Annual Average Daily Flow)

What impact is the continuing expansion of Laurencekirk expected to have on traffic flow within the area in the future ?

An assessment of the likely impact of the proposed housing development of approximately 200 dwellings has been undertaken by external consultants on behalf of Transport Scotland to determine what the effect on capacity, congestion and accidents might be. It concludes that, provided development does not continue unchecked, there is sufficient capacity in the current infrastructure to cope with the anticipated increase in traffic without any appreciable effect on the operation of the junction. It notes, however, that any further expansion advocated by the Aberdeenshire Local Development Plan is likely to have an adverse effect on junction operation, which would have to be addressed by any prospective developer.

I hope this is helpful.

Yours sincerely



pp JIM BARTON

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NORTH EAST UNIT

A90 LAURENCEKIRK ROAD SAFETY REVIEW

09/NE/0805/138



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ACCIDENT STATISTICS

1.0 Introduction

- 1.1 This report has been prepared by BEAR Scotland Limited following recommendations made within the Moving Cursor Programme 2009/2010 Report which identified the A90/A937 north junction for further investigation in addition to an instruction from Transport Scotland to investigate continuing local concerns over traffic safety at the A90 /A937 and B8091 Laurencekirk Junctions.
- 1.2 This report forms the second phase of the investigation process for this scheme. The first phase was documented in the A90 Laurencekirk Traffic Survey Report, which identified traffic patterns and conflicts at these junctions. This report builds upon the earlier document identifying all current issues affecting road safety at these locations and providing recommendations for future action.

2.0 Background

- 2.1 The A937 (South) and B9120 Junctions have been the subject of previous Road Safety Reviews having been identified within a list of schemes in the Annual Moving Cursor Programme. Despite a number of recommendations implemented as a result of these reviews there continues to be concerns raised by locals over traffic safety at these junctions.
- 2.2 Since the occurrence of two fatal accidents at the A90/B937 south junction in 2001, there has been continued local support for the provision of grade separation at this location. Indeed, this is mentioned as a safety priority for strategic roads in the NESTRANS Regional Transport Strategy. However, the Strategic Transport Projects Review, published by Transport Scotland earlier this year, which identifies major Trunk Road projects for the period beyond 2012 and primarily between 2012 and 2022, does not include this proposal.

3.0 Site Description

- 3.1 The A90 Trunk Road forms the main strategic link between Dundee and Aberdeen. The settlement of Laurencekirk is situated approximately 40 km south of Aberdeen. The A90 bypasses Laurencekirk to the east and is a dual carriageway at this point. Laurencekirk is served by three A90 junctions, the A90/A937 south junction, the A90/B9120 junction and the A90/A937 north junction. The location of these junctions is shown in Fig 3.1.
- 3.2 The surrounding area is rural in nature, with the exception of Laurencekirk, and is generally used for agriculture.

- 3.3 Aberdeenshire Council's Capacity Report for Laurencekirk reports in paragraph 3.5 that in 2006 the population of this town was 2,110. This report also states in paragraph 3.3 that the population of Laurencekirk increased by 9.3% between 2001 and 2006, which is a significantly higher growth rate than the Aberdeenshire average of 0.25%.
- 3.4 The Capacity Report contains an age distribution chart (Table 1) that shows there is a higher proportion of over 60s in Laurencekirk (26.49%) in comparison to Aberdeenshire as a whole (19.16%). Table 2 of this report also highlights that this age category is projected to increase within Aberdeenshire by 56% by 2016, using a base year of 2003.
- 3.5 The Aberdeenshire Local Development Plan is currently under review. The Main Issues Report which is the first stage in the consultation process was published in May 2009. This sets out choices in relation to the direction that policy and land use allocations can take. It is anticipated that the plan will be adopted early in 2011 and will cover the period up to 2023. It will provide firm guidance for the period up to 2016 when it will be reviewed.
- 3.6 The Main Issues Report proposes that a mixed use development incorporating 885 dwellings and around 20 ha of employment land is the preferred option at Laurencekirk. This would effectively mean doubling the size of the current settlement. Aberdeenshire Council prefer development in the north east of the town although there are also opportunities in the west and south east.
- 3.7 Transport Scotland has advised Aberdeenshire Council that expansion of Laurencekirk on that scale would require upgrading of the junctions on the A90. This has been acknowledged in the Main Issues Report. Depending on the location of the development, the upgrading is likely to take the form of grade separation at either the north or south A937 junctions with closure of the central reserve gaps. This would provide significant road safety benefits. Transport Scotland has no plans for upgrading of these junctions on that scale and hence such improvements would need to be developer funded.
- 3.8 In addition to the above, a proposed residential development within Laurencekirk is being considered under the current Aberdeenshire Local Development Plan, by Aberdeenshire Council. If given permission, the development in Blackiemoor Avenue, Laurencekirk, would consist of a further 210 dwellings.
- 3.9 A new rail halt on the Dundee to Aberdeen mainline was opened in Laurencekirk earlier this year.

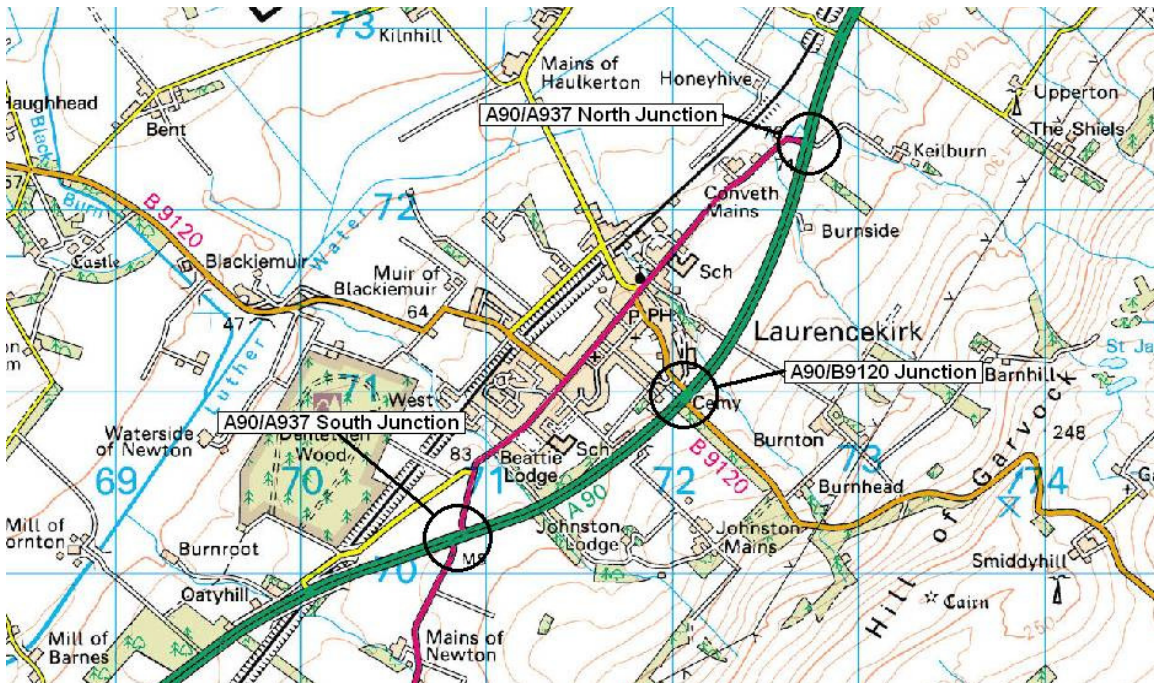


Figure 3.1 - Location of A90 Junctions in the vicinity of Laurencekirk

A90/A937 South Junction

- 3.10 The Traffic Survey Report states that 12,720 and 17,825 movements occurred at this junction during surveys on Saturday 9th May 2009 and Monday 11th May 2009 respectively.
- 3.11 The northern leg of the staggered junction at this location has a nearside auxiliary lane, which consists of a total deceleration length of 122.6m incorporating a direct taper of 30m. The right turn lane into the junction from the A90 southbound carriageway has a deceleration length of 110m and a direct taper of 30m. Both of these facilities comply with the standard specified within TD 42/95 of the Design Manual for Roads and Bridges (DMRB).
- 3.12 At the southern leg of this staggered junction there is a nearside diverge lane to allow A90 southbound vehicles to safely access the A937. The lane consists of a deceleration length of 127m including a direct taper of 40m.
- 3.13 There is also a right turn lane into the junction in the central reservation for A90 northbound vehicles which has a total deceleration length of 122m and a direct taper of 34m. Both of these facilities comply with the required standard specified within TD42/95 of the DMRB.
- 3.14 There are no merge lanes at either junction leg. However, there are insufficient left turn flows from these legs to justify a merge taper, as specified in TD42/95 of

- the DMRB (62 vehicles (northern leg) and 17 vehicles (southern leg) recorded in comparison to 600 vehicles per day required).
- 3.15 Junction visibility is to current standards for all manoeuvres.
- 3.16 The A90 Laurencekirk Traffic Survey Report records instances of vehicles queuing side by side that have exited the local roads in the central reserve at both gaps serving this junction.
- 3.17 Whilst the road markings at this junction appears to be in generally good condition, a road marking condition survey for the A90, carried out in October 2008, identified that the line reflectivity in this area is generally below the suitable level. In addition, it was noted during the site visit that a number of road studs were missing at this junction.
- 3.18 A 50mph local limit was introduced on this dual carriageway section of the trunk road in 2005. Appendix E contains details of a recent speed survey carried out at this junction. This records mean speeds of 42mph (northbound) and 49mph (southbound) and 85th percentile speeds of 45mph (northbound) and 52mph (southbound). The survey highlights a high proportion of recorded speeds greater than 50mph (32%) for the southbound direction. However the 85th percentile speed reading would indicate that approximately 17% of these vehicles are travelling within 2mph of the speed limit.
- 3.19 Signing at this junction is generally in good condition, as shown in the photographs contained in Appendix C.
- 3.20 Details of the existing road markings and signing provision for this junction are contained in Appendix G.

A90/B9120 Junction

- 3.21 The Traffic Survey Report states that 11,388 and 16,650 movements occurred at this junction during Saturday 9th May 2009 and Monday 11th May 2009 respectively.
- 3.22 The national speed limit is in place on this dual carriageway section of the trunk road. Appendix E contains details of a recent speed survey carried out at this junction. This records mean speeds of 61mph (northbound) and 65mph (southbound) and 85th percentile speeds of 69mph (northbound) and 74mph (southbound). The survey highlights a high proportion of recorded speeds greater than 70mph (29%) for the southbound direction. However the 85th percentile speed reading would indicate that approximately 14% of these vehicles are travelling within 4mph of the speed limit.
- 3.23 The B9120 meets the A90 at two junctions in a right/left staggered arrangement. The junction to the northwest provides access to Laurencekirk whereas the

B9120 to the southeast connects to the A92 and the coastal settlement of St. Cyrus.

- 3.24 At present, the northwest leg of the junction has a nearside diverge lane surfaced with anti-skid material and deceleration length of 111.5m. The southeast leg also has a nearside diverge lane which is surfaced with anti-skid material and has a deceleration length of 101.3m. This latter deceleration length is below the required standard of 110m. Photographs of the existing layout can be seen in Appendix C.
- 3.25 Both legs of the junction have right turn lanes in the central reservation to facilitate manoeuvres from the opposite A90 carriageway. The geometry of both of these facilities complies with the standards specified within TD42/95 of the DMRB.
- 3.26 There are no merge lanes at either junction leg. However, there are insufficient left turn flows from these legs to justify a merge taper, as specified in TD42/95 of the DMRB (136 vehicles (northwest leg) and 83 vehicles (southeast leg) recorded in comparison to 600 vehicles per day required.)
- 3.15 Visibility to the south from the northwest leg is restricted to approximately 120m in comparison to the standard 295m. This is due to a combination of the horizontal and vertical geometry of the A90 in this area. Visibility for all other movements at this junction is to current standards.
- 3.27 The Traffic Survey Reports records instances of side by side queuing by vehicles that have exited the local roads in the central reserve at both gaps serving this junction.
- 3.28 Whilst the road markings at this junction appears to be in generally good condition, a markings condition survey for the A90, carried out in October 2008, identified that the line reflectivity in this area is generally below the suitable level. In addition, it was noted during the site visit that a number of road studs were missing at the junction.
- 3.29 Signing for this junction is generally in good condition. However, the existing northbound advance direction sign is currently situated on a sweeping left hand bend, making the sign difficult for approaching trunk road traffic to see, thereby reducing the conspicuity of the junction. In addition, this sign is currently obscured by vegetation.
- 3.30 Also, it was noted that the exiting pedestrian warning signs on both approaches to this junction are outdated. Also a safety camera sign is missing on the northbound approach.
- 3.31 Details of the existing road marking and signing provision for this junction are contained in Appendix G.

- 3.32 There is an existing pedestrian crossing point directly south of this junction. A recent survey recorded seven crossing pedestrians in a twelve hour period.

A90/A937 North Junction

- 3.33 The Traffic Survey Report states that 12,437 and 17,853 movements occurred at this junction during Saturday 9th May 2009 and Monday 11th May 2009 respectively.
- 3.34 The national speed limit is in place on this dual carriageway section of the trunk road. Appendix E contains details of a recent speed survey carried out at this junction. This records mean speeds of 68mph (northbound) and 62mph (southbound) and 85th percentile speeds of 77mph (northbound) and 72mph (southbound). The survey highlights a high proportion of recorded speeds greater than 70mph in the northbound direction (44%). However the 85th percentile speed reading would indicate that approximately 29% of these vehicles are travelling within 7mph of the speed limit.
- 3.35 The A937 is the main route, which runs through the centre of Laurencekirk. The A937 meets the A90 trunk road at two junctions one to the southwest (which has been discussed in section 3.2) and one to the northeast. The locations of the junctions at Laurencekirk are shown in Figure 3.1.
- 3.36 The A937 to the north of Laurencekirk currently meets the A90 in an at-grade T-junction arrangement with a nearside diverge but no merge. Photographs of the existing layout at the junction can be seen in Appendix C. The nearside diverge lane is of an acceptable geometric standard. There is a right turn lane, which is 5m less than the required standard length.
- 3.37 There is no existing merge taper from this leg at present, despite sufficient left-turn exit movements at this location to justify such a provision, as specified in TD42/95 of the DMRB (1061 vehicles per day recorded in comparison to 600 required).
- 3.38 Visibility to and from this leg is to current standards for all movements.
- 3.39 Opposite the A90/A937 north junction there is an access to Keilburn Farm and Cottages, which forms a T-junction with the A90 carriageway. The farm junction has a right turn lane in the central reservation, which is 40m long in total, which is below the required standard of 110m plus 10m turning length.
- 3.40 Visibility to the north from the access is restricted to approximately 190 metres in comparison to the standard 295 metres. This is due to the horizontal geometry of the A90.

- 3.41 Whilst road markings at this junction appears to be in generally good condition, a markings condition survey for the A90, carried out in October 2008, identified that the line reflectivity in this area is generally below a suitable level. In addition, it was noted during the site visit that a number of road studs were missing in the general vicinity of this junction.
- 3.42 Signing at this junction is generally in good condition, as shown in the photographs contained in Appendix C.
- 3.43 Details of the existing road marking and signing provision for this junction are contained in Appendix G

4.0 **SCRIM Summary**

- 4.1 SCRIM results contained in Appendix A indicate that A90 skid resistance through this section is generally good. However, there are isolated locations at both the A90/B9120 and A90/A937 north junctions (northbound and southbound carriageways) where the need for intervention is required.

5.0 **Accident History**

- 5.1 SERIS accident details for the A90 covering the three junctions in question from January 2006 to December 2008 were obtained. These record thirteen injury accidents; six serious and seven slight injury accidents and seventeen damage only accidents within this section. Fig 5.1 shows the spread of injury accidents over the three year period. Table 5.1 provides an annual total of all accident types.

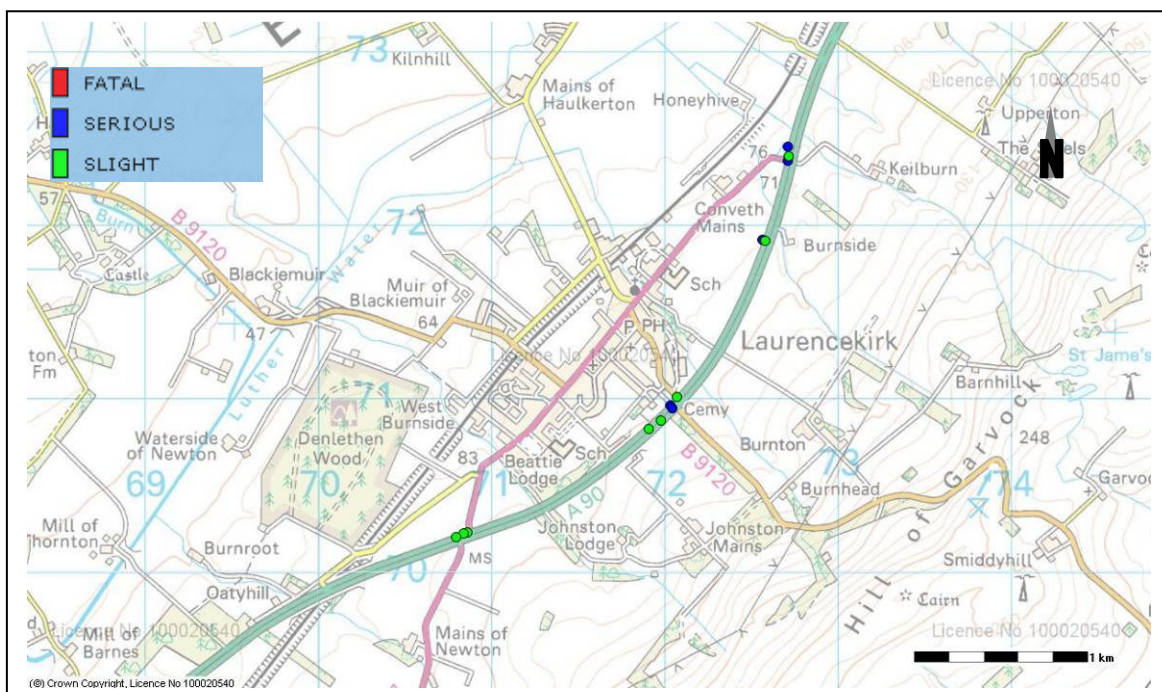


Figure 5.1 – A90 Laurencekirk Injury Accident Plot 2006 to 2008

Year	2006	2007	2008	Total
Fatal	0	0	0	0
Serious	2	3	1	6
Slight	1	2	4	7
Damage Only	5	6	6	17
Total (Injury)	3	5	5	13

Table 5.1 – A90 Laurencekirk Annual Record of Accidents

6.0 Previous Reports Accident Remedial Measures

A90/A937 South Junction

- 6.1 Three previous AIP studies have been carried out at the junction; the reports are dated April 2002, October 2004 and February 2007. The outcome of these studies was to recommend several low cost, short-term remediation works to be carried out at the junctions. Works incorporating a 50mph speed restriction, Vehicle Activated Signs, fixed speed cameras and high-friction surfacing were completed in September 2005. In addition minor road marking alterations to the central reserve were carried out in 2007 to address the issue of side by side vehicle queuing at this location.
- 6.2 The A90 Dundee to Stonehaven Junction Strategy Report, funded through the Minor Improvements budget and submitted to Transport Scotland in 2008, recommends a further feasibility study to investigate grade separation and associated gap closures. This study is not in the current Minor Improvement programme.

A90/B9120 Junction

- 6.3 An AIP study was carried out at the junction within the 2003-04 AIP programme, (report dated January 2004). The study recommended several remediation works to be carried out which included the installation of anti-skid surfacing on the deceleration lanes, upgrade of traffic signs, countdown signs and new road

markings. Currently, countdown markers have been installed, signs have been upgraded and high friction surfacing laid on the deceleration lanes.

- 6.4 The A90 Dundee to Stonehaven Junction Strategy Report recommends the following improvements to this junction:
- Lay buff coloured high friction surfacing on junction approaches
 - Install carriageway markings and red coloured surfacing to figure 7/10 of TD42/95 of the DMRB in both central reservation openings.
 - Renew carriageway markings

None of the above proposals are included in the current Minor Improvements programme.

A90/A937 North Junction

- 6.5 There is no record of any AIP studies being undertaken at this location and consequently no safety remedial measures have been carried out at this location.
- 6.6 The A90 Dundee to Stonehaven Junction Strategy Report recommends the following improvements to this junction:
- Construction of a northbound merge taper
 - Review of junction signing

The proposed installation of a northbound merge taper is currently programmed within the Minor Improvements Budget.

7.0 Section and Junction Analysis

Section Analysis

- 7.1 Of the thirteen injury accidents recorded over the study area during the 2006 - 2008 period, nine occurred at the junctions – three at each. Of these nine, five involved right turning vehicle manoeuvres. In addition six of the seventeen recorded damage only accidents involved right turning vehicle movements.
- 7.2 This pattern is consistent with the injury accident statistics for similar junctions in the North East Unit where accidents involving ‘right turn’ movements are more prominent than those involving other manoeuvres. Details of this are contained in Appendix H.
- 7.3 In addition injury accidents involving right turn movements feature prominently in the national accidents statistics, as detailed in Table 14a of Road Casualties Scotland 2007.
- 7.4 Also the prevalence of right turn accidents is of particular concern at this location given the predicted change in age demographic raised in paragraph 3.4. The

unpublished report entitled 'Dual carriageway at-grade priority junctions', prepared by TRL for Transport Scotland highlights that elderly drivers experience greater problems carrying out right turn movements across traffic flows as their reaction times are lower and visual deterioration more prominent. In this particular instance, three of the five right turn drivers involved in injury accidents at the junction were over 60 years of age. The projected increase in the over 60s living in this area may therefore exacerbate this issue over time.

- 7.5 Four of the thirteen injury accidents (31%) occurred during the hours of darkness. Damage only accident details for this area record that two (22%) occurred during darkness.
- 7.6 Seven of the thirteen injury accidents (54%) occurred when the road surface was wet/damp with nine (53%) of the damage only accidents on a wet/damp road surface.
- 7.7 The accident rate for this section of the A90 is 9.42/100m veh km which is slightly higher than the Scottish National Average of 7.90/100m veh km for dual carriageways, sourced through WebSERIS. The overall accident rate for the A90 route is 11.27/100m veh km.
- 7.8 There is no single dominant pattern to the injury or damage only accidents over this section with the main contributory factor being "failing to look properly" which was recorded on nine (31%) occasions.
- 7.9 Excessive or inappropriate speed was not recorded as a contributory factor in any of the injury or damage only accidents.
- 7.10 As shown in Table 7.1 30% (five) of the drivers involved live within 10miles of Laurencekirk. The spread of data displayed in this table is indicative of the strategic and local functions of the A90 route at this location. The values shown in Table 7.1 also indicate that the general layout of this section is clear to those unfamiliar with the area. Had this not been the case then a more prominent spike towards the greater distances would be expected.

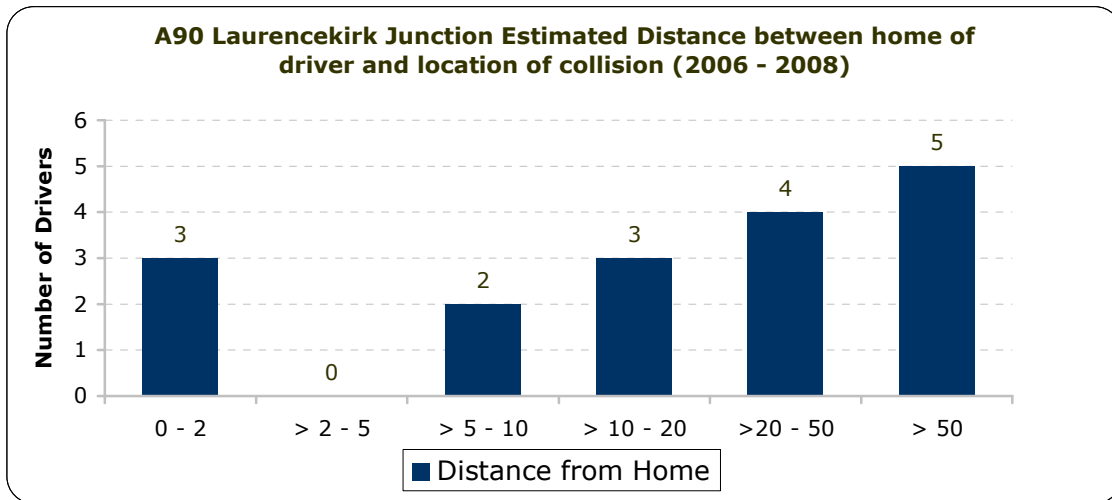


Table 7.1 – A90 Laurencekirk Estimated Distance between Driver Address and Collision Location

7.8 Table 7.2 indicates that the combined injury accident frequency for the three junctions over the past ten years has remained fairly steady, with the exception of the spike in 2001. This is despite a growth in traffic flows of approximately 19% in traffic over this period. The mean accident frequency over this period is 2.6 accidents per year in comparison to 3.3 for the most recent three year period. However, this slight increase in accident numbers is not statistically significant given the relatively low figures being analysed.

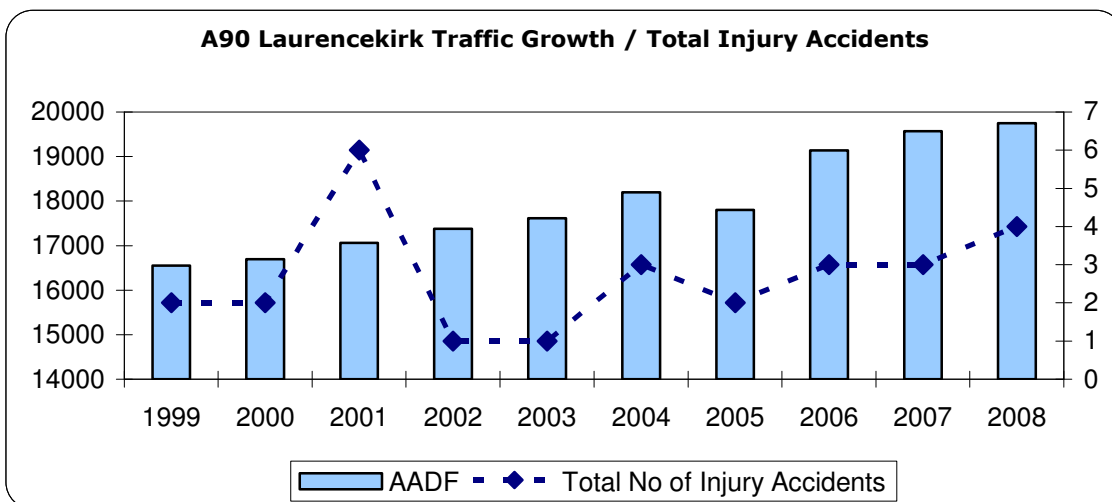


Table 7.2 – A90 Laurencekirk 10 year Traffic Flow Data / Junction Injury Accident Data

A90 / A937 (South) Junction

- 7.9 Three injury accidents have occurred at this junction over the period 2006 to 2008. Two of these accidents involved right turning manoeuvres;
- Two slight (86 year old male driver and 32 year old female driver)
- Two of the seven recorded damage only accidents involved a right turning movement.
- 7.10 All three injury accident occurred on the northbound carriageway.
- 7.11 All three injury accidents within this period occurred in daylight.
- 7.12 Two of the injury accidents occurred on a wet/damp road surface.
- 7.13 Two of the injury accidents at this junction involved skidding. However, one was due to oil on the road surface. The second accident was in wet/damp weather.
- 7.14 Table 7.3 indicates that the accident frequency over the past ten years has remained fairly steady, with the exception of the spike in 2001.

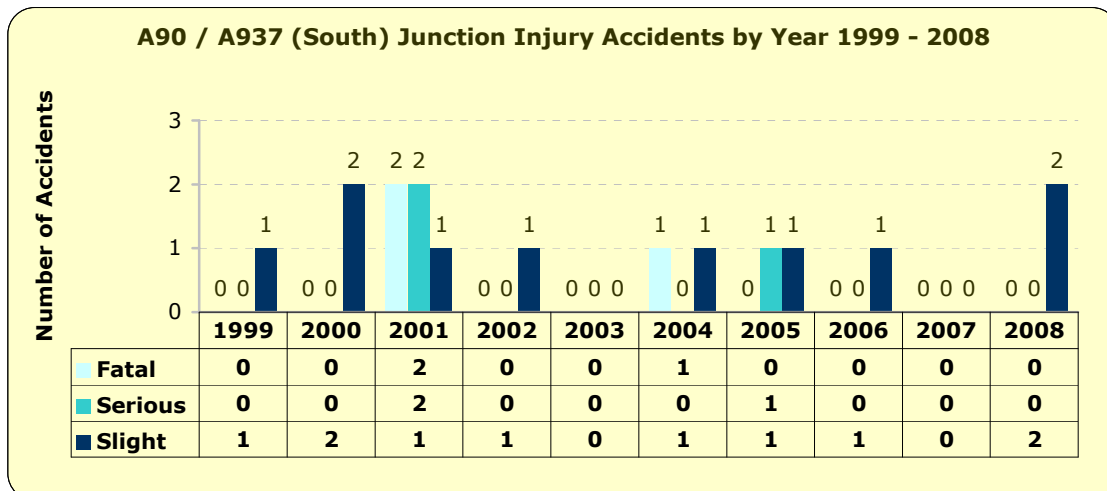


Table 7.3 – A90/A937 Laurencekirk South Junction 10 year Accident

- 7.15 Whilst the overall numbers of accidents have not reduced at this junction there has been no serious or fatal injury accidents recorded since the introduction of the 50mph speed limit at this location in 2005.
- 7.16 Figure 7.1 contains a scatterplot of the gaps accepted by drivers in comparison to the delay they encountered when attempting a crossing or merging manoeuvre during peak flow periods. Figure 7.1 shows that there is a wide spread of delays at this junction up to a maximum of about 55 seconds. The reason for this may be the bunching effect that a camera enforced lower speed limit at this location has on trunk road close following behaviour. When entering the 50mph speed limit, vehicles will naturally bunch up, resulting in a shorter gap between vehicles.

Consequently, average vehicle speeds tend to be lowered in this situation; however suitable gaps for crossing or merging traffic can also be reduced leading to additional delays for side road traffic.

7.17 Figure 7.1 also indicates that gap acceptance times at this junction are generally between five and twenty seconds. Table 7.4 shows the numbers of vehicles accepting a gap of five seconds or less. Whilst there are a fairly large number of vehicles accepting a five second gap, there are only two who accepted a smaller gap. This indicates that despite the sometimes lengthy delays at this junction, risk taking by drivers is low.

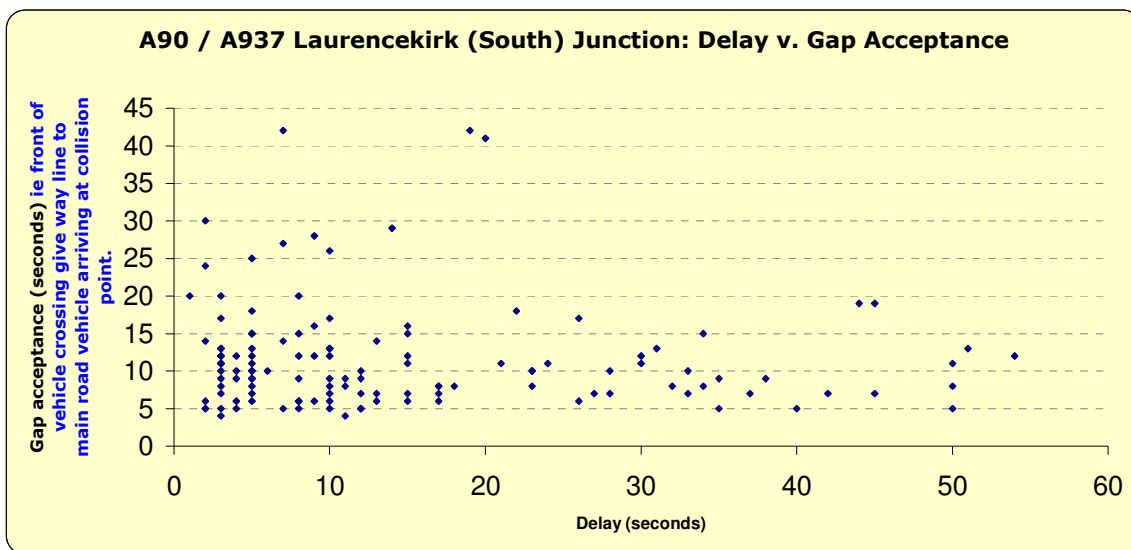


Figure 7.1 – A90/A937 South Junction - Delay against Gap Acceptance

Gap Acceptance (Seconds)	No. of vehicles
5	13
4	2
3	0
2	0

Table 7.4 – Number of Drivers Accepting a Five Second Gap or Less

7.18 The A90 Laurencekirk Traffic Survey Report concluded that right turning movements from both side roads were highlighted as conflicts. This is consistent with the recorded injury and damage only accidents at this junction. A typical conflict scenario at this junction is shown in Picture 7.1



Picture 7.1 Example of Predominant Conflict at the A90/A937 South Junction involving Right-turners from Laurencekirk and A90 Northbound Traffic

A90 / B9120 Junction

- 7.19 One of the three injury accidents that have occurred at this junction from 2006 to 2008 involved a right turning manoeuvre;
- One serious (65 year old female driver)
- One of the three recorded damage only accidents involved a right turning movement.
- 7.20 Both serious injury accidents occurred on the southbound carriageway. The one recorded slight injury accident occurred on the northbound carriageway.
- 7.21 All three injury accidents occurred during the hours of darkness.
- 7.22 Two accidents were on a wet/damp road surface.
- 7.23 One of three injury accidents involved skidding, which was in wet/damp conditions.

7.24 None of the recorded injury accidents involved pedestrians.

7.25 Table 7.5 indicates that the accident frequency over the past ten years has been sporadic, with no more than one accident occurring in any year. The average annual accident rate over this period is 0.6. This rate has increased to one per year in the past three years. However, given the low accident numbers being considered, this is not a significant increase, equating to one additional accident over the latest three year period.

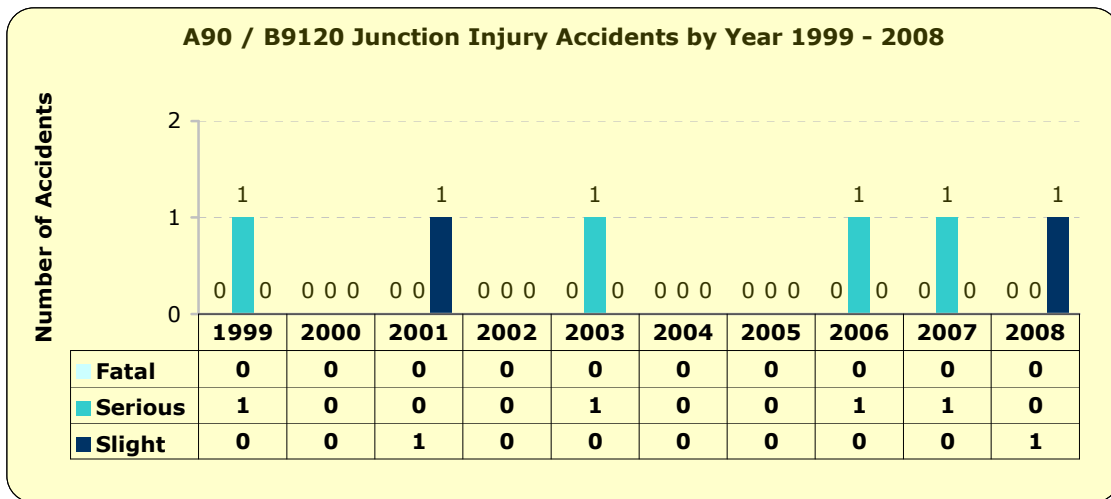


Table 7.5 – A90/B9120 Junction 10 year Accident Data

7.26 Figure 7.3 indicates that delays to crossing/merging traffic are relatively low, with the great majority of delays recorded below 25 seconds.

7.27 Table 7.6 shows that there is no significant degree of risk taking at this junction, although two vehicles were recorded accepting gaps of three and four seconds

7.28 The Traffic Survey Report concludes that the predominant conflict manoeuvre is the left turn from the northwest leg onto the northbound A90. However, this is not reflected in the accident statistics, which records only one damage only accident involving a left turn movement from 2006 to 2008. A typical conflict scenario at this junction is shown in Picture 7.2



Picture 7.2 Example of Predominant Conflict at the A90/B9120 Junction involving A90 Northbound Traffic Braking and Changing Lanes to Accommodate Left-turners from Laurencekirk

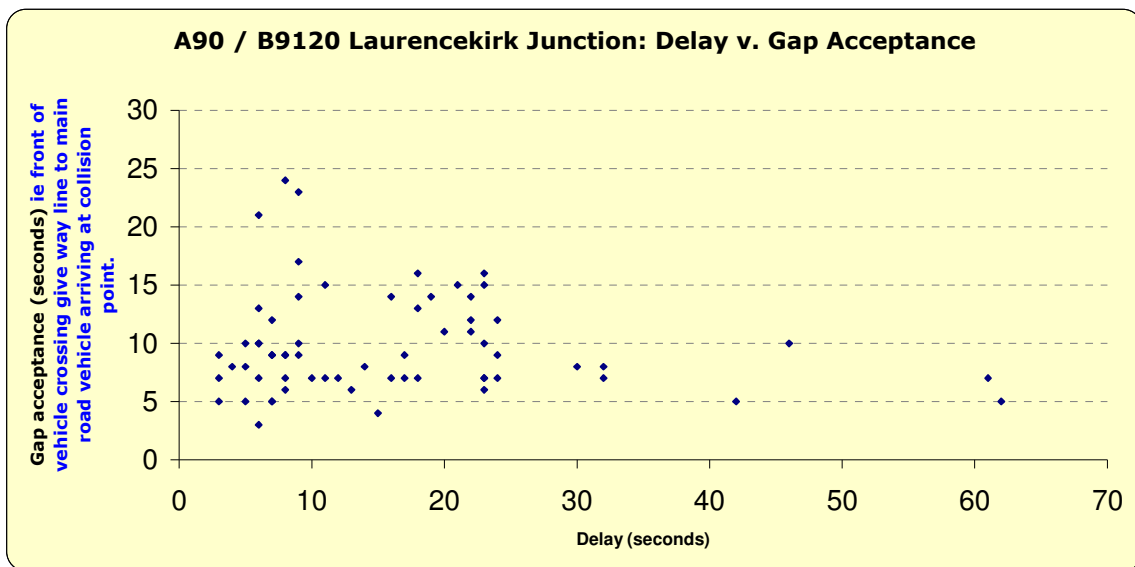


Figure 7.2 – A90/B9120 Junction - Delay against Gap Acceptance

Gap Acceptance (Seconds)	No. of vehicles
5	6
4	1
3	1
2	0

Table 7.6 - Number of Drivers Accepting a Five Second Gap or Less

A90 / A937(North) Junction

- 7.29 Two of the four injury accidents which occurred at the A937(North) involved right turning manoeuvres
- 1 serious (63 year old male driver) / 1 slight (47 year old male driver)
- One of the four recorded damage only accidents involved a right turn movement.
- 7.30 Three of the four injury accidents occurred on the northbound carriageway and during daylight hours.
- 7.31 One of the four injury accidents occurred on a wet/damp road surface.
- 7.32 Three of the four of the recorded injury accidents at this junction involved skidding.
- 7.33 Table 7.7 shows an increased injury accident frequency at this junction in recent years. No injury accidents were recorded from 1999 to 2003, however five have occurred since then. No change in junction layout or operation has been identified to explain this. However, due to the low accidents numbers and short time period over which these have been recorded, it is unclear whether this is an emerging pattern or a random variation.

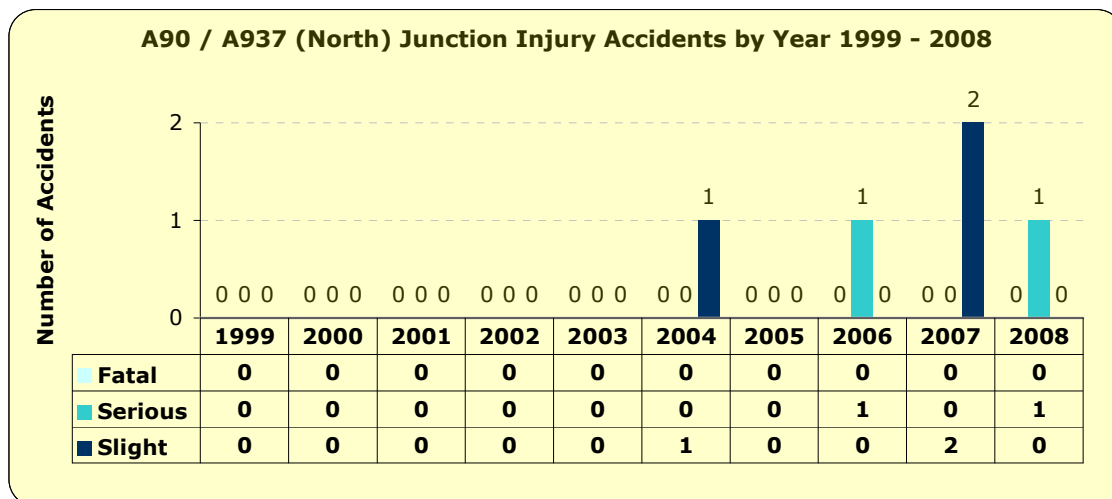


Table 7.7 – A90/A937 North Junction 10 year Accident Data

- 7.34 As with the A90/B120 junction Figure 7.3 indicates that delays to crossing/merging traffic are relatively low, with the majority of delays recorded below 25 seconds.
- 7.35 It would also appear from the vertical spread of values in Figure 7.3 that there are longer gaps available to traffic. Consequently, it is surprising to find in Table 7.8 that gap acceptance of four seconds and below is higher than the other two junctions.
- 7.36 The Traffic Survey Report identifies the predominant conflict manoeuvre is the left turn from the west leg onto the northbound A90. However, this is not reflected in the accident statistics, which records no injury or damage only accidents involving a left turn movement from 2006 to 2008. A typical conflict scenario at this junction is shown in Picture 7.3



Picture 7.3 Example of Predominant Conflict at the A90/A937 North Junction involving A90 Northbound Traffic Braking and Changing Lanes to Accommodate Left-turners from Laurencekirk

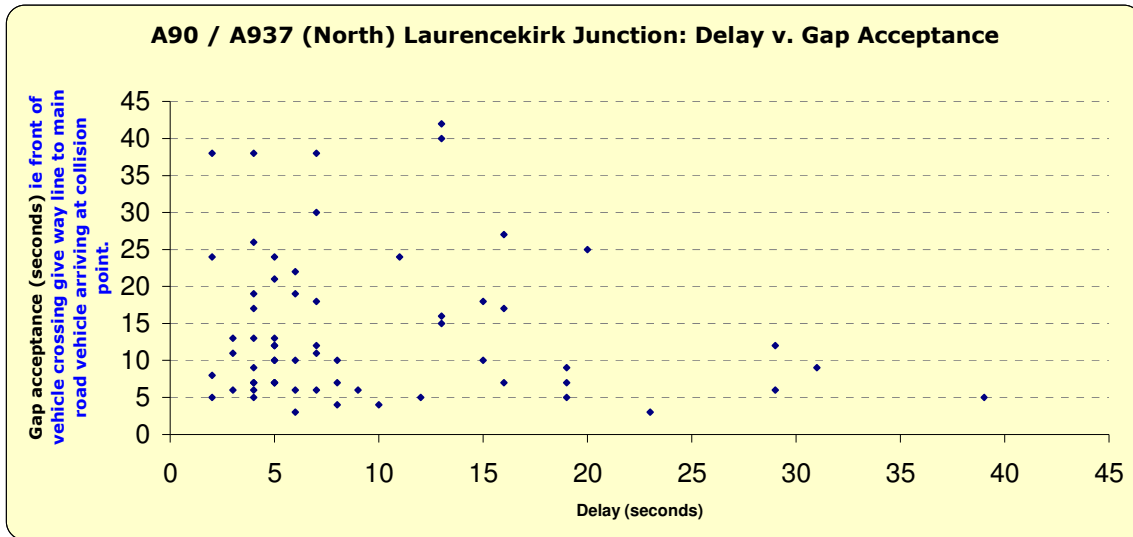


Figure 7.3 – A90/B9120 Junction - Delay against Gap Acceptance

Gap Acceptance (Seconds)	No. of vehicles
5	5
4	2
3	2
2	0

Table 7.8 - Number of Drivers Accepting a Five Second Gap or Less

8.0 Consultation

- 8.1 Grampian Police have been consulted as part of this review. With regards to the southern junction, there are concerns over the levels of speeding detected by the existing safety cameras. However, the Police do not believe that speeding or late braking have been contributory to the collisions that have occurred at this location since the improvements carried out in 2005. The Police considers careless manoeuvres by side road drivers, who have become frustrated by the delays experienced due to the high Trunk Road traffic volume, as being the main contributory factor.
- 8.2 The Police would support any engineering measures to improve safety at the A90/B9120 junction. However they would not be supportive of an extension to the 50mph speed limit to cover this junction.
- 8.3 The Police has raised no concerns over the operation of the A90/A937 north junction.
- 8.4 The North east Safety Camera Partnership were also asked for their views of this section of the A90. They have confirmed that they will continue to enforce this

section through the existing permanent/mobile safety camera provision as part of their A90 route strategy.

- 8.5 NESCAMP also provided speed data for their permanent installations at the A90/A937 junctions, recording speeds which are generally consistent with the aforementioned recent speed survey. NESCAMP concludes that as this section of the A90 is not visually different from the national speed limit sections, then the safety cameras are having a significant impact on speeds. However, NESCAMP highlight that speeds appear to have levelled out at this location and therefore without further intervention, such as average speed cameras, the level of offenders at this site will remain static.
- 8.6 Aberdeenshire Council was also consulted as part of this review and has no significant concerns over the operation of these junctions at present. However, additional delays to side road traffic have been noted at the A90/A937 south junction since the introduction of the 50mph speed limit. This comment ties in with the recorded delays shown in Figure 7.1 and discussed in paragraph 7.16.

9.0 Options Analysis

- 9.1 It is evident from the analysis in Section 7 that accidents involving right-turn manoeuvres are the most prevalent. The following options have been considered to address this accident type.

9.1.1 Closure of the Central Reserve Gaps

- 9.1.1.1 Whilst closure of the central reserve gaps on high speed roads is recognised as good practice and, in this instance, would improve road safety at each junction, it is not feasible in this case.
- 9.1.1.2 In order for these closures to be viable, suitable alternative routes should be available for diverted traffic, which are of a reasonable length and would not result in a possible migration of accidents from one location to another. For these junctions, the nearest diversion routes not utilising a central reserve gap are Spurryhillock interchange, Stonehaven to the north and Stracathro Interchange to the south. These diversion routes would be 40 kilometres and 22 kilometres in length respectively. Consequently, gap closures at Laurencekirk are not feasible.
- 9.1.1.3 It should also be noted that closure of any of these central reserve gaps may have a significant affect on the surrounding local road network.

9.1.2 Closure of Central Reserve Gaps with Grade Separation Provision

- 9.1.2.1 This option removes the potential for right-turn accidents and also addresses the issues of suitable diversion routes and accident migration. However, this proposal is not included in the Strategic Projects Review list of major

infrastructure improvements. Consequently, funding for such a scheme cannot be guaranteed.

- 9.1.2.2 In addition, a grade separated junction would cost in the region of £4m to construct. The accident savings resulting from this would provide a first year rate of return of 4.7% as detailed in Appendix D. Consequently this option would not provide best value in relation to accident savings.
- 9.1.2.3 It should also be noted that closure of any of these junctions may have a significant affect on the surrounding local road network.

9.1.3 Closure of Central Reserve Gaps with Provision of Roundabout

- 9.1.3.1 Whilst the provision of a roundabout and closure of the two remaining central reserve gaps is less costly than a grade separated junction, it is estimated this would still cost in the region of £1m. This would give a first year rate of return figure of 18.1% as detailed in Appendix D.
- 9.1.3.2 A roundabout would also introduce delays to trunk road traffic. This conflicts with the principles set out in Scotland's National Transport Strategy, which states in paragraph 78 'Our strategic networks are particularly important for connecting our cities, connecting our towns with cities and bringing people and goods to those cities. They are also critical for providing key routes into our wider region, including the Highlands and Islands, to our regeneration areas, to England and global markets to contribute to the accessibility of Scotland as a whole'. The Strategy goes on to state in paragraph 98 that 'we recognise that enhancing connections and improving journey times between and within our major centres of economic growth are vital'. This highlights the importance of the strategic function of trunk roads and the need to minimise delays.
- 9.1.3.3 It should also be noted that closure of any of these junctions may have a significant effect on the surrounding local road network.

9.1.4 Closure of Central Reserve Gaps with Signalisation of Junction

- 9.1.4.1 Signalisation of one junction and closure of the remaining central reserve gaps would separate the conflicting manoeuvres and is less costly than both grade separation and roundabout provision. It is estimated this proposal would cost in the region of £600,000, giving a first year rate of return of 30.2%, as detailed in Appendix D.
- 9.1.4.2 However, this proposal would introduce significant delays to trunk road traffic, which goes against the principles set out in Scotland's National Transport Strategy.

9.1.4.3 It should also be noted that closure of any of these junctions may have a significant effect on the surrounding local road network.

9.1.5 Installation of Vehicle Activated Signing

9.1.5.1 This option would involve the installation of vehicle activated signing on the direct approaches to the A90/B9120 and A90/A937 north junctions. These signs would be triggered by vehicles approaching from the local road or from the opposite direction, wishing to turn right and would highlight the risk of crossing traffic to approaching vehicles and raise the conspicuity of the junctions.

9.1.5.2 At the A90/B9120 junction, these signs are proposed for the northbound and southbound approaches as recent injury accidents have been recorded on both. It is suggested that a sign is installed on the northbound approach to the A90 northbound junction, as all recent injury accidents have occurred on this carriageway.

9.1.5.3 It is not proposed to install these signs at the A90/A937 junctions as the existing signing provision at the location is extensive, as shown in Appendix G. Consequently, such a provision would be difficult to site effectively and may lead to information overload for approaching drivers. In addition the recent injury accident severities at this junction are lower than those recorded at the other junctions.

9.1.5.4 It is estimated that the provision of these signs would cost in the region of £20,000.

9.1.5.5 This signing provision may lose some effectiveness during peak hours, as the sometimes heavy right-turn flows may trigger the sign continuously, making it less conspicuous on oncoming traffic. However, it would be possible to have the sign message flashing to ensure conspicuity at all times.

9.2 In addition to the above proposals to specifically address the prevalence of right-turn accidents, the accident analysis section also highlighted that all recent accidents at the A90/B9120 junction occurred during the hours of darkness. Provision of street lighting at this junction has therefore been investigated

9.3 An appraisal for street lighting provision at each individual junction location and over the whole section, in line with TA49/07 of the DMRB, has been undertaken. This concludes that provision of street lighting at this location is not justified. A copy of the appraisal is contained within Appendix F.

9.4 It was also noted during site visits that the southern visibility from the western junction mouth at the A90/B9120 junction is also restricted due to a combination of carriageway vertical alignment and existing shrubbery. Cutting back of this

shrubby and installation of the aforementioned Vehicle Activated signing is proposed to address this issue.

- 9.5 In order to address the low SCRIM readings at the A90/B9120 and A90/A937 north junctions, a carriageway treatment could be carried out to improve skid resistance. The approximate cost of this would be £10,000.
- 9.6 It should be noted that the previously submitted A90 Junction Strategy Study Report recommended the installation of high friction surfacing at this point. However, there does not appear to be sufficient evidence from the recent accident history to justify this.
- 9.7 The following options aimed to improve general road safety at these junctions, rather than a particular accident type, have also been considered.

9.7.1 Lowering of Speed Limit over B9120 and A937 North Junctions to 50mph

- 9.7.2 As discussed in the Accident Analysis section of the report, there has been a reduction in accident severity at the A90/B937 southern junction since the introduction of a 50mph speed limit in 2005. Extension of this speed limit to cover the remaining two junctions has therefore been investigated.
- 9.7.3 The Scottish Executive's ETLCD Circular 1/06 is the current guidance for assessing speed limits. It states that 'what the road looks like to road users should be a key factor when setting a speed limit'. It goes on to say that 'mean speeds should be used as a basis for determining local speed limits. These are underpinned by extensive research demonstrating the well proven relationship between speed and accident frequency and severity, and also reflect what the majority of drivers perceive as an appropriate speed to be driven for the road. Speed surveys carried out at the A90/B9120 and A90/A937 north junctions have recorded mean speeds at these junctions of 61/66mph and 63/68mph respectively.
- 9.7.4 Circular 1/06 also warns that 'if a speed limit is set in isolation, or is unrealistically low, it is likely to be ineffective and lead to disrespect for the speed limit. As well as requiring significant, and unavoidable, enforcement costs, this may also result in substantial numbers of drivers continuing to travel at unacceptable speeds, thus increasing the risk of collisions and injuries'. The mean speeds recorded above would suggest that the current national speed limit is suitable for this area
- 9.7.5 The speed limit introduction at the A90/A937 south junction and the supporting fixed safety cameras has proven effective in reducing the number of serious and fatal accidents. However, injury accidents are still being recorded at this junction, at approximately the same rate as the ten year average. Consequently a speed restriction will not necessarily completely remove an accident problem.

- 9.7.6 It should also be noted that excessive/inappropriate speed has not been recorded as a causation factor for any of the recent accidents at the A90/B9120 and A90/A937 junctions.
- 9.7.7 Grampian Police has indicated that they would not be supportive of an extension of the 50mph limit to cover the A90/B9120 junction.
- 9.7.8 Whilst there are no significant concerns over excessive vehicle speeds on this section of the A90, it is possible to use vehicle activated signing containing the safety camera symbol and the message 'SLOW DOWN' to generally improve adherence to the speed limit.
- 9.7.9 Despite previous work carried out at the A90/A937 south junction central reserve gap, side by side queuing at this location and at the A90/B9120 junction central reserve persists. The use of a camera monitoring system to identify the vehicles executing such a manoeuvre has been considered. Under such a system, letters would be dispatched to the registered keepers of the identified vehicles advising them of the road safety issues this situation creates and requesting they refrain from future similar manoeuvres. However, this system would be extremely labour intensive and would not guarantee that the practice ceased.
- 9.7.10 It is proposed that additional hatching is laid at the A90/B9120 junction and red surface treatment is laid at both junctions to further clarify the area to be used by drivers in the central reserve gaps. It should be noted that the previously submitted A90 Dundee to Stonehaven Junction Strategy Study recommended the installation of give way markings in the central reserve. However concerns have been raised at other similar sites with this arrangement that the central reserve give way markings may lead to driver confusion over priorities, which in turn may increase the potential for conflict. Consequently, these give way markings are not proposed.
- 9.7.11 In order to address the reflectivity issue with the existing lining, as mentioned in section 3, it is proposed that the existing lining at all three junctions is refreshed. The opportunity should also be taken to replace all existing road studs at these locations with high visibility studs that use microprismatic faces, to further highlight the junctions.
- 9.7.12 It is also proposed to site the existing northbound advanced direction sign for the A90/B9210 junction approximately 100 metres south to improve conspicuity for approaching drivers. In addition, the existing pedestrian warning signs should be updated and a new speed camera sign erected.
- 9.7.13 It is also proposed that shrubbery is cut back at the northbound advanced direction sign for the A90/A937 junction.
- 9.8 Generally, given the development potential within Laurencekirk, as indicated by Aberdeenshire Council's Capacity Report and Local Plan, the need to enhance

these junctions to cope with the resulting potential substantial increases in traffic flows should be a major consideration when assessing future planning applications.

10 Conclusions

- 10.1 The information contained within Aberdeenshire Council's Capacity Study and Local Plan and referred to in paragraphs 3.3 to 3.8 would indicate there may be significant future increase in the usage of these three A90 junctions.
- 10.2 However, at present the numbers of injury accidents on this section of the A90 appear to be fairly consistent on an annual basis, despite increased flows of approximately 19% over ten years.
- 10.3 The current accident rate for this section of the A90 is slightly higher than the national average for dual carriageway. However, it is lower than the overall rate for the A90 route.
- 10.4 The accident details covering the period 2006 to 2008 show a prevalence of accidents involving right turn manoeuvres. These accident types are typical for this junction layout, but there is particular concern at this location, given the higher proportion of elderly residents in the area and the projected high increase in this age group in future years. Further details are contained in paragraph 7.4.
- 10.5 Closure of the central reserve gaps is not an option to be pursued based upon accident savings, but efforts should be made to clarify the junction layout to users and provide enhanced warning to approaching drivers.
- 10.6 To meet this objective vehicle activated signs triggered by local road and crossing traffic should be installed at both the A90/B9120 (northbound and southbound carriageways) and A90/A937 (northbound carriageway only) junctions. This is particularly important for northbound A90 traffic at the B9120 junction, where junction visibility is restricted. Also 'cross with care' signs should be installed opposite both legs at this junction.
- 10.7 As compliance to the speed limits in this area are generally high and excessive speed has not been specified as a contributory factor in any of the recorded accident, the safety camera vehicle activated signing, mentioned in paragraph 9.7.7 should not be installed at this time. However, should excessive speed become a safety concern in the future, these signs can be considered.
- 10.8 A number of accidents at the A90/B9120 and A90/A937 north junction have involved vehicles skidding. The SCRIM results discussed in paragraph 4.1 and contained in Appendix A indicate that carriageway surface treatment measures should be undertaken at both the A90/B9120 and A90/A937 north junction to improve skid resistance.

- 10.9 Injury accidents involving skidding have also been recorded at the A90/A937 south junction. However, these have either been in wet/damp condition or oil has been present on the road surface. Furthermore, high friction surfacing is already in place in this area.
- 10.10 The three injury accidents recorded at the A90/B9120 junction in the past three years have occurred in darkness. However, lighting of this junction cannot be justified as detailed in Appendix F.
- 10.11 Signing and the road markings at the three junctions should be improved as covered in section 10 to improve conspicuity. This is generally consistent with recommendations contained in the previously submitted A90 Dundee to Stonehaven Junction Strategy Study with the exception of the treatment of the A90/B9120 central reserve gaps. This is explained further in paragraph 9.7.9.
- 10.12 The slightly shorter than standard southbound diverge lane mentioned in paragraph 3.21 does not appear to be impacting upon the safe usage of this junction.
- 10.13 The sub-standard right –turn lanes at the north junction mentioned in paragraphs 3.18 and 3.21 do not appear to be affecting road safety in this area

12.0 Recommendations

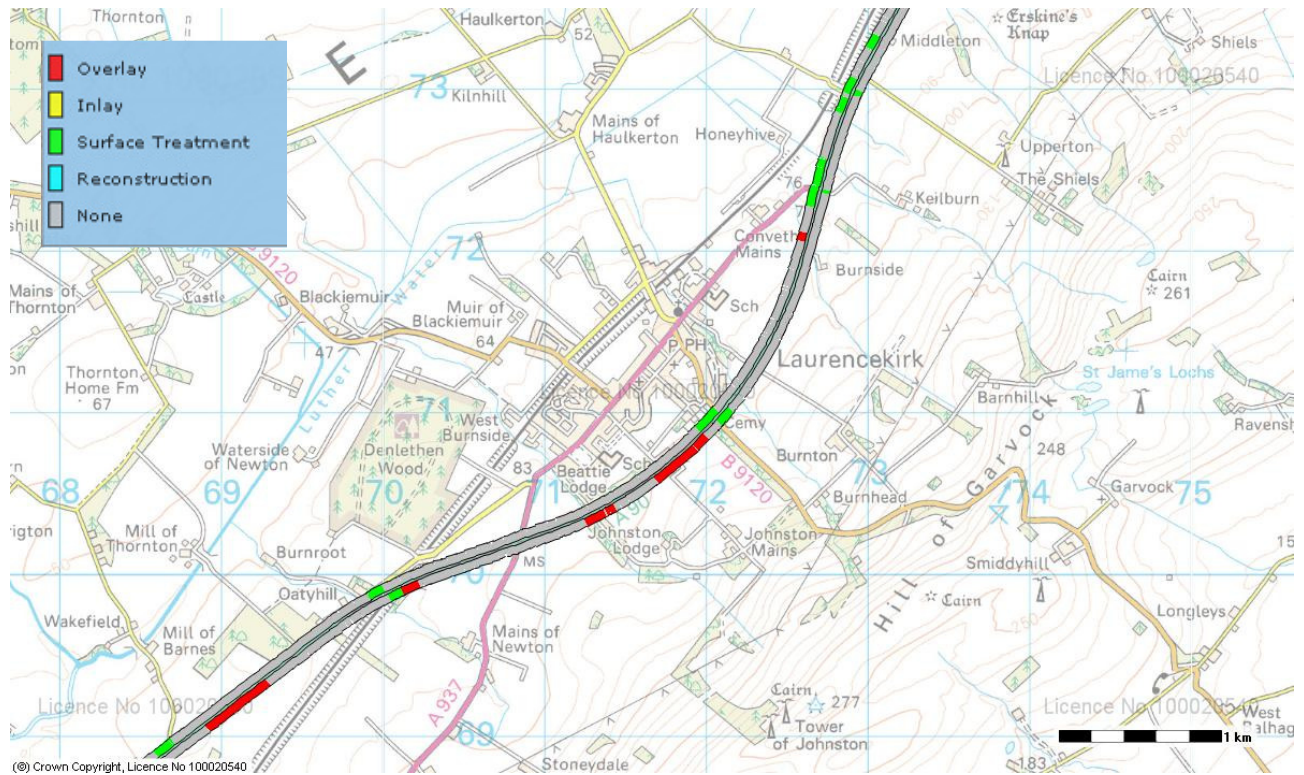
- 12.1 It is recommended that the following measures are installed:
- 12.1.1 Vehicle activated signing on the A90 approaches by local road and crossing traffic at the A90/B9120 (northbound and southbound approach) and A90/A937 (northbound approach only) junctions (£20,000)
- 12.1.2 'Cross With Care' signs opposite both legs at the A90/B9120 junction (£500)
- 12.1.3 Surface treatment measures on both A90 carriageways at the B9120 and A937 north junctions (£10,000).
- 12.1.4 Relocation of the existing northbound advance direction sign for the A90/B9120 junction approximately 100 metres southwards (£1000)
- 12.1.5 Upgrade the existing pedestrian warning signs sign and install a new safety camera sign at the A90/B9120 junction (£700)
- 12.1.6 Refresh road markings and replace studs with high visibility alternatives at all junctions (£5,000)

12.1.7 Cut back shrubbery adjacent to the northbound advance direction sign for the A90/A937 north junction. (£500)

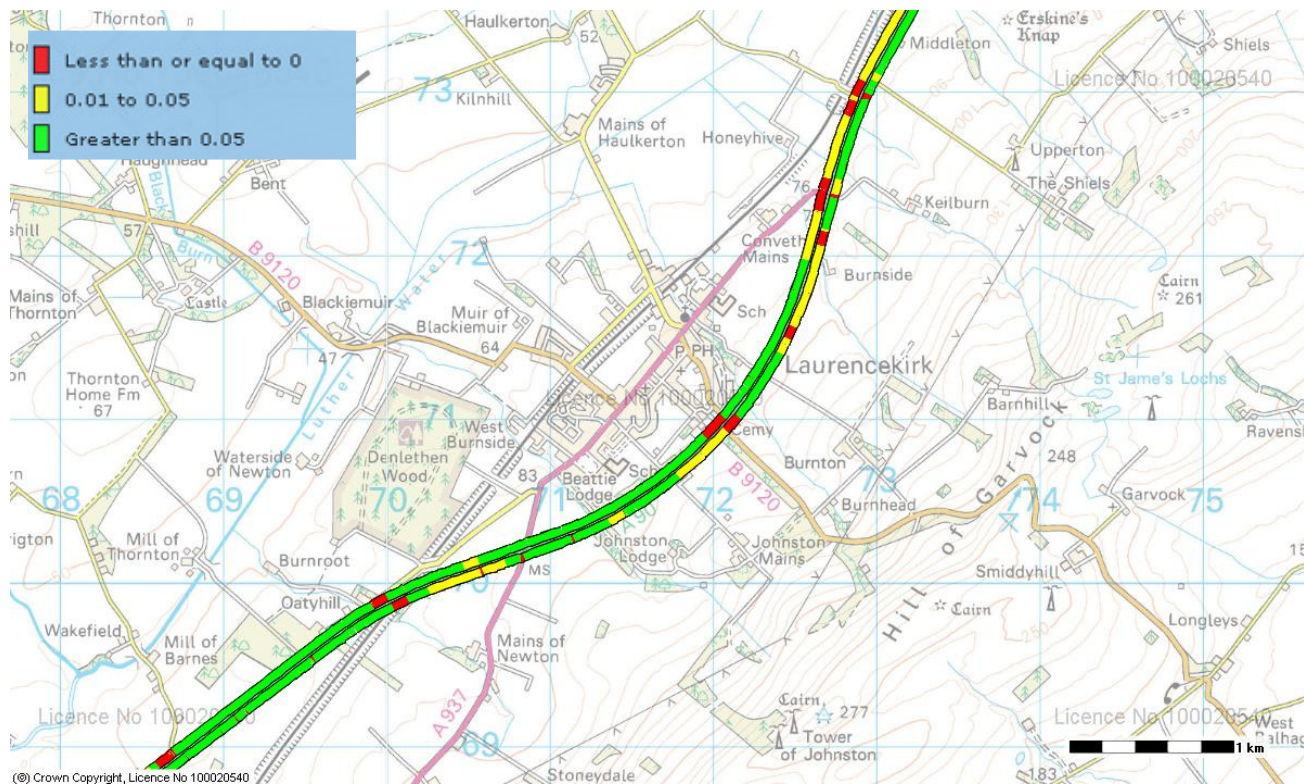
12.1.8 The total estimated cost of these measures is £37,700 giving a first year rate of return of 480.6% as detailed in appendix D.

APPENDIX A

SCRIM ANALYSIS



NE PREDICTED MICRO SCHEMES



NE SCRIM SUMMARY

APPENDIX B

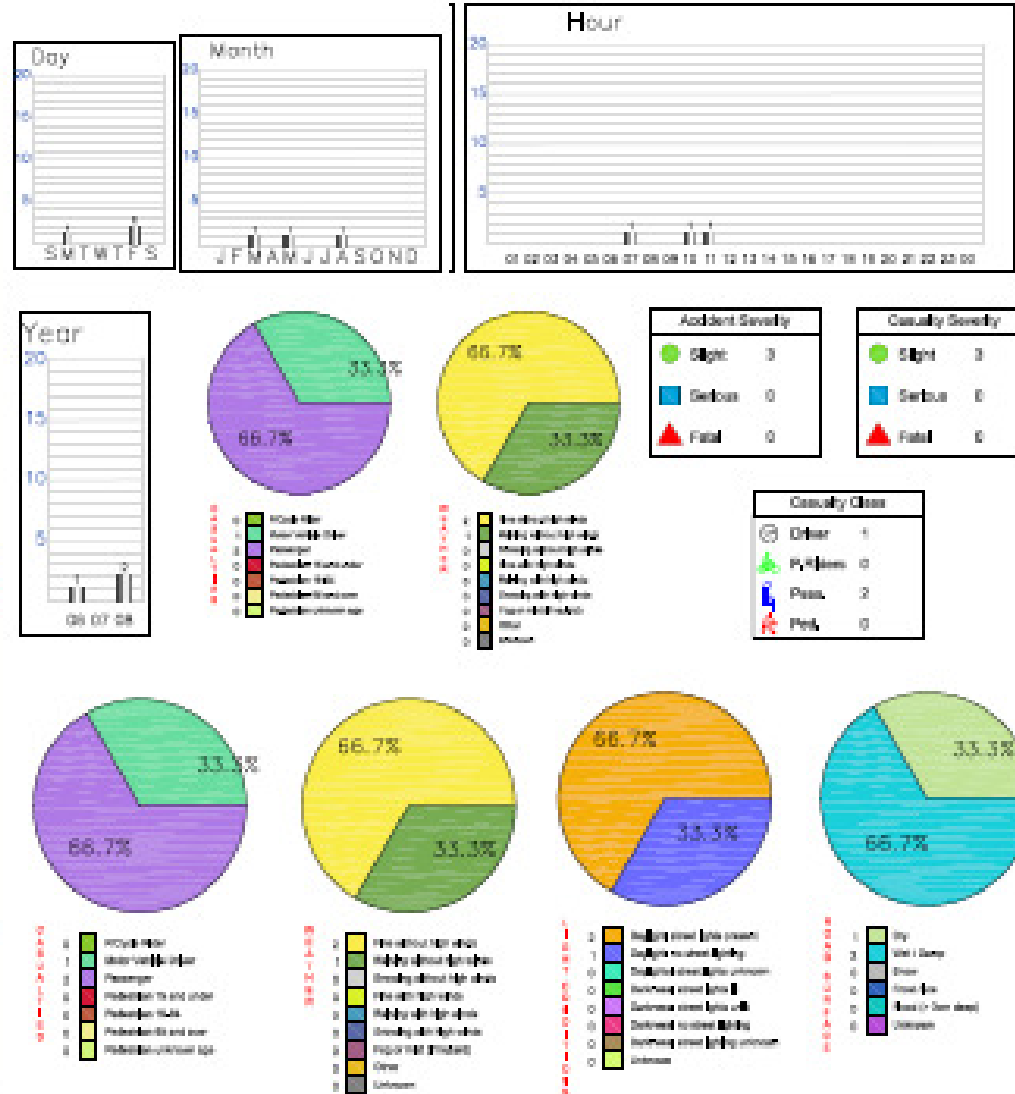
ACCIDENT DETAILS

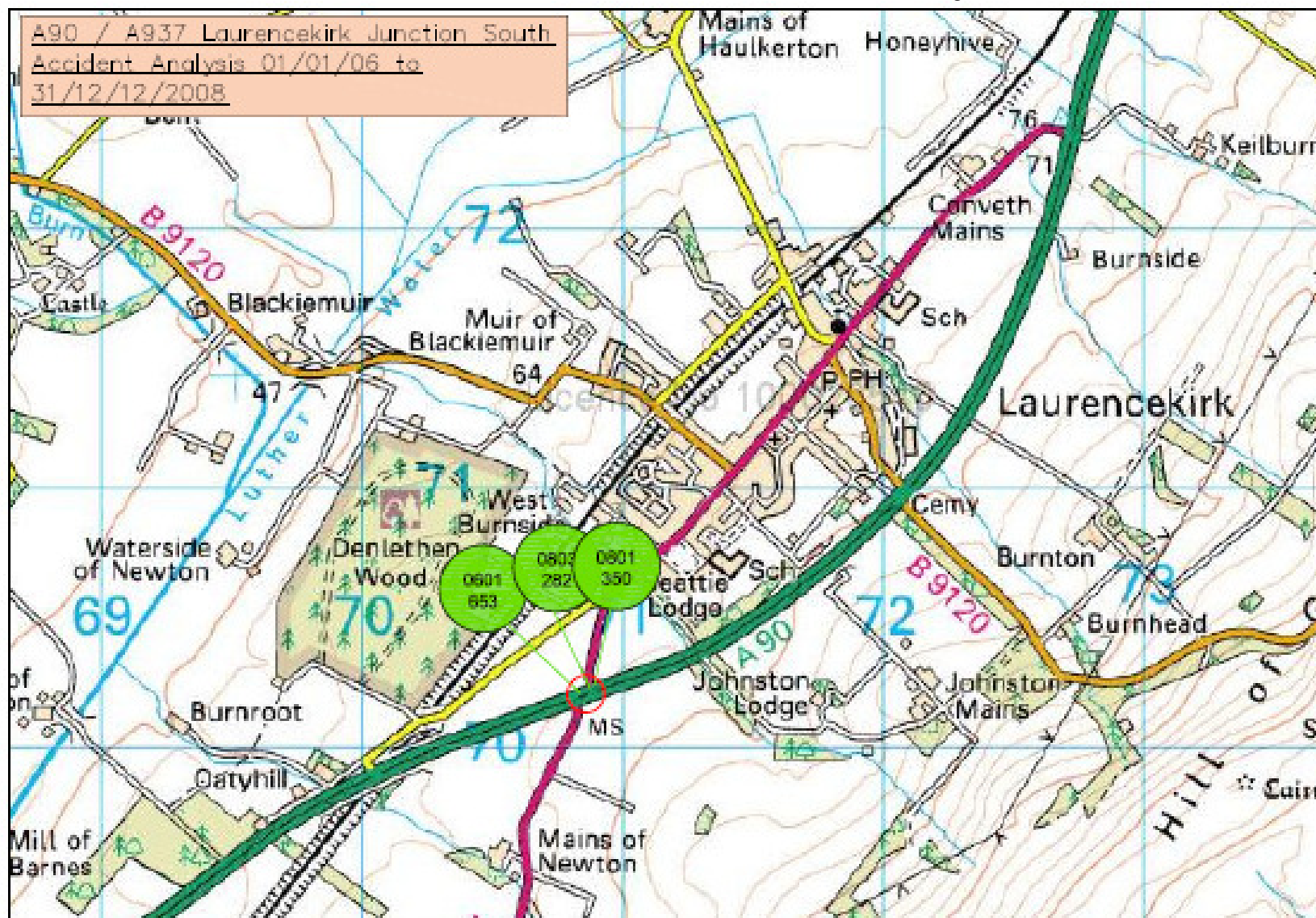
A90 / A937 Laurencekirk Junction South

Accident Analysis 01/01/06 to
31/12/2008

Reference Number	
Date / Day	
Month	
Year	
Time	
Severity	
Dark <input type="checkbox"/> / Lit <input type="checkbox"/>	
Weather Conditions	
Road Surface	
Special Conditions	
Carriageway Hazards	
Vehicle Manoeuvres	
Vehicle	1 5 6
Vehicle	2 6 t
Vehicle	3 7 c
Vehicle	4 8
Casualty / age	
Failed to Give-Way <input type="checkbox"/>	
Signal Ignored <input type="checkbox"/>	
Loss of Control	
Hit Object <u>IN</u> C'way	
Hit Object <u>OFF</u> C'way	
Vehicle Left C'way	
Breath Test	
Contributory Factors	1/2
	3/4
* possible, ** very likely	5/6
Signal No./Ref.	

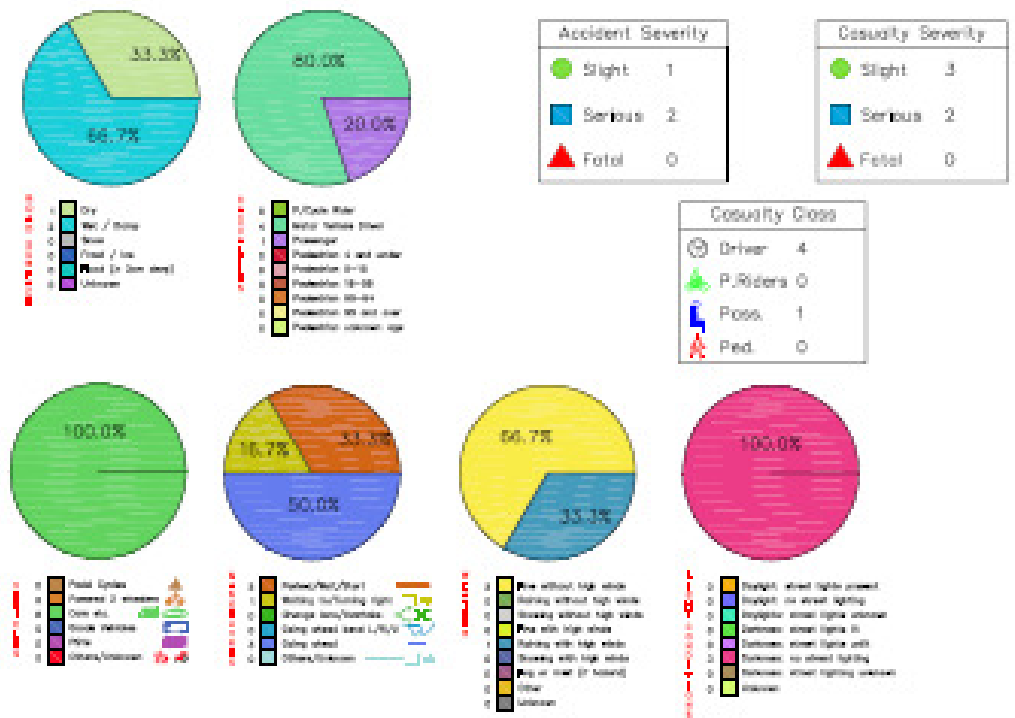
	1	2	3
Reference Number	0801 653	0803 382	0801 350
Date / Day	Mo15	Fr15	Fr28
Month	May	Aug	Mar
Year	2006	2008	2008
Time	1130	0715	1030
Severity	SI	SI	SI
Dark <input type="checkbox"/> / Lit <input type="checkbox"/>			
Weather Conditions			
Road Surface			
Special Conditions			
Carriageway Hazards			
Vehicle Manoeuvres			
Vehicle	1 5 6		
Vehicle	2 6 t		
Vehicle	3 7 c		
Vehicle	4 8		
Casualty / age			
Failed to Give-Way <input type="checkbox"/>			
Signal Ignored <input type="checkbox"/>			
Loss of Control			
Hit Object <u>IN</u> C'way			
Hit Object <u>OFF</u> C'way			
Vehicle Left C'way			
Breath Test			
Contributory Factors	1/2 405 504	1/2 102	1/2 ** 1/1 ** 405 409
* possible, ** very likely			
Signal No./Ref.			

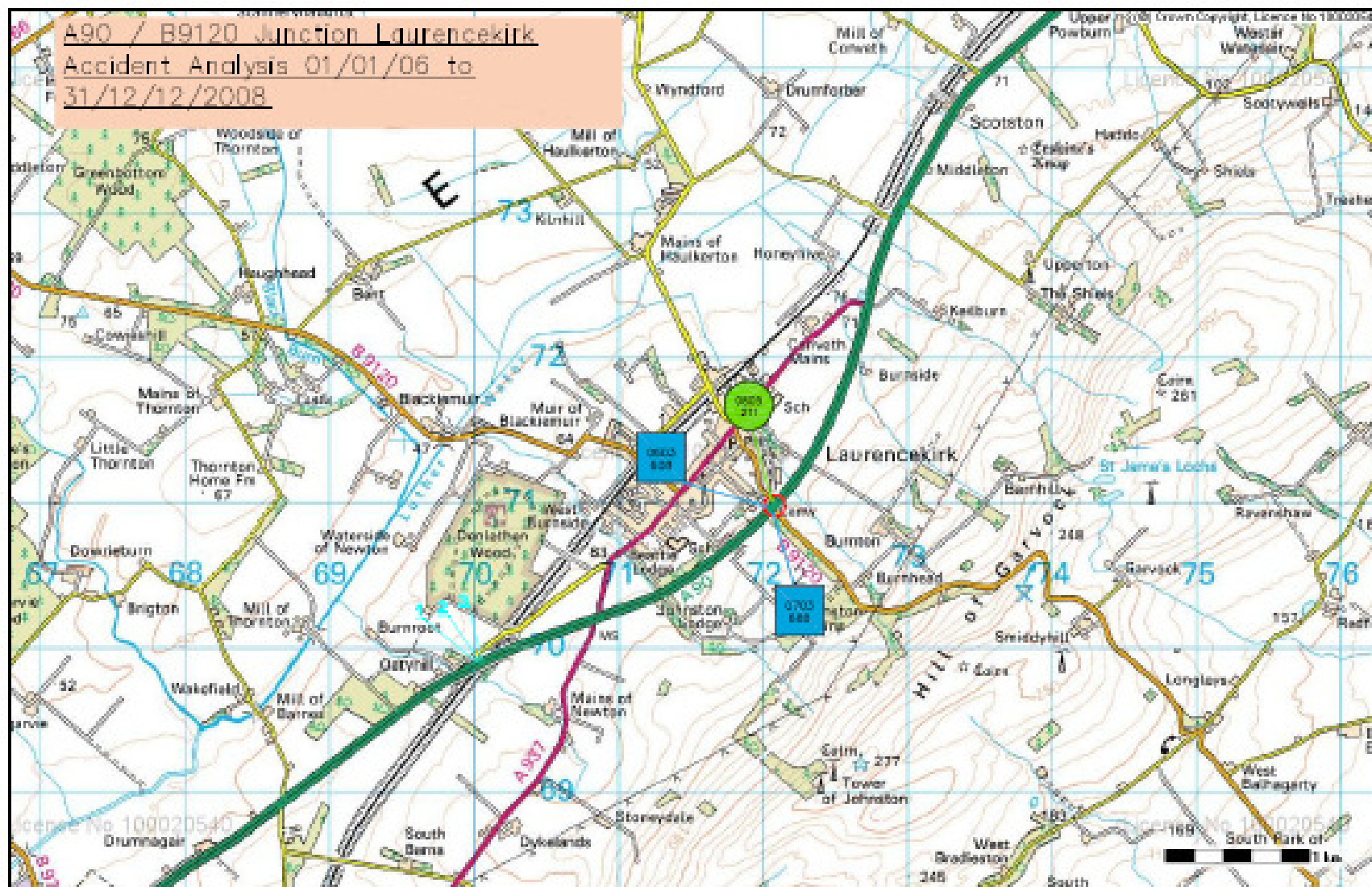




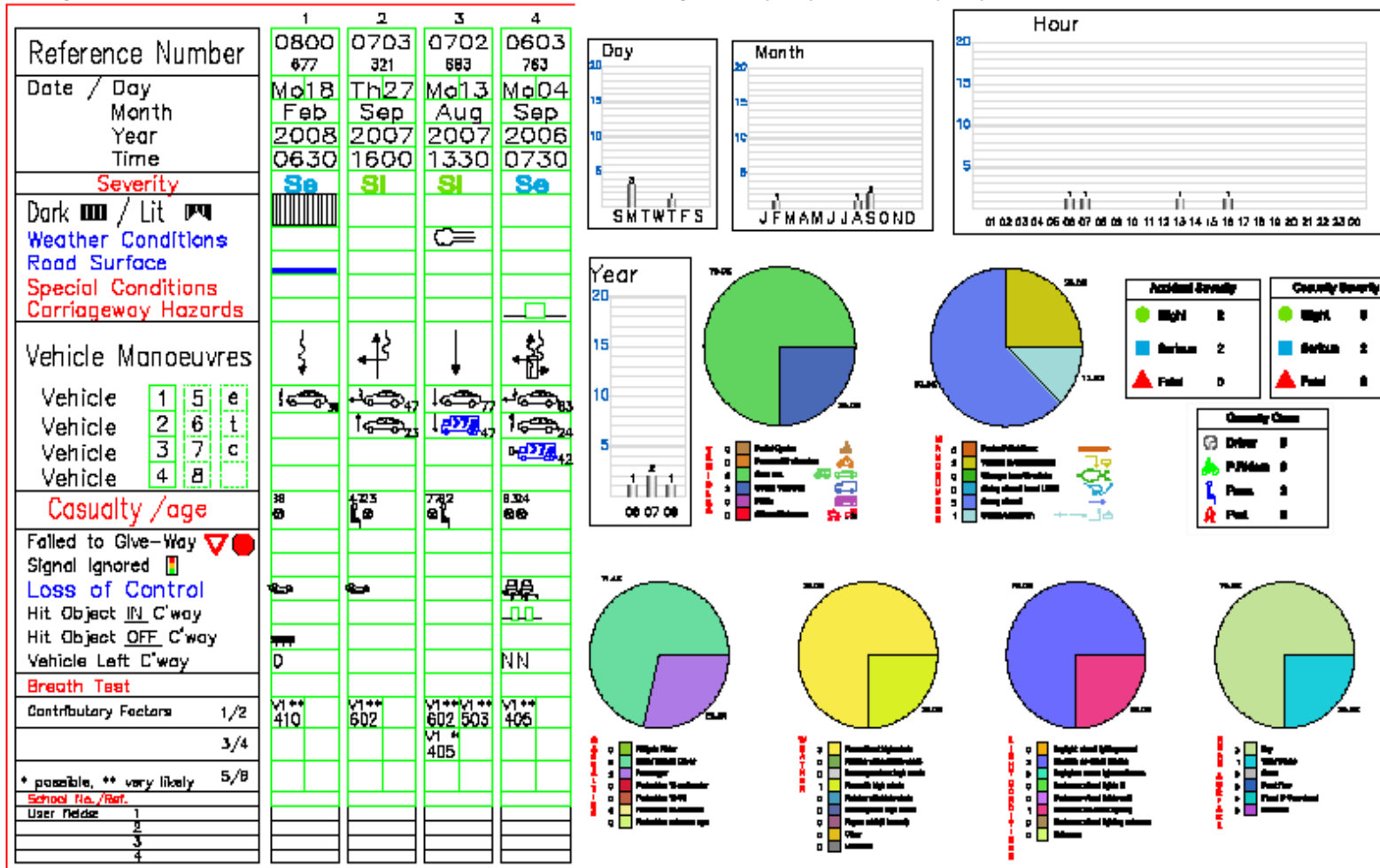
A90 / B9120 Junction Laurencekirk
Accident Analysis 01/01/06 to
31/12/12/2008

Reference Number	0803 608	0703 688	0803 211
Date / Day	Tu 26	Th 01	Fr 12
Month	Sep	Nov	Dec
Year	2006	2007	2008
Time	2225	1715	1630
Severity	Se	Se	S
Dark / Lit	Dark	Dark	Dark
Weather Conditions			W
Road Surface			
Special Conditions			
Carriageway Hazards			
Accident			
Vehicle	1 5 e	1 5 e	1 5 e
Manoeuvres	2 6 l	2 6 l	2 6 l
	3 7 c	3 7 c	3 7 c
	4 8	4 8	4 8
Veh. Type & Driver Age	1 5 e	1 5 e	1 5 e
	2 6 l	2 6 l	2 6 l
	3 7 c	3 7 c	3 7 c
	4 8	4 8	4 8
Casualty / age	35	35	35
Failed to Give-Way			
Signal Ignored			
Loss of Control			
Hit Object IN C'way			
Hit Object OFF C'way			
Vehicle Left C'way			
Breath Test			
Contributory Factors	1/2	1/2	1/2
	3/4	3/4	3/4
* possible, ** very likely	5/6	5/6	5/6
Sched No./Box			
User Note			





A90/A937 Laurencekirk North Junction Accident Analysis 01/01/06 to 31/12/2008



A90/A937 Laurencekirk North Junction Accident Analysis 01/01/06 to 31/12/2008



APPENDIX C
PHOTOGRAPHS



A90 / A937 (North) Junction looking north



A90 / A937 (North) Junction looking south



A90 Junction with Keilburn Farm Access – looking south



A90 Junction with Keilburn Farm Access - looking north



A90 Junction with Keilburn Farm Access looking west to Junction with A937



A90 Junction with A937 North – looking east to Keilburn Farm Access



A90 Junction with B9120(E) – looking west



A90 Junction with B9120(E) – looking north



A90 Junction with B9120(E) – looking south



A90 Junction with B9120(W) – looking south



A90 Junction with B9120(W) – looking north



A90 Junction with A937E (South junction) – looking south



A90 Junction with A937E (South Junction) – looking south



A90 Junction with A937E (South Junction) – looking west



A90 Junction with A937W (South Junction) – looking north



A90 Junction with A937W (South Junction) – looking south

APPENDIX D

FIRST YEAR RATE OF RETURN

FIRST YEAR RATE OF RETURN

$$\text{First Year Rate of Return} = \frac{\text{Ave. accident cost} \times \text{No. accidents saved} \times 100\%}{\text{Scheme cost} \times 3 \text{ years}}$$

Gap Closure and Grade Separation

Construction Cost = £4m

Existing accident number at junctions over 3 year period = 9

Average accident number per year = 3

Estimated Accident Reduction Rate = 44% (Source: RoSPA Road Safety Engineering Manual Section 5)

Estimated Annual Accident Reduction = $3 \times 0.44 = 1.32$ accident / year

Estimated Annual Accident Saving = $1.32 \times £141,058$ (Source: Road Casualties Scotland 2007 Table 10) = £181,196.56

First Year Rate of return = $£181,196.56 \times 100/4,000,000 = 4.7\%$

Gap Closure and Roundabout Provision

Construction Cost = £1m

Estimated Accident Saving = £181,196.56 (as above)

First Year Rate of return = $181,196.56 \times 100/1,000,000 = 18.1\%$

Gap Closure and Signalisation

Construction Cost = £600,000m

Estimated Accident Saving = £181,196.56 (as above)

First Year Rate of return = $181,196.56 \times 100/600,000 = 30.2\%$

Recommended Measures

Vehicle Activated Signing Installation - Construction Cost = £20,000

Surface Treatment – Construction Cost = £10,000

Cross With Care Signs – Construction Cost = £500

Relocation of ADS - Construction Cost - £1000

Upgrade Pedestrian Warning Sign - Construction Cost - £500

Install Safety Camera Sign - Construction Cost - £200

Refresh Marking and Replace Studs - Construction Cost - £5000

Cut Back Shrubbery - Construction Cost = £500

Total Cost = £37,700

Estimated Accident Saving = £181,196.56 (as above)

First Year Rate of return = $181,196.56 \times 100/37,700 = 480.6\%$

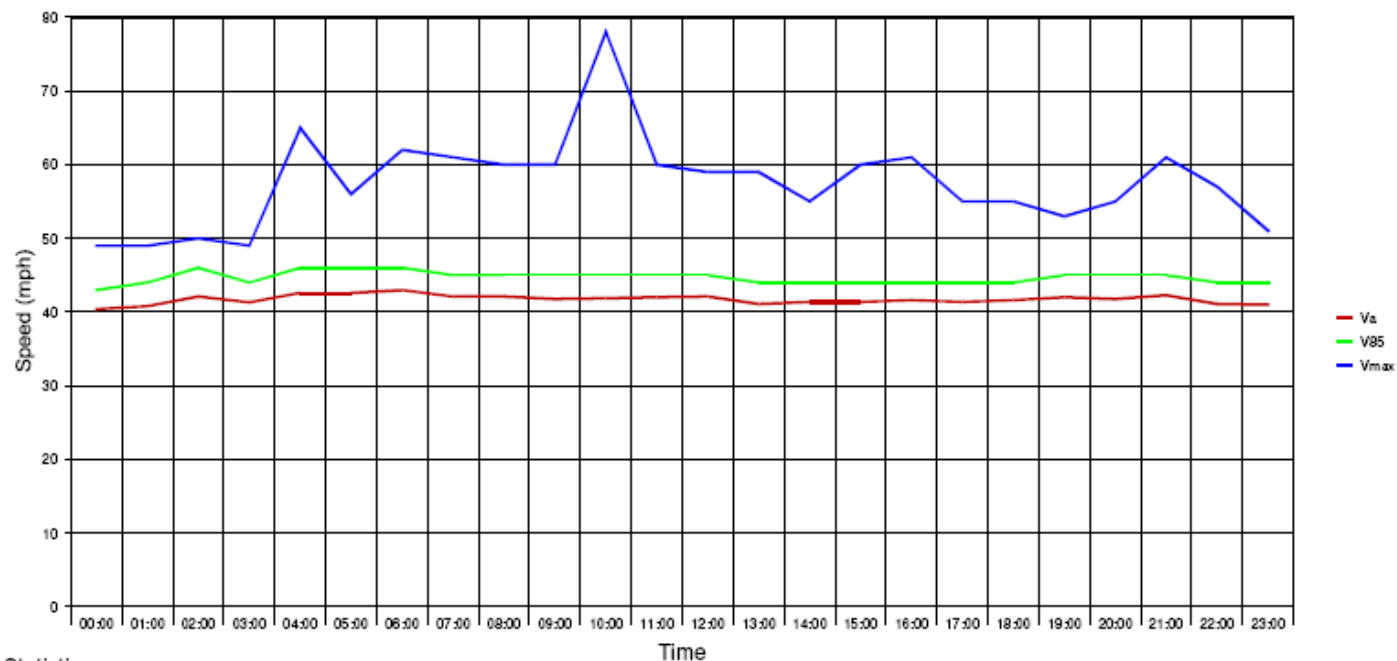
APPENDIX E
SPEED SURVEY DATA

A90/A937 South Junction – Speed Survey Equipment Location



	<ul style="list-style-type: none"> • Applied Traffic Services • Vehicle-by-Vehicle Classification • High & Low Speed Weigh In Motion • Radar Counter Classifiers • Radar Speed Warning Signs • Temporary & Permanent Surveys • Data Collection & Analysis • CCTV with Text Overlay 	Applied Traffic Limited Unit 5, Southview Park Maraack Street Caversham Reading RG4 5AF Tel: 0118 946 1900 Fax: 0118 946 1862 www.appliedtraffic.co.uk
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A90 Laurencekirk South junction Northbound Carriageway

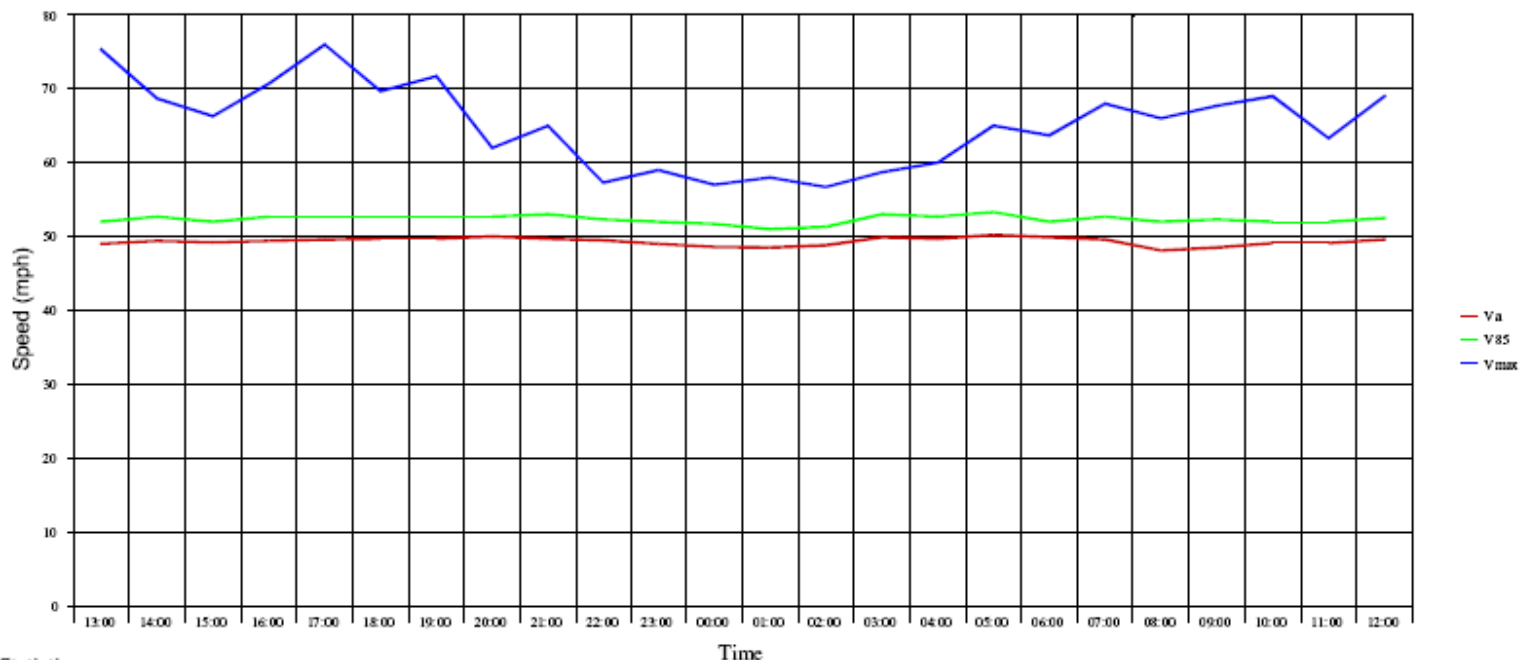


Statistics						
Period: 24 June 2009, 12:00 o'clock to 25 June 2009, 11:49 o'clock						
			Count	Va [mph]	V85 [mph]	Vmax [mph]
Speed violations:	2 %	Motorcycle	331	39	42	52
Average time interval:	6 sec.	Car	8953	42	45	78
Traffic in column:	100 %	Truck	798	42	45	51
ADT:	10664	Long truck	501	42	45	53
Truck Share:	12 %	Total:	10583	42	45	78



	<ul style="list-style-type: none"> • Applied Traffic Services • Vehicle-by-Vehicle Classification • High & Low Speed Weigh In Motion • Radar Counter Classifiers • Radar Speed Warning Signs • Temporary & Permanent Surveys • Data Collection & Analysis • CCTV with Text Overlay 	Applied Traffic Limited Unit 5, Southview Park Marsack Street Caversham Reading RG4 5AF Tel: 0118 946 1900 Fax: 0118 946 1862 www.appliedtraffic.co.uk
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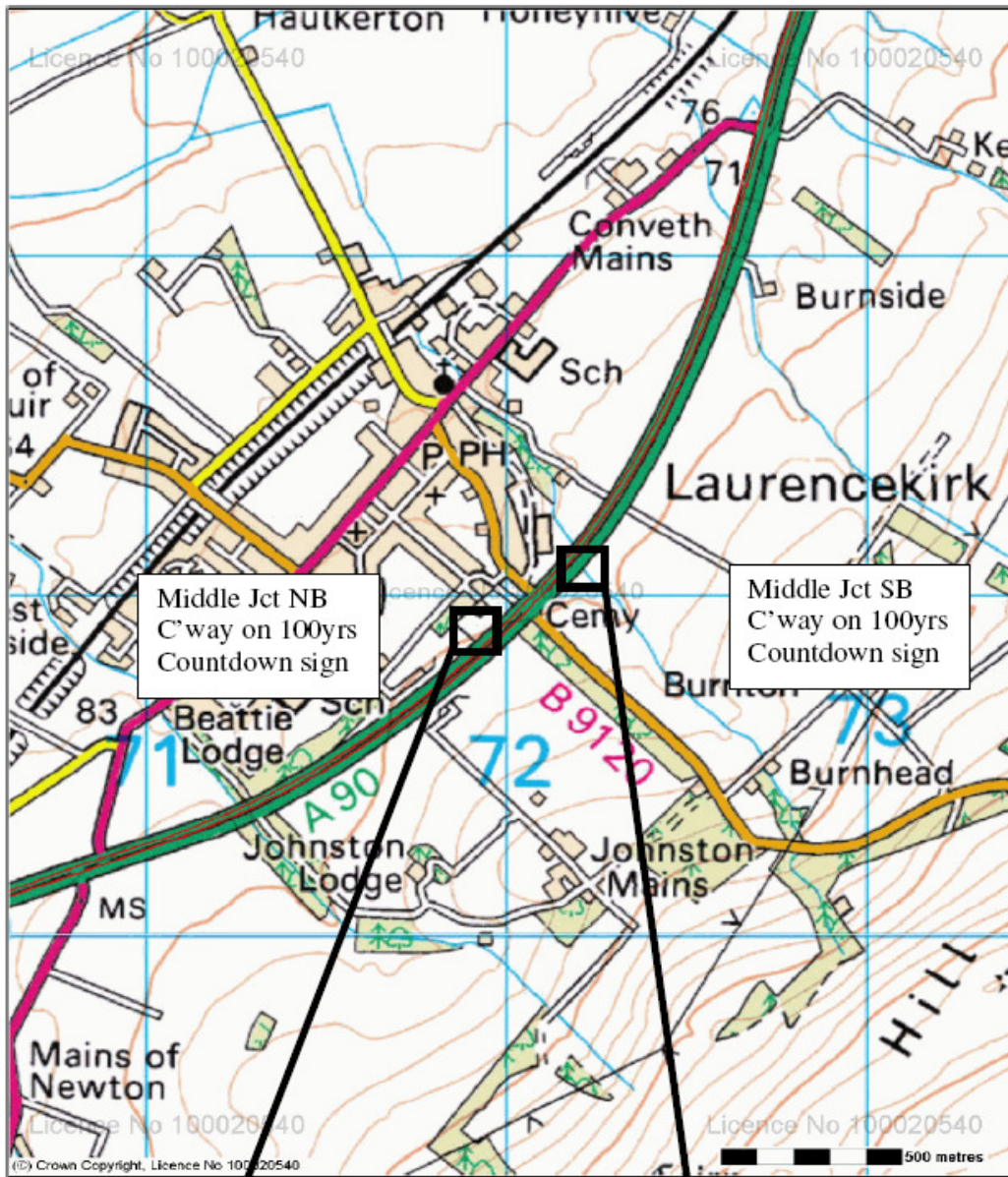
A90 Laurencekirk South junction Southbound Carriageway



Statistics		19 June 2009, 13:00 o'clock to 21 June 2009, 10:00 o'clock				
Period:	Count	Va [mph]	V85 [mph]	Vmax [mph]		
Speed violations:	32 %	Motorcycle	132	46	52	63
Average time interval:	6.5 sec.	Car	5478	49	52	78
Traffic in column:	100 %	Truck	13872	49	52	84
ADT:	8587	Long truck	5741	49	52	81
Truck Share:	78 %	Total:	25223	49	52	84



A90/B9120 Junction – Speed Survey Equipment Location

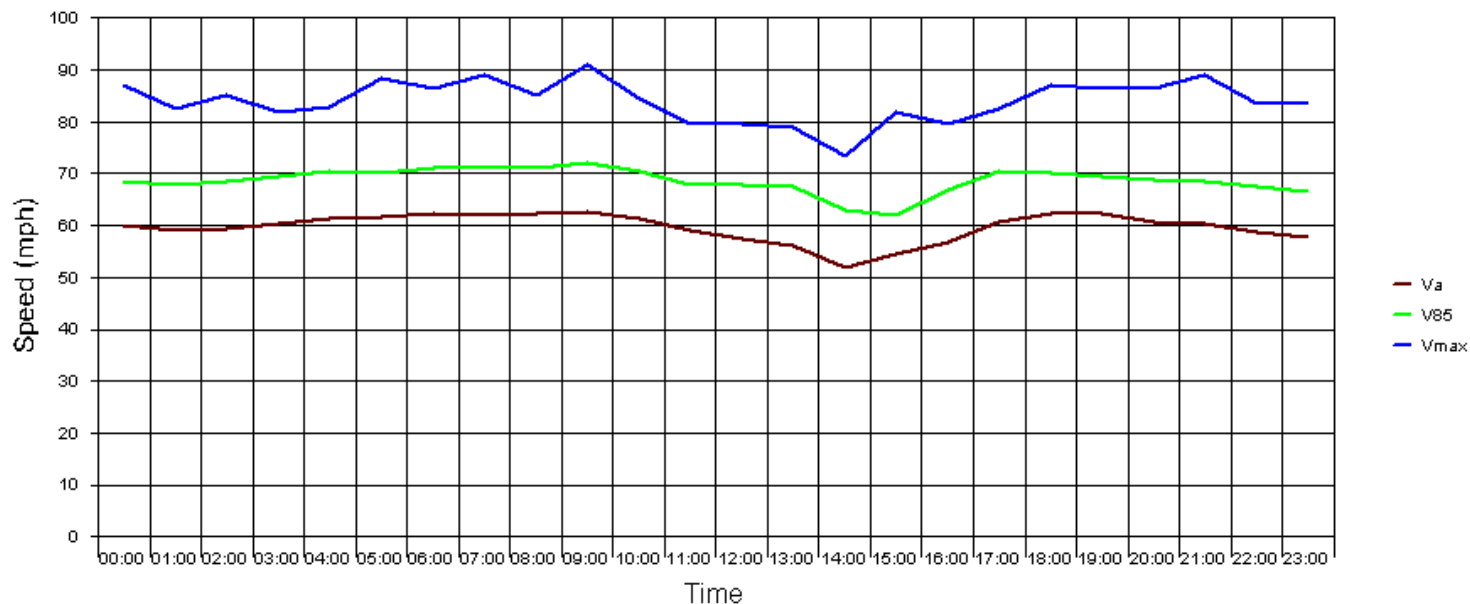




- Applied Traffic Services
- Vehicle-by-Vehicle Classification
- High & Low Speed Weigh In Motion
- Radar Counter Classifiers
- Radar Speed Warning Signs
- Temporary & Permanent Surveys
- Data Collection & Analysis
- CCTV with Text Overlay

Applied Traffic Limited
 Unit 5, Southview Park
 Kingsway Street
 Glasgow
 G4 5JL
 Tel: 0118 946 1000
 Fax: 0118 946 1800
 www.appliedtraffic.co.uk

A90 Laurencekirk Middle Junction N/B



Statistics

Period: 01 January 2000, 00:00 o'clock to 02 January 2000, 23:35 o'clock

	Count	Va [mph]	V85 [mph]	Vmax [mph]
Speed violations:	12 %			
Average time interval:	5.9 sec.			
Traffic in column:	100 %			
ADT:	10801			
Truck Share:	18 %			
	Total:	21414	61	69
				98







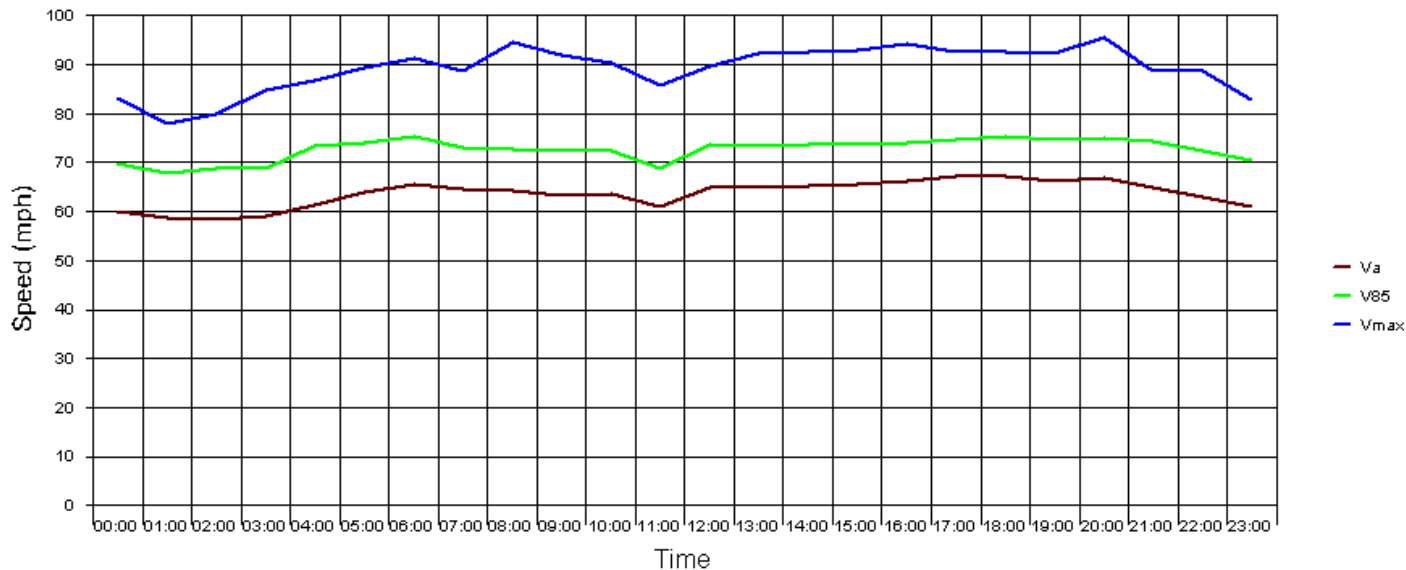
**APPLIED
TRAFFIC**

- Applied Traffic Services
- Vehicle-by-Vehicle Classification
- High & Low Speed Weight in Motion
- Radar Counter Classification
- Radar Speed Warning Signs
- Temporary & Permanent Surveys
- Data Collection & Analysis
- CCTV with Text Overlay

Applied Traffic Limited
 Unit 15, Southview, Park
 Mansel Street
 Glasgow
 G12 8JN

Tel: 0118 946 1900
 Fax: 0118 946 1899
 www.appliedtraffic.co.uk

A90 Laurencekirk Middle Junction S/B



Statistics

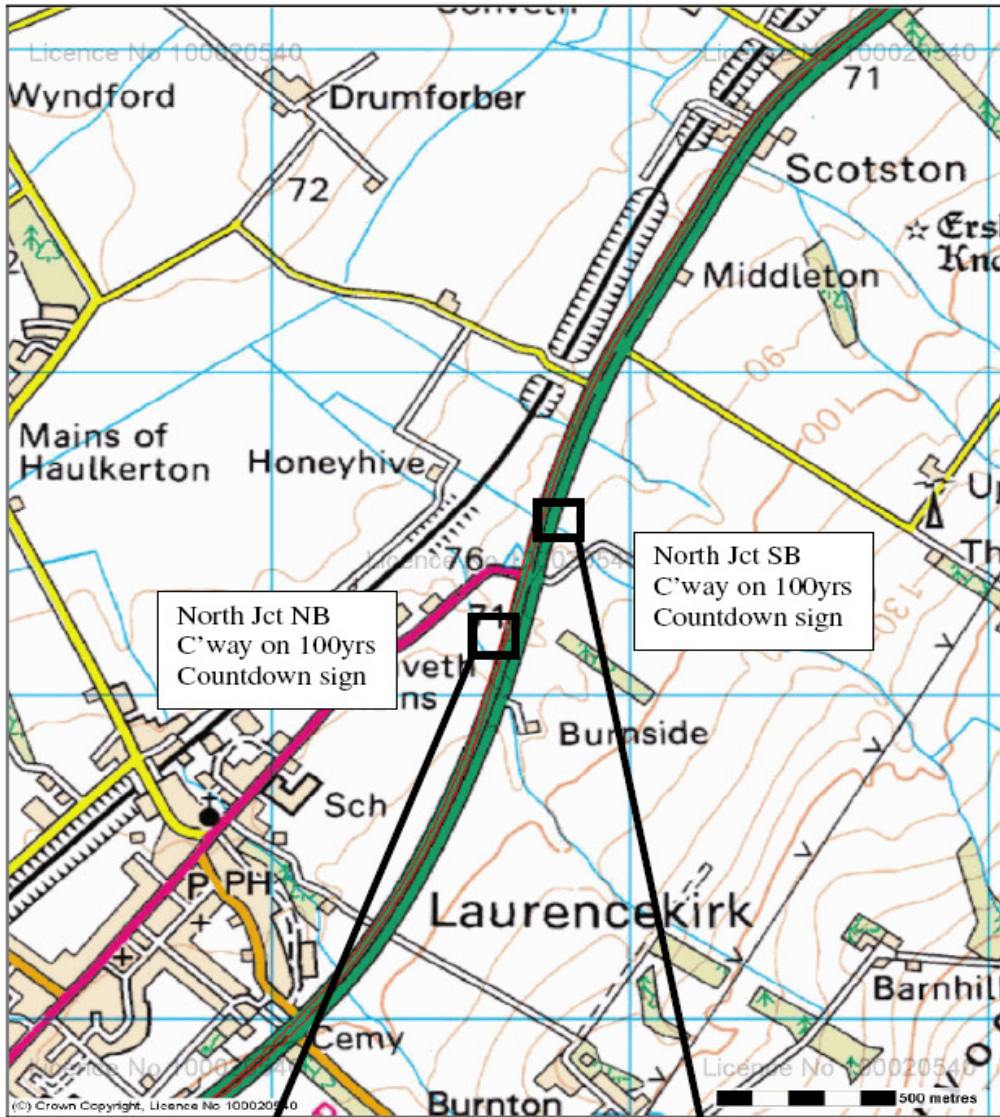
Period:

25 June 2009, 11:49 o'clock to 01 July 2009, 10:53 o'clock

			Count	Va [mph]	V85 [mph]	Vmax [mph]
Speed violations:	29 %	Motorcycle				
Average time interval:	6.2 sec.	Car	46746	67	75	111
Traffic in column:	100 %	Truck	4338	60	69	90
ADT:	9434	Long truck	5155	55	60	83
Truck Share:	17 %	Total:	56239	65	74	111



A90/A937 North Junction – Speed Survey Equipment Location

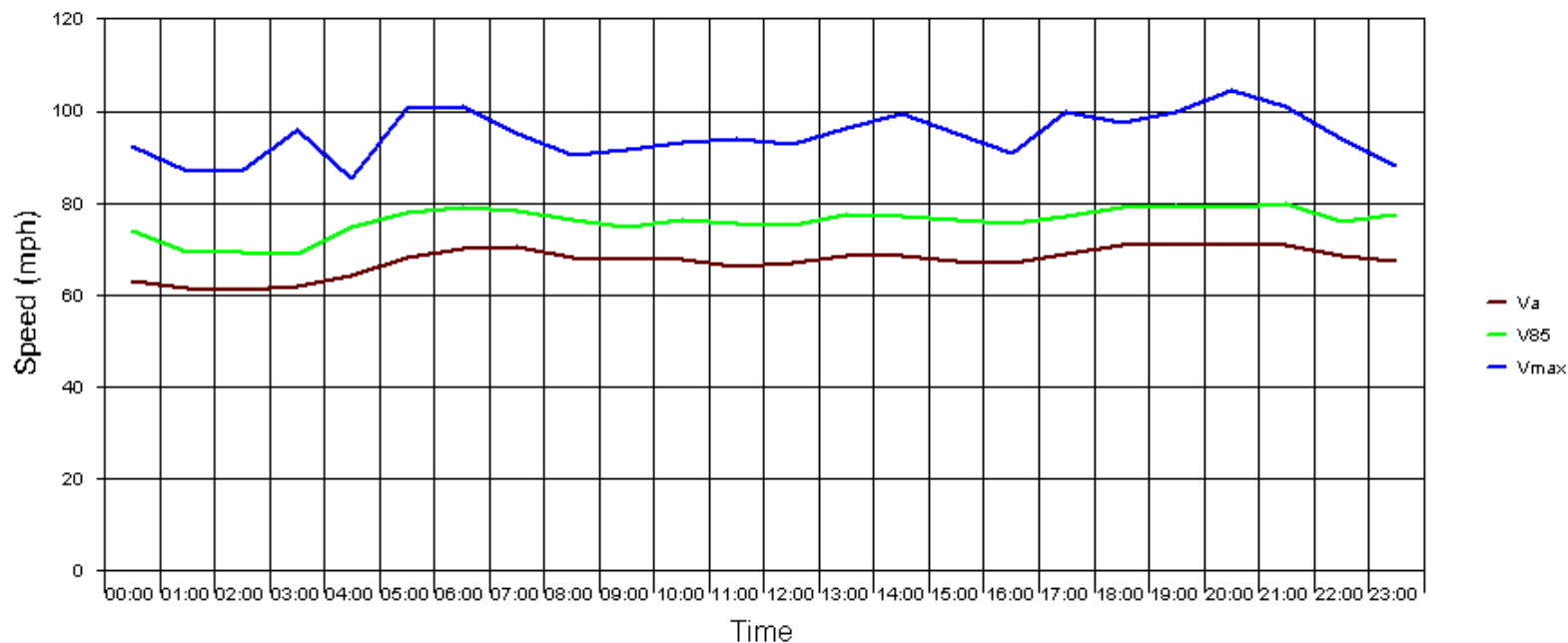




- Applied Traffic Services
- Vehicle-by-Vehicle Classification
- High & Low Speed Weight In Motion
- Radar Counter Classifiers
- Radar Speed Warning Signs
- Temporary & Permanent Surveys
- Data Collection & Analysis
- CCTV with Text Overlay

Applied Traffic Limited
 Unit 15, Southview Park
 Mansfield Street
 Glasgow
 G4 5AJ
 Tel: 0113 946 1900
 Fax: 0113 946 1867
 www.appliedtraffic.co.uk

A90 /A937 North Junction Northbound



Statistics

Period:

10 June 2009, 11:52 o'clock to 12 June 2009, 15:43 o'clock

			Count	Va [mph]	V85 [mph]	Vmax [mph]
Speed violations:	44 %	Motorcycle				
Average time interval:	6.9 sec.	Car	15580	71	78	105
Traffic in column:	100 %	Truck	1520	64	74	94
ADT:	9389	Long truck	3184	58	62	89
Truck Share:	23 %	Total:	20284	68	77	105



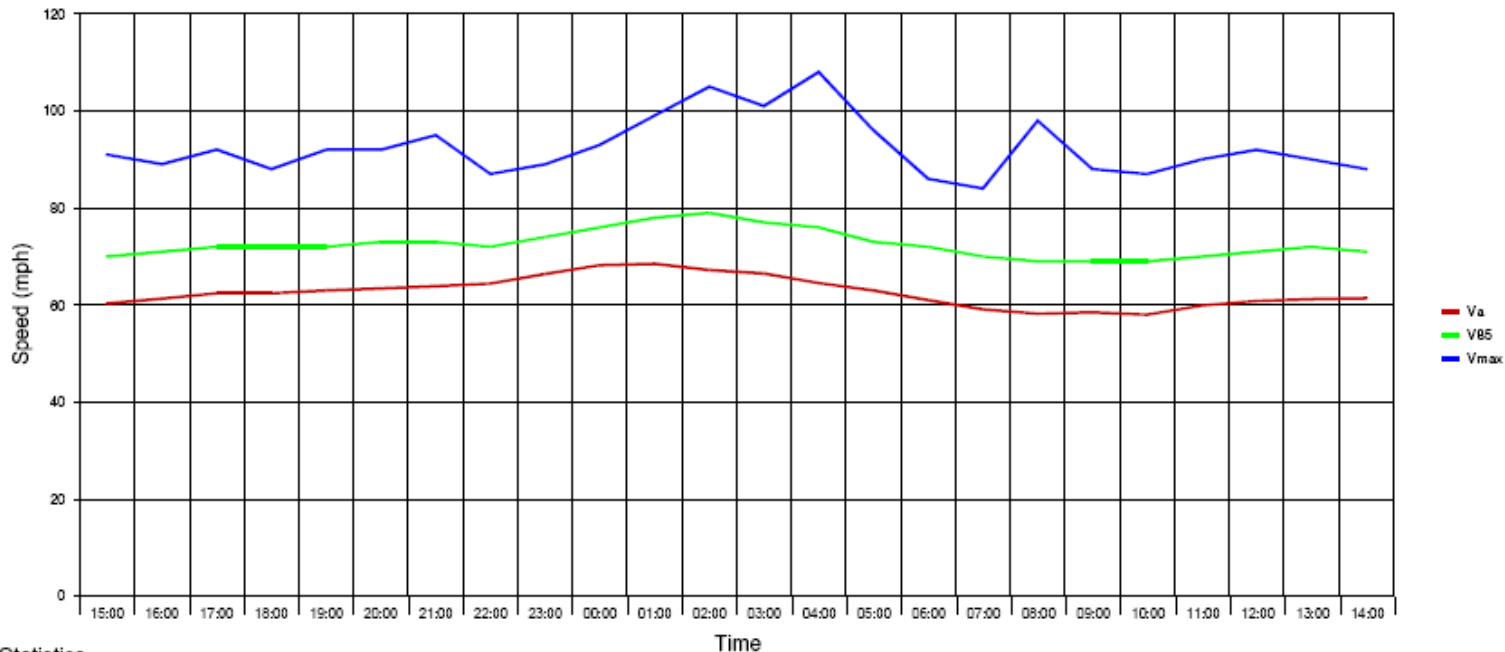


**APPLIED
TRAFFIC**

- ◆ Applied Traffic Services
- ◆ Vehicle-by-Vehicle Classification
- ◆ High & Low Speed Weight In Motion
- ◆ Radar Counter Classifiers
- ◆ Radar Speed Warning Signs
- ◆ Temporary & Permanent Surveys
- ◆ Data Collection & Analysis
- ◆ CCTV with Text Overlay

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 Fax: 0118 946 1862
 www.appliedtraffic.co.uk

A90 Laurencekirk North Junction Southbound Carriageway



Statistics

Period: 12 June 2000, 16:00 o'clock to 14 June 2009, 23:59 o'clock

			Count	Va [mph]	V85 [mph]	Vmax [mph]
Speed violations:	21 %	Motorcycle	81	54	66	85
Average time interval:	5.8 sec.	Car	14123	64	73	105
Traffic in column:	100 %	Truck	3342	63	74	108
ADT:	8929	Long truck	2791	55	61	83
Truck Share:	30 %	Total:	20537	62	72	108



**APPENDIX F
STREET LIGHTING APPRAISAL**

Street lighting

A recommended 9 Street Lighting Columns on each side of the A90 at each Junction. Located 4 on each side and 1 at the junction itself..

A total of 18 Columns at each of the two junctions.

On average £2300 per Lighting Column = **£41,400** + 20% Decommissioning Costs + £12,000 maintenance costs for 18 Columns and 40 year design life + £2000 Supply

= £41,400 + £8280 + £12,000 + £2000 = **£63,680** per Junction.

This value is likely to be higher as energy and environmental costs have not been calculated.

Accidents Cost Saving

As per DMRB TA 49/07 'Appraisal of new and replacement lighting on the strategic motorway and all purpose trunk road network' the introduction of Street lighting will save 10% on darkness Personal Injury Accidents.

There have been 3 darkness accidents at the Middle Laurencekirk Junction and 1 darkness accident at the north junction in the last 5 Years. The Cost of these accidents have been calculated using 'Road Casualties Scotland 2007' these are shown below:

South Junction

1 Serious Accident 05 Mar 2005 = £ 231,557

1 Slight Accident 06 Feb 2005 = £ 24,232

1 Slight Accident 15 Dec 2004 = £ 24,232

Total = £ 280,021

The Cost Saving of installing the Lighting Columns at the middle junction is 10% of the total

Cost Saving = £280,021 * 10% = **£ 28,002.1**

As the total cost of installing the lighting is more than the cost saving the option of installing the columns would not be recommended.

Middle Junction

1 Serious Accident 26 Sep 2006 = £ 231,557
1 Serious Accident 01 Nov 2007 = £ 231,557
1 Slight Accident 12 Dec 2008 = £ 24,232

Total = £ 487,346

The Cost Saving of installing the Lighting Columns at the middle junction is 10% of the total

Cost Saving = £487,346 * 10% = **£ 48,734.6**

As the total cost of installing the lighting is more than the cost saving the option of installing the columns would not be recommended

North Junction

1 Serious Accident 18 Feb 2008 = £ 231,557

Total = £ 231,557

The Cost Saving of installing the Lighting Columns is 10% of the total

Cost Saving = £231,557 * 10% = **£ 23,155.7**

As the total cost of installing the lighting is more than the cost saving the option of installing the columns would not be recommended.

All 3 Junctions combined

Street lighting

The approximate distance Street lighting would cover = 3.5km per side.

Each lighting column would be placed approximately 40m apart.

$3500 / 40 = 87.5$ lighting columns

A total of 175 Columns to cover the three junctions

On average £2300 per Lighting Column = **£402,500** + 20% Decommissioning Costs +
£116,400 maintenance costs for 175 Columns and 40 year design life + £2000 Supply

= £402,500 + £80,500 + £116,400 + £2000 = **£601,400.**

This value is likely to be higher as energy and environmental costs have not been calculated.

Accidents Cost Saving

South Jct = **£ 280,021**

Middle Jct = **£ 487,346**

North Jct = **£ 231,557**

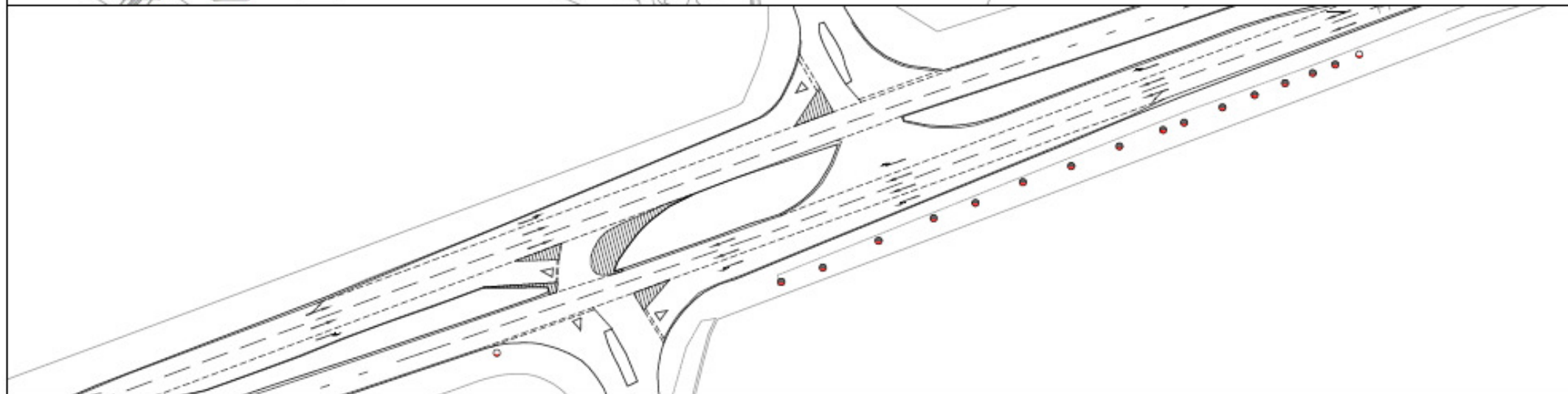
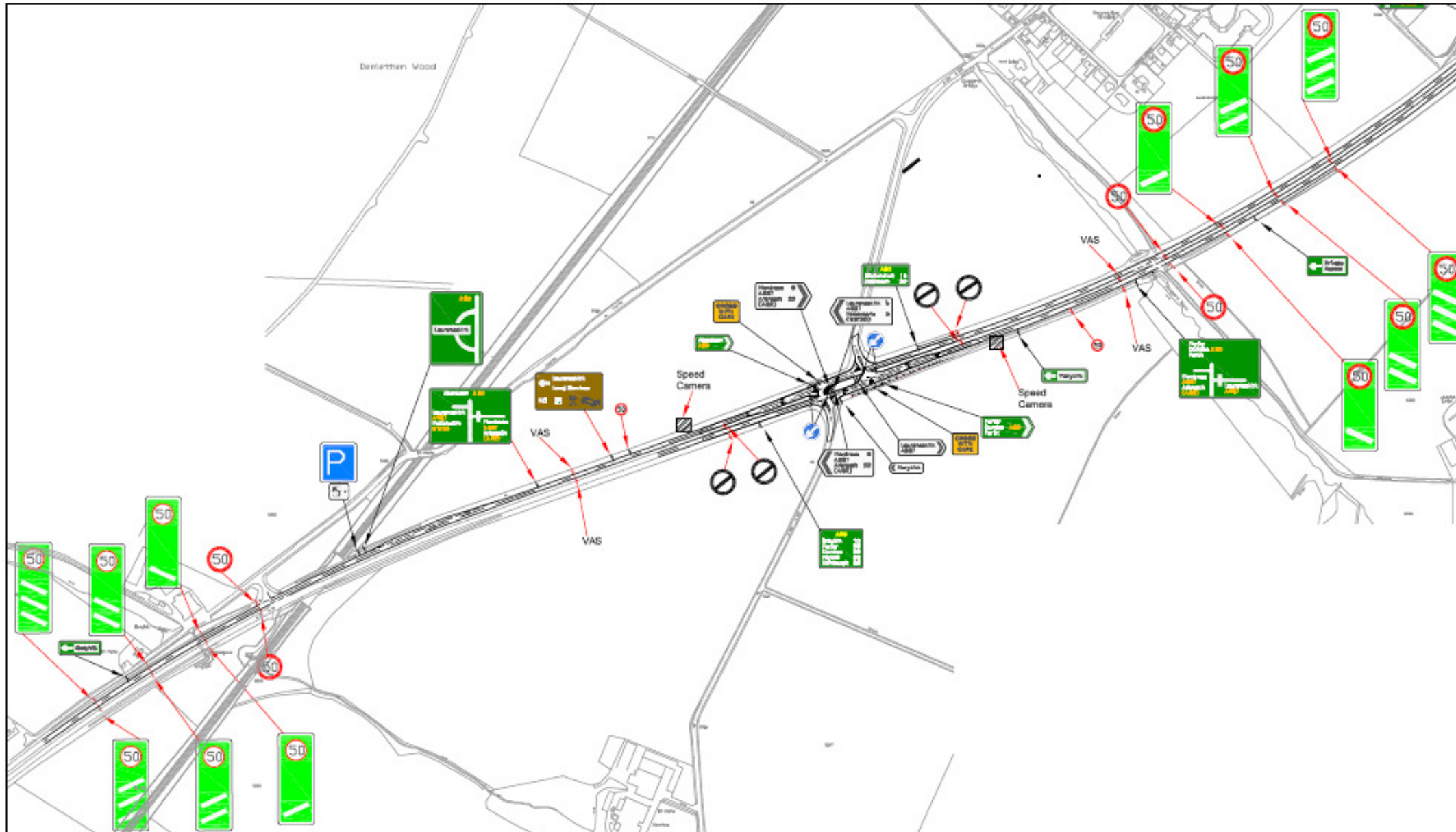
Total = £ 998,924

The Cost Saving of installing the Lighting Columns is 10% of the total

Cost Saving = £998,924 * 10% = **£ 99,892.4**

As the total cost of installing the lighting is more than the cost saving the option of installing the columns would not be recommended.

APPENDIX G
EXISTING JUNCTION ROAD MARKING AND SIGNING LAYOUTS




Drawing Number: 09/NE/0805/138

Admiral Bollard
 Hazard Marker Post

Do not scale this drawing

Rev	1	2	3	4	5
Date					

Client: **TRANSPORT SCOTLAND**

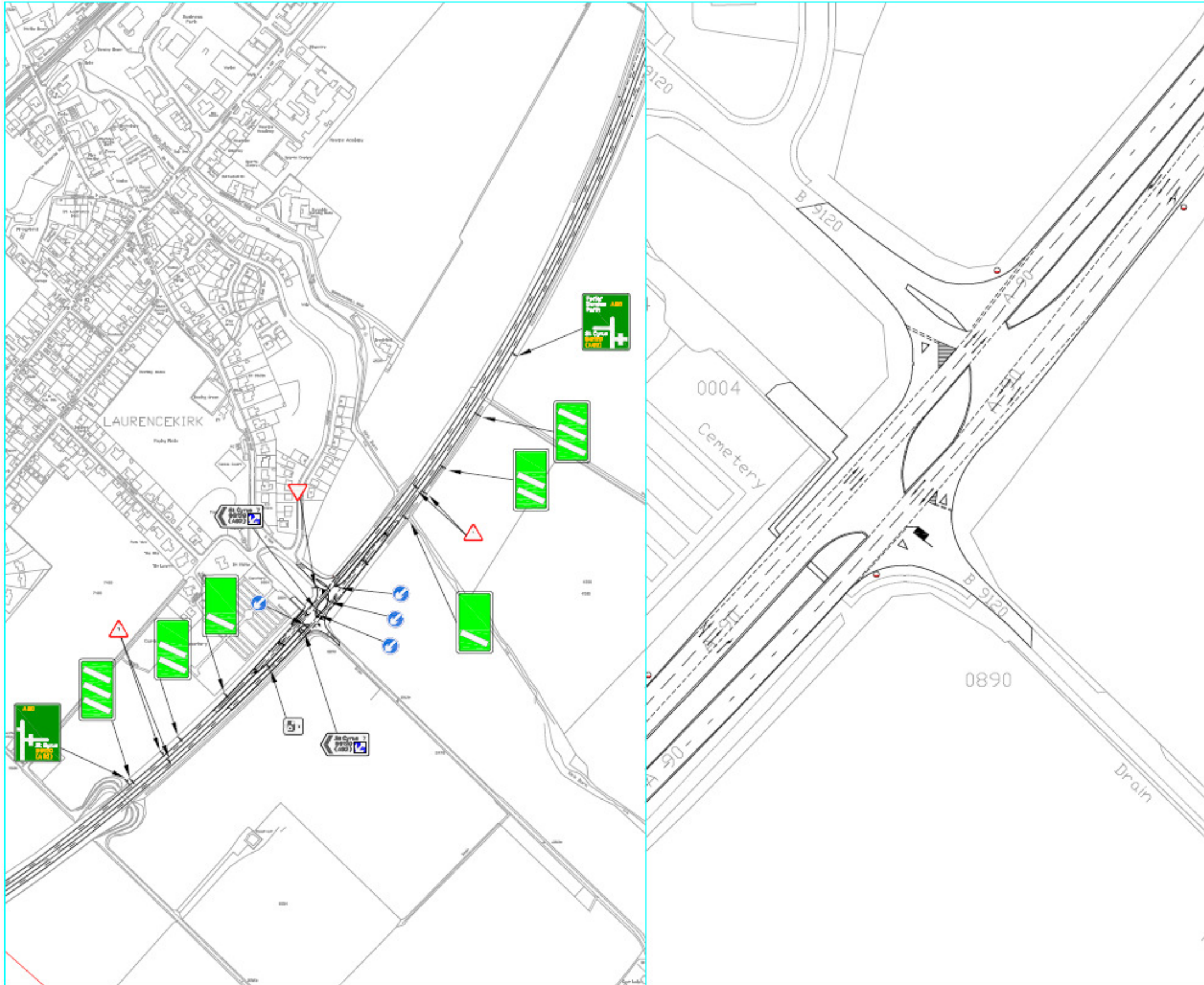

BEAR

Project: A90 PERTH TO ABERDEEN TRUNK ROAD
 LAURENCEKIRK STUDY

Title: SOUTH JUNCTION
 EXISTING ROAD MARKING
 & SIGNING LAYOUT

Drawing No.	09/NE/0805/138
Scale	AS SHOWN
Drawn	MS
Checked	AC
Approved	GB

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Drawing number
 OS/NE/0805/138

Admiral Bellard

Do not scale this drawing

Rev	Desc	Date

Client
 TRANSPORT SCOTLAND

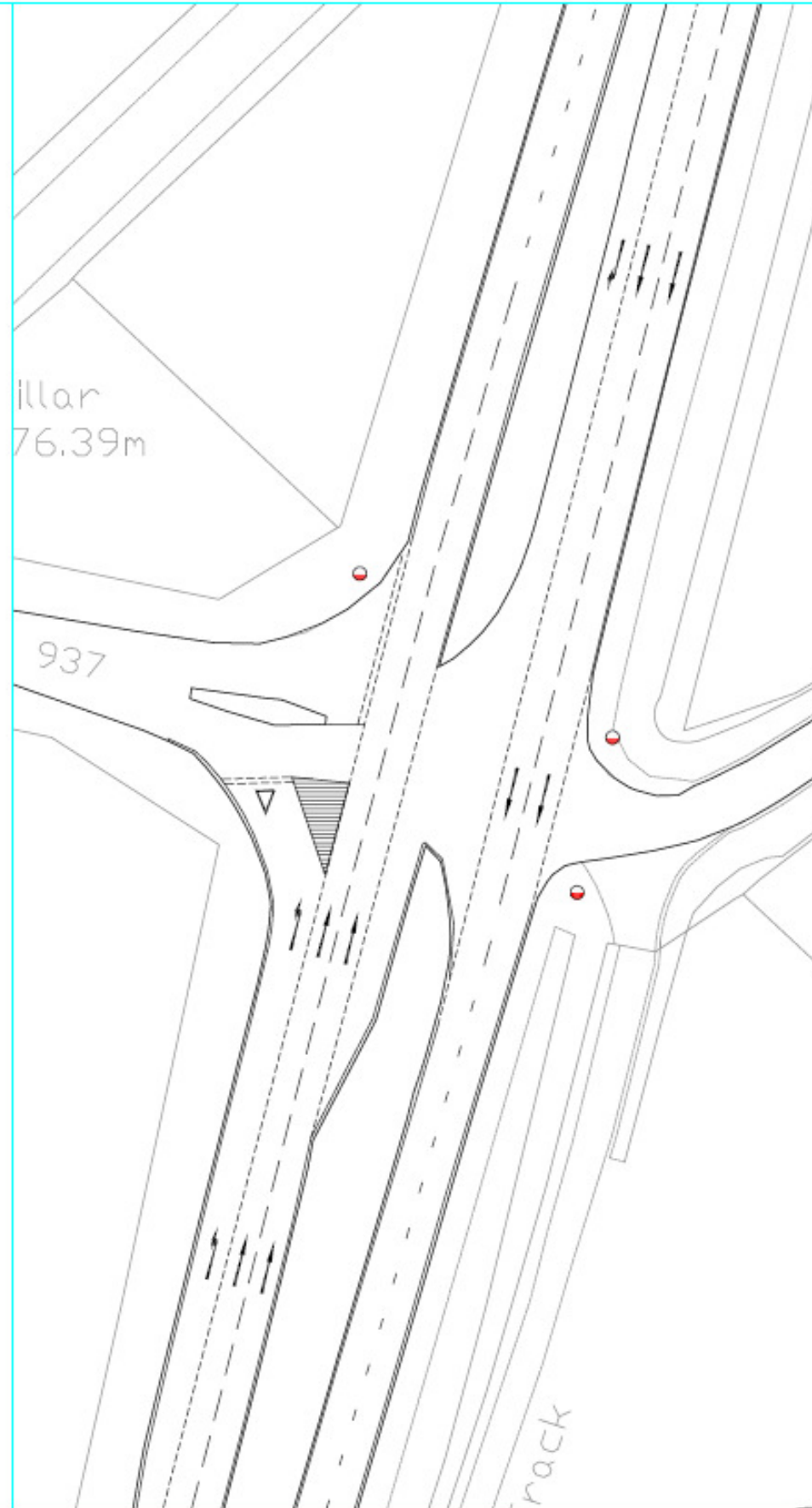
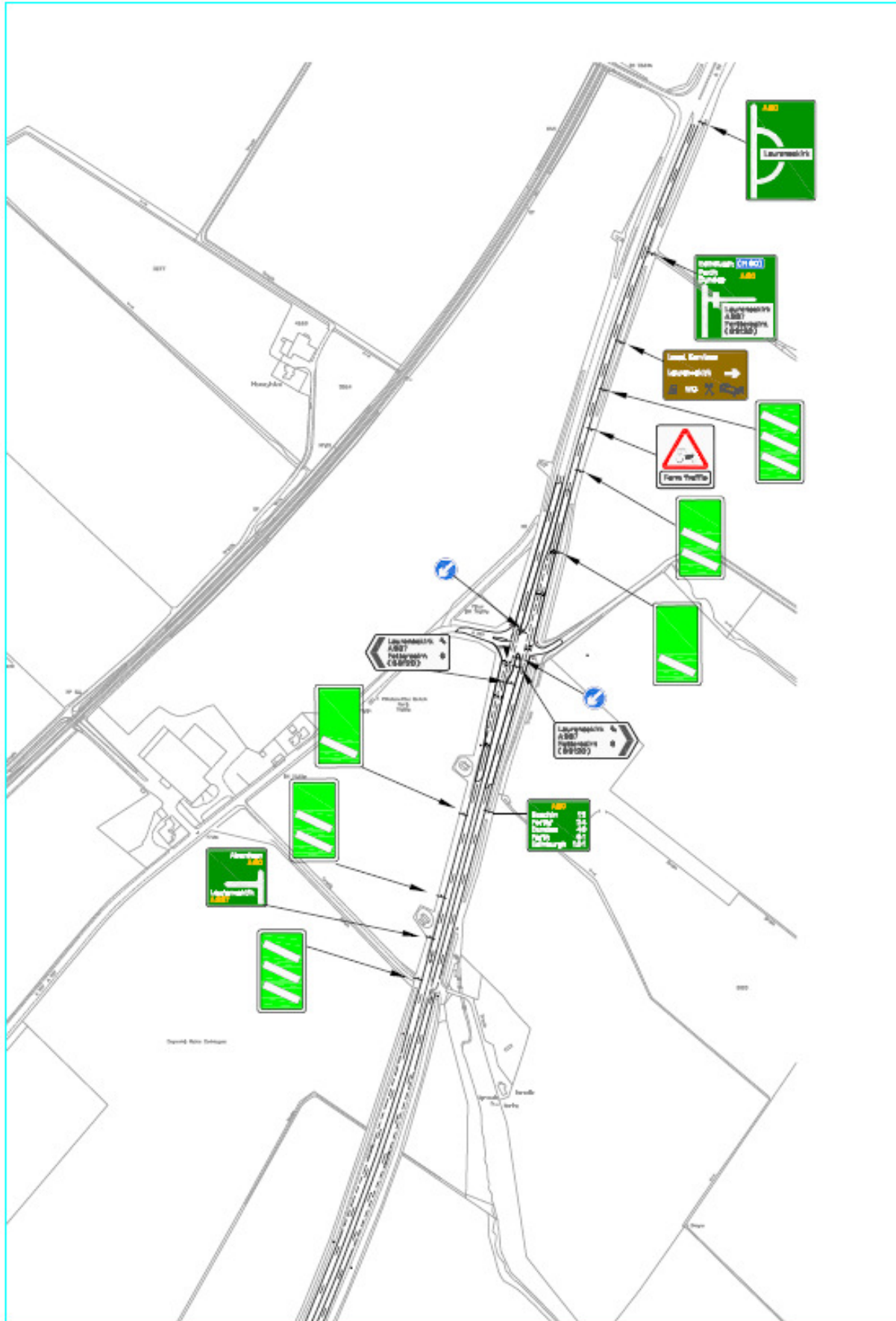
Contractor

Project
 A90 PERTH TO ABERDEEN TRUNK ROAD
 LAURENCEKIRK STUDY

Title
 MIDDLE JUNCTION
 EXISTING ROAD MARKING
 & SIGNING LAYOUT

Drawing No	OS/NE/0805/138				
Scale	1:100	Drawn	MS	Checked	AC
				Approved	GR

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Drawing Number
 09/NE/0805/138

Admiral Board

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No.	Rev.	Issued

Client
 TRANSPORT SCOTLAND

Project
 A90 PERTH TO ABERDEEN TRUNK ROAD
 LAURENCEKIRK STUDY

Title
 NORTH JUNCTION
 EXISTING ROAD MARKING
 & SIGNING LAYOUT

Drawing No.	09/NE/0805/138	Scale	AS SHOWN
Date	10/2009	Drawn	MS
Checked	AC	Approved	GB

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APPENDIX
NE NETWORK DUAL CARRIAGEWAY T/STAGGERED JUNCTION
ACCIDENT STATISTICS

