



Transport Scotland:  
Strategy & Investment

Aberdeenshire Council  
Local Development Plan  
Main Issues Report

Laurencekirk Expansion - A90(T) Appraisal  
Report



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Local Development Plan  
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Report

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## **Aberdeenshire Council Local Development Plan Main Issues Report**

Laurencekirk Expansion - A90(T) Appraisal

Report

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# Executive Summary

## Purpose of Report

1. In order to inform the decision making process relating to the delivery of Aberdeenshire Council's housing allowances proposed within the Main Issues Report (MIR), an appraisal requires to be undertaken to assess the potential implications that the location and scale of the potential allocations may have on the strategic transport network and the options available to achieve an acceptable access strategy to the A90 Trunk Road.
2. The purpose of this report is to look specifically at the three potential development locations (north, central and south) within Laurencekirk, identify the trip generation potential of the development, assess the impact on the trunk road network and appraise the options for supporting roads infrastructure to deliver an acceptable access strategy.
3. This assessment has been undertaken by JMP, on behalf of Transport Scotland, to support the wider transport appraisal work being undertaken by Aberdeenshire Council to examine the transport implications of the emerging Local Development Plan. The findings and recommendations contained within this report are therefore intended to inform the current process. It is for Aberdeenshire Council to consider these findings and subsequently take forward any recommendations to support the preferred development strategy through the Local Development Plan process.

## Background

4. The Aberdeen City and Shire Structure Plan was approved by Ministers on 17 August 2009. Schedule 1 of the Structure Plan identifies housing allowances within the area 'south of Drumlithie – Laurencekirk' at 1000 units between 2007 and 2030. As a consequence of the Structure Plan's spatial strategy, possible land use allocations in and adjacent to the settlement of Laurencekirk have been included within the MIR of the emerging Aberdeenshire Local Development Plan.
5. Transport Scotland is engaged in consultation with Aberdeenshire Council regarding the MIR, the proposed land use allocations and the potential impact on the strategic transport network. It is also a key stakeholder on the Council's Future Infrastructure Requirement for Services (FIRS) Group.
6. At present Aberdeenshire Council has indicated that a mixed use development located to the north of Laurencekirk, incorporating 885 dwellings and approximately 20 Ha of employment land, is the preferred option. The rationale for selecting this option is set out in Aberdeenshire Council's 'Laurencekirk Capacity Report' (LCR) and identifies the issues associated with access to the A90 as a significant constraint to the development proposals within Laurencekirk. It recognises that grade separation is a requirement although suggests that a single junction upgrade may be acceptable.
7. Development of the scale proposed in the MIR will have an impact on the existing transport infrastructure including the connections to the A90 Trunk Road, which is of specific concern to Transport Scotland. Transport Scotland has provided early advice to both Aberdeenshire Council and developers that any significant scale of development is likely to require upgrade of at least one of the existing at-grade junctions.
8. The LCR attaches an indicative cost in the order of £5m to the grade separation of a single junction. Reference is made to the possibility of funding streams from both private developers and the Scottish Government.

9. Specific consideration was given to the case for the grade separation of the southern junction at Laurencekirk / Marykirk within the Strategic Transport Projects Review 2008 (STPR). It concluded that "accident rates along the corridor are already below the national average and therefore the grade separation of the Laurencekirk / Marykirk junction would not address or make a significant contribution to objectives. Local accident cluster issues have been identified and remedial works [speed limits and enforcement cameras] have been introduced at this location. In order to assess the impact of the remedial works the accident patterns will continue to be closely monitored." As such Transport Scotland has no plans at this time to construct a grade separated junction at this location.

## Existing Settlement

10. As at the 2001 Census, the settlement of Laurencekirk was recorded as comprising 783 dwellings with a population of 1808. In 2006 the population of Laurencekirk was quoted as 2110, comprising approximately 890 dwellings, indicating growth of nearly 17% over 5 years.
11. Under the current Aberdeenshire Local Plan 2006 there is potential for a further 280 dwellings to be developed.
12. Access to Laurencekirk from the A90 is afforded via three at-grade priority junctions, the A90/A937 (South), A90/B9120 (Mid) and the A90/A937 (North).
13. Due to a number of fatal and serious accidents at the south junction a package of accident prevention measures were introduced in September 2005, which have been shown to have stabilised the accident situation. These measures comprise:
- 50mph speed restriction
  - Vehicle Activated signs
  - Speed cameras
  - High friction surfacing
14. The historic accident records at the mid and north junctions are not as poor as the south however there have been a number of fatal and serious accidents at these locations, most recently a fatality at the north junction in September 2009.
15. Accident investigation studies have concluded that despite growth in Laurencekirk, the number of injury accidents has remained reasonably static and whilst the rate is slightly higher than the national average it is lower than the overall rate for the A90.

## Methodology

16. The assessment estimates the number of people and vehicle trips likely to be generated by the proposed development allocation and has utilised available data from the Census and traffic surveys for the existing settlement to predict likely travel patterns of the proposed development affecting the trunk road network (A90). In defining the expected modal split, information on the patronage of the recently re-opened Laurencekirk has been provided by NEStrans and this has been utilised with regard to determining an appropriate percentage of trips from Laurencekirk which would be undertaken by rail.
17. It is predicted that development of the scale proposed could generate in the order of 1200 peak hour people trip movements. Of these it is predicted that there would be in the order of 450

additional vehicle movements between Laurencekirk and the A90, of which 60% would be to and from the north. Given that the nature and scale of development, and the anticipated modal split, will be the same regardless of location, the estimated traffic generation and associated volume of traffic which will impact upon the trunk road network is similar across the three potential locations.

18. In undertaking the appraisal any significant constraints adjacent to the A90 have also been considered. These are generally:

the Scottish Gas Network pipeline to the west;

BP Forties pipeline to the east;

Laurencekirk cemetery located immediately to the west of the existing A90/B9120 junction; and

local concerns of existing traffic volumes through the town, particularly on High Street.

## Traffic Impacts

19. The analysis indicates that the provision of 885 additional residential units at Laurencekirk will essentially double traffic movements to and from the A90 Trunk Road regardless of whether development is located to the north, centrally or to the south of the town. In addition to identified capacity issues with the north and south junctions, there are concerns with regard to safety at all three at-grade junctions if there was to be an increase in the traffic volumes as a consequence of development within Laurencekirk.

20. The following conclusions can be made with regard to the potential effects of three development location options:

**Development Located to the North** – Traffic flow predictions indicate that should development be located to the north traffic flows would increase by 16%. The left turn movement from Laurencekirk north on to the A90 at the north junction will be over capacity in the morning peak hour and the right turn movement from the A90 to Laurencekirk in the evening peak will experience similar conditions with full development. While the main impact will be on the north junction, the south junction will experience increase in traffic movements in the order of 4%.

**Centrally Located Development** – Traffic flow predictions indicate that should development be located centrally there will be a significant impact at the north junction with an increase in traffic movements in the order of 11%. The left turn movement from Laurencekirk north on to the A90 at the north junction will be over capacity in the morning peak hour and the right turn movement from the A90 to Laurencekirk in the evening peak will experience similar conditions as with the North development. There will be an increased impact at the south junction in the order of 6%.

**Development Located to the South** – Traffic flow predictions indicate that development at the south location would have least impact at the north junction with the majority of traffic using the south junction which would experience an increase in traffic movements in the order of 12%. The increase in traffic movements at the south junction is such that the left turn movement from Laurencekirk to travel north on the A90 will be over capacity in the morning peak period; and the right turn movement from the A90 to Laurencekirk in the evening peak period while not being over capacity experiences a significant increase.

21. Given the above, irrespective of the location of development within or adjacent to the settlement of Laurencekirk, both the north and south junctions will experience an increase in traffic movements and with regard to certain movements these will exceed the capacity available at the junction.



22. Transport Scotland has concerns with regard to any increase in traffic volumes at the junctions associated with development proposals and as indicated the proposed options detailed within Aberdeenshire Council's Main Issues Report will result in a significant increase in the volume of traffic accessing the A90 and the associated junctions at Laurencekirk.

## Conclusions

### Preferred

23. Transport Scotland's preferred option, irrespective of the location of development is for both the north and south junctions to be upgraded to grade separation with access to Laurencekirk removed at the A90/B9120 junction. This strategy is illustrated in Figure 1.
24. Indicative layouts for grade separation at the North and South junctions are illustrated in Figures 2 and 3 respectively. Appropriate layout options will require to be developed as the assessment progresses. This includes removal of access to Laurencekirk from the A90 at its junction with the B9120 but keeping the central reserve open to maintain access to the east, as detailed in Figure 4.

### Alternative

25. Transport Scotland has indicated that it would however be prepared to consider a lower cost option if it can be demonstrated that this would adequately addresses the issues detailed within this report. This option comprises similar treatment of the A90/B9120 junction, grade separation of the south junction (A90/A937) and provision of a northbound merge lane and closure of the central reserve at the north junction. The junction strategy is illustrated in Figure 5. Detail of the configuration at the north junction is illustrated in Figure 6.
26. Whilst the preferred option will result in some increase in traffic flows through Laurencekirk, this alternative option is likely to result in a significant increase in traffic along the A937 through the town, as the right turn from the A90 southbound is displaced to the south junction. The scale of this increase will be dependent on where development is located. This issue will require detailed consideration if this option is to be progressed.

## Costs

27. Initial broad brush cost estimates indicate that the cost of Transport Scotland's preferred option is in the order of £15M, with the lower cost option estimated to be in the order of £8M. This level of required funding would equate to a cost per dwelling unit of in the order of £15k for the preferred option and £9k for the lower cost option based on a development of 885 units. At this stage, no allowance has been made for contributions from the proposed development of the 20Ha of employment land use.
28. It is noted that this cost may exceed the level of planning gain that could be expected or afforded. This is particularly relevant in a situation where contributions will be required to other supporting infrastructure (such as education facilities) in Laurencekirk.

# 1 Introduction

- 1.1 The Aberdeen City and Shire Structure Plan was approved by Ministers on 17 August 2009. Schedule 1 of the Structure Plan identifies housing allowances within the area 'south of Drumlithie – Laurencekirk' at 1000 units between 2007 and 2030. As a consequence of the Structure Plan's spatial strategy, possible land use allocations in and adjacent to the settlement of Laurencekirk have been included within the Main Issues Report (MIR) of the emerging Aberdeenshire Local Development Plan.
- 1.2 Laurencekirk sits to the immediate north west of the A90 Trunk Road, between Dundee and Aberdeen. Access to Laurencekirk is currently afforded from the A90 via three at-grade priority junctions all of which have central reserve openings to allow right turn manoeuvres. The performance of these junctions, particularly with regard to safety, is continually reviewed by Transport Scotland. The implication of further development on the operation of these junctions therefore requires detailed consideration.
- 1.3 Transport Scotland is engaged in consultation with Aberdeenshire Council regarding the MIR, the proposed land use allocations and the potential impact on the strategic transport network. It is also a key stakeholder on the Council's Future Infrastructure Requirement for Services (FIRS) Group.
- 1.4 Development of the scale proposed in the MIR will have an impact on the existing transport infrastructure including the connections to the A90 Trunk Road, which is of specific concern to Transport Scotland. In a development management context, Transport Scotland has provided early advice to both Aberdeenshire Council and developers that any significant scale of development is likely to require upgrade of at least one of the existing at-grade junctions.
- 1.5 At present Aberdeenshire Council has indicated that a mixed use development located to the north of Laurencekirk, incorporating 885 dwellings and approximately 20 Ha of employment land, is the preferred option.

## Laurencekirk Capacity Report

- 1.6 The rationale for selecting this option is set out in Aberdeenshire Council's 'Laurencekirk Capacity Report' (LCR), which was agreed by the Kincardine and Mearns Area Committee on 28 October 2008. The LCR compares the various development opportunities against a range of criteria, including transport.
- 1.7 The LCR identifies the issues associated with access to the A90 as a significant constraint to the development proposals within Laurencekirk. It recognises that grade separation is a requirement although suggests that a single junction upgrade may be acceptable. There is however no assessment of the traffic and transport implications of future development on the A90 junctions.
- 1.8 The LCR attaches an indicative cost in the order of £5m to the grade separation of a single junction. Reference is made to the possibility of funding streams from both private developers and the Scottish Government.

## Strategic Transport Projects Review

- 1.9 Specific consideration was given to the case for the grade separation of the southern junction at Laurencekirk / Marykirk within the Strategic Transport Projects Review 2008 (STPR). It concluded that "accident rates along the corridor are already below the national average and therefore the grade separation of the Laurencekirk / Marykirk junction would not address or make a significant contribution to objectives. Local accident cluster issues have been identified and remedial works [speed limits and enforcement cameras] have been introduced at this location. In order to assess the impact of the remedial works the accident patterns will continue to be closely monitored." As such Transport Scotland has no plans at this time to construct a grade separated junction at this location.

## Purpose of Report

- 1.10 In order to inform the decision making process relating to the delivery of Aberdeenshire Council's housing allowances proposed within the MIR, an appraisal requires to be undertaken to assess the implications that the location and scale of the potential allocations may have on the strategic transport network and the options available to achieve an acceptable access strategy to the A90 Trunk Road.
- 1.11 The purpose of this report is to look specifically at the three potential development locations (north, central and south) within Laurencekirk, to examine issues of accessibility, identify the trip generation potential of the development, assess the impact on the trunk road network and appraise the options for supporting roads infrastructure to deliver an acceptable access strategy.
- 1.12 It is not the purpose of this report to replicate or revisit the findings of the Laurencekirk Capacity Report (LCR) produced by Aberdeenshire Council, particularly with regards to sites rejected for development. It does however seek to establish and assess the implications of the proposed development on the continued safe and efficient operation of the A90 Trunk Road.
- 1.13 This assessment has been undertaken by JMP, on behalf of Transport Scotland, to support the wider transport appraisal work being undertaken by Aberdeenshire Council to examine the transport implications of the emerging Local Development Plan. The findings and recommendations contained within this report are therefore intended to inform the current process. It is for Aberdeenshire Council to consider these findings and subsequently take forward any recommendations to support the preferred development strategy through the Local Development Plan process.
- 1.14 BEAR, Transport Scotland's appointed operating contractor for the North East area, has undertaken a comprehensive review of safety on the A90, and in particular Laurencekirk, over the last two years. The outcomes of these studies are recorded in the following reports.

A90 Dundee to Stonehaven Junction Strategy – August 2008

A90 Laurencekirk Road Safety Review Traffic Survey Report – June 2009

A90 Laurencekirk Road Safety Review – October 2009

- 1.15 These reports contain a considerable amount of technical detail relating to the nature, standard and operation of the A90 Trunk Road junctions at Laurencekirk. Whilst this report makes reference to, employs data from, and summarises key findings within, these reports, it does not seek to replicate the content. It is therefore recommended that the BEAR reports are considered in conjunction with this report.

## Consultation

- 1.16 During the preparation of this appraisal, consultation has been undertaken with the Network Management, Development Management, Strategic Road Safety and Standards Branches of Transport Scotland.

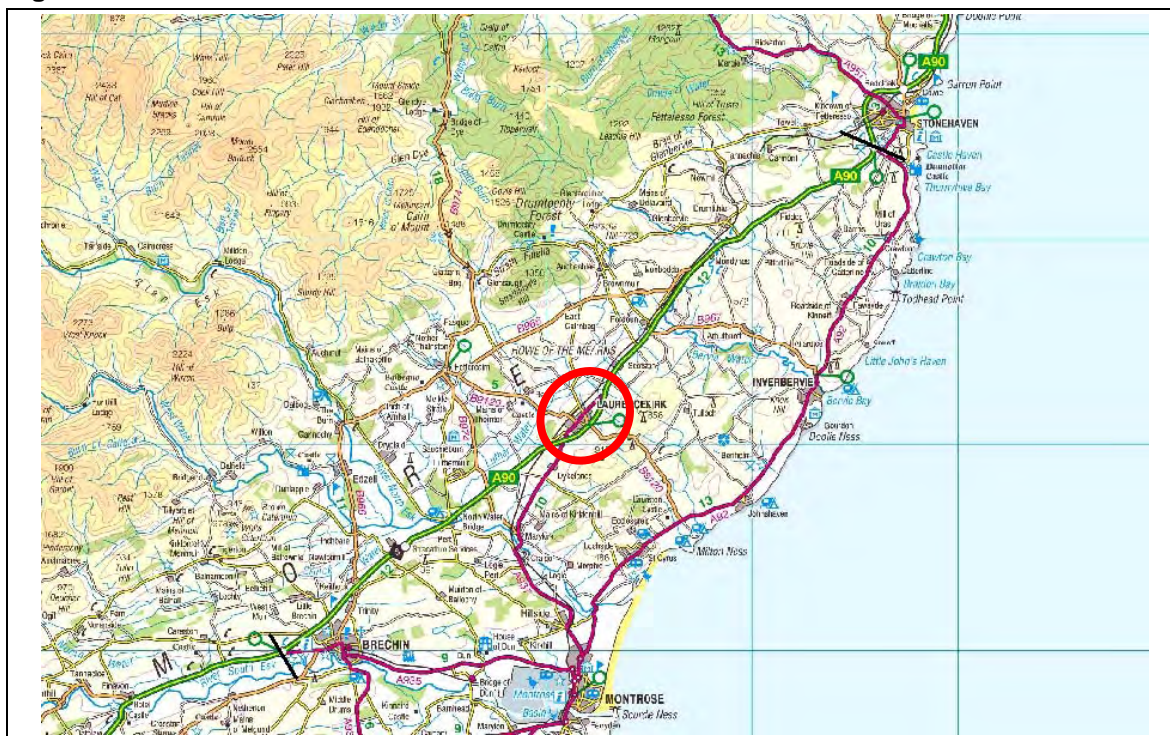
## Format of Report

- 1.17 Following this introductory chapter, Chapter 2 looks at the existing settlement profile of Laurencekirk, Chapter 3 presents the Proposed Development scenarios including an assessment of trip generation potential, Chapter 4 contains an Access Option Assessment which looks at the level of infrastructure required to support the new development scenarios and Chapter 5 identifies Conclusions and Recommendations of the Appraisal.

## 2 Existing Settlement Profile

- 2.1 Laurencekirk is situated to the south of the Aberdeenshire Local Authority Area. The settlement lies adjacent to both the A90 trunk road and the Dundee – Aberdeen rail line and is located approximately 40km south of Aberdeen and 60km north of Dundee. The general location of Laurencekirk is illustrated on Figure 2.1.

**Figure 2.1 General Location**



### Demographic Profile

- 2.2 As at the 2001 Census, the settlement of Laurencekirk was recorded as comprising 783 dwellings with a population of 1808. This equates to an occupancy density of 2.31 people per dwelling. Of these 1235 (1.58 per dwelling) were termed economically active, while 384 (0.5 per dwelling) were in full or part time education. Approximately 80% of households owned one or more cars.
- 2.3 The Laurencekirk Settlement Extract of the Aberdeenshire Local Plan 2006 (ALP) indicates that the population in 2004 had increased to 1971. Adopting the same occupancy density of 2.31 indicates an increase in the number of dwellings to 853.
- 2.4 Aberdeenshire Council's LCR indicates that in 2006 the population of Laurencekirk was 2110. Again adopting the same occupancy density would indicate the settlement had grown to 890 dwellings.
- 2.5 The LCR also states that the population of Laurencekirk has increased by 9.3% between 2001 and 2006. However comparison of the above figures suggests a growth in population of nearer 17%. As the 2001 figures quoted in the Capacity Report accord with the Census figures for 2001 it is not clear where this discrepancy lies. Population trends are summarised in Table 2.1.

**Table 2.1 Population Trends**

	2001 Census	2004 (ALP)	2006 (LCR)	2011 Predicted (LCR)
Population	1808	1971	2110	2476
Households	783	853*	913*	1072
% Increase	-	9%	17%	37%

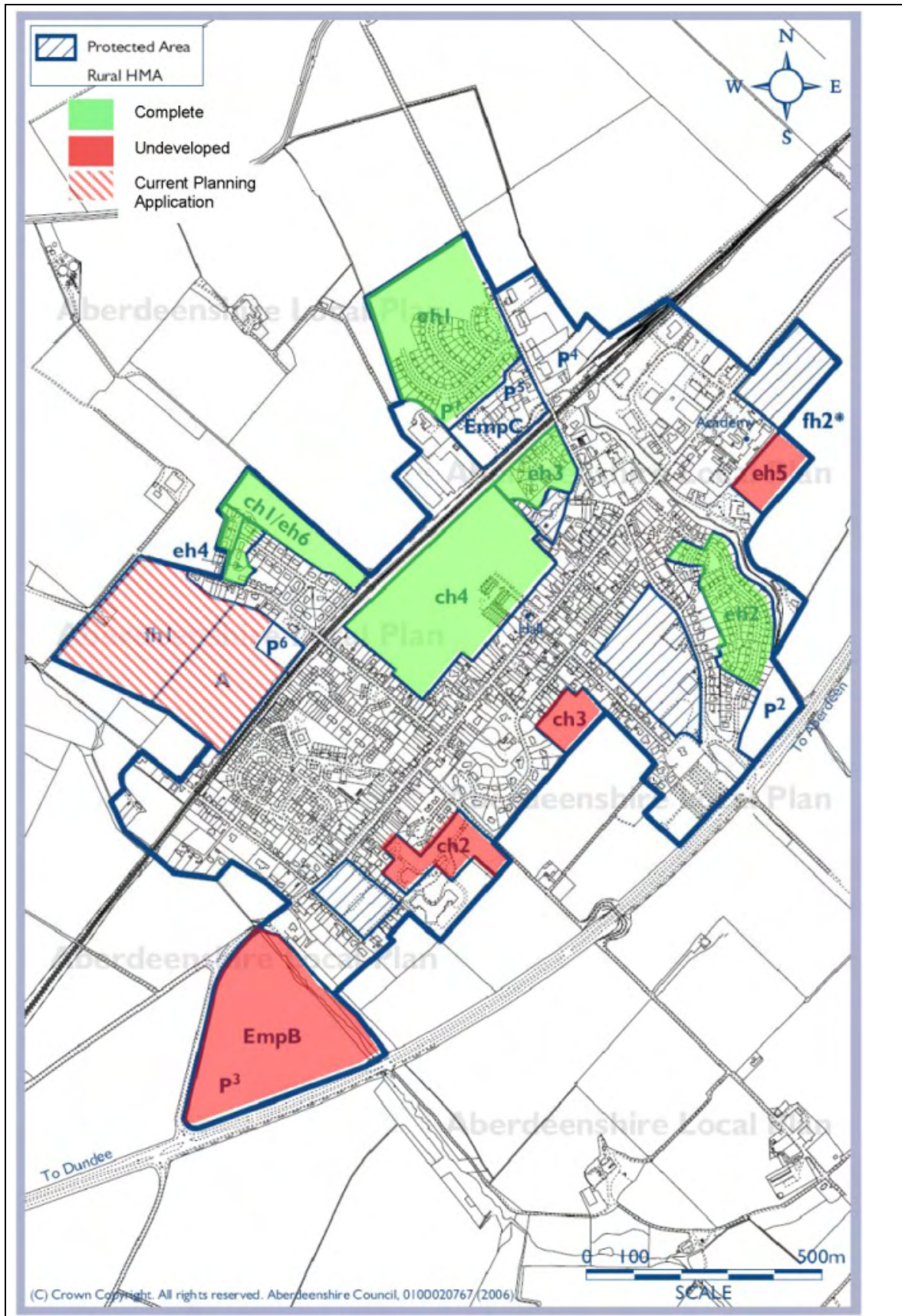
\* Assumed values based on occupancy density of 2.31 people per dwelling

- 2.6 The Aberdeen City Council Briefing Paper 2008/04, 'Population Report Aberdeen City & Shire' indicates that the overall population of Aberdeenshire is estimated to have increased from 226,940 in mid 2001 to 239,160 in mid 2007, growth of 5.4%.
- 2.7 It is evident that, notwithstanding any discrepancy in actual figures, the level of actual population growth in Laurencekirk is exceeding growth in Aberdeenshire as a whole.

### Further Planned Expansion

- 2.8 The Adopted Aberdeenshire Local Plan (ALP) 2006 identified capacity for approximately 530 additional dwellings within Laurencekirk. Comparison of the plan with current aerial photography indicates that the majority of these allocations have since been developed and are now occupied.
- 2.9 There is a current planning application for circa 210 housing units at Blackiemuir Avenue, identified as sites A & fh1 within the ALP. This application was supported by a Transport Assessment dated July 2008. Whilst it is understood that this application has yet to be determined by the Planning Authority, Transport Scotland has provided a formal response indicating that it has no objection to these proposals.
- 2.10 This leaves only the sites ch2, ch3 & eh5 undeveloped, which have a combined indicative capacity of 68 units, along with the EmpB employment site at the south west edge of the settlement.
- 2.11 Under the currently adopted ALP there is potential for a further 280 dwellings to be developed. The transport impact of these dwellings therefore also requires to be taken into account.

**Figure 2.2 Local Plan Allocations**



*Aberdeenshire Local Plan 2006*

## Local Amenities

- 2.12 Although Laurencekirk is a relatively small town, it is well served in terms of amenities which also serve the surrounding rural area. The main amenities of the town are described in more detail below.
- 2.13 Laurencekirk Primary School and associated nursery is located at Frain Drive which is just to the south of the town centre. The school catchment covers the whole of Laurencekirk as well as the rural area surrounding the main settlement which contains a number of small out-lying settlements. The school has capacity for 300 pupils and is relatively modern having been constructed in 1999.
- 2.14 Laurencekirk contains Mearns Secondary School which is located at the north end of the town with access from High Street. The School is a 6 year co-educational facility with a roll of approximately 620 pupils. The school catchment covers the southern area of Aberdeenshire and is fed by 7 primary schools located in surrounding villages.
- 2.15 The Mearns Sports Centre is located beside Mearns Academy at the North end of Laurencekirk and offers a range of sports activities. Facilities include a main sports hall and fitness suite.
- 2.16 Laurencekirk has a Community Centre located at the centre of the town with access available from High Street and the town also has its own Police Station located at the north end of the town with access from High Street.
- 2.17 In terms of healthcare, Laurencekirk has a Community Clinic located at Blackiemuir Avenue close to the centre of town and a Health Centre also located on Blackiemuir Avenue.
- 2.18 Laurencekirk also has an Industrial Park located at the north end of the town which contains mainly small units. Access is taken from High Street.

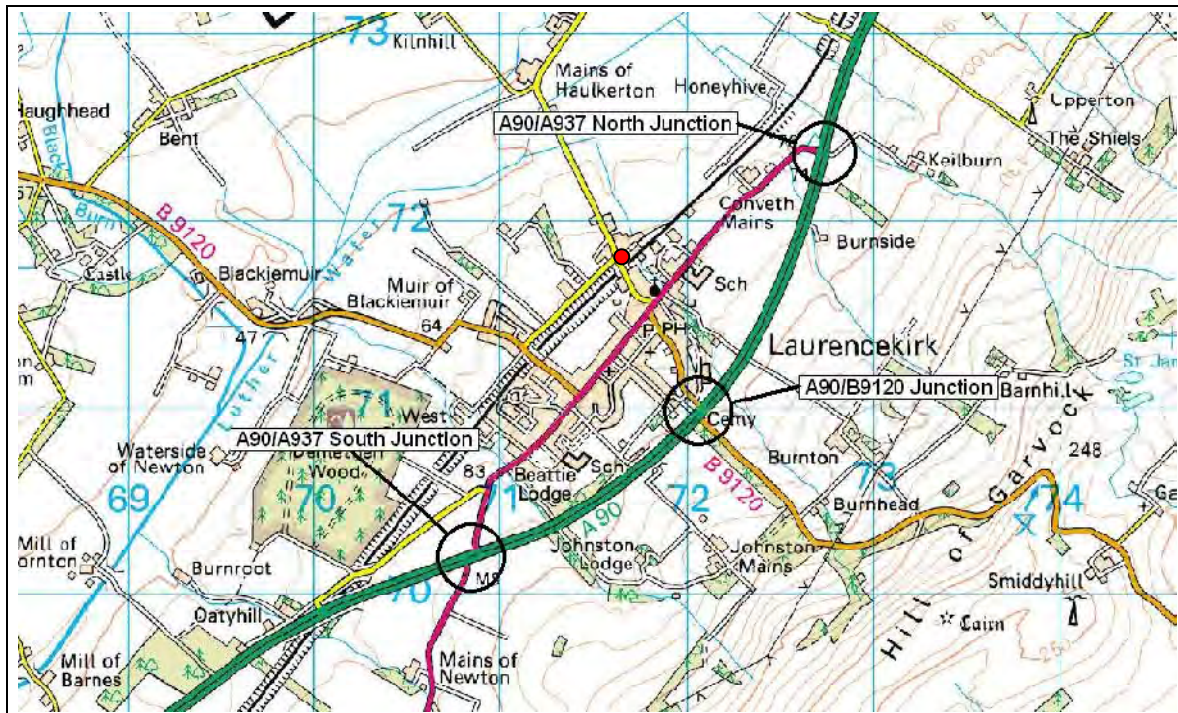
## Transport Access

### Road

- 2.19 The A90 Trunk Road is a dual two lane carriageway at this location and bypasses Laurencekirk to the south east. Access to Laurencekirk from the A90 is afforded via three at grade priority junctions, the A90/A937 (South), A90/B9120 (Mid) and the A90/A937 (North). Throughout this report these junctions are referred to as South, Mid and North.
- 2.20 These junctions are identified on Figure 2.3. It is also noted that there are a number of additional at-grade junctions in the area which provide local access to farm buildings and minor access roads. These routes do not provide strategic access to Laurencekirk but will be considered in terms of any new roads infrastructure.



**Figure 2.3 A90 Junction Locations**



- 2.21 The South junction is effectively a staggered crossroads between the A90 and the A937. The A937 connects to Laurencekirk to the north and Montrose to the south. All movements are permissible at the junction. The right turn movement from the A90 southbound into Laurencekirk incorporates a deceleration lane and direct taper from the A90. This layout is effectively mirrored for traffic turning right into the A937 from the A90 northbound. There are no merge tapers for traffic turning left onto the A90 but traffic surveys have indicated that these movements are not high. The speed limit on the A90 through the junction is 50mph and a speed camera is also present.
- 2.22 The Mid junction is also a staggered crossroads between the A90 and the B9120. The B9120 provides access to the centre of Laurencekirk to the west of the A90 and access to the rural area to the east. The junction is a right/left stagger arrangement. The northwest leg of the junction (to/from Laurencekirk) has a nearside diverge lane with a deceleration length of approximately 100m. Both right turn movements from the A90 at the junction have associated right turning lanes within the central reservation. There are no merge lanes onto the A90 but traffic surveys indicate that these movements are not high. A 70mph speed limit is in force on the A90 at this location.
- 2.23 The North junction connects the A90 with the A937 which provides access to and from Laurencekirk while access to Keilburn Farm to the east is also accommodated at the junction. A right turn lane from the A90 southbound to the A937 is provided within the central reservation while a short right turning lane is provided from the A90 northbound to the farm access. A nearside diverge lane is provided from the A90 northbound but there is no merge lane from the A937 to the A90 northbound despite a high left turn movement from Laurencekirk. A 70mph speed limit is in force on the A90 at this location.
- 2.24 The main route running through Laurencekirk is the A937 connecting the northern and southern junctions to the A90. It is a single carriageway being named High Street to the south of the junction with the B9120 and Aberdeen Street to the north of the B9120. The single carriageway is rural in nature outwith the extent of the town being defined by kerbs and soft verges. Within the extent of the town footways abut the carriageway in varying formats and widths.

- 2.25 One of the most significant features of the High Street is the predominantly uncontrolled parking on both sides of the carriageway along its length. This constricts the free flow of two way traffic through the town, a problem most apparent when either buses or heavy goods vehicles conflict with other road users. This parking problem is most prevalent adjacent to the frontage of the local retail units, although it is apparent along most of the length of the High Street/Aberdeen Street.
- 2.26 Numerous priority junctions along the High Street serve to give access to the remainder of the town. The presence of the uncontrolled parking tends to compromise visibility splays to these priority junctions and generally adds to the congested feel and constricted flow of the traffic within the town.

### **Rail**

- 2.27 Laurencekirk is served by a rail halt on the Dundee – Aberdeen main line. This halt reopened in mid 2009 having been closed since 1967. The station is situated towards the north eastern end of the village and is also indicated on Figure 2.3. It is served by approximately 20 weekday services, which includes hourly peak services. Available data indicate that currently the station caters for some 1,200 passenger movements per week. A new 67 space car park has also been constructed at the station.

### **Buses**

- 2.28 Laurencekirk is served by two bus service operators, Stagecoach Bluebird and MW Nichols Coach Company. The operators provide services to destinations including Brechin, Montrose, Stonehaven and Aberdeen.
- 2.29 Details of the existing bus services are provided in Table 2.2 below. The table indicates that a number of the services are infrequent while two of the services are related to school transport. The most frequent level of service is to Montrose with 2 buses per hour. There is just one service to Aberdeen with a two hour frequency and it is noted that the journey time is approximately 1hr 22mins. There are no direct bus services to Dundee with a trip requiring 2 changes and a 2hr journey time.

**Table 2.2 Existing Bus Services**

Operator	Bus No	Route	Frequency (Mon-Fri)	Frequency (Sat)	Frequency (Sun)
Strathtay Scottish	102	Stonehaven-Arbutnott-Laurencekirk-Montrose	1 a Day (Fridays only)	No Service	No Service
Stagecoach	103	Aberdeen-Netherly-Stonehaven-Auchenblae-Laurencekirk	Every 2 hours	Every 2 hours	No Service
Strathtay Scottish	104	Stonehaven-Laurencekirk-Montrose	School Service	No Service	No Service
Stagecoach	24	Stonehaven-Laurencekirk-Brechin	Every 2 hours	Every 2 hours	Every 2 hours
Strathtay Scottish	29	Edzell Woods-Laurencekirk-Montrose	2 Services a day on Fri/Sat	2 Services	No service
MW Nicholl	29 A	Brechin - Laurencekirk	Every 2 hours	Every 2 hours	No Service
MW Nicholl	31	Laurencekirk-Brechin-Abroath College	School Service	No Service	No Service
MW Nicholl	8	Laurencekirk – Montrose	Every hour	Every hour	Every 2 hours
MW Nicholl	9	Montrose - Laurencekirk	Every hour	Every hour	No Service
Strathtay Scottish	339	Laurencekirk-Ezdell-Brechin-Montrose	School service	No Service	No Service

- 2.30 All the bus services (with the exception of some of the school services) route through Laurencekirk Interchange which is located at Main Street / Farquhar Street at the centre of the town. The interchange is equipped with illuminated shelters and public transport information displays.

## Travel Characteristics of Existing Settlement

### Distribution

- 2.31 The 2001 Census has been examined to provide an indication of travel patterns associated with Laurencekirk. Relevant tables of data from the Scottish Census Results On-line website are contained in Appendix B. These outputs are summarised below.
- 2.32 Table UV36 provides an indication of travel distance to place of work or study. The numerical values include those not currently working or studying. Excluding these provides a sample of 1182 people. It is estimated that 49% of people living in Laurencekirk, work or study at, or within 2km of, their home.
- 2.33 These data include school pupils and students. Table CAS 220 provides details of the distance people travel to place of study. Of the 380 students recorded, 81% are educated within Laurencekirk. Deducting students and those not currently working or studying from Table UV36 provides a sample of 802, of which 34% of employed people work at or within 2km of their home, while 53% travel over 2km. The remainder either have no fixed place of work or work overseas/offshore. Whilst there is a high level of internal employment there is also a significant proportion of people travelling outwith Laurencekirk.

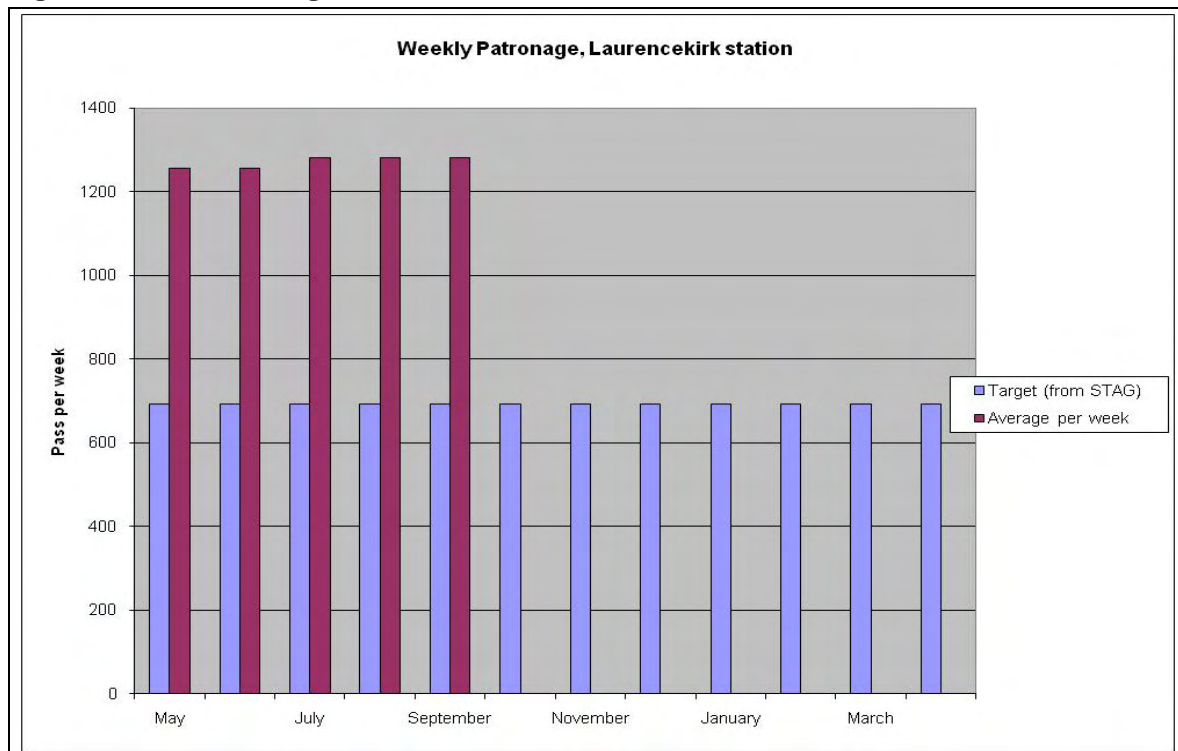
- 2.34 Geographic distribution of trips has been examined using the 2001 Census Origin – Destination data contained in dataset TV203, for Ward level. Laurencekirk lies in the Mearns Central ward (No. 66). The total population of this ward is 3292, of which Laurencekirk comprises 54%. The remainder of the ward is rural / agricultural in nature and is therefore likely to bias the proportion of people living and working within the home ward. Notwithstanding, these data should provide a reasonable indication of trip distribution. Analysis of these data is also contained in Appendix B.
- 2.35 These data indicate that 2225 people remain within the Mearns Central ward. The distribution of the remaining 1068 people travelling outwith the Mearns Central Ward, i.e. excluding those people remaining within the Home Ward, is broadly as follows:-

Aberdeen City	45%
Aberdeenshire wards North/East of Laurencekirk	35%
Aberdeenshire wards south of Laurencekirk	5%
Angus; Dundee etc	15%

#### Mode Share

- 2.36 In terms of modal share, Table UV40 indicates that, excluding those people not currently working or studying (giving a sample size of 1182), 35% of people walk while 44% are car driver or taxi trips.
- 2.37 Again these data include school pupils and students. Table CAS219 provides details of mode of travel to place of study. Of the 380 students, 78% walk or cycle which will contribute significantly to the overall walk mode share.
- 2.38 Deducting students and those not currently working or studying from the sample size in Table UV40 indicates that 22% of employed people walk or cycle while 61% travel as car driver.
- 2.39 Comparison of the distance and mode data indicates that 33% of people work within Laurencekirk while 22% of people walk or cycle. This suggests that up to 10% of people who live and work within Laurencekirk also drive.
- 2.40 Laurencekirk Rail halt has been reopened (mid 2009). Limited data are available with regard to rail patronage however indications from Nestrans are that the halt caters for approximately 1,200 passenger movements per week as indicated in Figure 2.4, which would approximate to 200 passenger movements per day, assuming Sat and Sunday combined are equivalent to a weekday. Assuming that each movement would be part of a 2-way trip this equates to approximately 100 return journeys per day.

**Figure 2.4 Rail Patronage**



Nestrans

## Traffic Patterns

- 2.41 Data relating to traffic movements between Laurencekirk and the A90 have been derived from the following sources:-
- A90 Dundee to Stonehaven Junction Strategy (BEAR) – August 2008
  - A90 Laurencekirk Road Safety Review – Traffic Survey Report (BEAR) – June 2009
  - Residential Development Blackiemuir Avenue Laurencekirk TA – Fairhurst – July 2008
- 2.42 The 2008 Bear Report identifies that of the eighteen at-grade junctions on the A90 Trunk Road between Dundee and Stonehaven, the Laurencekirk South and North junctions are the 2nd and 3rd busiest with 4,427 and 2,451 turning movements respectively occurring weekdays between 7:00 – 19:00. The mid junction ranks 8th with 1,421 turning movements. Combined these junctions accommodate 8,300 turning movements over the 12 hour survey period.
- 2.43 As part of the 2009 Bear Safety Review classified hourly turning counts were undertaken on Monday 11 May 2009 between 07:00 and 19:00. The AM peak hour at all junctions is shown to be 07:00 – 08:00 while the PM peak occurs between 17:00 and 18:00. The early AM peak is heavily influenced by the high northbound flow on the A90, coupled with the northbound movements from both Laurencekirk and the A937 Montrose road. This suggests a high proportion of commuter based traffic seeking to reach Aberdeen between 08:00 and 09:00.
- 2.44 Recorded 12hr weekday traffic movements at the three A90 junctions are illustrated on Appendix C Figure 1 while the AM and PM peak flows are illustrated on Appendix C Figure 2 and 3 respectively.

- 2.45 An indication of peak hour traffic flows within Laurencekirk itself has been extracted from the 2008 Fairhurst TA which contains survey data from April 2008. These flows have been simplified to the central A937/B9120 are also illustrated on Appendix C Figure 2 and 3. The TA also included manual classified turning counts at each of the A90 junctions. Although not used here, inspection indicates similar flow levels.
- 2.46 Inspection of the traffic patterns recorded in the Fairhurst TA would indicate that within Laurencekirk the traffic flows along the main street in the centre of the settlement are of the order of 400 2-way movements during the peak periods.
- 2.47 Traffic entering and exiting the settlement via the two minor roads to the north-west, B9120 Blackiemuir Avenue and unclassified Station Road, are low. It is reasonable therefore to assume that the majority of the traffic movements between Laurencekirk and the A90 at the South, Mid and North junctions have origins or destinations within Laurencekirk.
- 2.48 The pattern of traffic movements to and from Laurencekirk, i.e. excluding movements solely between the A937 east and the B9120 east with the A90, are summarised in Table 2.3 for the 12hr survey period. Peak hour turning movements are summarised in Table 2.4 and Table 2.5, which indicate a similar pattern to the daily movements.

**Table 2.3 Daily Traffic Patterns**

	A90 South	A937 East	B9120 East	A90 North
North Junction	120 (7%)	-	-	2174 (88%)
Mid Junction	539 (34%)	-	340*	223 (9%)
South Junction	943 (59%)	853*	-	77 (3%)
<b>Total (5269)</b>	<b>1602</b>	<b>853</b>	<b>340</b>	<b>2474</b>

*Bear 2009 Report (\*no data to identify movements between these junctions)*

**Table 2.4 AM Peak Traffic Patterns**

	A90 South	A937 East	B9120 East	A90 North
North Junction	6 (5%)	-	-	210 (85%)
Mid Junction	42 (36%)	-	21*	27 (11%)
South Junction	69 (59%)	54*	-	9 (4%)
<b>Total (438)</b>	<b>117</b>	<b>54</b>	<b>21</b>	<b>246</b>

*Bear 2009 Report (\*no data to identify movements between these junctions)*

**Table 2.5 PM Peak Traffic Patterns**

	A90 South	A937 East	B9120 East	A90 North
North Junction	8 (5%)	-	-	264 (90%)
Mid Junction	62 (36%)	-	37*	21 (7%)
South Junction	102 (60%)	101*	-	9 (3%)
<b>Total (604)</b>	<b>172</b>	<b>101</b>	<b>37</b>	<b>294</b>

*Bear 2009 Report (\*no data to identify movements between these junctions)*

2.49 Traffic movements at the North Junction can be summarised as follows:-

- Approximately 90% of all traffic movements between Laurencekirk and the A90 North, route through the North Junction.
- The largest single movement at any of these junctions is at the North Junction between Laurencekirk and the A90 North, with 210 movements in the AM peak and 264 movements in the PM peak.
- In the AM peak the left turn out of Laurencekirk is 158, while in the PM peak the right turn into Laurencekirk is 180.
- The A90 northbound flow approaching the junction is ~1500 in the AM peak hour.
- The flows to and from the south are nominal with <10 movements within the peak periods and 120 over the 12hr survey period.
- Traffic to and from the farm access is nominal with only 2 or 3 movements within the peak periods and less than 30 over the 12hr survey period.

2.50 Traffic movements at the Mid Junction can be summarised as follows:-

- Individual turning movements during the peak hours are generally between 10 and 30 vehicles.
- There are up to 120 movements to and from the B9120 west during the peak period and ~1100 movements over the 12hr survey period.
- There are up to 75 movements to and from the B9120 east during the peak period and ~630 movements over the 12hr survey period.
- In the PM peak hour there are some 37 vehicle movements between the B9120 east and west arms, crossing both carriageways of the A90
- Overall the turning movements at this junction are considered to be low.

2.51 Traffic Patterns at the South Junction can be summarised as follows:-

- Approximately 60% of traffic between Laurencekirk and the A90 South uses the South Junction.
- The second largest movement at any of the three junctions is between the A937 East (Montrose Road) and the A90 North. In the AM peak the right turn movement to the A90 is 161, while in the PM peak the left turn from the A90 is 256.
- In the AM peak there are some 54 movements between the A937 east and west arms, crossing both carriageways of the A90. In the PM peak there are 101 vehicles making these movements.
- The flow between the A937 east and the A90 south is nominal with less than 5 movements in the peak periods and ~35 over the 12hr survey period.
- The flow between the A937 west and the A90 north is nominal with less than 10 movements in the peak periods and 110 movements over the 12hr survey period.

## Accident Assessment

2.52 Data relating to accident records at these junctions has been derived from the following sources:-

- A90 Dundee to Stonehaven Junction Strategy – August 2008
- A90 Laurencekirk Road Safety Review Traffic Survey Report – June 2009
- A90 Laurencekirk Road Safety Review – October 2009

2.53 These reports contain a considerable amount of technical detail relating to the accident trends and causation and these aspects have not been replicated here. The following however is a summary of the headline accident statistics.

### A90 Dundee to Stonehaven Junction Strategy – August 2008

2.54 The former report considered the performance of all at-grade junctions, eighteen in all, on the A90 between Dundee and Stonehaven, over a 15 year period between 1992 and 2007. The accidents recorded at Laurencekirk are summarised in Table 2.6 below.

**Table 2.6 Accident Records (1992 – 2007)**

	15 Year (1992-2007)			3 Year (2005-2007)			Traffic Movements
North Junction	2f	3s	10sl	2s	3sl		2451
Mid Junction	0f	5s	5sl	1s			1421
South Junction	4f	5s	16sl	1f	1s	2sl	4427

*Bear 2008 Report (f-fatal; s – serious; sl – slight)*

2.55 The report concluded that some 68% of all accidents at the South Junction involved a right turn manoeuvre of some sort, either directly or as part of the A937 crossing movement.

2.56 As a result of the poor safety record of the South Junction a package of accident investigation & prevention (AIP) measures were introduced in September 2005. These comprise:-

- 50mph speed restriction
- Vehicle Activated signs
- Speed cameras
- High friction surfacing

2.57 In addition the report also recommended a feasibility study into grade separating this junction however it is understood that no such study has yet been progressed.

2.58 At the Mid Junction no common cause of accidents was determined. Following an earlier AIP study in 2004, anti skid surfacing on the diverge lanes, upgraded traffic signs, countdown and speed camera signs and new road markings were introduced.

2.59 At the North Junction the most common cause of accidents was attributed to the right turn into the A937 from the north, which reflects the predominant traffic movement. There are no AIP measures noted. The report does indicate that due to the high left turn movement from the A937 to the A90 northbound, consideration should be given to the provision of a merge taper as recommended in TD42/95. The report also states that the junction should be considered within any assessment of grade separation options for Laurencekirk.



## A90 Laurencekirk Road Safety Review – October 2009

- 2.60 This report was prepared by BEAR following identification of the North Junction for further investigation as part of the Moving Cursor Programme 2009/2010, and to investigate continuing local concerns regarding safety at the Laurencekirk access junctions.
- 2.61 The report recognises that consideration was given to upgrading these junctions within the Strategic Transport Projects Review 2008 (STPR), however, this concluded that recently introduced safety improvements (speed limits and enforcement cameras) had stabilised the identified road safety problem. Upgrade of the Laurencekirk junctions is therefore not currently included within STPR and as such is not within Transport Scotland's current 'Future Investment Programme'.
- 2.62 The report specifically considers the safety record of the three Laurencekirk Junctions over the three preceding years, including accident numbers, severity and causation. The accident records are summarised in Table 2.7.

**Table 2.7 3 Year Accident Records (2006-2008)**

Ranking	Fatal	Serious	Slight
North Junction	-	2	2
Mid Junction	-	2	1
South Junction	-	-	3

*Bear 2009 Report*

- 2.63 A fatal accident occurred at the North Junction on 8 September 2009 and was not included in the report data.
- 2.64 It is noted that approximately half of the injury accidents occurring at these junctions involved right turn manoeuvres, while a third of damage only accidents involved right turns.
- 2.65 Speed survey analysis contained within the report indicates that the 50mph speed limit introduced at the South Junction is generally adhered to with mean speeds of 42mph northbound and 49mph southbound recorded, while the 85<sup>th</sup> percentile speeds were 45mph northbound and 52mph southbound.
- 2.66 The report concludes that despite growth in Laurencekirk, the number of injury accidents has remained reasonably static and whilst the rate is slightly higher than the national average it is lower than the overall rate for the A90.
- 2.67 The possibility of closing up the central reserve openings is discounted in the report based upon accident savings but a number of measures are recommended for implementation to improve safety. The measures can be summarised as follows:
- Vehicle activated signage
  - Surface treatment measures
  - New and re-located signage
  - New safety camera at the A90/B9120 Mid Junction
  - Refresh road markings and replace studs
  - Cut back vegetation

2.68 Whilst this report recognises the potential detriment to accident rates due to further expansion of the settlement it does not specifically assess the predicted travel patterns or impact of new development on traffic flow and potential issues with regard to road safety.

## Potential Constraints

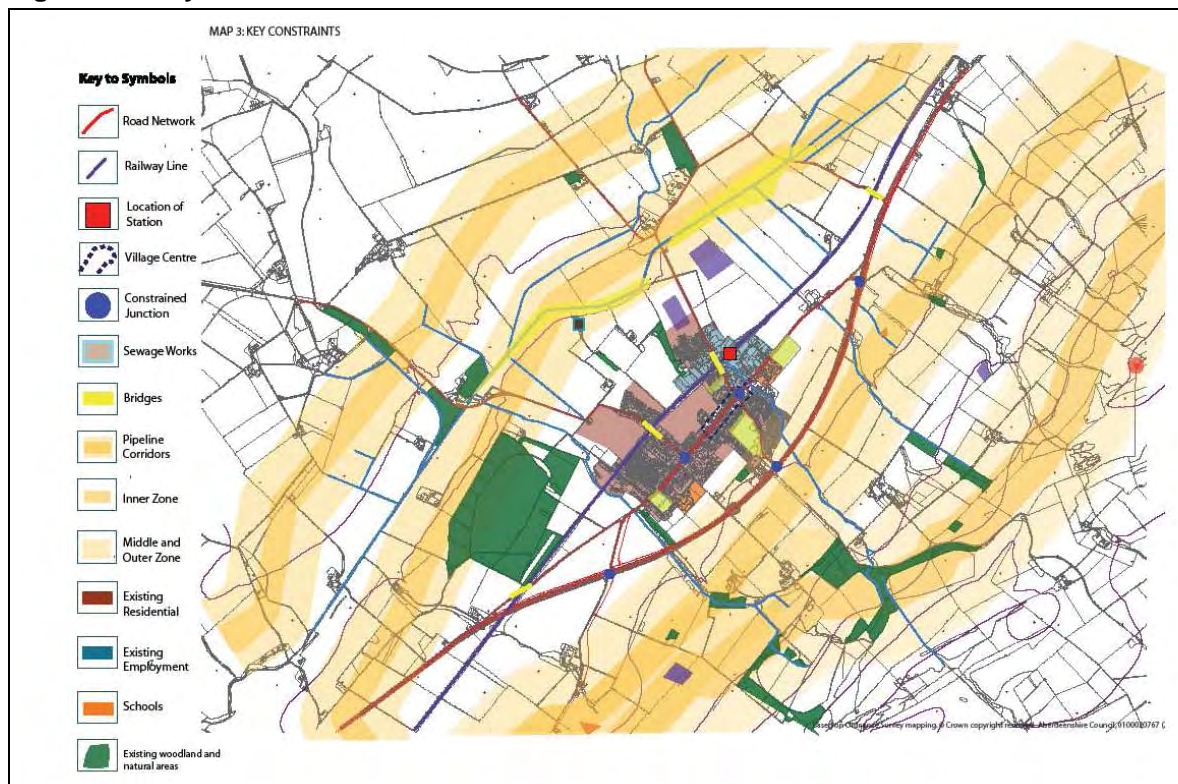
2.69 In undertaking the appraisal any significant constraints have been considered. These are generally the Scottish Gas Network pipeline to the west and the BP Forties pipeline to the east. Both pipelines have corridors of restriction with regard to permitted development in their proximity. The main impact of these restrictions lies at the existing junction of the A90/B9120 where the “exclusion” corridor for the BP Forties Filed is located immediately to the east of the junction.

2.70 The Laurencekirk cemetery is located immediately to the west of the existing junction of the A90/B9120 and is considered to be a constraint to any significant improvement of that junction.

2.71 Consultation with Aberdeenshire Council’s Transportation Service has identified a further constraint as existing traffic volumes through the town, particularly on High Street.

2.72 The Laurencekirk Capacity Study identified these physical constraints to development. These are summarised in Figure 2.5 on the extract from the LCR below.

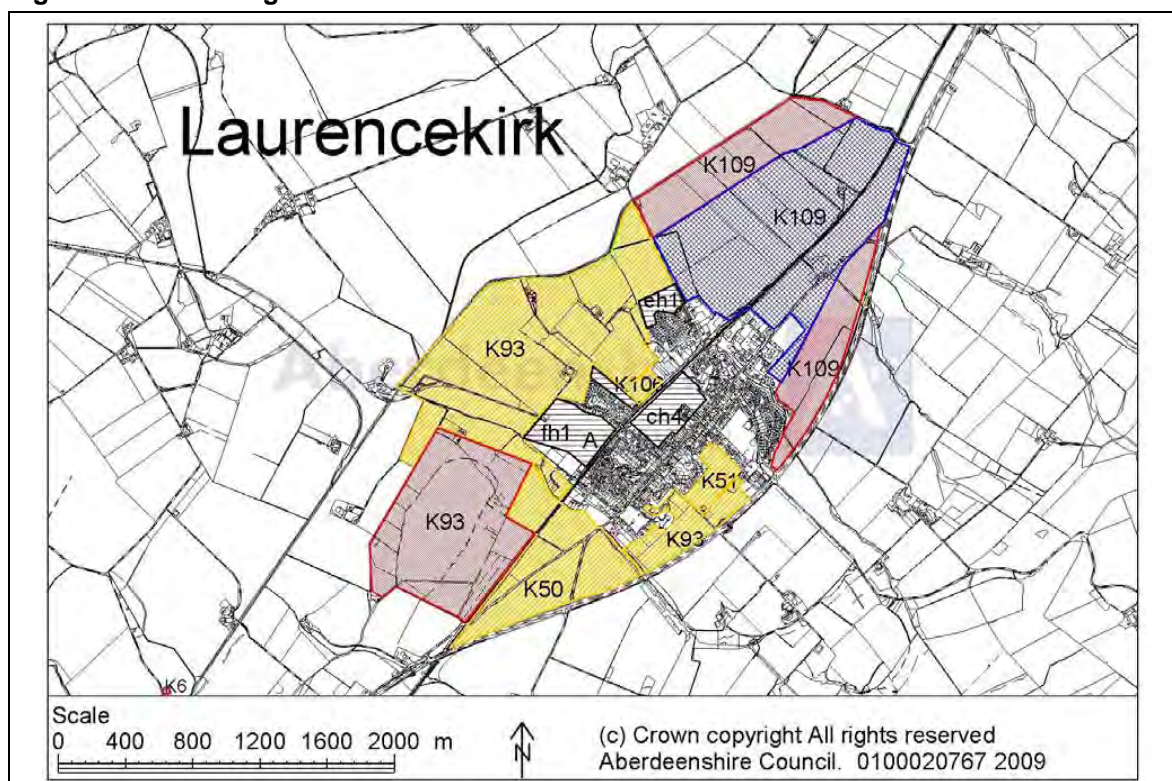
**Figure 2.5 Physical Constraints**



### 3 Proposed Development

- 3.1 The options presented within the MIR are illustrated on the extract from the MIR below. At present Aberdeenshire Council has indicated that a mixed use development at K109 incorporating 885 dwellings and approximately 20 ha of employment land is the preferred option (shaded blue).
- 3.2 The rationale of Aberdeenshire Council for selecting K109 as the preferred site is set out in the Laurencekirk Capacity Report. Other options are available, however, in the central and southern areas of Laurencekirk. Those shaded yellow in Figure 3.1 are identified in the MIR as being technically feasible but not preferred.
- 3.3 For the purpose of this assessment the development options have been referred to as Northern (preferred), Central and Southern, although these relate to general locations as opposed to specific sites.

**Figure 3.1 MIR Designations**



*Aberdeenshire Local Development Plan - MIR*

### Accessibility

- 3.4 An initial assessment of the relative accessibility of these options has been undertaken and this is summarised in Table 3.1. A walk distance of 1600m is generally considered acceptable. Distances greater than this are highlighted in bold. It is evident that, depending on which services are examined, the distances between them and the development options vary.
- 3.5 Centrally located development would provide the best fit in terms of distance to all services. With regards to the North and South options however some of these distances are likely to improve as services such as school location and employment opportunities follow the location of future development. One key indicator is distance to the rail station, as this will remain a fixed location. In this context the south development lies the greatest distance from the station.

**Table 3.1 Accessibility Assessment for Site Scenarios**

Amenities	*Distance to Amenities (m)		
	North Site	Central Site	South Site
Medical Centre	1300	600	800
Primary School	<b>1600</b>	1200	800
Secondary School	600	1200	<b>1800</b>
Business Park	600	800	<b>1700</b>
Community Centre	1200	800	1000
Railway Station	700	800	<b>1600</b>
Post Office	1200	800	1000
Local Shops	1200	800	1000
Bus Stops (assumed)	400	400	400

*\*Distances are approximate and as the crow flies to centre of site*

- 3.6 Whilst the North and Central locations appear to be more accessible to a greater range of current services there is no overriding factor that, in a strategic context, indicates a preferred location in terms of accessibility. Overall therefore accessibility of these development options is considered a neutral aspect in considering the impact on the A90.

## Travel Characteristics

- 3.7 In a trip generation context, outwith Laurencekirk itself, there is likely to be little difference in the travel patterns associated with the proposed new development locations in terms of generation, mode share and distribution. These parameters are therefore assumed to be common for all sites within Laurencekirk.
- 3.8 There will however be significant differences in terms of how the resulting car based trips generated by development assign to the network and access the A90. This will further be dictated by any associated improvements / rationalisation of the existing A90 junctions.

### Trip generation

- 3.9 In accordance with Scottish Government transport policy and publication "Transport Assessment and Implementation: A Guide", the proposed development has been assessed on a people trip basis to identify the likely number of people trips generated by the site and its associated modal split. A number of mechanisms are currently available to calculate the people trips and mode of transport for a development including census data and the TRICS database. For the purposes of this development, the people trip generation has been calculated using both the TRICS database and local travel to work census data.
- 3.10 With regard to the Residential development, whilst it is expected that there will be a proportion of affordable housing included within any allocation, given the small and rural nature of the settlement it is anticipated that the travel patterns of all houses would be similar.
- 3.11 With regard to employment there are no firm details of the scale or mix of development within the allocated 20 Ha. It is expected that there would be a mix of new employment opportunities reflecting the mix currently within the settlement. For the purposes of this exercise Business Park development has been assumed as this is likely to provide a robust assessment of trip generation.

### Proposed People Trips

- 3.12 The TRICS database version 2009(a) has been interrogated under the 'Residential - Houses Privately Owned' and 'Employment – Business Park' categories respectively to identify the rates of people trip arrivals and departures for the Weekday AM and PM peak respectively.
- 3.13 The estimated people trip rates and resultant people trip generation for 885 residential units and the 6,000m<sup>2</sup> business park (assumed 30% density of 20ha allocations) are indicated in Table 3.2 below:

**Table 3.2 Proposed Development Generated People Trips**

Development Type	Weekday AM Peak			Weekday PM Peak		
	In	Out	Total	In	Out	Total
Residential	0.207	1.010	1.217	0.692	0.430	1.122
People Trips (885 Units)	183	894	1077	612	381	993
Business Park Trip Rates	2.329	0.419	2.748	0.286	1.890	2.176
People Trips (6000m <sup>2</sup> )	140	25	165	17	113	131
<b>Total</b>	<b>323</b>	<b>919</b>	<b>1242</b>	<b>630</b>	<b>494</b>	<b>1124</b>

Source: TRICS 2009(b)

- 3.14 Table 3.2 above indicates that the two way people trips of the development for the weekday AM and PM peak periods will be 1242 and 1124 respectively.

### Mode Share

- 3.15 The proposed vehicle trip generation characteristics for the proposed development has been derived by applying a mode share obtained from the 2001 Census. The TRICS data which have been adopted predict all people movements to and from development. In the case of residential development rates this will also include school pupils.
- 3.16 To reflect this it is considered most appropriate to adopt the mode share contained within Table UV40 'Method of Travel to Work and Study – Resident Population' as described in Chapter 2. In order to better represent the likely pattern of people travelling in the peak period the sample has been adjusted to remove the category 'Those not currently working or studying' and those 'who work from home'.
- 3.17 A further adjustment has been made to reflect the potential impact the recently opened rail halt would have on mode share. The level of rail patronage for Stonehaven and Montrose, which provide the adjacent stations on the Dundee – Aberdeen Rail Line has been investigated by viewing similar Census 'travel to work' statistics. This indicates that these settlements achieve a mode share by rail of between 3% and 5%. The frequency of service at these stations is however some three times that of Laurencekirk.
- 3.18 It is therefore considered appropriate to assume that the mode share by rail that can be achieved at Laurencekirk would not exceed 5%. It has also been assumed that the majority of this mode share would derive from a shift away from private car trips.
- 3.19 For employment, reference is made to Chapter 2 which indicated that 33% of people lived and worked in Laurencekirk and of those 22% walked, while 61% travel as car driver. Again, a 5% allowance has been made for rail which has been applied to reduce car driver trips.

- 3.20 Taking these factors into account the predicted mode share for new development within Laurencekirk is defined in Table 3.3 below:

**Table 3.3 Anticipated Mode Share**

Mode	Residential	Employment
Walking	37%	23%
Cycle	3%	3%
Bus	3%	3%
Train	5%	5%
Passenger in a Car or Van	6%	7%
Driving a Car or Van	44%	57%
Other	2%	2%
<b>Total</b>	<b>100%</b>	<b>100%</b>

*Adjusted 2001 Census Table UV40*

- 3.21 Table 3.4 and Table 3.5 indicate the resultant trip generation by each mode of travel for the proposed development during the Weekday AM and PM Peak periods.

**Table 3.4 People Trips – Residential**

Mode Share		Weekday AM Peak			Weekday PM Peak		
		In	Out	2-way	In	Out	2-way
Walking	37%	68	331	399	227	141	367
Cycling	3%	5	27	32	18	11	30
Bus	3%	5	27	32	18	11	30
Train	5%	9	45	54	31	19	50
Car Pass'er	6%	11	54	65	37	23	60
Car Driver	44%	79	384	463	263	164	427
Other	2%	5	27	32	18	11	30
<b>Total</b>	<b>100%</b>	<b>183</b>	<b>894</b>	<b>1077</b>	<b>612</b>	<b>381</b>	<b>993</b>

- 3.22 Table 3.4 above indicates that the residential element of the proposed development is likely to generate around 463 and 427 two-way vehicle trips during the weekday AM and PM peak periods respectively.

**Table 3.5 People Trips – Employment**

Mode Share		Weekday AM Peak			Weekday PM Peak		
		In	Out	2-way	In	Out	2-way
Walking	23%	32	6	38	4	26	30
Cycling	3%	4	1	5	1	3	4
Bus	3%	4	1	5	1	3	4
Train	5%	7	1	8	1	6	7
Car Pass'er	7%	10	2	12	1	8	9
Car Driver	57%	80	14	94	10	65	74
Other	2%	3	1	3	0	2	3
<b>Total</b>	<b>100%</b>	<b>140</b>	<b>25</b>	<b>165</b>	<b>17</b>	<b>113</b>	<b>131</b>

3.23 Table 3.5 above indicates that the employment element of the proposed development is likely to generate around 94 and 74 two-way vehicle trips during the weekday AM and PM peak periods respectively.

3.24 Tables 3.4 and 3.5 also indicate 120 rail trips over both AM and PM peak hours, which is equivalent to 60% of the daily movements observed at the station. Considering that the proposed development is essentially a doubling of the settlement size this is considered a reasonable assumption.

## Distribution of Vehicular Trips

3.25 The strategic distribution of vehicular traffic generated by the proposed development has been based on a combination of the 2001 Census Origin Destination data together with the traffic turning proportions at the A90 junctions as discussed in Chapter 2.

3.26 The Census data examined in Chapter 2 indicate that approximately 80% of external trips from Laurencekirk were to/from the north while 20% were to/from the south.

3.27 In terms of traffic turning data it is considered that the traffic exiting Laurencekirk in the AM peak, and entering Laurencekirk in the PM peak would provide the best indication of likely residential traffic patterns. The opposite movements, i.e. traffic entering Laurencekirk in the AM peak and exiting in the PM would best reflect employment trip patterns.

3.28 A summary of these data is provided in Table 3.6 and Table 3.7 together with the adopted strategic distribution pattern for development. With regard to trips East it is assumed that these would route via the A937 south junction rather than the B9120. The B9120 is considered to be more of an 'origin' and will not attract significant additional traffic to or from Laurencekirk. In Table 3.6 the 10% internal trips reflects the analysis of the existing travel characteristics set out in Chapter 2.

**Table 3.6 Traffic Distribution Pattern - Residential**

	North	East	South	Internal
Census	70-80%	<10%	20%	
AM Out	68%	12%	12%	-
PM In	58%	19%	20%	-
<b>Adopted</b>	<b>60%</b>	<b>10%</b>	<b>20%</b>	<b>10%*</b>

*\*Based on Census Mode & Distance Data*

**Table 3.7 Traffic Distribution Pattern - Employment**

	North	East	South
AM In	36%	27%	37%
PM Out	36%	27%	37%
<b>Adopted</b>	<b>36%</b>	<b>27%</b>	<b>37%</b>

*\*Applied only to trips with an origin outside Laurencekirk – Assumed to be 70% of trips.*

3.29 Applying the adopted global strategic distribution patterns to the predicted car trip generation would result in the traffic numbers indicated in Table 3.8 and Table 3.9.

**Table 3.8 Proposed Traffic Distribution - Residential**

Development Type	Weekday AM Peak			Weekday PM Peak		
	In	Out	Total	In	Out	Total
<b>Residential</b>	<b>79</b>	<b>384</b>	<b>463</b>	<b>263</b>	<b>164</b>	<b>427</b>
Internal (10%)	8	38	46	26	16	43
North (60%)	47	231	278	158	99	255
East (10%)	8	38	46	26	16	43
South (20%)	16	77	93	53	33	86

**Table 3.9 Proposed Traffic Distribution - Employment**

Development Type	Weekday AM Peak			Weekday PM Peak		
	In	Out	Total	In	Out	Total
<b>Employment</b>	<b>80</b>	<b>14</b>	<b>94</b>	<b>10</b>	<b>65</b>	<b>74</b>
<i>Internal (assume 30%)</i>	<i>24</i>	<i>3</i>	<i>28</i>	<i>3</i>	<i>20</i>	<i>22</i>
North (36%)	20	4	23	2	16	19
East (27%)	15	3	18	2	12	14
South (37%)	21	4	25	3	17	19

3.30 Comparison of the traffic volumes in Table 3.8 and Table 3.9 indicates that in terms of the peak directional movements, i.e. out during the AM and in during the PM, the employment uses would contribute a nominal amount of additional traffic. The employment figures are likely to be an overestimate of actual generation as business park uses have been assumed and there is also uncertainty over likely take up of employment land based on current trends. Further detailed assessment of employment trips has not been undertaken.

3.31 Tables 3.8 and 3.9 also indicate some 483 and 436 vehicle trips to and from Laurencekirk in the AM and PM peaks respectively. This compares well with the current movements to and from the settlement which are recorded as 438 and 604 in the AM and PM peaks respectively. Considering that the proposed development is essentially a doubling of the settlement size this is considered a reasonable prediction. The difference in the PM peak is attributed to the fact that as the peak is from 17:00, the mode by car will be an underestimate as most school pupils, who contribute to the walk share, will have travelled earlier. This is not however considered a significant issue.

## Assignment

3.32 Assignment of generated trips in accordance with the above distribution will vary depending on the location of the proposed development. This is described more fully under the assessment of the options contained in the subsequent chapters.



## 4 Traffic Impact and Access Option Assessment

### Introduction

- 4.1 Following on from the identification of trip generation potential, this chapter seeks to identify the key traffic impacts arising from each of the three development scenarios at Laurencekirk in relation to the trunk road. On identification of these impacts, the chapter goes on to investigate the level of and options for infrastructure that would be required to support each of the new development scenarios.

### Traffic Impact Assessment

#### Assessment Years

- 4.2 In order to provide a level of consistency with the other transport assessment work being undertaken by Aberdeenshire Council to support the emerging Local Development Plan, a future year horizon of 2023 has been adopted for the purposes of traffic assessment.
- 4.3 Current traffic levels have been projected from the 2009 survey year to 2023 using the NRTF Low Growth projection. This predicts a 15.2% increase over the 14 year assessment period, which has therefore been applied to the survey data. The 2023 Projected Flows are illustrated on Appendix C Figure 4 and 5.
- 4.4 It is debatable whether traffic to and from Laurencekirk would increase at this rate if specific allowance is being made for the additional development traffic. However, as the flows are generally low the absolute change is likely to be insignificant when compared to the additional development traffic. Growth factors have therefore been applied to all movements for a robust analysis.

#### Committed / Allocated Development

- 4.5 As indicated in Chapter 2 there are a number of allocated sites within the current Adopted Local Plan that require to be taken into account. The traffic generation from the Blackiemuir sites has been extracted from the TA submitted in support of the planning application. For the purpose of this assessment, these flows have been factored up to allow for the additional 68 units in the other 3 sites that are allocated in the Local Plan.
- 4.6 The anticipated traffic flows associated with the allocated Local Plan sites are illustrated on Appendix C Figures 6 and 7.
- 4.7 Traffic flows projected to 2023 and including the Local Plan allocations are illustrated on Appendix C Figures 8 and 9.

## Development Options

- 4.8 The following describes the implications of locating the proposed MIR development to North, Central or South of Laurencekirk and describes the impact over the three trunk road junctions (north, middle and south).
- 4.9 Within the BEAR report 'A90 Laurencekirk Road Safety Review', dated October 2009, options for the introduction of a roundabout or signalisation at the existing south junction were considered but rejected based on the delays that would be introduced to A90 traffic. This was confirmed through the consultation exercise with various branches of Transport Scotland, where it was advised that a roundabout or signalised option would not be acceptable at any of the Laurencekirk junctions as this would not align with the overall route strategy for this section of the A90. It was further confirmed by Transport Scotland that any upgrade scheme should be based upon the principle of grade separation.
- 4.10 The application of appropriate design standards for grade separation has been discussed with Transport Scotland's Route Manager for the A90 and the Standards, Traffic and Economics Branch. While the anticipated post development flows for the mainline may be acceptable for compact grade separated junction design, being in the order of 27,000 AADT, the flows for the minor road are greater than 10% of the mainline flows, being 7,000 AADT, which exceeds the recommendations for compact design standards.
- 4.11 As a result Transport Scotland confirmed that a "hybrid" format would be the most suitable junction form in this location. Such arrangements are considered to work effectively, having been introduced at other locations along the A90 route. This arrangement would ensure merge and diverge tapers on the mainline would be in accordance with TD22/06. Outwith the extents of the merge/diverge the use of more relaxed geometry than given in TD22/06 would be acceptable for design of the connector roads, such as TD40/94 Layout of Compact Grade Separated Junctions.
- 4.12 For the purposes of this report the term "grade separation" relates to the above junction format. The specific application of standards would, however, require to be fully developed in conjunction with Transport Scotland as design progresses.
- 4.13 Cost estimates contained within this report are based on figures contained within the 2008 and 2009 Bear reports or comparisons with similar schemes. These costs make no allowance for land purchase costs.

## North Development Option

- 4.14 The proposal to locate development to the north of the settlement is identified in the MIR as Aberdeenshire's Preferred Strategy.
- 4.15 Based on the existing junction configuration and traffic patterns the following traffic assignment assumptions have been made:
- 100% of traffic accessing the A90 northbound carriageway will use the north junction.
  - 80% of traffic accessing the A90 southbound carriageway will use the north junction while 20% will access via the south junction.
  - 80% of traffic accessing the area to the east (Montrose and surrounding area) will access via the north junction (then via the south junction to the A937) and 20% via the south junction.
- 4.16 Applying these to the strategic distribution described in Chapter 3 produces the assignment patterns for residential traffic is illustrated in Appendix C Figures 13 and 14. Combining these with the 2023 base traffic patterns results in the flows illustrated in Appendix C Figures 19 and 20.

### Impacts

- 4.17 Key traffic impacts as a result of development at the North junction are:-
- In the AM Peak the left turn to A90 North increases to approximately 490 vehicles; around three times the current (2008) movements. In addition, a right turn flow to the A90 south of approximately 100 vehicles is predicted at the north junction, creating a series of potential conflicts that did not previously occur due to the low flows at this location. Through assumed background growth the A90 northbound flow increases to just over 1700 vehicles just to the south of the north junction.
  - In the PM peak the right turn movement from the A90 to the A937 would increase to approximately 440 vehicles; more than double the current movements. The left turn from the A90 northbound onto the A937 would also increase from a nominal flow to approximately 70 vehicles.
  - There would be a total of 460 additional turning movements at the north junction in the PM peak including approximately 240 additional right turn movements from the A90.
  - Overall turning movements at the north junction would increase to over 730 in the AM peak and 780 in the PM peak hours, compared to 500 in the AM and 700 in the PM at the south junction.
  - The North junction therefore would become the busiest junction of the three under this development scenario.
  - Preliminary PICADY analysis of this junction indicates that in the AM peak the A937 arm would operate significantly over capacity with RFC values on both left and right movements over 1.3. In the PM peak the right turn movement into the A937 is above practical capacity with an RFC of 0.79. Whilst the predicted queue of 3 vehicles can be accommodated, the fact that queues are predicted could result in driver frustration and a more aggressive approach to gap acceptance.
- 4.18 Other than traffic growth there are no significant changes to traffic patterns anticipated at the Mid Junction.

4.19 Key traffic impacts as a result of development at the South junction are:-

- At the south junction there would be an increase to the right turn movement from Laurencekirk of approximately 25 vehicles in the AM peak period taking the total right turn movement to approximately 95 vehicles (including A90 south and A937 west).
- In the PM peak the left turn from the A90 northbound to the A937 increases from approximately 50 vehicles to 70 vehicles while the right turn onto the A90 from the A937 increases by approximately 15 vehicles.
- Further increases are estimated from the A937 westbound with an additional 16 movements expected to turn right onto the A90 northbound carriageway in the PM peak and a further 13 vehicles estimated to cross the A90 and access the south of Laurencekirk.
- Overall, turning movements at the junction will increase by approximately 90 vehicles in the AM and PM peaks.

**Need for Improvement**

4.20 The above information indicates that the provision of development at the north location in Laurencekirk will have some significant traffic impacts at the Laurencekirk trunk road junctions. A summary of the impacts at each location and the level of mitigation required is summarised in Table 4.1 below.

**Table 4.1 – Summary of Development Impact and Level of Mitigation Required**

Junction	Development Traffic Impact (Compared to 2023 Base)	Level of Mitigation Required
North	~390 additional turning movements in AM; ~360 in PM. +230 left turns to A90N in AM +90 right turns to A90S in AM +160 right turns from A90N in PM	Capacity exceeded at existing junction. PICADY – AM RFC 1.3; PM RFC 0.79 Results in significant safety concerns. Improvement required to accommodate left turn to A90N and right turn from A90S. Grade-separation (or closure) required
Middle	No additional turning movements. ~100 additional through movements on A90.	Direct mitigation not required. Desirable to close access to Laurencekirk. Provision of access to/from B9120 East.
South	~90 additional turning movements in Peaks Equates to increases of ~4% beyond 2023 base traffic levels.	Level of additional flow unlikely to have capacity issues. Given the safety record and guidance from Transport Scotland Strategic Road Safety Team, level of impact likely to require improvement of junction.

**Options for Improvement on Trunk Road**

**Northern Development Option - North Junction**

4.21 As a result of the above impacts to the existing infrastructure resulting from development at the northern location the following options have been investigated in order to mitigate the resultant strain on the existing road network.

#### 4.22 Do Nothing

- The do nothing option is deemed unacceptable in terms of safety, capacity, environment and severance as detailed previously.

#### 4.23 Northbound Merge Taper (In accordance with TD42 Paragraph 7.59)

- This option is as recommended in the 2008 Bear report in order to accommodate existing high left turn movement.
- The 2008 Bear report estimated the cost of this option at £150,000.
- This option would provide adequate capacity for northbound design flows.
- This option does not address/accommodate the increased right turn movements into Laurencekirk from the A90 or the right turn demand from the A937 to the A90 southbound, which are shown to be a concern in terms of both capacity and safety.

#### 4.24 Northbound Merge Taper with Closed Central Reserve

- As above but with the A90 gap closed. This would force right turn movements to alternative junctions placing increased demand on these locations that will then inevitably require upgrade.
- With allowance for additional central reserve works cost is estimated at £300,000.
- This would increase traffic through Laurencekirk town centre by up to 230 vehicles in AM peak and up to 490 in PM peak, resulting in detrimental impact on safety, capacity, environmental and severance issues along the High Street.
- This would also result in an average increase of approx 4km in journey distance to access new development, whilst existing journeys to the settlement would also increase by 2km on average.
- Notwithstanding minimal flow, the farm access right turn would require to be accommodated either by a relocated access or keeping the gap open solely for farm access. The latter could however lead to an element of driver confusion.

#### 4.25 Partial Grade Separation

- It would be envisaged that the introduction of grade separation would take a form similar in standard to other grade separated junctions along the A90 route.
- Based on a preliminary costing and comparison of other schemes cost of this option is estimated at £6.5m.
- Partial grade separation (north facing) would deal with movements to and from the north as well as accommodate the farm access movements.
- It would result in all southbound traffic from the development routing through Laurencekirk by upwards of 150 vehicles in the AM and PM peak hours resulting in detriment through the existing settlement.
- There would be no significant increase in journey distance with routing through settlement.
- Traffic movements at the south junction would increase as it will require to accommodate the resulting south & east bound movements.

- It may also have implications regarding how the middle junction can be treated with regard to increased movements.

#### 4.26 Full Grade Separation

- The difference in cost between full and partial grade separation is attributable to two additional merge/diverge slips/tapers. These are likely to increase the cost of this option to an estimated £7.5m.
- This is the most expensive option at the north junction but addresses all movements and also minimises impact at other junctions and through the town centre.
- The benefit of full grade separation over partial grade separation is significant compared to the relatively low increase in overall costs.
- It is considered this option would address all issues at the north junction.

#### 4.27 Close Junction

- Such an option would result in the need for all traffic (new and existing) to be routed through the town resulting in significant additional pressure on the south (and possibly mid) junction as well as the main street infrastructure.
- This option could only be considered alongside upgrading of either the south or mid junction.
- Due to the significant constraints on the A937 within the town centre, the resultant significant additional flows are likely to be deemed unacceptable.

#### *Northern Development Option - Middle Junction*

#### 4.28 Do Nothing

- It is undesirable to have any significant increase in traffic on the link leading to this junction from the town centre, however some traffic would inevitably use this route.
- To discourage use, traffic calming would be required on the residential links to the High Street in order to encourage routing of traffic to the south and north junction.

#### 4.29 Close Central Reserve Gaps

- Right turn traffic from Laurencekirk onto the A90 would require to re-route to either north or south junctions.
- This would equate to approximately 70 movements in the AM peak and 130 in the PM peak. The majority of these are likely to re-route to the south junction.
- Would require alternative routing for right turns from the B9120 east link. These could be accommodated at the North & South Junctions provided all-ways movements are retained.
- This would increase turning movements at adjacent junctions by approximately 15 movements in the AM Peak and 40 movements in the PM peak. These would essentially become U-turn manoeuvres.
- Cost estimate for this option is approximately £50,000.

4.30 Close Laurencekirk Arm but Maintain Central Reserve Crossing to B9120 East.

- Existing traffic would require to re-route through the town centre, equating to approximately 100 additional movements and resulting in some detriment to High Street.
- Driver perception issues – Drivers are used to accessing Laurencekirk from the middle junction and may attempt to use gap once access to Laurencekirk has been closed.
- Reduces the number of junctions serving Laurencekirk.
- Reduces number of turning movements and conflict points at this location.

4.31 Grade Separation - Given the proximity to the cemetery and the residential development to the west, and a gas pipeline to the east (as defined in the LCR), together with issues of junction spacing, the initial view is that it is impractical to grade separate at this location (with or without connections to A90).

*Northern Development Option - South Junction*

4.32 Do Nothing

- New development at the north is estimated to add around 60 turning movements to the current junction configuration in the peak periods. This equates to a 17% increase in turning movements, which is considered a material impact.
- Given the safety record and the remedial measures currently in place, Transport Scotland has expressed concerns regarding any material increase at this junction.
- Certain formats of junction reconfiguration to the north will indirectly increase traffic flows at this junction. The right turn issue from the A90 North to Laurencekirk at the north junction has been identified as a significant concern.
- If this is not dealt with at the north then by implication over 400 right turn movements require to be accommodated by the south (or mid) junction. It is unlikely this could be accommodated at-grade.

4.33 Gap Closure

- The most significant turning movements at this junction are between A937 East and A90 North. Traffic on this arm is probably more strategic than the Laurencekirk arm and these movements are largely independent of the Laurencekirk development options.
- This option would require re-routing of the A937 traffic. One option could be to provide an overbridge link to Laurencekirk, with no access to the A90.
- This would add an additional 180 vehicles to Laurencekirk High Street in the AM Peak which would have a detrimental impact on safety, capacity, environment and severance on this route.
- This option would require construction of a grade separated crossing to accommodate A937 movements, with no benefit of connection to the A90.
- This option is therefore discounted.

#### 4.34 Full Grade Separation

- Access is required from the A90 to the A937 both the east and west. In order to minimise the increase in traffic routing through Laurencekirk it is considered logical that all-ways movements be retained at this location.
- This would address all current traffic issues at the south junction.
- As with the North option for full grade separation, the cost is estimated at approx £7.5m.
- Grade separation at the south junction would have capacity to accommodate all traffic from an expanded Laurencekirk should other junctions be closed.
- This would however result in all traffic routeing through the village to access the south junction, which will have capacity, environmental, safety and severance implications within the settlement.
- Grade separation of the south junction only, without modifications to the north, is therefore not considered a viable solution to serve development at the north of the settlement.

### Central Development Option

4.35 The proposal to locate development more centrally in Laurencekirk is also under consideration and is generally identified as yellow site K93 within the Aberdeenshire Council MIR.

4.36 Based on the existing junction configuration and turning movements the following traffic assignment assumptions have been made. It has been assumed that intensification in use of the Mid junction would be minimal:

- 90% of traffic accessing the A90 northbound carriageway will use the north junction.
- 10% of traffic accessing the A90 northbound carriageway will use the south junction.
- 100% of traffic accessing the A90 southbound carriageway will use the south junction.
- 100% of traffic accessing the area to the east (Montrose and surrounding area) will use the south junction.

4.37 Applying these to the strategic distribution described in Chapter 3 produces the assignment patterns for residential traffic illustrated in Appendix C Figures 15 and 16. Combining these with the 2023 base traffic patterns results in the flows illustrated in Appendix C Figures 21 and 22.

#### Impacts

4.38 Key traffic impacts as a result of Central development at the north junction are:

- In the AM Peak, the left turn to the A90 Northbound increases to approximately 465 vehicles at the north junction, more than double the current movement.
- In the PM peak, the right turn from the A90 to the A937 at the north junction would increase to approximately 430 movements; again more than double the current movements. The left turn movement from the A90 to the A937 would be unaffected.
- In the AM peak, the total turning movements at the north junction increase from approximately 220 movements to approximately 600 while in the PM peak, the movements will increase from approximately 270 to approximately 650.



4.39 Traffic movements at the middle junction experience a moderate change in traffic flow as a result of development at the central location. The turning movements at the junction (including movements across the A90) would increase by approximately 45 movements to a total of approximately 170 turning movements in the AM peak period. In the PM peak period the turning movements would increase by approximately 55 vehicles to a total of approximately 240 vehicles.

4.40 Key traffic impacts as a result of Central development at the south junction are:

- In the AM peak, the right turn movement onto the A90 at the south junction increases to approximately 118 vehicles, which is more than three times the current flow of 33 vehicles. The flow crossing the A937 towards Montrose increases nearly three fold from approximately 25 vehicles to approximately 70 vehicles.
- In the PM peak, the left turn from the A90 northbound at the south junction more than doubles from 50 vehicles to approximately 110 vehicles. The flow crossing the A90 from the A937 towards Laurencekirk increases by approximately 35 vehicles to 90 movements in the peak hour while the movement towards Montrose also increases by approximately 25 movements.
- Overall the turning movements (including the movements across the A90) at the junction increase by approximately 160 movements in the AM and PM peaks.

#### Need for Improvement

4.41 The above information indicates that siting development at the central location in Laurencekirk will have some significant traffic impacts at the Laurencekirk trunk road junctions. A summary of the impacts at each location and the level of mitigation required is summarised in Table 4.2 below.

**Table 4.2 – Summary of Development Impact and Level of Mitigation Required**

Junction	Development Traffic Impact (Compared to 2023 Base)	Level of Mitigation Required
North	~280 additional turning movements in AM; ~260 in PM. +207 left turns to A90N in AM +142 right turns from A90N in PM	Capacity issues at existing junction which will have implications on safety. Significant improvement required to accommodate left turn to A90N and right turn from A90S. Grade-separation (or closure) required
Middle	<30 additional turning movements. Not Significant	Direct mitigation not required. Desirable to close access to Laurencekirk. Provision of access to/from B9120 East.
South	~140 additional turning movements AM; ~130 in PM +115 right turns to A90S in AM Equates to increases of ~6% beyond base traffic levels.	Level of additional flow unlikely to have significant capacity issues. Given the safety record and guidance from Transport Scotland Strategic Road Safety Team, level of impact likely to require improvement of junction.

## Options for Improvement on Trunk Road

### *Central Development Option - North Junction*

- 4.42 As a result of the above impacts to the existing infrastructure resulting from development at the central location the following options have been investigated in order to mitigate the resultant strain on the existing road network.
- 4.43 Do Nothing
- The do nothing option is deemed unacceptable in terms of safety, capacity, environment and severance as detailed previously.
- 4.44 Northbound Merge Taper (In accordance with TD42 Paragraph 7.59)
- This option is as recommended in the 2008 Bear report in order to accommodate existing high left turn movement.
  - The 2008 Bear report estimated the cost of this option at £150,000.
  - This option would provide adequate capacity for northbound design flows.
  - This option does not address/accommodate the increased right turn movements into Laurencekirk from the A90 or the right turn demand from the A937 to the A90 southbound, which are shown to be a concern in terms of both capacity and safety.
- 4.45 Northbound Merge Taper with Closed Central Reserve
- As above but with the A90 gap closed. This would force right turn movements to alternative junctions placing increased demand on these locations that will then inevitably require upgrade.
  - With allowance for additional central reserve works, the cost is estimated at £300,000.
  - This would increase traffic through town by up to 130 vehicles in AM peak and up to 430 in PM peak, resulting in detrimental impact on safety, capacity, environmental and severance issues.
  - This would also result in an average increase of approx 2km in journey distance to access both new development and existing journeys to the settlement.
  - Notwithstanding minimal flow, the farm access right turn would require to be accommodated either by a relocated access or keeping the gap open solely for farm access. The latter could however lead to an element of driver confusion.
- 4.46 Partial Grade Separation
- It would be envisaged that the introduction of grade separation would take a form similar in standard to other grade separated junctions along the A90 route.
  - Based on a preliminary costing and comparison of other schemes cost of this option is estimated at £6.5m.
  - Partial grade separation (north facing) would deal with movements to and from the north as well as accommodating the farm access movements.
  - No significant additional impact on Mid or South Junctions.

#### 4.47 Full Grade Separation

- The difference in cost between full and partial grade separation is down to two additional merge/diverge slips/tapers. This is likely to increase the cost of this option to an estimated £7.5m.
- This option would address all issues at the north junction.
- This is the most expensive option at the north junction but addresses all movements and also minimises impact at other junctions and through the town centre.
- The benefit of full grade separation over partial grade separation is significant compared to the relatively low increase in overall costs.

#### 4.48 Close Junction

- Such an option would result in the need for all traffic (new and existing) to be routed through the town resulting in significant additional pressure on the south (and possibly mid) junction as well as the main street infrastructure.
- This option could only be considered alongside upgrading of either the south or mid junction.
- Due to the significant constraints associated with the town centre through-route to accommodate the resultant significant additional flows, this option is deemed to be unacceptable.

#### *Central Development Option - Middle Junction*

#### 4.49 Do Nothing

- It is undesirable to have any significant increase in traffic on the link leading to this junction from the town centre, however some traffic would inevitably use this route.
- Traffic calming would be required on the residential links to the High Street in order to encourage routing of traffic to the south and north junction.

#### 4.50 Close Central Reserve Gaps

- Right turn traffic from Laurencekirk onto the A90 would require to re-route to either north or south junctions.
- This would equate to approximately 85 movements in the AM peak and 150 in the PM peak, the majority of which would be to the south junction.
- Would require alternative routing for right turns from the B9120 east link. These could be accommodated at the North & South Junctions provided all-ways movements are retained.
- This would increase turning movements at adjacent junctions by approximately 15 movements in the AM Peak and 40 movements in the PM peak. These would essentially become U-turn manoeuvres.
- Cost estimate for this option is approximately £50,000.

4.51 Close Laurencekirk Arm but Maintain Central Reserve Crossing to B9120 East.

- Traffic would require to re-route through the town centre, equating to approximately 100 movements and resulting in some detriment to High Street.
- Driver perception issues – Drivers are used to accessing Laurencekirk from the middle junction and may attempt to use gap once access to Laurencekirk has been closed.
- Reduces number of junctions accessing Laurencekirk.
- Reduces number of turning movements and conflict points at this location.

4.52 Grade Separation - Given the proximity to the cemetery and the residential development to the west, and an oil pipeline to the east (as defined in the LCR), together with issues of junction spacing, the initial view is that it is impractical to grade separate at this location (with or without connections to the A90).

*Central Development Option - South Junction*

4.53 Do Nothing

- New development at the north is estimated to add around 130 turning movements to the current junction configuration in the peak periods. This equates to a 30% increase in turning movements in the AM peak and a 20% increase in the PM peak, which is considered a material impact.
- Given the safety record and the remedial measures currently in place, Transport Scotland has expressed concerns regarding any material increase at this junction.
- Certain formats of junction reconfiguration to the north will indirectly increase traffic flows at this junction. The right turn issue from the A90 North to Laurencekirk at the north junction has been identified as a significant concern. If this is not dealt with at the north then by implication over 400 additional right turn movements require to be accommodated at the south (or mid) junction. It is unlikely this could be accommodated at-grade in terms of both capacity and safety considerations.

4.54 Gap Closure

- The most significant turning movements at this junction are between A937 East and A90 North. This arm is probably more strategic than the Laurencekirk arm and these movements are largely independent of the Laurencekirk development options.
- This option would require re-routing of the A937 traffic. One option could be to provide an overbridge link to Laurencekirk, with no access to A90.
- This would add an additional 180 vehicles to the A937 through Laurencekirk in the AM Peak. This would be detrimental to safety, capacity, environmental and severance issues within the town.
- This option would require construction of a grade separated crossing with no benefit of connection to the A90.
- This option is therefore discounted.

#### 4.55 Full Grade Separation

- Turning movements are shown to increase by between 20 and 30% in the peak periods.
- Given access is required to both the east and west of the A90, and in order to minimise the increase in traffic routing through Laurencekirk it is considered logical that all-ways movements be retained at this location.
- This would address all current traffic issues at the south junction.
- As with the North option for full grade separation the cost is estimated at approximately £7.5m.
- Grade Separation at the south junction would have capacity to accommodate all traffic from an expanded Laurencekirk should other junctions be closed.
- This would however result in all traffic routeing through the village to access the south junction.
- This will have capacity, environmental, safety and severance implications within the settlement.
- Grade Separation of the south junction only, without modifications to the north, is therefore not considered a viable solution to serve development in the centre of the settlement.

### South Development Option

4.56 The proposal to locate development at the south end of Laurencekirk is also under consideration and is generally identified as the red site K93 within the Aberdeenshire Council MIR.

4.57 Based on the existing junction configuration the following traffic assignment assumptions have been made:

- 50% of traffic accessing the A90 northbound carriageway will use the north junction
- 50% of traffic accessing the A90 northbound carriageway will use the south junction
- 100% of traffic accessing the A90 southbound carriageway will use the south junction
- 100% of traffic accessing the area to the east (Montrose and surrounding area) will use the south junction

4.58 Applying these to the strategic distribution described in Chapter 3 produces the assignment patterns for residential traffic is illustrated in Appendix C Figures 17 and 18. Combining these with the 2023 base traffic patterns results in the flows illustrated in Appendix C Figures 23 and 24.

#### Impacts

4.59 Key traffic impacts as a result of south development on the North junction are:-

- In the AM Peak, the left turn to the A90 Northbound movement at the north junction increases to approximately 375 vehicles, more than double the current movement. The right turn flow to the A90 southbound carriageway would be unaffected by development at the south location.
- In the PM peak, the right turn from the A90 southbound to the A937 would increase to approximately 365 movements; nearly double the estimated base traffic movement of 205 vehicles. The left turn into the junction would be unaffected.

- The total turning movements at the north junction would increase by approximately 240 vehicles in the AM and by approximately 235 vehicles in the PM peak period as a result of development at the south location.
- A preliminary PICADY assessment has indicated that in the 2023 design scenario, the junction will be operating over practical capacity with an RFC of 0.89 in the AM peak period on the A937 approach to the junction from Laurencekirk.

4.60 Key traffic impacts as a result of south development on the South junction are:-

- In the AM peak, the right turn movement onto the A90 at the south junction increases to approximately 120 vehicles, which is more than three times the current flow of 33 vehicles. The left turn movement onto the A90 from the A937 increases from a nominal flow of 8 vehicles to an estimated 123 vehicles.
- The right turn from the A90 southbound towards Laurencekirk increases from an estimated 2 vehicles in the base scenario to approximately 25 vehicles in the base plus development scenario. The flow crossing the A937 towards Montrose also more than doubles from 24 vehicles to approximately 70 vehicles.
- A preliminary PICADY assessment has indicated that in the 2023 design scenario, the junction will be operating over practical capacity with an RFC of 0.88 in the AM peak period on the A937 eastbound approach to the junction.
- In the PM peak, the left turn from the A90 northbound at the south junction more than doubles from approximately 45 vehicles to approximately 110 vehicles.
- The right turn flow from the A90 southbound is the most significant change with a flow of 85 vehicles expected compared to a nominal flow of just 6 vehicles expected in the base traffic scenario.
- The left turn movement from Laurencekirk onto the A90 at the south junction increases from a nominal flow of 5 vehicles in the base to approximately 55 in the base plus development scenario.
- The flow crossing the A90 from the A937 towards Laurencekirk increases by approximately 35 vehicles to 90 movements in the peak hour while the movement towards Montrose also increases by approximately 25 movements.
- Overall the turning movements (including the movements across the A90) at the junction increase by approximately 303 movements in the AM peak hour and 290 movements in the PM peak hour.

4.61 Traffic movements at the middle junction experience a relatively small change in traffic flows as a result of development at the south location. The turning movements at the junction (including movements across the A90) would increase by approximately 20 movements to a total of approximately 140 turning movements in the AM peak period. In the peak period the turning movements would increase by approximately 30 vehicles to a total of approximately 210 vehicles.

#### Need for Improvement

4.62 The above information indicates that the provision of development at the south location in Laurencekirk will have some significant traffic impacts at the Laurencekirk trunk road junctions. A summary of the impacts at each location and the level of mitigation required is summarised in Table 4.3 below.

**Table 4.3 – Summary of Development Impact and Level of Mitigation Required**

Junction	Development Traffic Impact (Compared to 2023 Base)	Level of Mitigation Required
North	~140 additional turning movements in AM; ~130 in PM. +115 left turns to A90N in AM +79 right turns from A90N in PM	Practical Capacity exceeded for left turn to A90N in AM peak; RFC - 0.89, resulting in safety concerns. Significant improvement required to accommodate left turn to A90N Right turn from A90N could be re-routed to South if grade separated.
Middle	No additional turning movements. ~140 additional through movements on A90.	Direct mitigation not required. Desirable to close access to Laurencekirk. Provision of access to/from B9120 East
South	~280 additional turning movements in AM; ~260 in PM Equates to increases of ~12% beyond 2023 base traffic levels.	Practical Capacity exceeded in AM Peak; RFC - 0.88 At-grade improvements unsuitable. Grade Separation likely to be required. Could accommodate displaced right turn from north junction.

#### Options for Improvement on Trunk Road

##### *South Development Option - North Junction*

- 4.63 As a result of the above impacts to the existing infrastructure resulting from development to the south location the following options have been investigated in order to mitigate the resultant strain to the network.
- 4.64 Do Nothing
- Traffic flows at this junction would increase by more than 40% under the south development option. Safety and capacity issues identified above would remain significant.
  - The do nothing option is therefore deemed unacceptable in terms of safety, capacity, environment and severance as detailed previously.
- 4.65 Northbound Merge Taper
- In accordance with TD42 Paragraph 7.59
  - This option is as recommended in the 2008 Bear report in order to accommodate existing high left turn movement.
  - The 2008 Bear report estimated the cost of this option at £150,000.
  - This option would provide adequate capacity for northbound design flows.
  - This option does not address/accommodate the increased right turn movements into Laurencekirk from the A90 or the right turn demand from the A937 to the A90 southbound, which are shown to be a concern in terms of both capacity and safety.

#### 4.66 Northbound Merge Taper with Closed Central Reserve

- As above but with the A90 gap closed. This would force right turn movements to alternative junctions placing increased demand on these locations that will then inevitably require upgrade.
- With allowance for additional central reserve works, cost is estimated at £300,000.
- This would increase traffic through the town by up to 110 vehicles in the AM peak and up to 360 in the PM peak, resulting in detrimental impact on safety, capacity, environmental and severance issues.
- This would also result in an average increase of approx 1km in journey distance to access new development and approx 2km for existing journeys to the settlement.
- Notwithstanding minimal flow, the farm access right turn would require to be accommodated either by a relocated access or by keeping the gap open solely for farm access. The latter could however lead to an element of driver confusion.
- Unlike other scenarios this has not been discounted as it is assumed grade separation of the south junction will also be required.

#### 4.67 Partial Grade Separation

- It would be envisaged that the introduction of grade separation would take a form similar in standard to other grade separated junctions along the A90 route.
- Based on a preliminary costing and comparison of other schemes, cost of this option is estimated at £6.5m.
- Partial grade separation (north facing) would deal with movements to and from the north as well as accommodating the farm access movements.
- No significant additional impact on Mid or South Junctions as a result of this option.

#### 4.68 Full Grade Separation

- The difference in cost between full and partial grade separation is down to two additional merge/diverge slips/tapers. This is likely to increase the cost estimate of this option to £7.5m.
- This option would address all issues at the north junction.
- This is the most expensive option at the north junction but addresses all movements and also minimises the impact at other junctions and through the town centre.
- The benefit of full grade separation over partial grade separation is significant compared to the relatively low increase in overall costs.

#### 4.69 Close Junction

- Such an option would result in the need for all traffic (new and existing) to be routed through the town resulting in significant additional pressure on the south (and possibly mid) junction as well as the main street infrastructure.
- This option could only be considered alongside upgrading of either the south or mid junction.
- Due to the significant constraints associated with the town centre through-route to accommodate the resultant significant additional flows, this option is deemed to be unacceptable.



### *South Development Option - Middle Junction*

#### 4.70 Do Nothing

- It is undesirable to have any significant increase in traffic on the link leading to this junction, however some traffic would inevitably use this route.
- Traffic calming would be required on the residential links to the High Street in order to encourage routing of traffic to the south and north junction.

#### 4.71 Close Central Reserve Gaps

- Right turn traffic from Laurencekirk onto the A90 would require to re-route to either north or south junctions.
- This would equate to approximately 90 movements in the AM peak and 130 in the PM peak, the majority of which would be to the south junction.
- Would require alternative routing for right turns from the B9120 east link. These could be accommodated at the North & South Junctions provided all-ways movements are retained.
- This would increase turning movements at adjacent junctions by approximately 15 movements in the AM Peak and 40 movements in the PM peak. These would essentially become U-turn manoeuvres.
- Cost estimate for this option is approximately £50,000.

#### 4.72 Close Laurencekirk Arm but Maintain Central Reserve Crossing to B9120 East.

- Traffic would require to re-route through the town, equating to approx 160 movements in the PM peak. This would result in some detriment to High Street.
- Driver perception issues – Drivers are used to accessing Laurencekirk from the middle junction and may attempt to use gap once access to Laurencekirk has been closed.
- Reduces number of junctions accessing Laurencekirk.
- Reduces number of turning movements and conflict points at this location.

#### 4.73 Grade Separation - Given the proximity to the cemetery and the residential development to the west, and an oil pipeline to the east (as defined in the LCR), together with issues of junction spacing, the initial view is that it is impractical to grade separate at this location (with or without connections to A90).

### *South Development Option - South Junction*

#### 4.74 Do Nothing

- New development at the south is estimated to add around 260 turning movements to the current junction configuration in the peak and periods. This equates to a 65% increase in the AM peak and a 40% increase in turning movements in the PM peak, which is considered a material impact.
- Given the safety record and the remedial measures currently in place, Transport Scotland has expressed concerns regarding any material increase at this junction.

- Certain formats of junction reconfiguration to the north will indirectly increase traffic flows at this junction. The right turn issue from the A90 North to Laurencekirk at the north junction has been identified as a significant concern. If this is not dealt with at the north then by implication over 380 additional right turn movements require to be accommodated at the south (or mid) junction.
- It is unlikely this could be accommodated at-grade.
- This option is therefore discounted.

#### 4.75 Gap Closure

- The most significant turning movements at this junction are between A937 East and A90 North. This arm is probably more strategic than the Laurencekirk arm and these movements are largely independent of the Laurencekirk development options.
- This option would require re-routing of the A937 traffic. One option could be to provide an overbridge link to Laurencekirk, with no access to the A90.
- This would add an additional 180 vehicles through Laurencekirk in the AM Peak which would be detrimental to safety and capacity. There would also be environmental and severance issues within the town associated with reaching the northbound A90.
- This option would require construction of a grade separated crossing with no benefit of connection to the A90.
- This option is therefore discounted.

#### 4.76 Full Grade Separation

- Turning movements are shown to increase by between 40% and 65% in the peak periods. Any re-routed traffic from other junctions would exacerbate this.
- Given access is required to both the east and west of the A90, and in order to minimise the increase in traffic routing through Laurencekirk it is considered logical that all-ways movements be retained at this location.
- This would address all current traffic issues at the south junction.
- As with the North option for full grade separation the cost is estimated at approximately £7.5m.
- Grade Separation at the south junction would have capacity to accommodate all traffic from an expanded Laurencekirk should other junctions be closed.
- This would however result in all traffic routeing through the village to access the south junction.
- This will have capacity, environmental, safety and severance implications within the settlement.
- Grade Separation of the south junction only, without some modifications to the north, is therefore not considered a viable solution.

## 5 Conclusions / Recommendations

- 5.1 This report is intended to inform the Aberdeenshire Council's Main Issues Report (MIR) with regard to the proposed development options identified within the MIR and how these may affect the strategic transport network. The options detailed within the MIR have been considered in the context of: scale; location; accessibility; and traffic impact. Having considered these issues an informed view has been taken by Transport Scotland as to what the potential impacts are with regard to the differing locations and the appropriate interventions necessary to support the delivery of proposed development within Laurencekirk.
- 5.2 This assessment has been undertaken by JMP, on behalf of Transport Scotland, to support the wider transport appraisal work being undertaken by Aberdeenshire Council to examine the transport implications of the emerging Local Development Plan. The findings and recommendations contained within this report are therefore intended to inform the current process. It is for Aberdeenshire Council to consider these findings and subsequently take forward any recommendations to support the preferred development strategy through the Local Development Plan process.

### Location/Accessibility

- 5.3 The accessibility characteristics of the three potential development options located to the north, centrally or south of Laurencekirk have been identified. A comparison of access to the existing amenities within the town indicates that the accessibility to local services and facilities such as the rail halt is relatively equal across the three sites with "winners" and "losers" identified depending on the amenity under consideration. It is therefore considered that, in the context of this appraisal report, a preferred location in terms of trunk road impact should not be determined by accessibility to local facilities. While this is undoubtedly an issue that requires to be addressed at a more detailed development masterplanning stage, it is sufficient to understand that this issue will not significantly affect the decision making process for the strategic transport network.
- 5.4 In a similar vein, the report examines existing external travel habits with regard to modal split and it is considered that the location of development will not affect expected modal split given the scale of the existing settlement and the accessibility to the available modes of transport: car, bus and rail.
- 5.5 Given that the nature and scale of development, and the anticipated modal split, will be the same regardless of location, the estimated traffic generation and associated volume of traffic which will impact upon the trunk road network is similar across the three potential locations.

### Constraints to Development

- 5.6 In undertaking the appraisal any significant constraints have been considered. These are generally the Scottish Gas Network pipeline to the west and the BP Forties pipeline to the east. Both pipelines have corridors of restriction with regard to permitted development in their proximity. The main impact of these restrictions lies at the existing junction of the A90/B9120 where the "exclusion" corridor for the BP Forties Filed is located immediately to the east of the junction.
- 5.7 The Laurencekirk cemetery is located immediately to the west of the existing junction of the A90/B9120 and is considered to be a constraint to any significant improvement of that junction.

- 5.8 Consultation with Aberdeenshire Council's Transportation Service has identified a further constraint which has been recognised which is existing traffic volumes through the town, particularly on High Street.

## Traffic Impacts

- 5.9 The analysis indicates that the provision of 885 additional residential units at Laurencekirk will essentially double traffic movements to and from the A90 Trunk Road regardless of whether development is located to the north, centrally or to the south of the town. In addition to identified capacity issues with the north and south junctions, there are concerns with regard to safety at all three at-grade junctions if there was to be an increase in the traffic volumes as a consequence of development within Laurencekirk.
- 5.10 The following conclusions can be made with regard to the potential effects of three development location options:
- **Development Located to the North** – Traffic flow predictions indicate that should development be located to the north traffic flows would increase by 16%. The left turn movement from Laurencekirk north on to the A90 at the north junction will be over capacity in the morning peak hour and the right turn movement from the A90 to Laurencekirk in the evening peak will experience similar conditions with full development. While the main impact will be on the north junction, the south junction will experience increase in traffic movements in the order of 4%.
  - **Centrally Located Development** – Traffic flow predictions indicate that should development be located centrally there will be a significant impact at the north junction with an increase in traffic movements in the order of 11%. The left turn movement from Laurencekirk north on to the A90 at the north junction will be over capacity in the morning peak hour and the right turn movement from the A90 to Laurencekirk in the evening peak will experience similar conditions as with the North development. There will be an increased impact at the south junction in the order of 6%.
  - **Development Located to the South** – Traffic flow predictions indicate that development at the south location would have least impact at the north junction with the majority of traffic using the south junction which would experience an increase in traffic movements in the order of 12%. The increase in traffic movements at the south junction is such that the left turn movement from Laurencekirk to travel north on the A90 will be over capacity in the morning peak period; and the right turn movement from the A90 to Laurencekirk in the evening peak period while not being over capacity experiences a significant increase.
- 5.11 Given that, irrespective of the location of development within or adjacent to the settlement of Laurencekirk, both the north and south junctions will experience an increase in traffic movements and with regard to certain movements these will exceed the capacity available at the junction.
- 5.12 As stated previously Transport Scotland has concerns with regard to any increase in traffic volumes at the junctions associated with development proposals and as indicated the proposed options detailed within Aberdeenshire Council's Main Issues Report will result in a significant increase in the volume of traffic accessing the A90 and the associated junctions at Laurencekirk.

## Options

### Preferred

- 5.13 In these circumstances, it is concluded that significant mitigation measures are required to support major development in Laurencekirk.
- 5.14 Taking the above into consideration, Transport Scotland's preferred option, irrespective of the location of development is for the provision of grade separation at both the north and south junctions, with access to/from Laurencekirk removed at the A90/B9120 junction. This strategy is illustrated in Appendix D Figure 1.
- 5.15 Indicative layouts for grade separation at the North and South junctions are illustrated in Appendix D Figures 2 and 3 respectively. Based on discussion with Transport Scotland, these layouts assume a hybrid grade separation arrangement and are intended as illustrative only at this stage of the assessment. Appropriate layout options will require to be developed as the assessment progresses.
- 5.16 As highlighted above, the ability to provide significant mitigation measures at A90/B9120 junction (middle junction) is constrained by the proximity of the cemetery and the existing residential development to the west of the A90 and the BP Forties pipeline to the east. It is, therefore, concluded that to address the concern of an increase in traffic movement at this junction when the opportunity for improvement is limited, the existing access from the A90 to Laurencekirk will be closed. The central reserve gap requires to remain open to afford access to the east since closure of this access would require either significant new infrastructure (collector/distributor roads) or a significant detour to afford access to the A90.
- 5.17 In this context, all options to support the MIR development proposals include the above proposal (i.e. removal of access to Laurencekirk from the A90 at its junction with the B9120 but keeping the central reserve open to maintain access to the east) as detailed in Appendix D Figure 4.

### Alternative

- 5.18 Transport Scotland has indicated that it would however be prepared to consider a lower cost option if it can be demonstrated that this would adequately addresses the issues detailed within this report. This option comprises similar treatment of the A90/B9120 junction, grade separation of the south junction (A90/A937) and provision of a northbound merge lane and closure of the central reserve at the north junction. The junction strategy is illustrated in Appendix D Figure 5. Detail of the configuration at the north junction is illustrated in Appendix D Figure 6.
- 5.19 Whilst the preferred option will result in some increase in traffic flows through Laurencekirk, this alternative option is likely to result in a significant increase in traffic along the A937 through the town, as the right turn from the A90 southbound is displaced to the south junction. The scale of this increase will be dependent on where development is located. This issue will require detailed consideration by the Aberdeenshire Council if this option is to be progressed.

## Costs

- 5.20 Initial broad brush cost estimates indicate that the cost of the preferred option is in the order of £15M, with the lower cost option estimated to be in the order of £8M. This level of required funding would equate to a cost per dwelling unit of in the order of £15k for the preferred option and £9k for the lower cost option based on a development of 885 units. At this stage, no allowance has been made for contributions from the proposed development of the 20Ha of employment land use.

5.21 It is noted that this cost may exceed the level of planning gain that could be expected or afforded. This is particularly relevant in a situation where contributions will be required to other supporting infrastructure (such as education facilities) in Laurencekirk.

# Appendix A

## Aberdeenshire Local Plan 2006

# Laurencekirk

## 1 Key Facts

- a) **Role** – One of the main service and employment centres for the south part of Kincardine and Mearns.
- b) **Population** – 1,971 (2004).
- c) **Main services and facilities** –
  - 1 secondary and 1 primary school.
  - A leisure centre and other community facilities.
  - A medical centre.
  - 1 industrial park.

## 2 What are the main planning issues affecting Laurencekirk?

- a) Demand for new housing.
- b) Protection and enhancement of the role and attractiveness of the central area.

## 3 What are the main Local Plan proposals for Laurencekirk

The following set of proposals have been prepared to help deal with the issues listed above. Their boundaries are shown on the map opposite.

Twelve development sites shown as:

- **Site eh1**, suitable for around 100 houses.
- **Site eh2**, suitable for around 46 houses.
- **Site eh3**, suitable for around 7 houses.
- **Site eh4** is suitable for around 10 houses.
- **Site eh5**, suitable for around 28 housing units including 20 sheltered housing units.
- **Site ch1/eh6** is suitable for around 30 houses.
- **Site ch2**, suitable for around 30 housing units.
- **Site ch3**, suitable for around 10 houses.
- **Site ch4**, suitable for around 59 houses and appropriate employment use(s).
- **Site A** is suitable for around 60 houses.
- **Sites EmpB and C**, suitable for appropriate employment use(s).

Six project areas shown as:

- **Site P<sup>1</sup>** (strategic landscaping).
- **Site P<sup>2</sup>** (strategic landscaping).
- **Site P<sup>3</sup>** (strategic landscaping).
- **Site P<sup>4</sup>** (possible reopening of the railway station).
- **Site P<sup>5</sup>** (opportunity for a car park to serve the railway station should it be reopened).
- **Site P<sup>6</sup>** (extension to Health Centre).

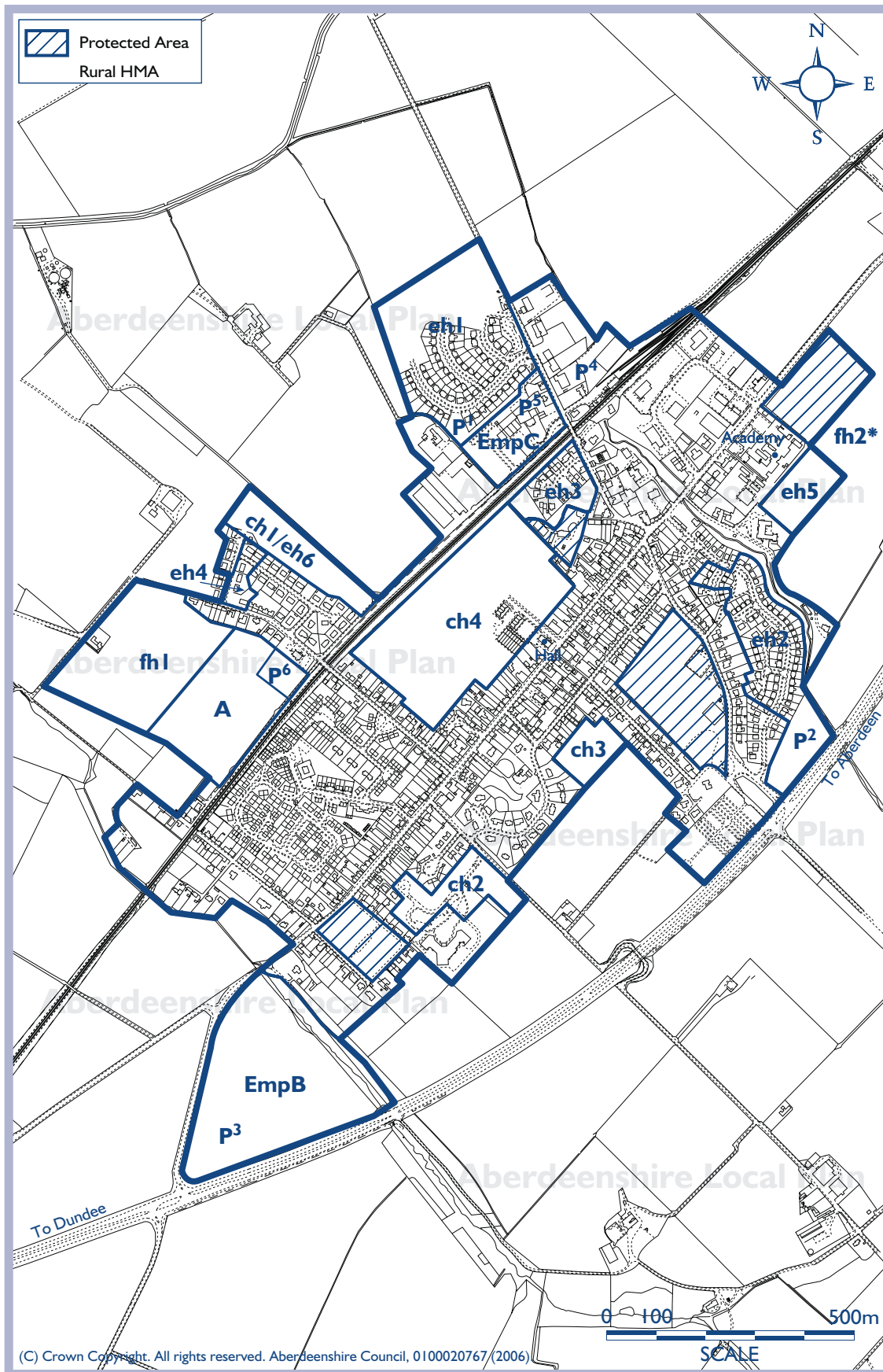
Future housing land shown as:

- **Sites fh1 (150) and fh2\***.

Other land use allocations shown as:

- **Protected areas.**
- **Countryside designations.**





- Please see this settlement's introductory page for an explanation of the letters on this map.
- Please see the Glossary for a full explanation of the allocations on this map and relevant policies.

## Appendix B

### 2001 Census Data

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Job No	Report No	Issue no	Report Name
SCT6310D	1	1	Aberdeenshire Council

**UV36 Distance travelled to place of work or study (Scotland)**

**All people**

**Geographical level : Settlement**

	ALL PEOPLE	Not currently working or studying	Works or studies mainly at or from home	Less than 2km	2km - less than 5km	5km - less than 10km	10 km - less than 20km	20km - less than 40km	40km and over	No fixed place of work or study	Working or studying outside the UK	Working at offshore installation
Laurencekirk	1808	626	71	511	7	68	92	154	170	74	4	31
		35%	4%	28%	0%	4%	5%	9%	9%	4%	0%	2%
	1182	-	6%	43%	1%	6%	8%	13%	14%	6%	0%	3%

1 The distance travelled is a calculation of the straight line between the postcode of place of residence and postcode of workplace or study.

2 'Working or studying' includes all people of any age who work or study mainly at or from home, at no fixed place or travel to a place of work or study.

**CAS220 Age by distance to place of study**

**Full-time students whether or not in employment and part-time students not in employment**

**Geographical level : Settlement - Laurencekirk**

	TOTAL	Studies mainly at home	Distance to place of study					Other
			Less than 2km	2km - less than 5km	5km - less than 10km	10km - less than 20km	20km and over	
ALL AGES	380	31	280	0	4	8	52	5
0 - 4	19	1	15	0	1	0	2	0
5 - 11	163	10	138	0	1	1	13	0
12 - 15	106	11	94	0	0	0	1	0
16 - 17	32	3	25	0	0	1	3	0
18 and over	60	6	8	0	2	6	33	5

Footnotes:

1 'Other' comprises no fixed place of study and studies outside the UK.

2 Distance travelled is a calculation of the straight line between the postcode of place of residence and postcode of place of study.

**Calculations - All people - not currently working or studying - students(CAS220)**

TOTAL	works or Studies mainly at home	Distance to place of study					Other
		Less than 2km	2km - less than 5km	5km - less than 10km	10km - less than 20km	20km and over	
802	40	231	7	64	84	272	109
	5%	29%	1%	8%	10%	34%	14%

**UV40 Method of travel to work or study - resident population (Scotland)**

All people resident in area

Geographical level : Settlement

	TOTAL 'NIGHT TIME' POPULATION	Not currently working or studying	Works or studies mainly at or from home	Underground, tube, metro or light rail	Train	Bus, minibus or coach	Taxi or minicab	Driving a car or van	Passenger in a car or van	Motorcycle, scooter or moped	Bicycle	On foot	Other
Laurencekirk	1808	626	71	0	1	30	7	512	83	4	33	412	29
Montrose	11774	4471	292	4	235	566	86	2562	749	40	385	2255	129
Stonehaven	9577	2869	325	1	312	269	60	2953	746	13	105	1763	161

Footnotes:

1 No fixed place: counted as if working or studying in the area and are classified according to the means of transport used.

2 'Working or studying' includes all people of any age who work or study mainly at or from home, at no fixed place or travel to a place of work or study.

**UV40 Method of travel to work or study - resident population (Scotland)**

All people resident in area

Geographical level : Settlement

	TOTAL 'NIGHT TIME' POPULATION	currently working or studying	Works or studies mainly at or from home	Underground, tube, metro or light rail	Train	Bus, minibus or coach	Taxi or minicab	Driving a car or van	Passenger in a car or van	Motorcycle, scooter or moped	Bicycle	On foot	Other
Laurencekirk	1808	1182	6%	0%	0%	3%	1%	43%	7%	0%	3%	35%	2%
Montrose	11774	7303	4%	0%	3%	8%	1%	35%	10%	1%	5%	31%	2%
Stonehaven	9577	6708	5%	0%	5%	4%	1%	44%	11%	0%	2%	26%	2%

Footnotes:

1 No fixed place: counted as if working or studying in the area and are classified according to the means of transport used.

2 'Working or studying' includes all people of any age who work or study mainly at or from home, at no fixed place or travel to a place of work or study.

**CAS219 Age by method of travel to place of study**

Geographical level : Settlement - Laurencekirk

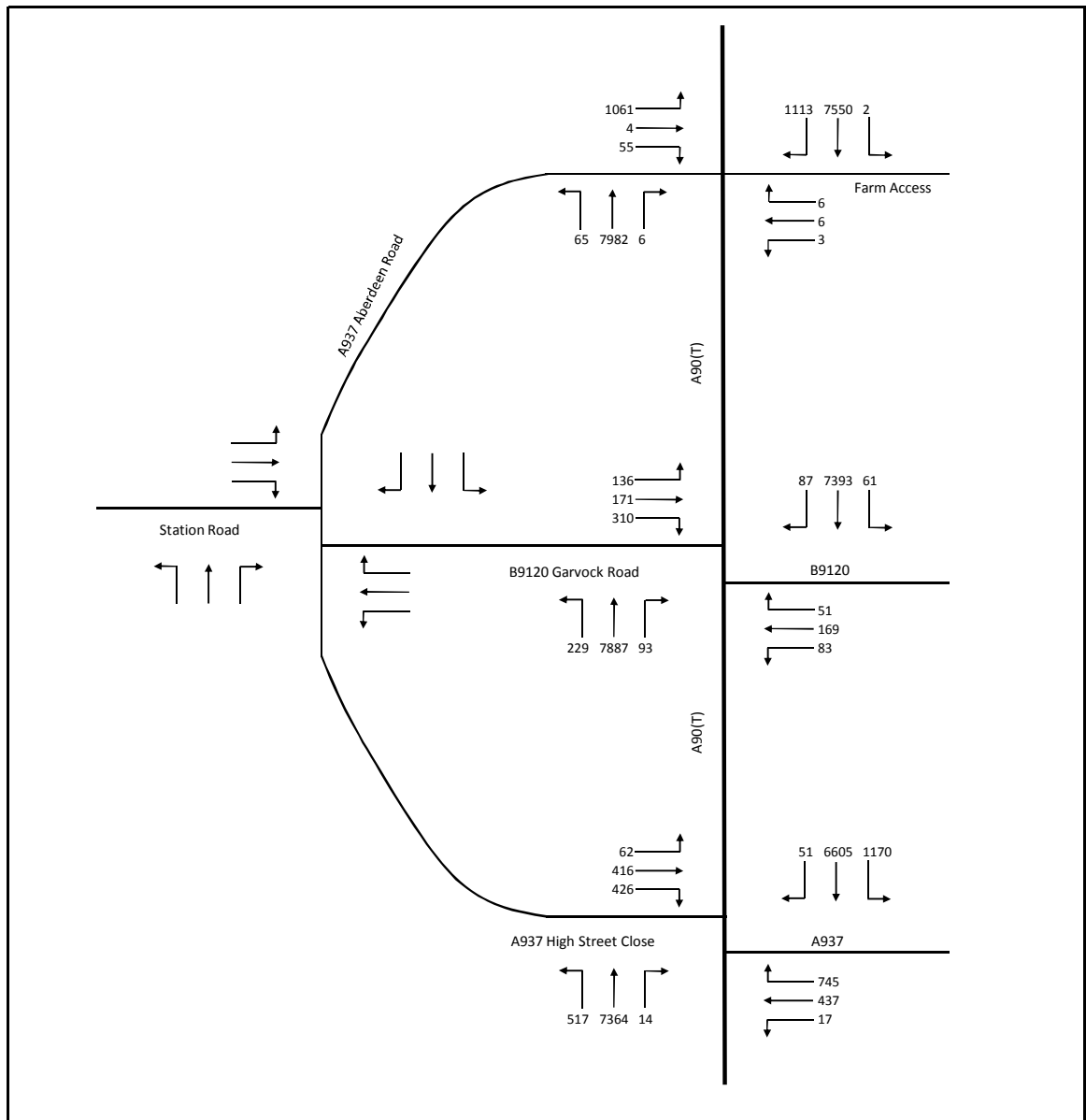
Full-time students whether or not in employment and part-time students not in employment

	TOTAL	Studies mainly at home	Underground, tube, metro or light rail, train	Bus, minibus, coach	Taxi or minicab, driving a car or van	Passenger in car or van	Motor cycle, scooter or moped	Bicycle	On foot	Other
ALL AGES	384	31	1	14	32	32	1	9	261	3
0 - 4	19	1	0	2	0	7	0	0	9	0
5 - 11	163	10	0	6	0	14	0	8	125	0
12 - 15	106	11	0	1	0	1	0	1	92	0
16 - 17	32	3	0	2	0	1	0	0	26	0
18 and over	64	6	1	3	32	9	1	0	9	3
		8%	0%	4%	8%	8%	0%	2%	68%	1%

**Calculations - All people - not currently working or studying - students(CAS220)**

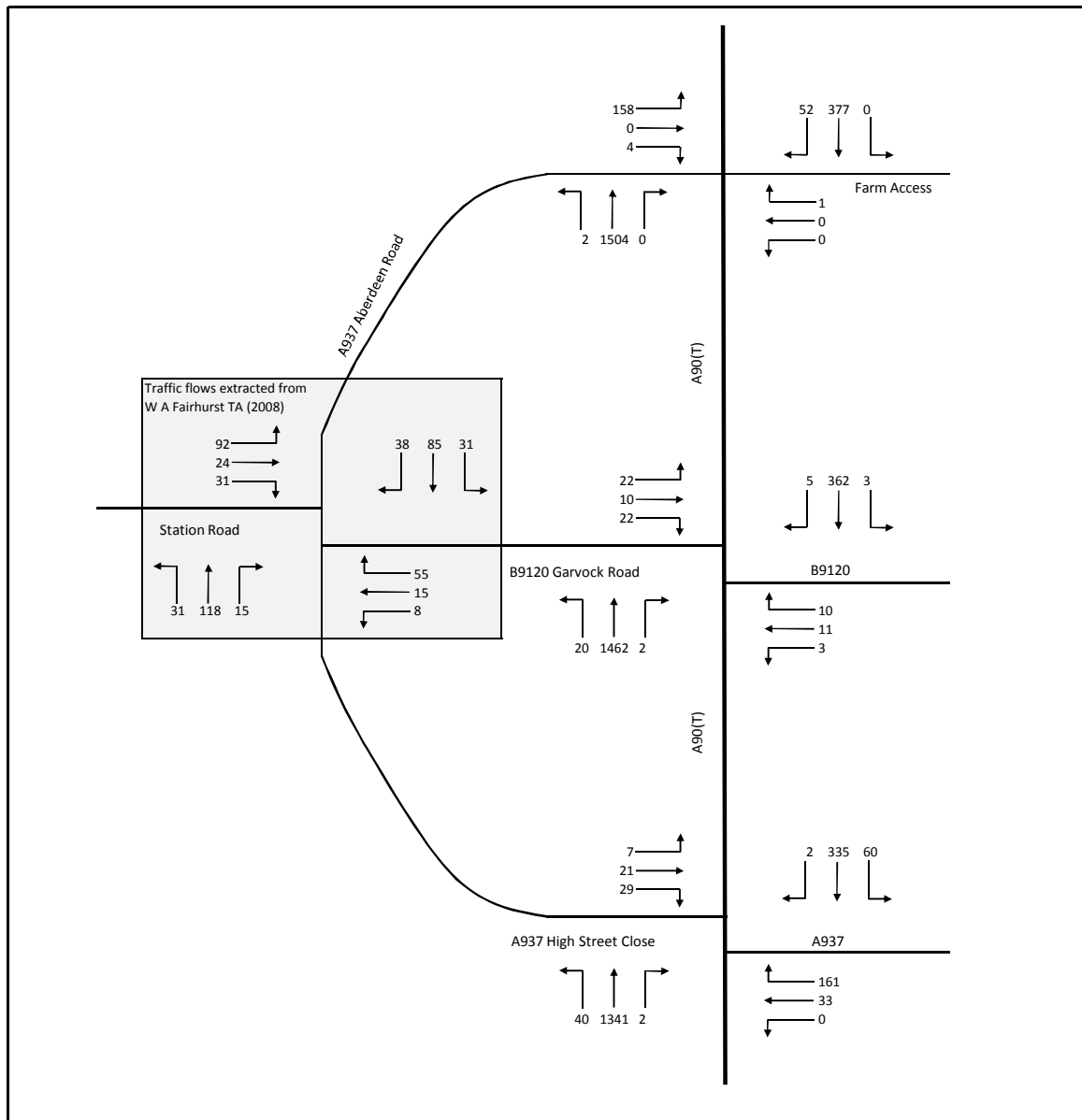
	WORKS or studies mainly at or from home	Underground, tube, metro or light rail	Train	Bus, minibus or coach	Taxi or minicab	Driving a car or van	Passenger in a car or van	Motorcycle, scooter or moped	Bicycle	On foot	Other
798	40	0	0	16	487	51	3	24	151	26	
	5%	0%	0%	2%	61%	0%	6%	0%	3%	19%	

## Traffic Flow Diagrams



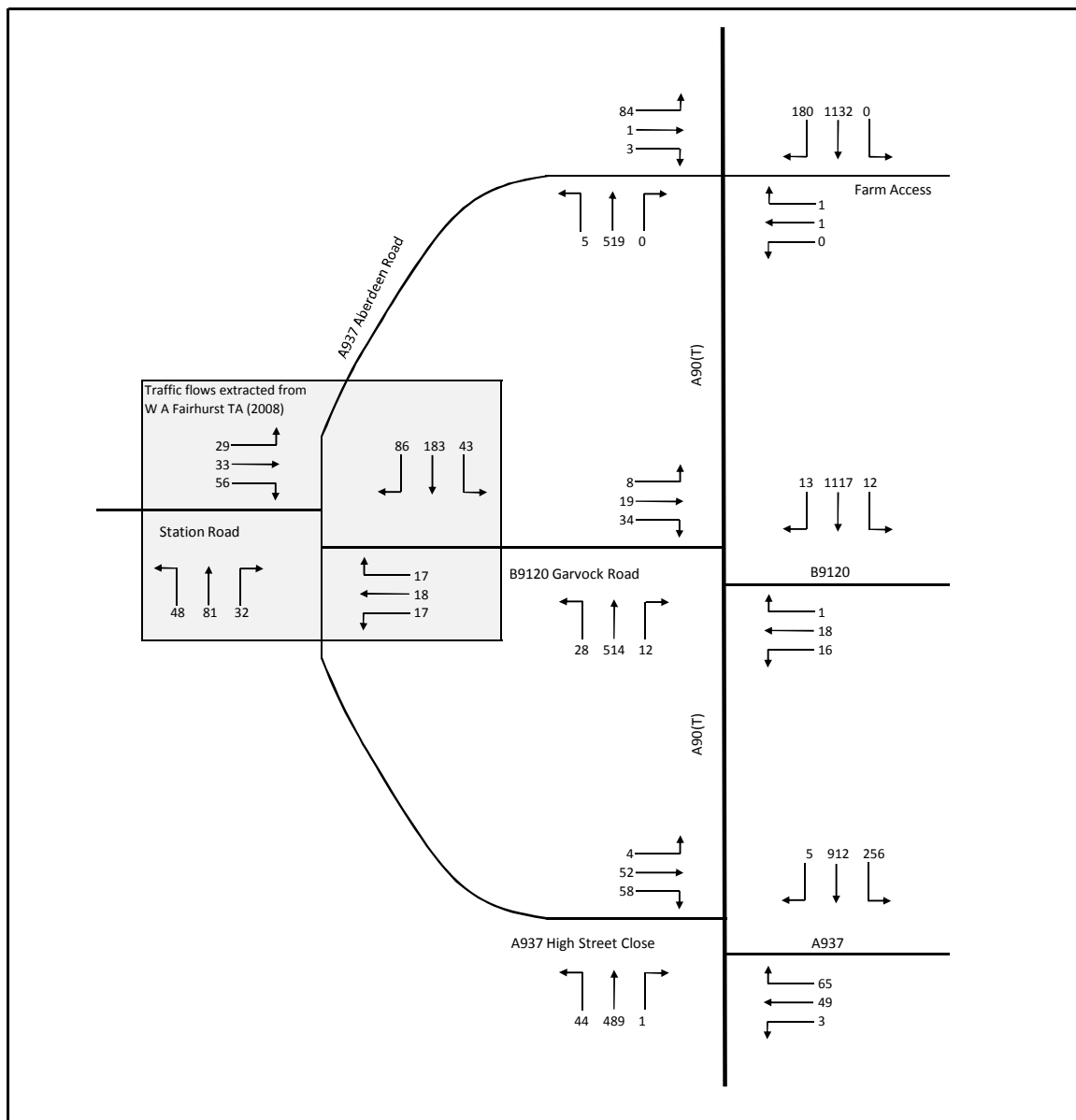
2009 12 Hour Traffic Flows

figure 1



2009 Observed AM Traffic Flows

figure 2

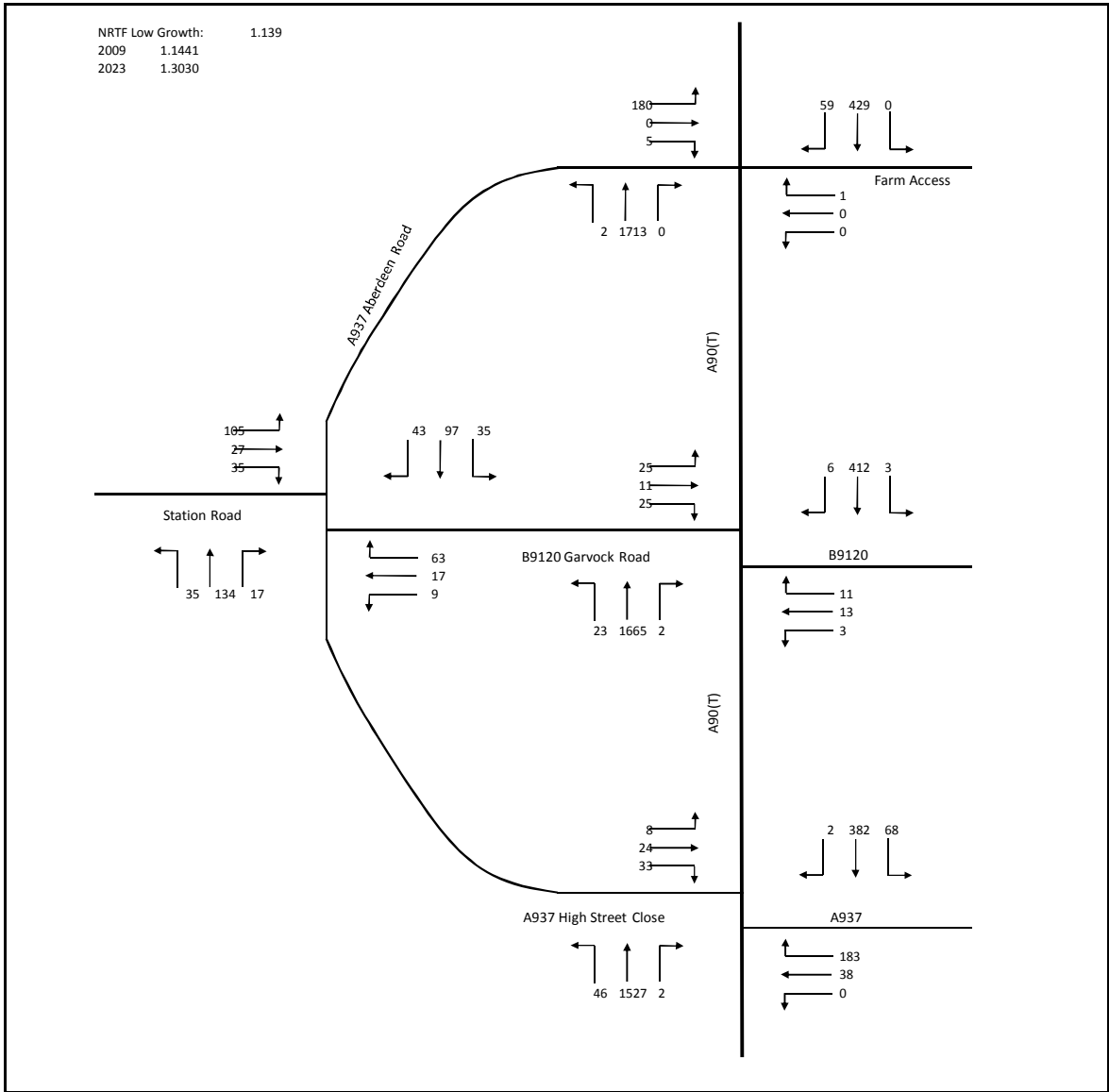


2009 Observed PM Traffic Flows

figure 3

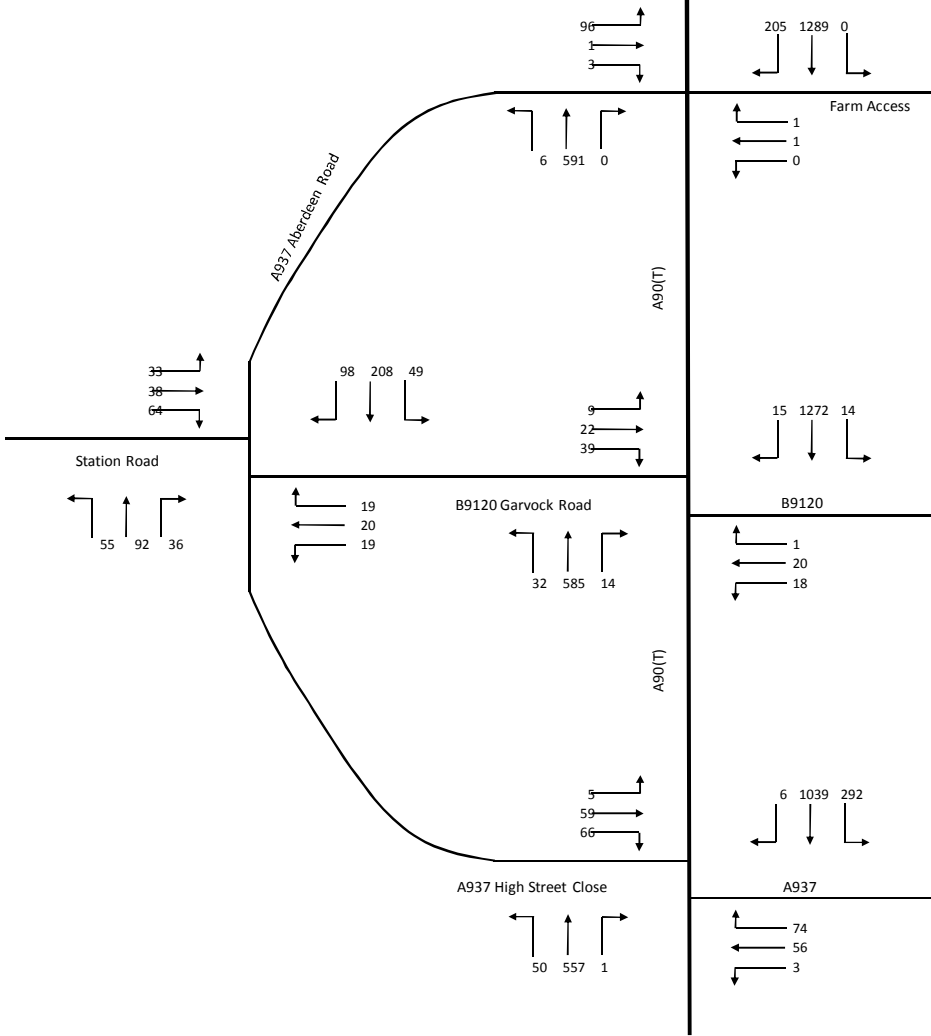


NRTF Low Growth: 1.139  
 2009 1.1441  
 2023 1.3030



2023 Factored AM Traffic Flows

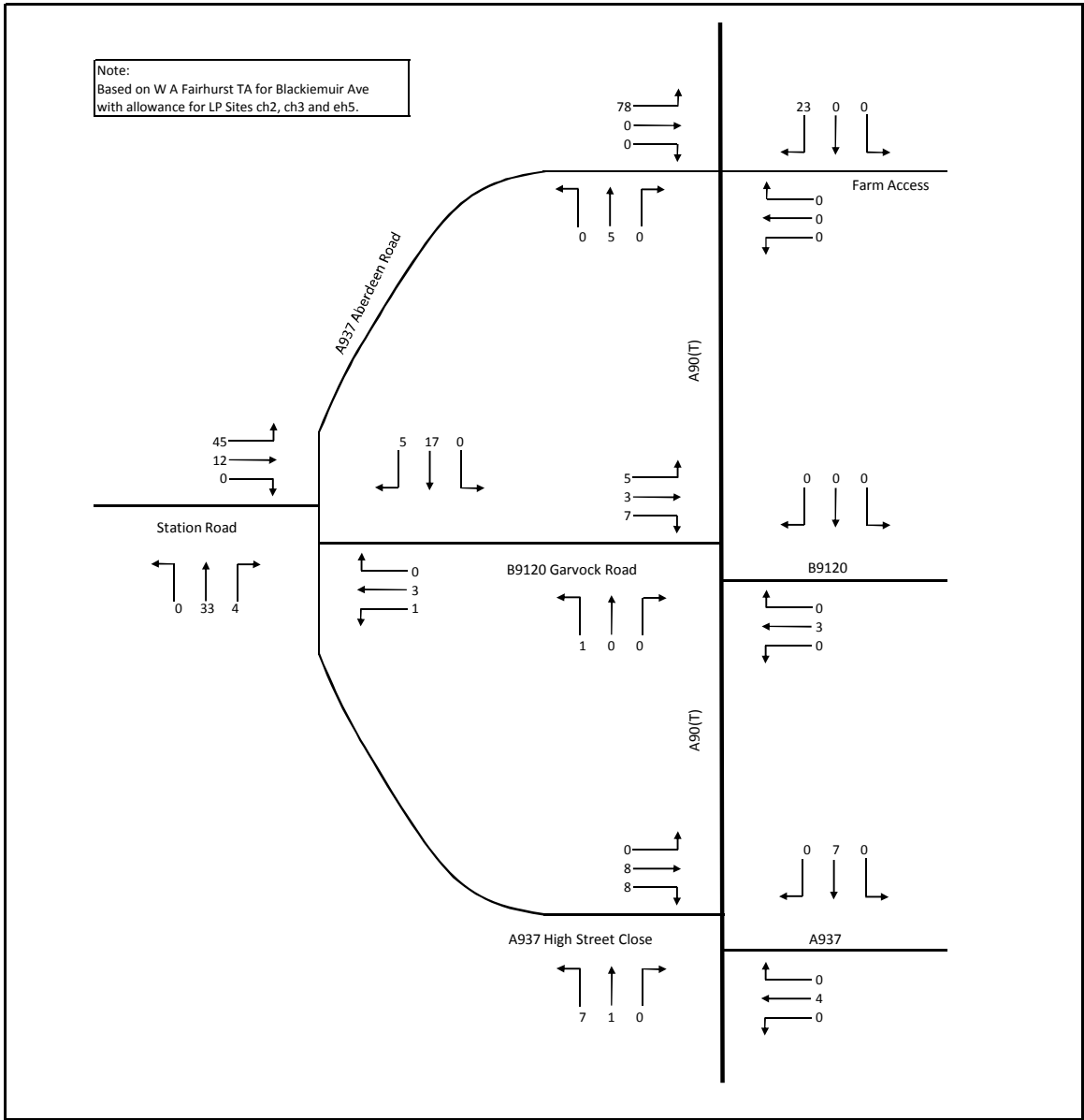
NRTF Low Growth: 1.139  
 2009 1.1441  
 2023 1.3030



2023 Factored PM Traffic Flows

figure 5

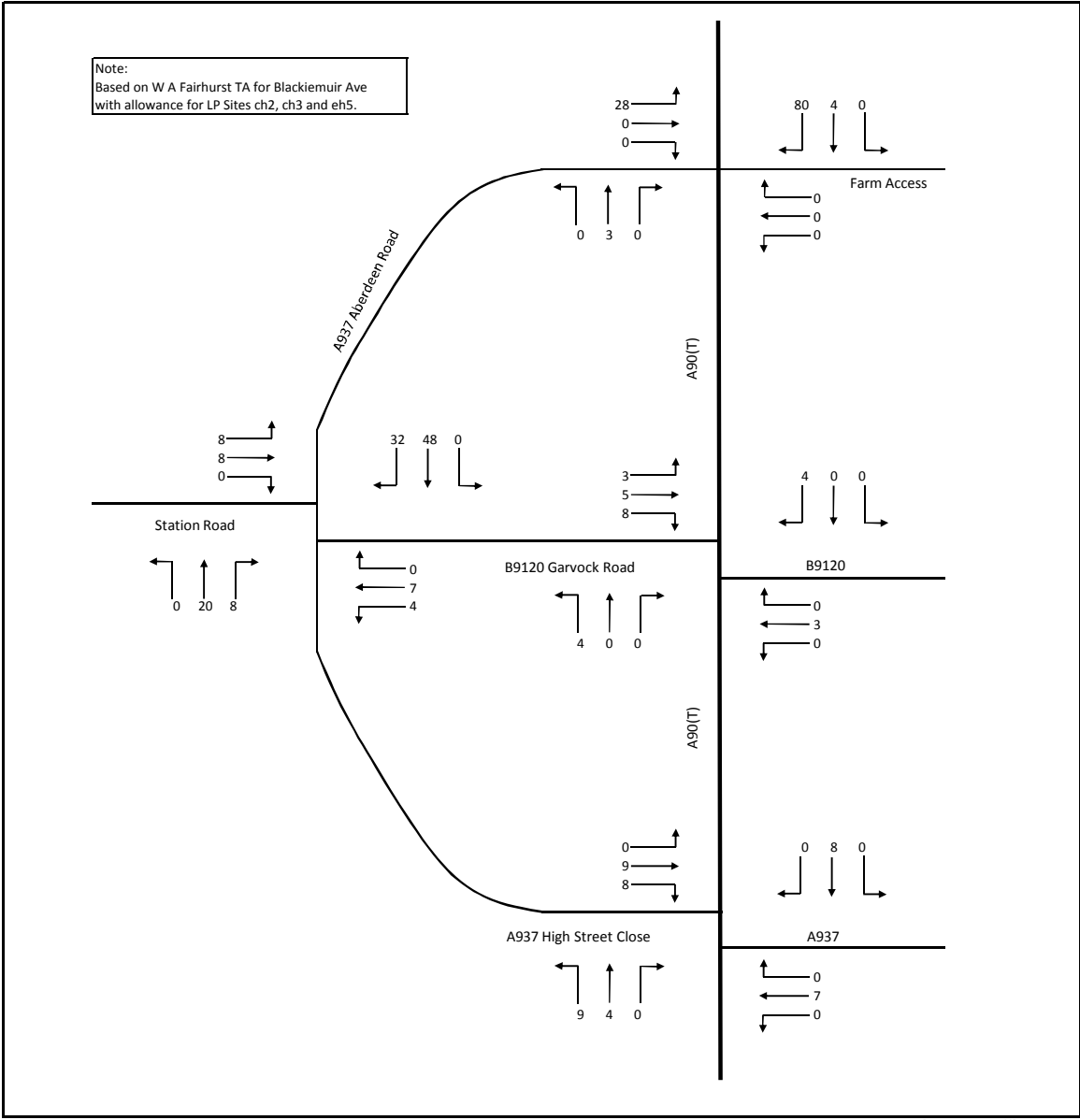
Note:  
Based on W A Fairhurst TA for Blackiemuir Ave  
with allowance for LP Sites ch2, ch3 and eh5.



Adopted LP Allocation AM Traffic Flows

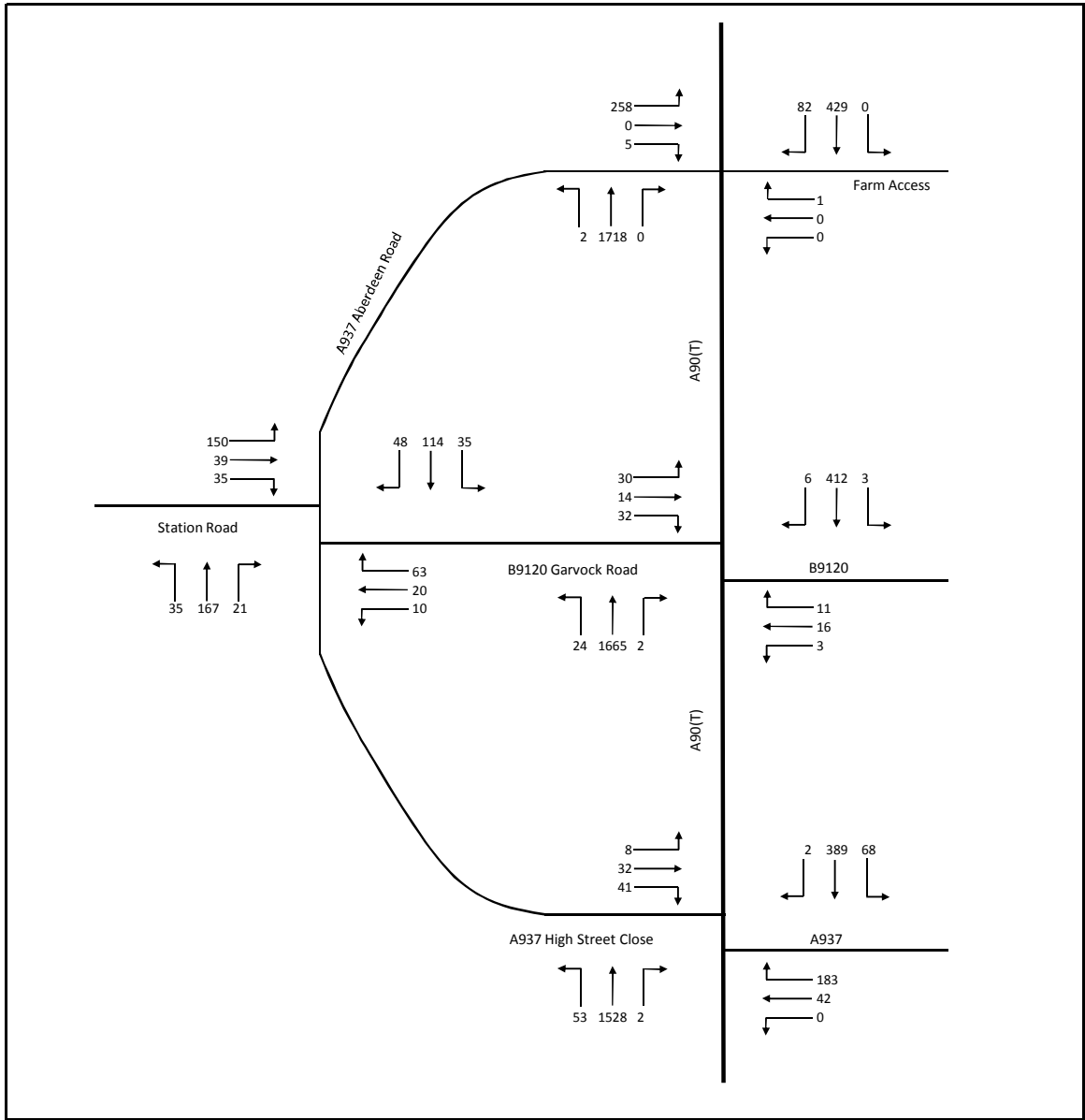
figure 6

Note:  
Based on W A Fairhurst TA for Blackiemuir Ave  
with allowance for LP Sites ch2, ch3 and eh5.



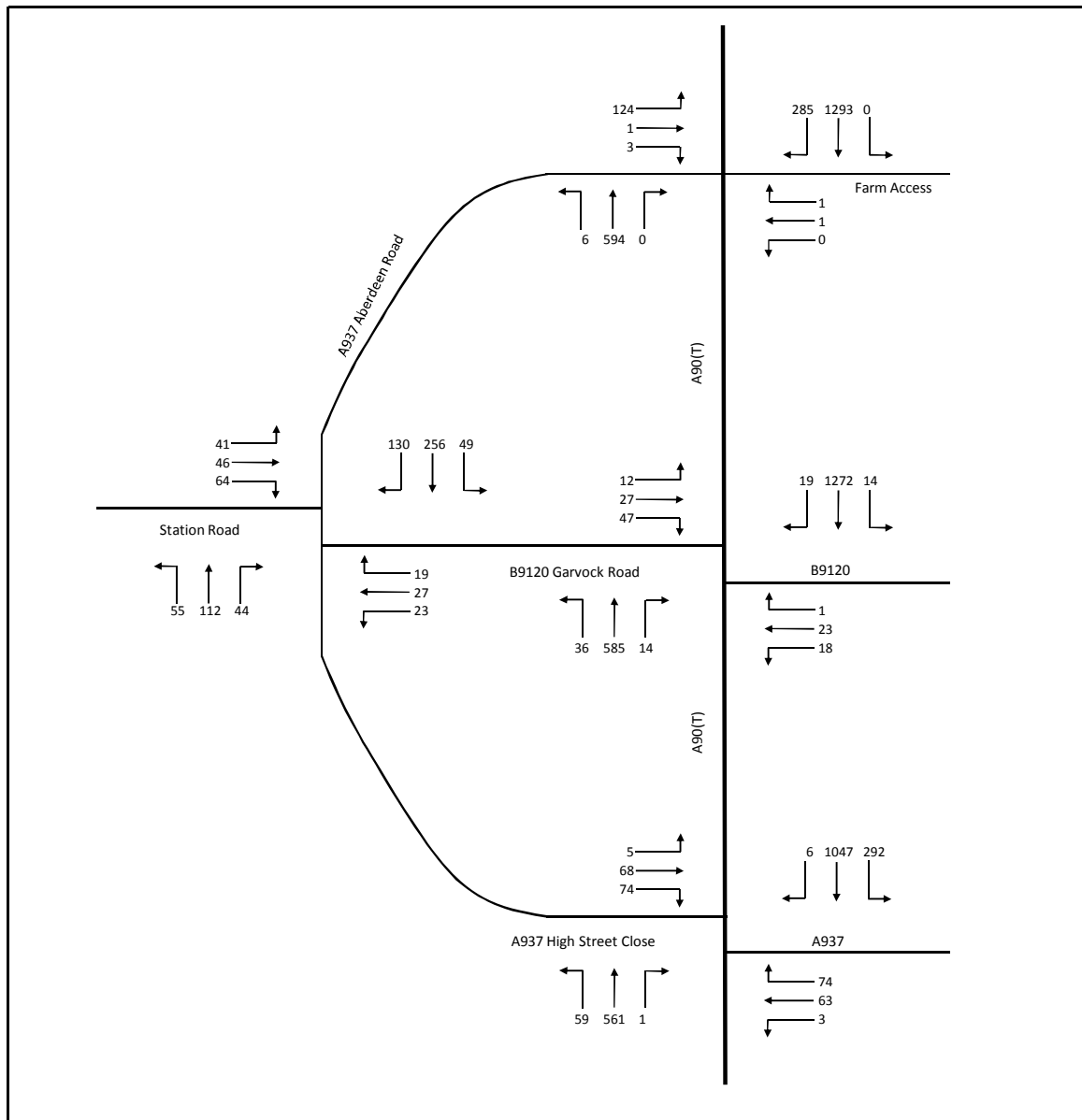
Adopted LP Allocation PM Traffic Flows

figure 7



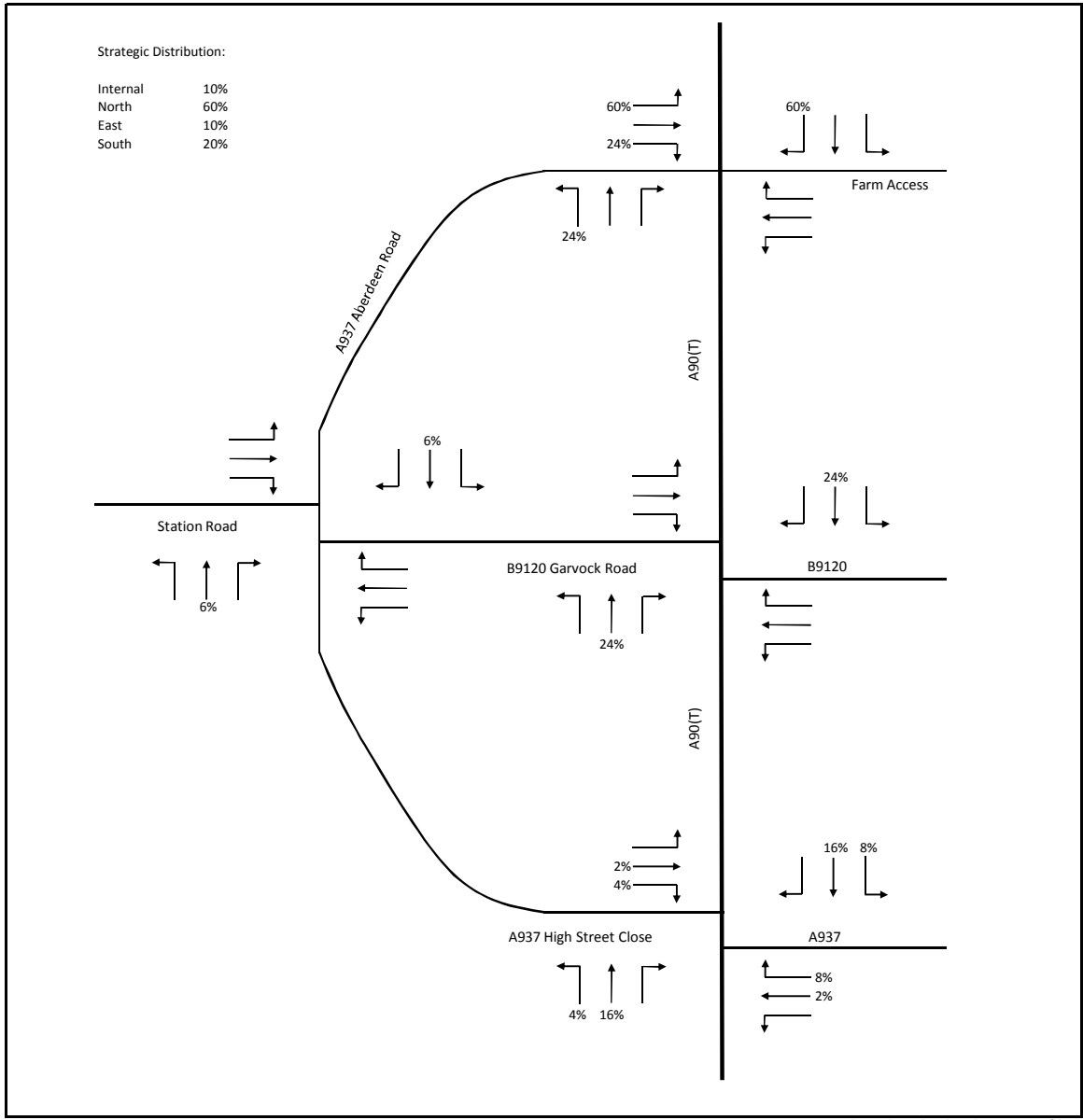
2023 AM Base Traffic Flows

figure 8



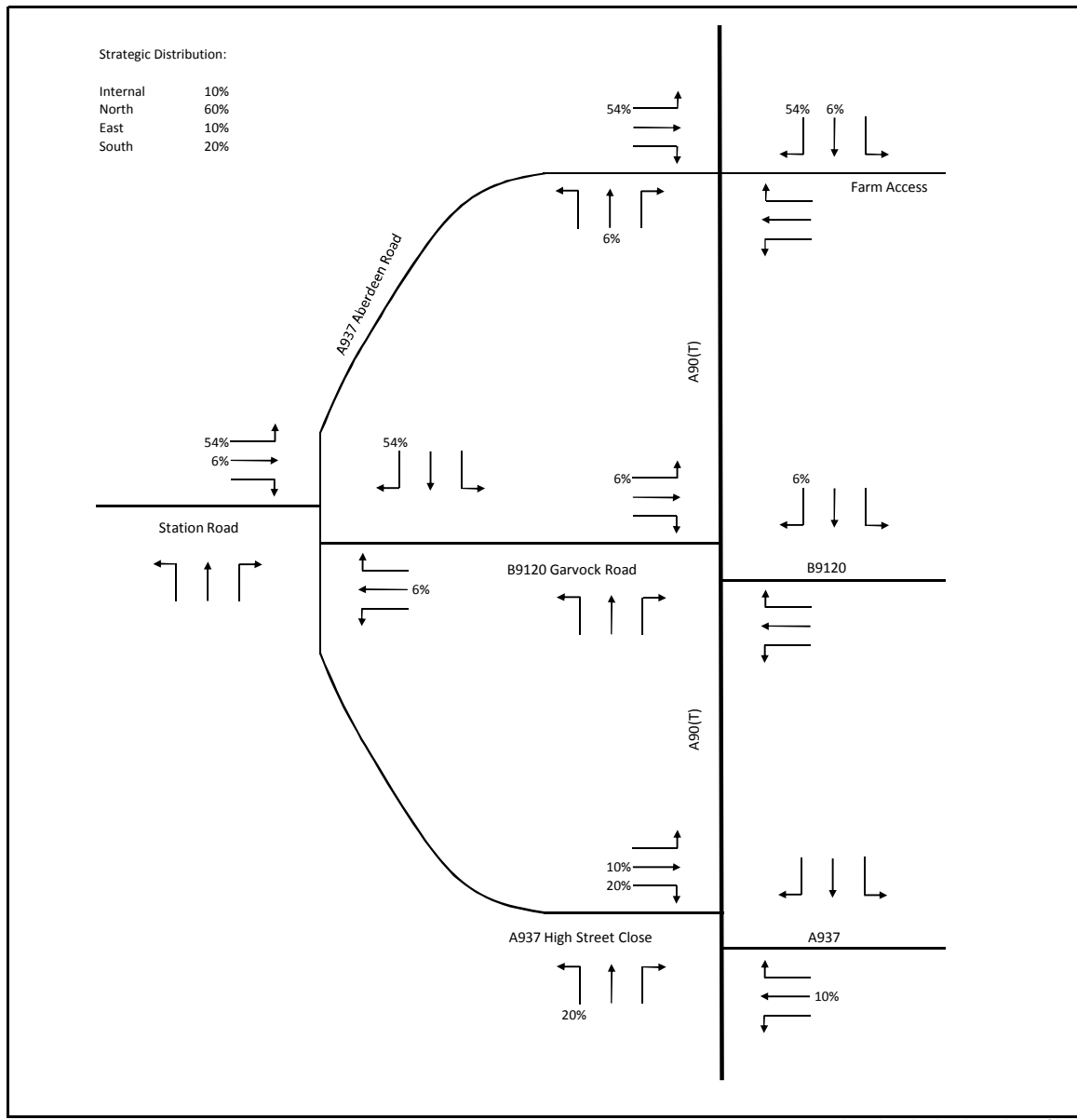
2023 PM Base Traffic Flows

figure 9



Residential Distribution North Site

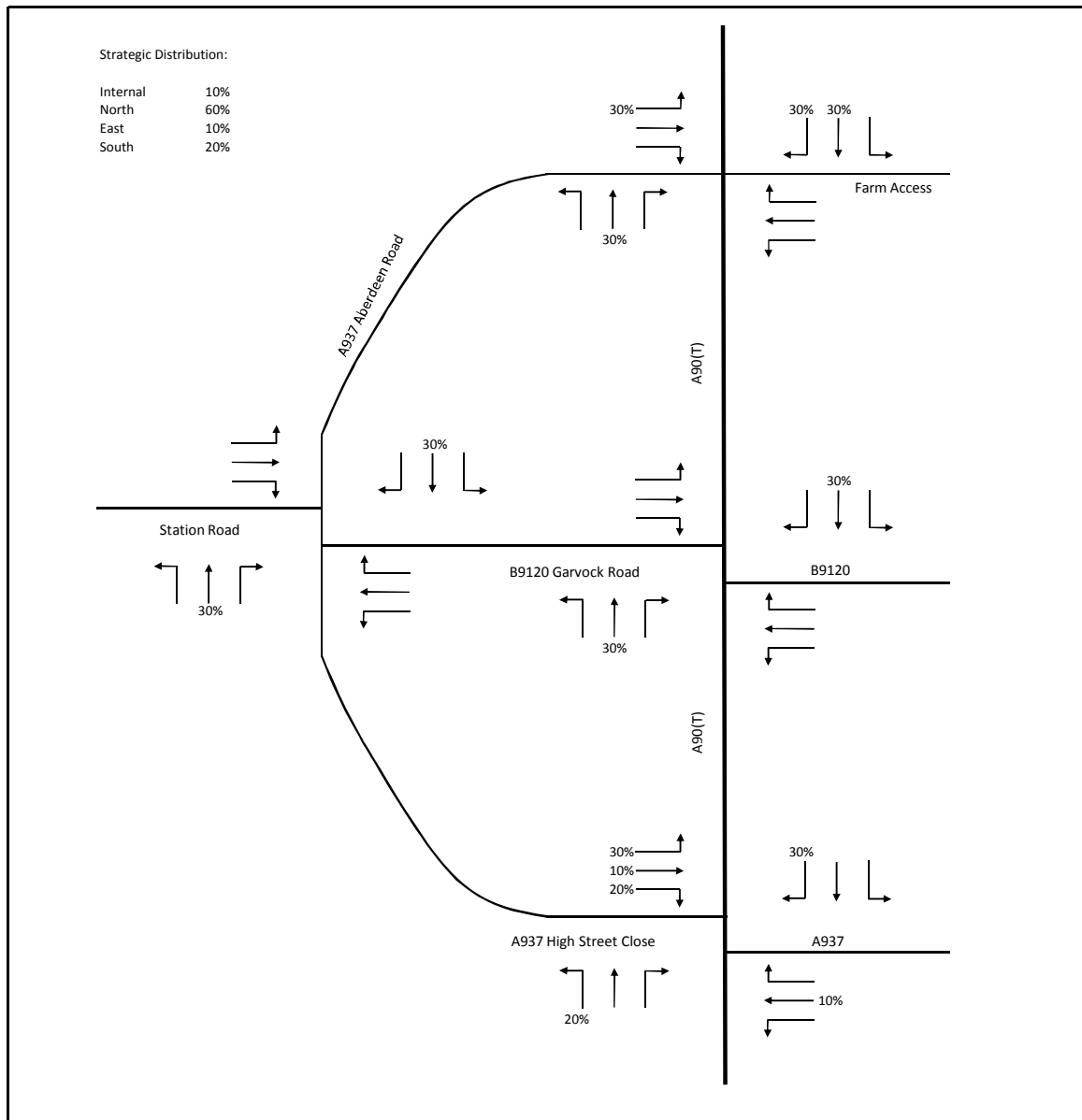
figure 10



Residential Distribution Middle Site

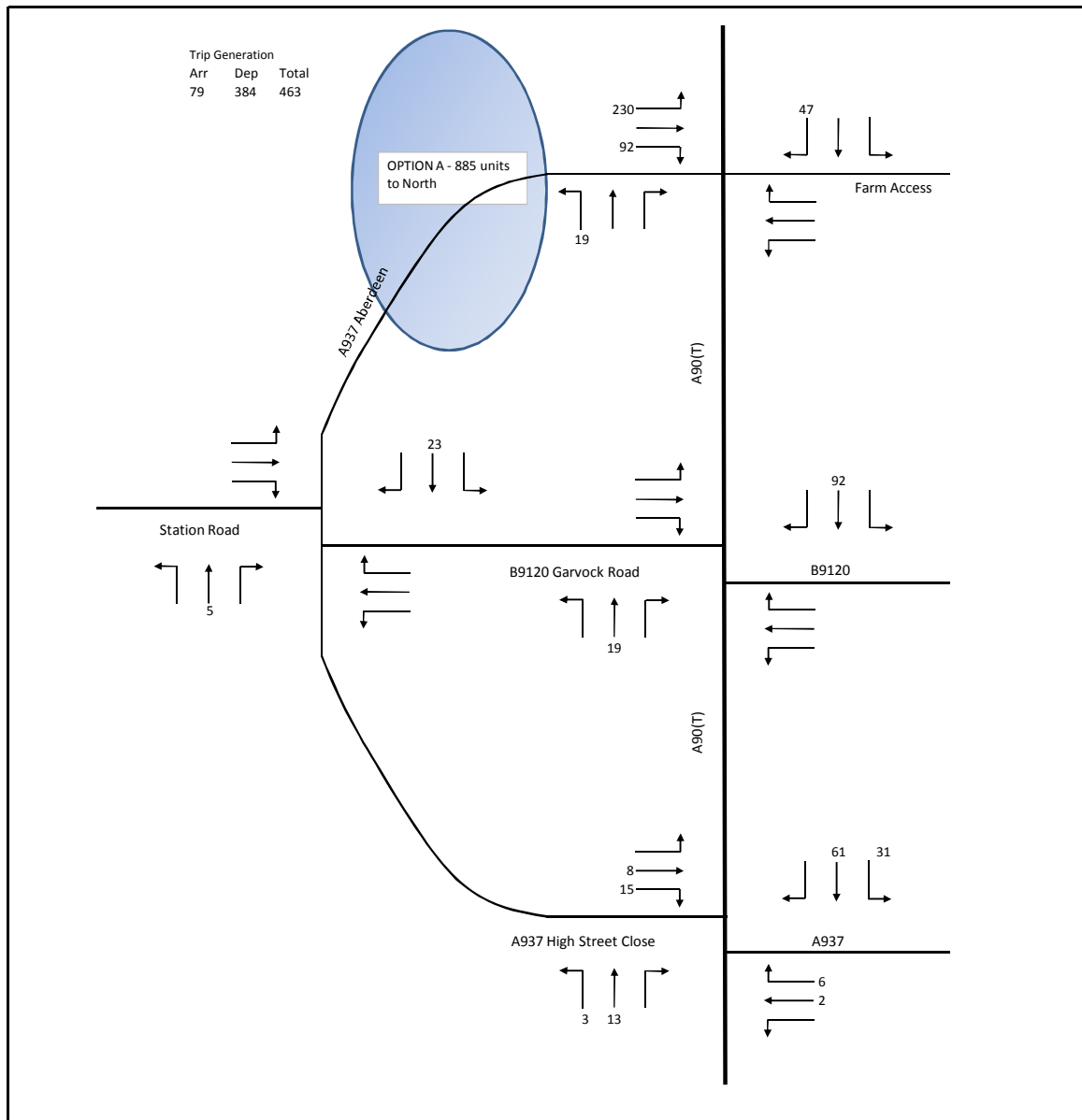
figure 11





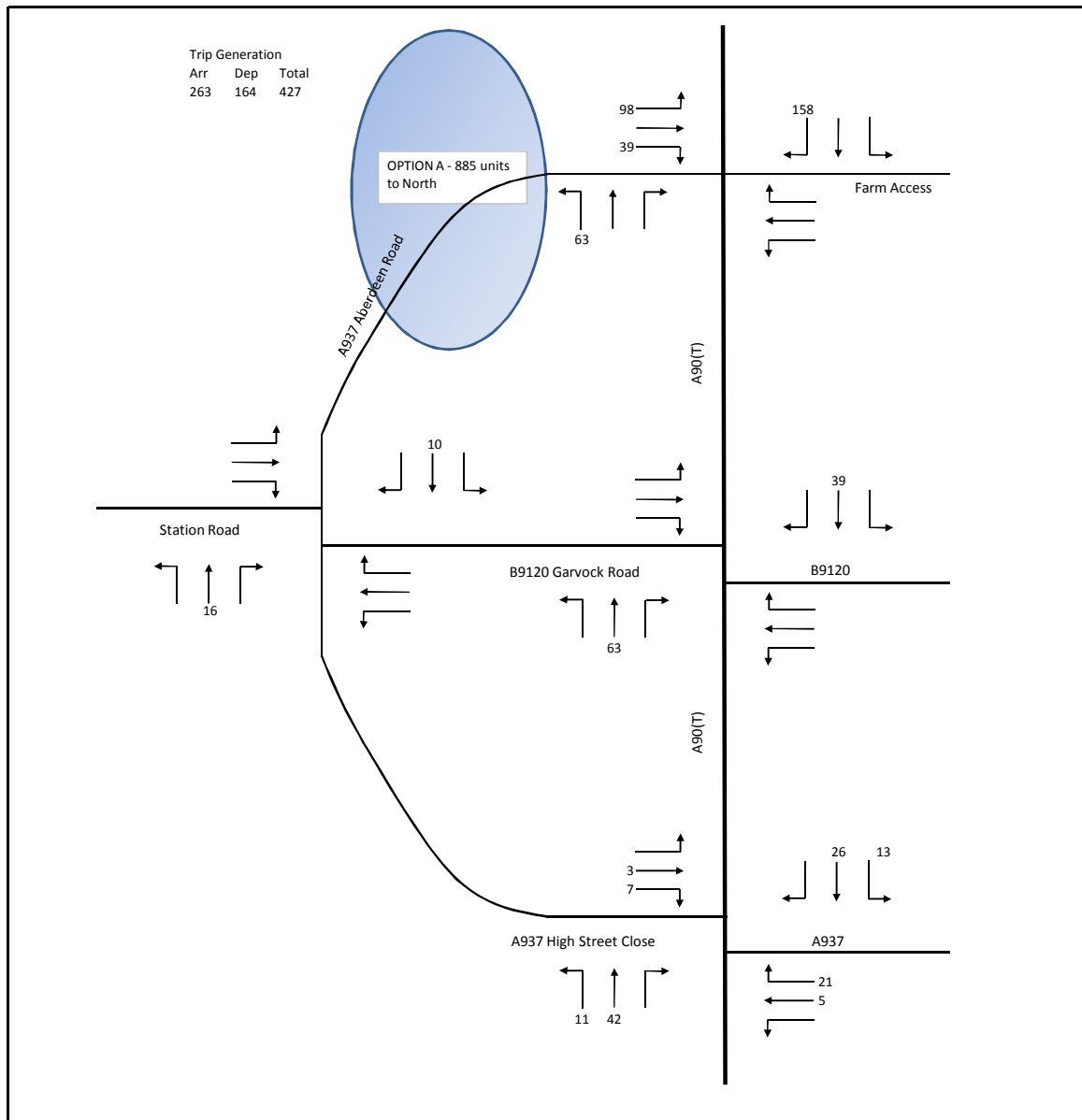
Residential Distribution South Site

figure 12



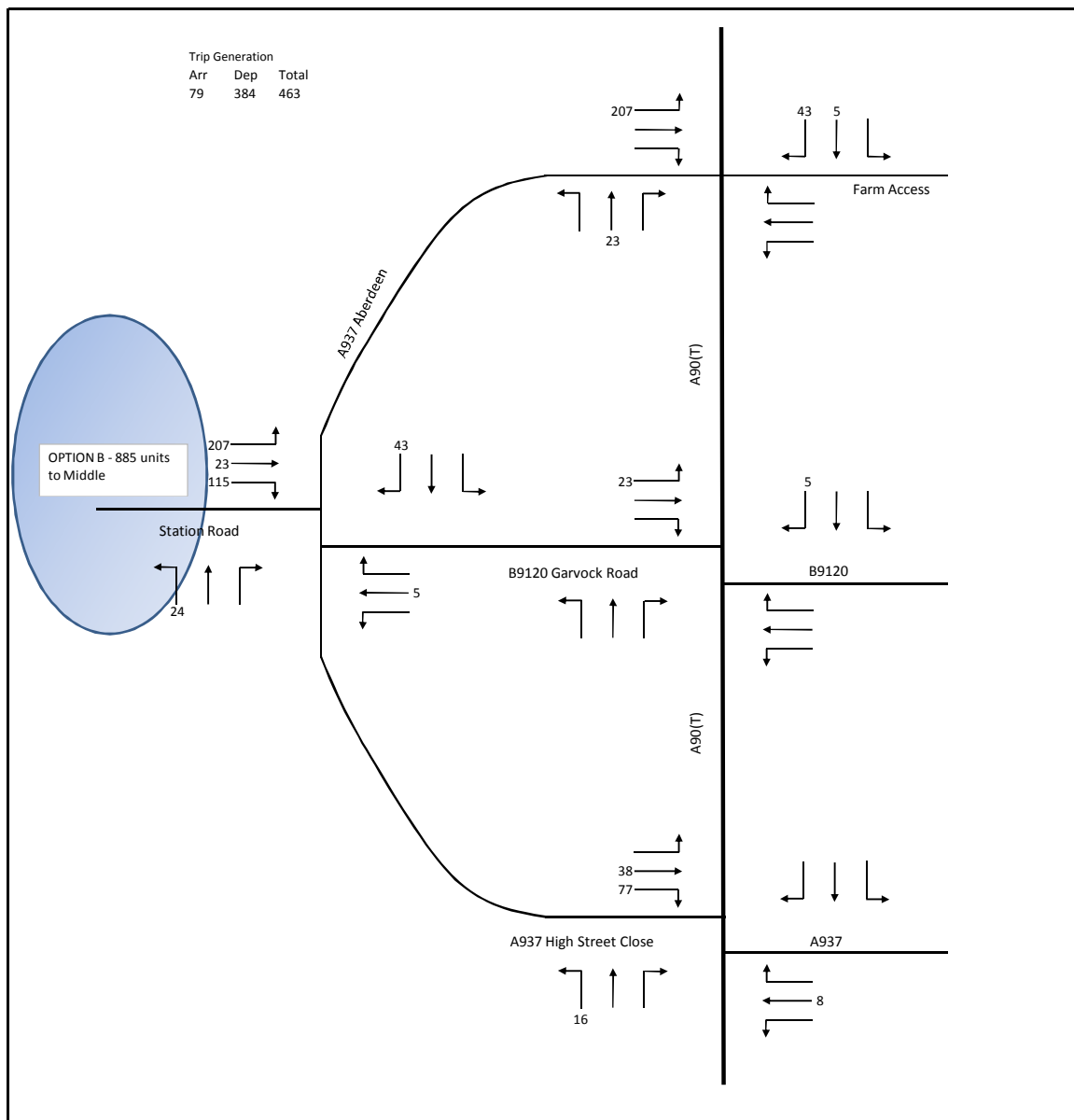
Residential Development AM Traffic Flows North Site

figure 13



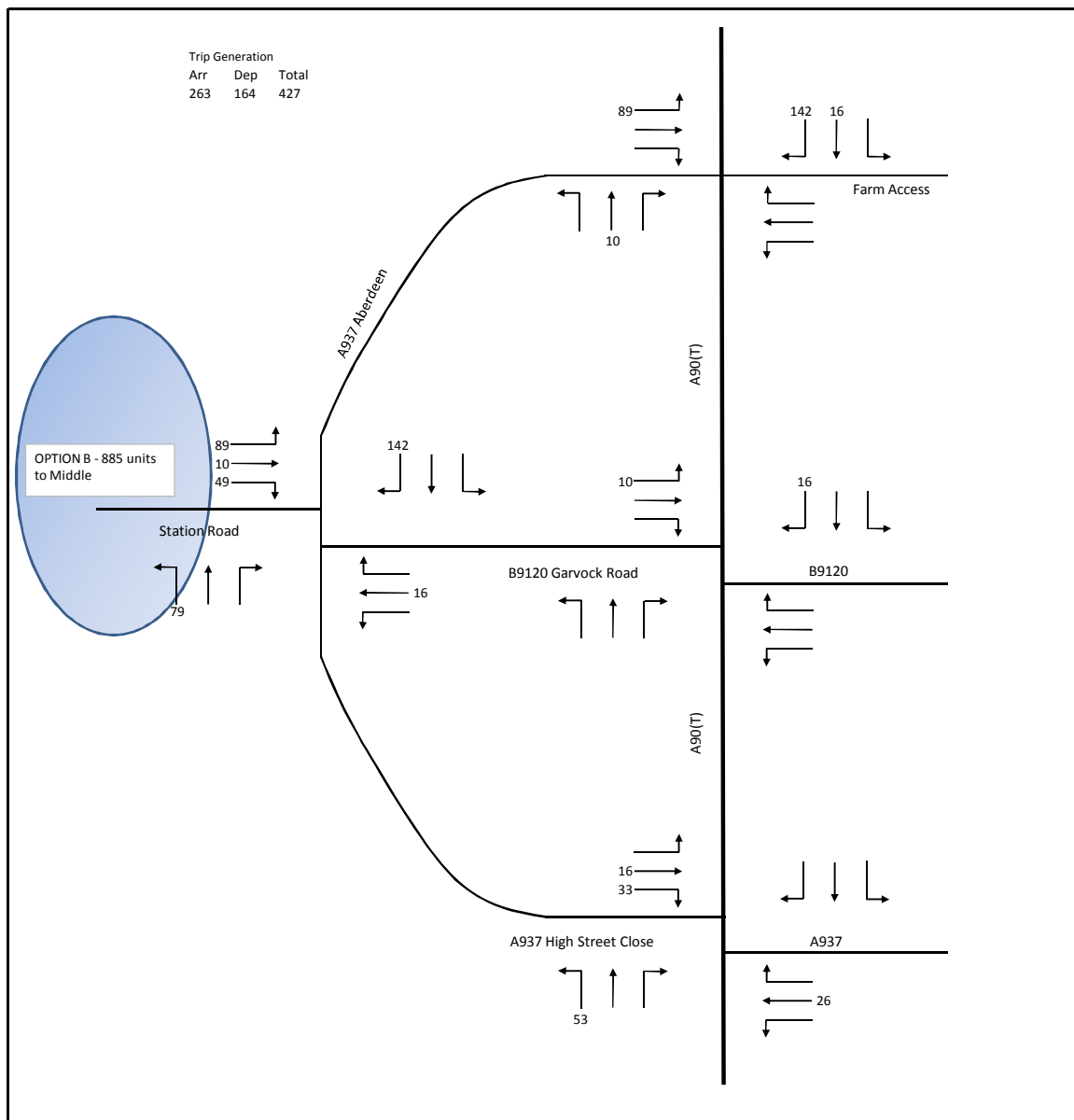
Residential Development PM Traffic Flows North Site

figure 14



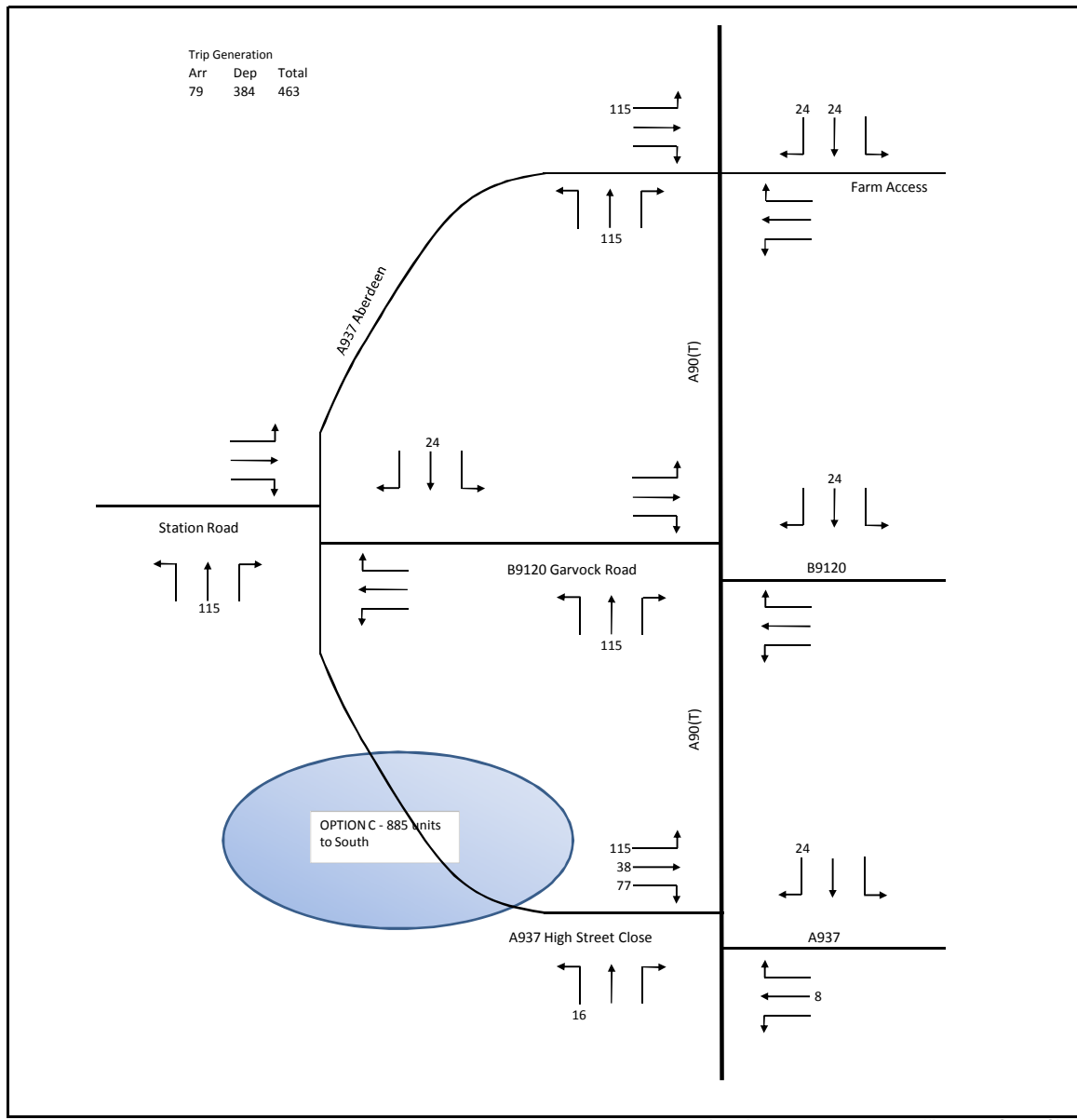
Residential Development AM Traffic Flows Middle Site

figure 15



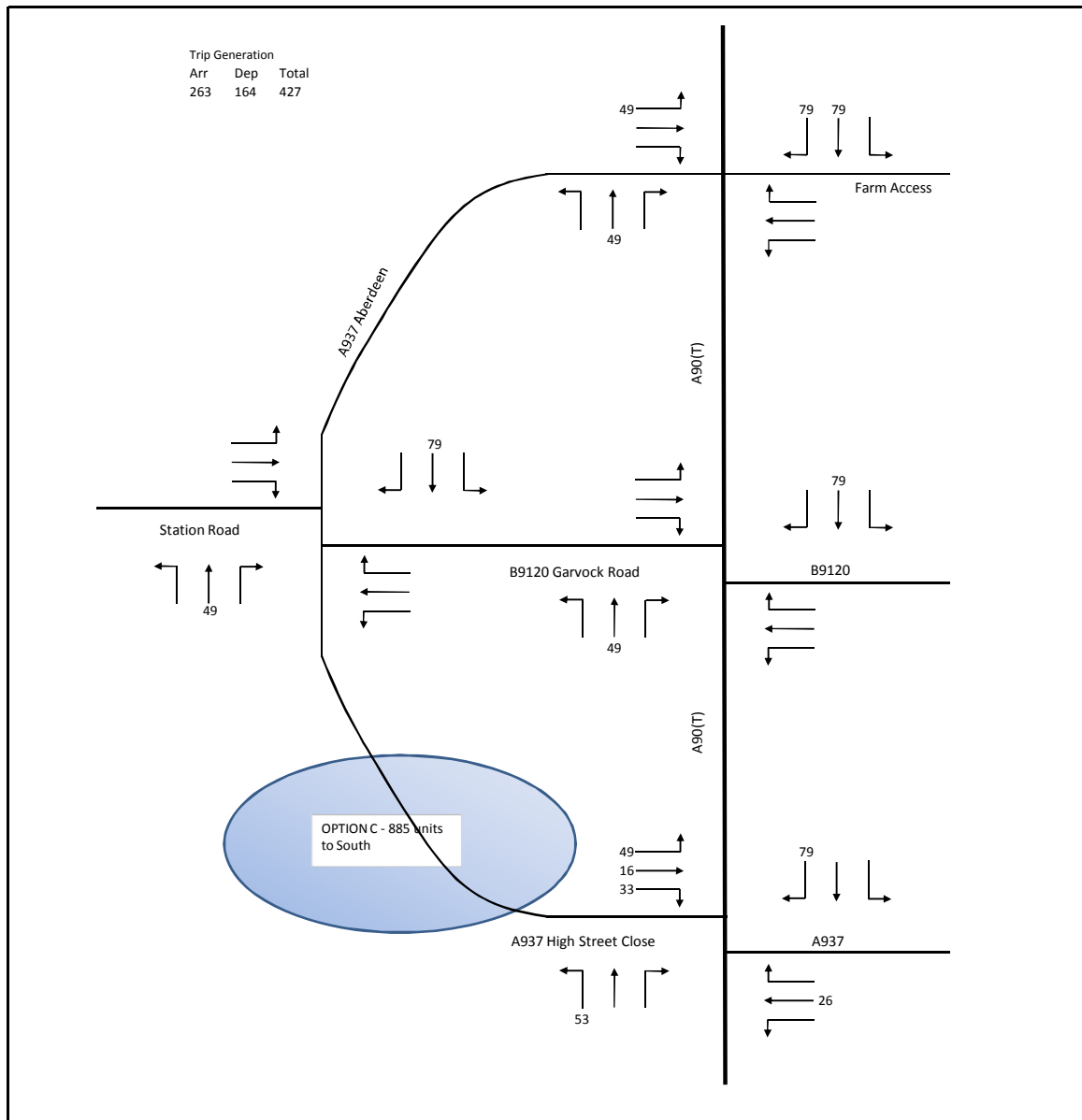
Residential Development PM Traffic Flows Middle Site

figure 16



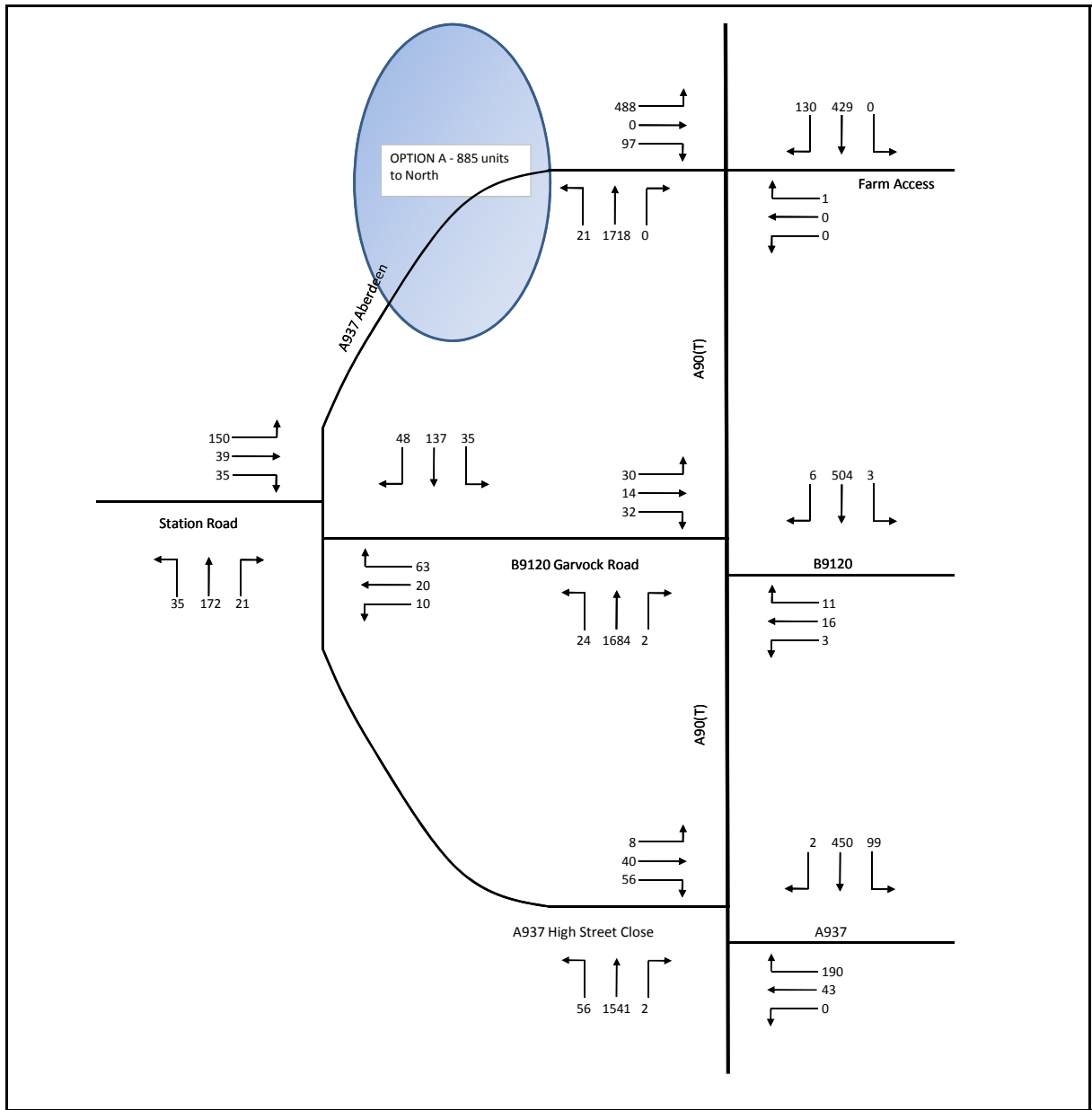
Residential Development AM Traffic Flows South Site

figure 17



Residential Development PM Traffic Flows South Site

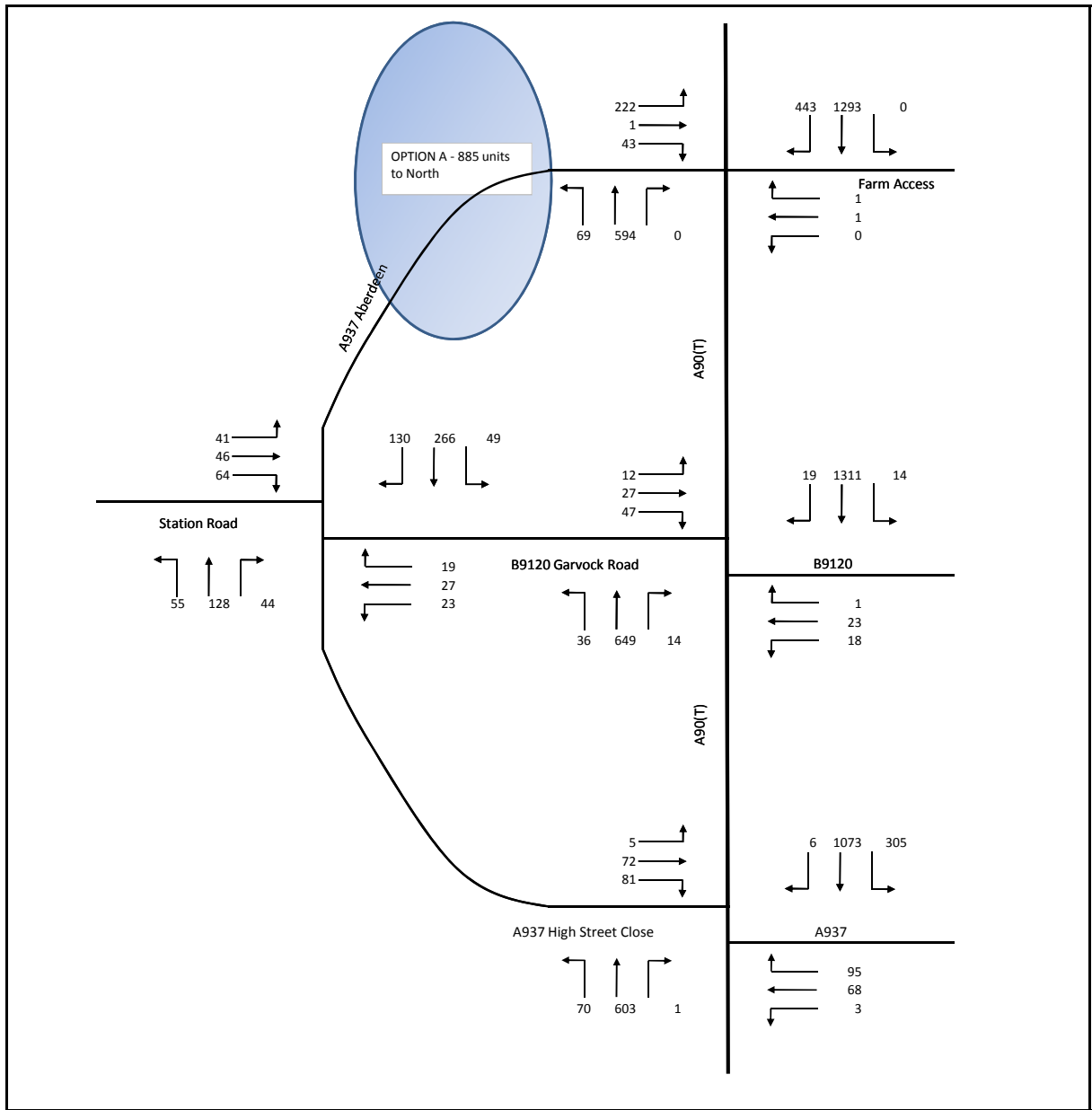
figure 18



2023 AM Base Traffic Flows + Development Flows (North Site)

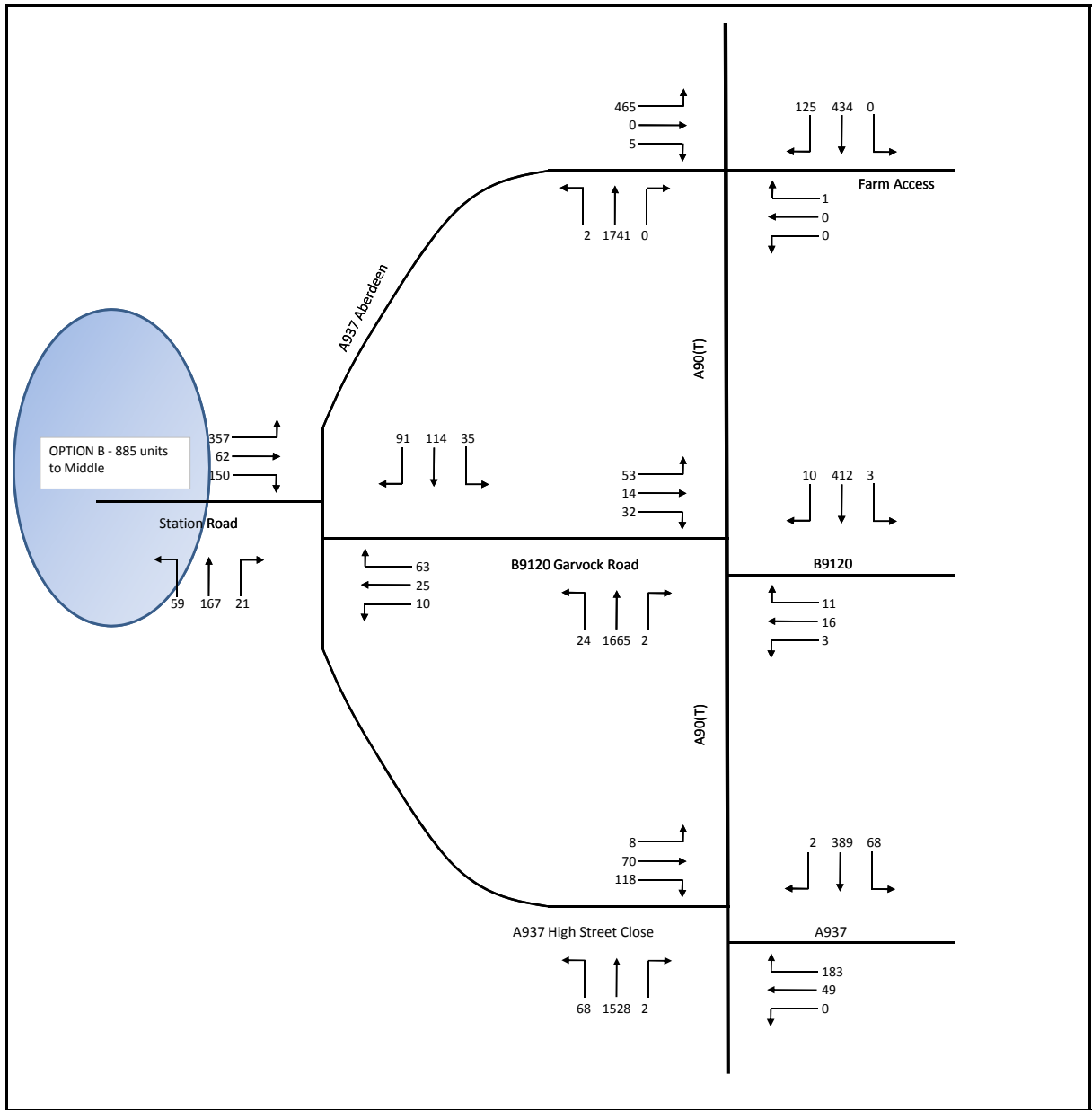
figure 19



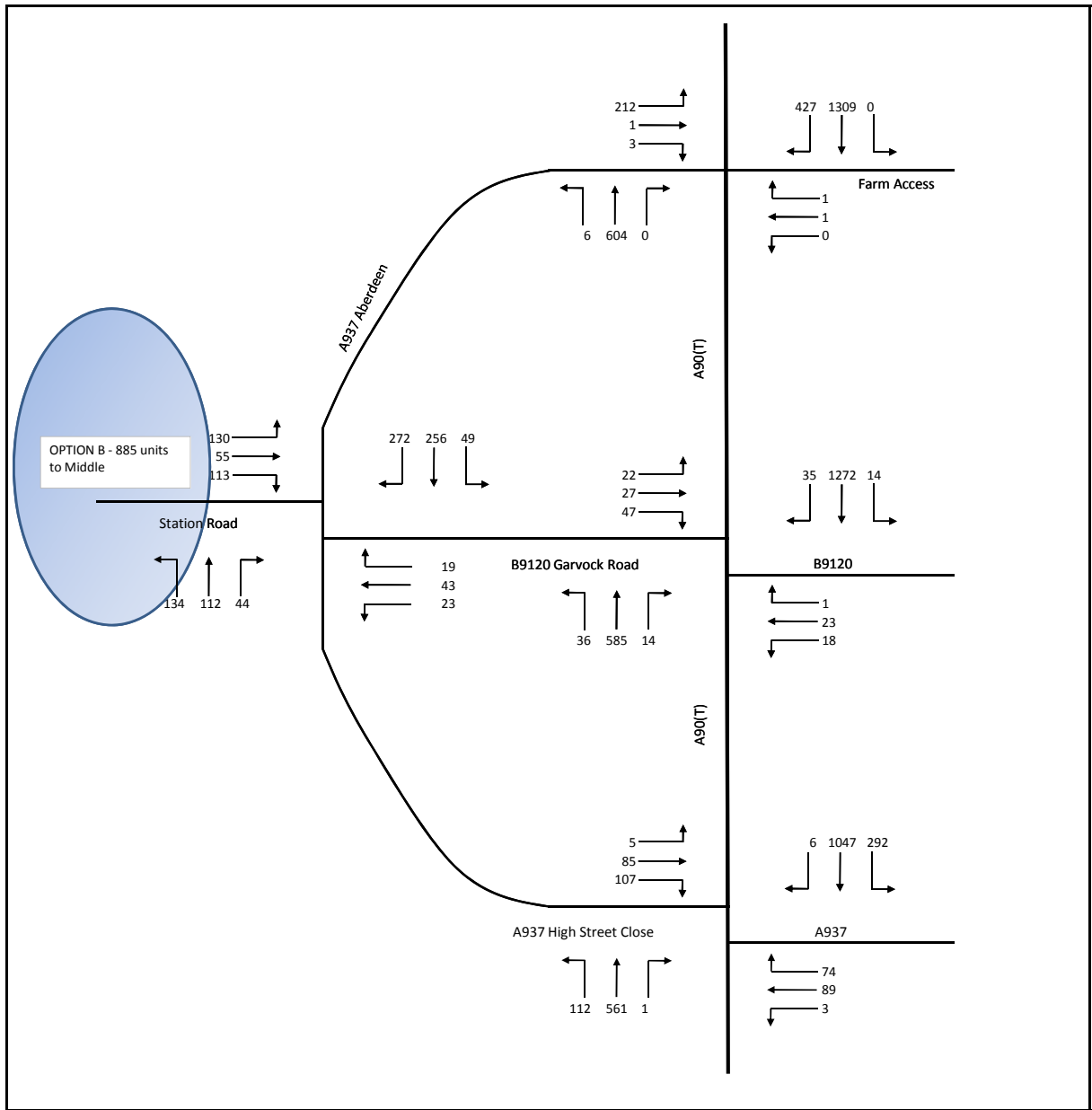


2023 PM Base Traffic Flows + Development Flows (North Site)

figure 20

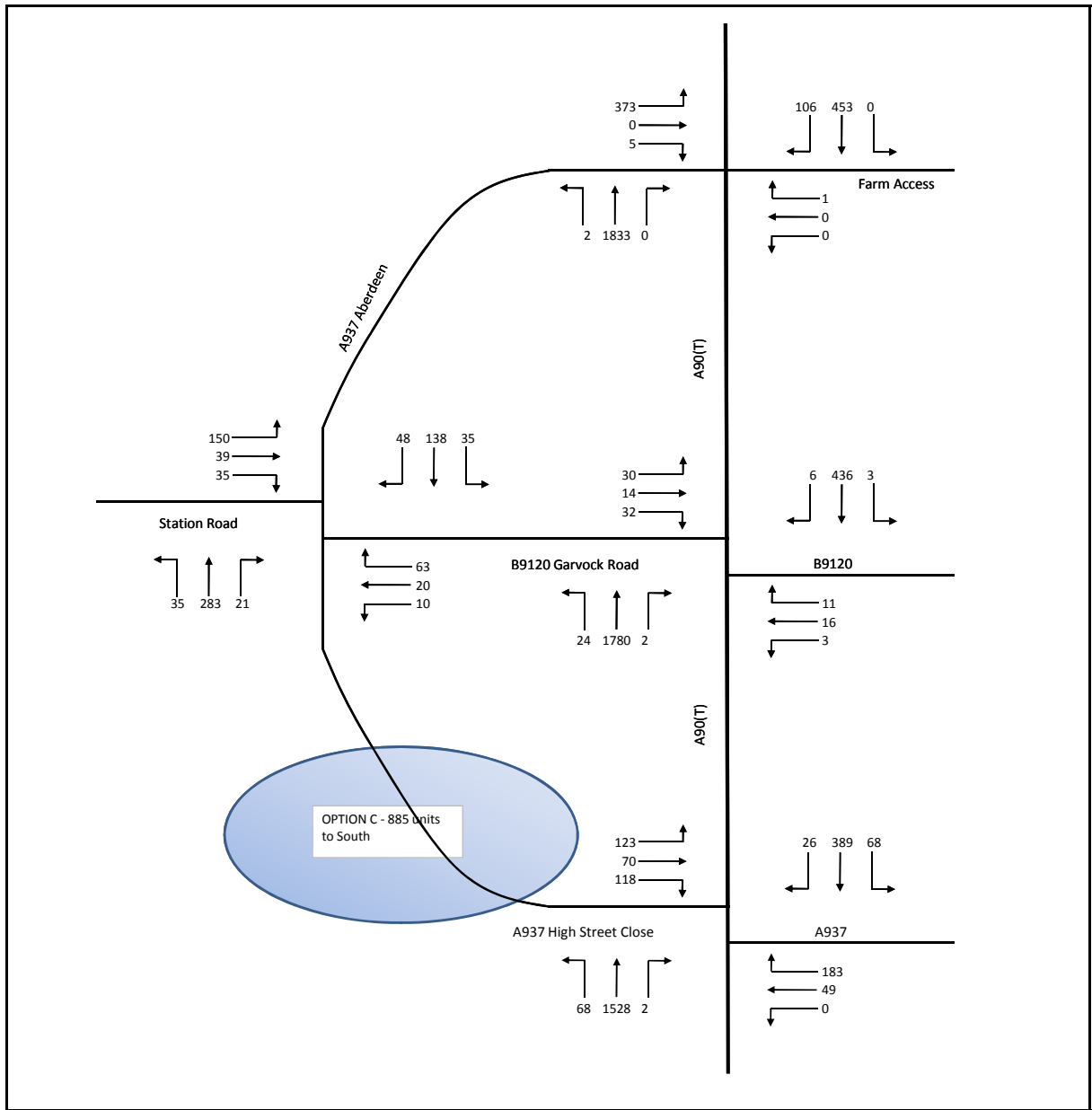


2023 AM Base Traffic Flows + Development Flows (Middle Site)



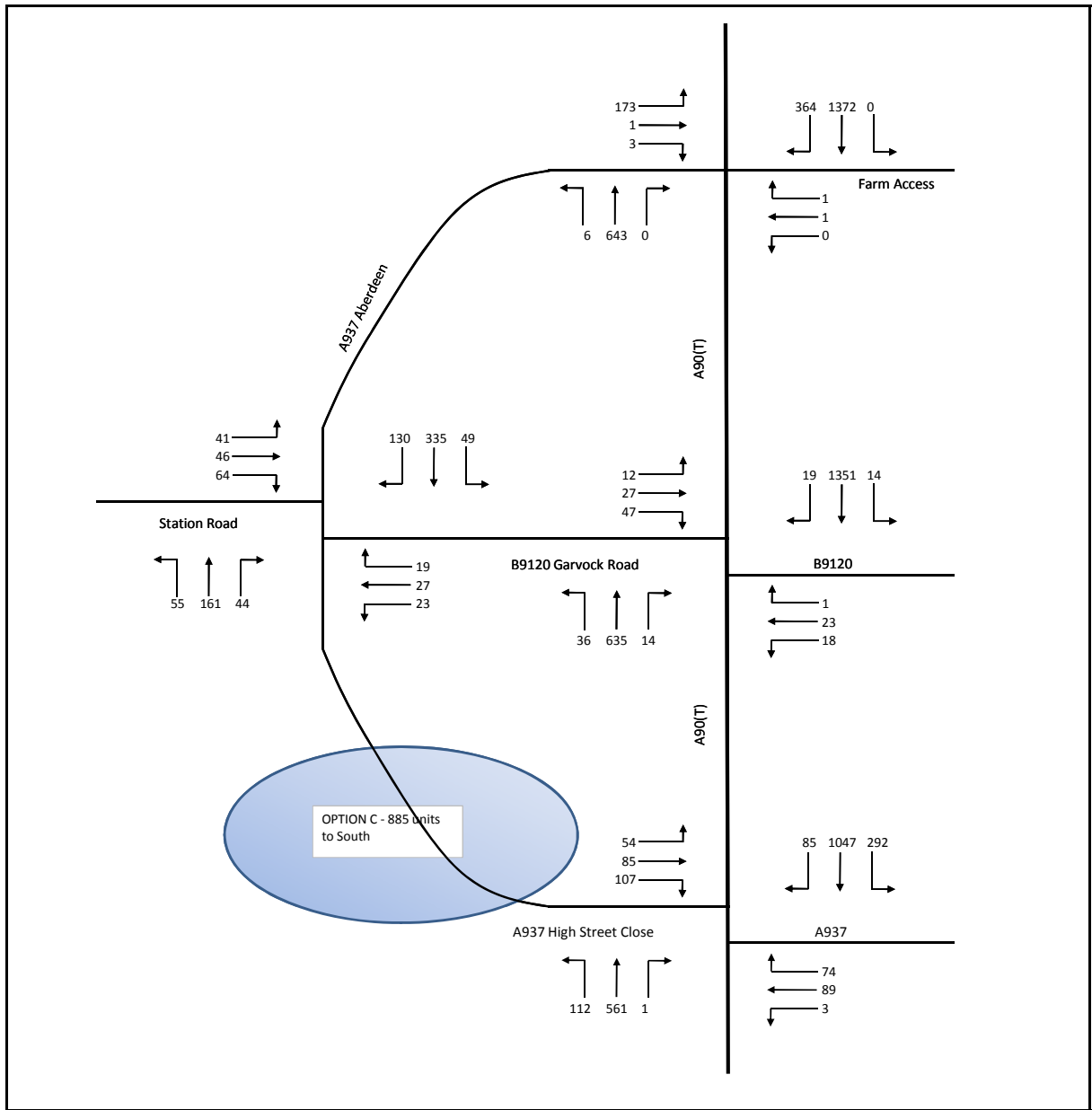
2023 PM Base Traffic Flows + Development Flows (Middle Site)

figure 22



2023 AM Base Traffic Flows + Development Flows (South Site)

figure 23



2023 PM Base Traffic Flows + Development Flows (South Site)

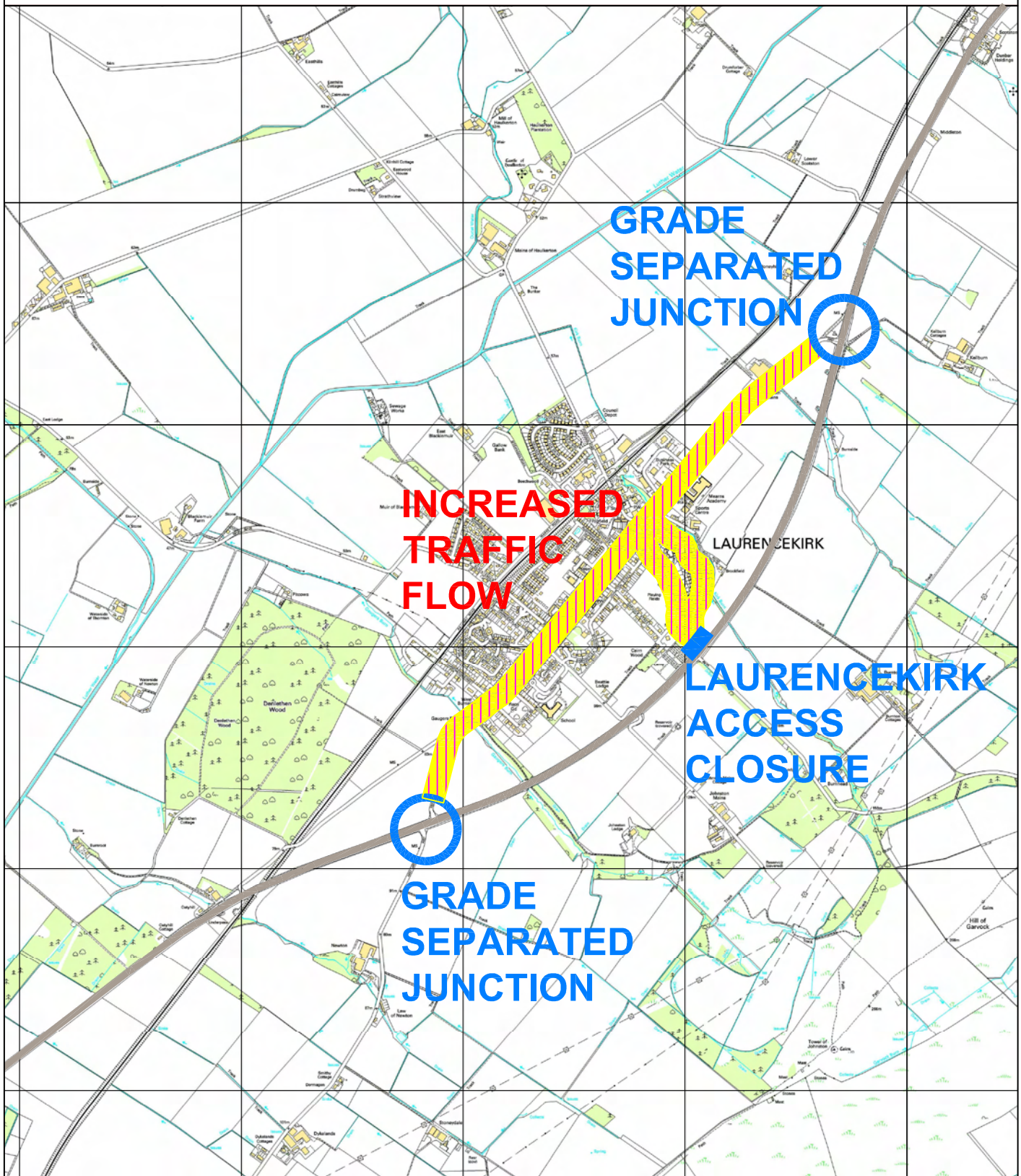
figure 24

# Appendix D

## Option Figures

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Job No	Report No	Issue no	Report Name
SCT6310D	1	1	Aberdeenshire Council





➤ North Junction - Compact Grade Separated Layout

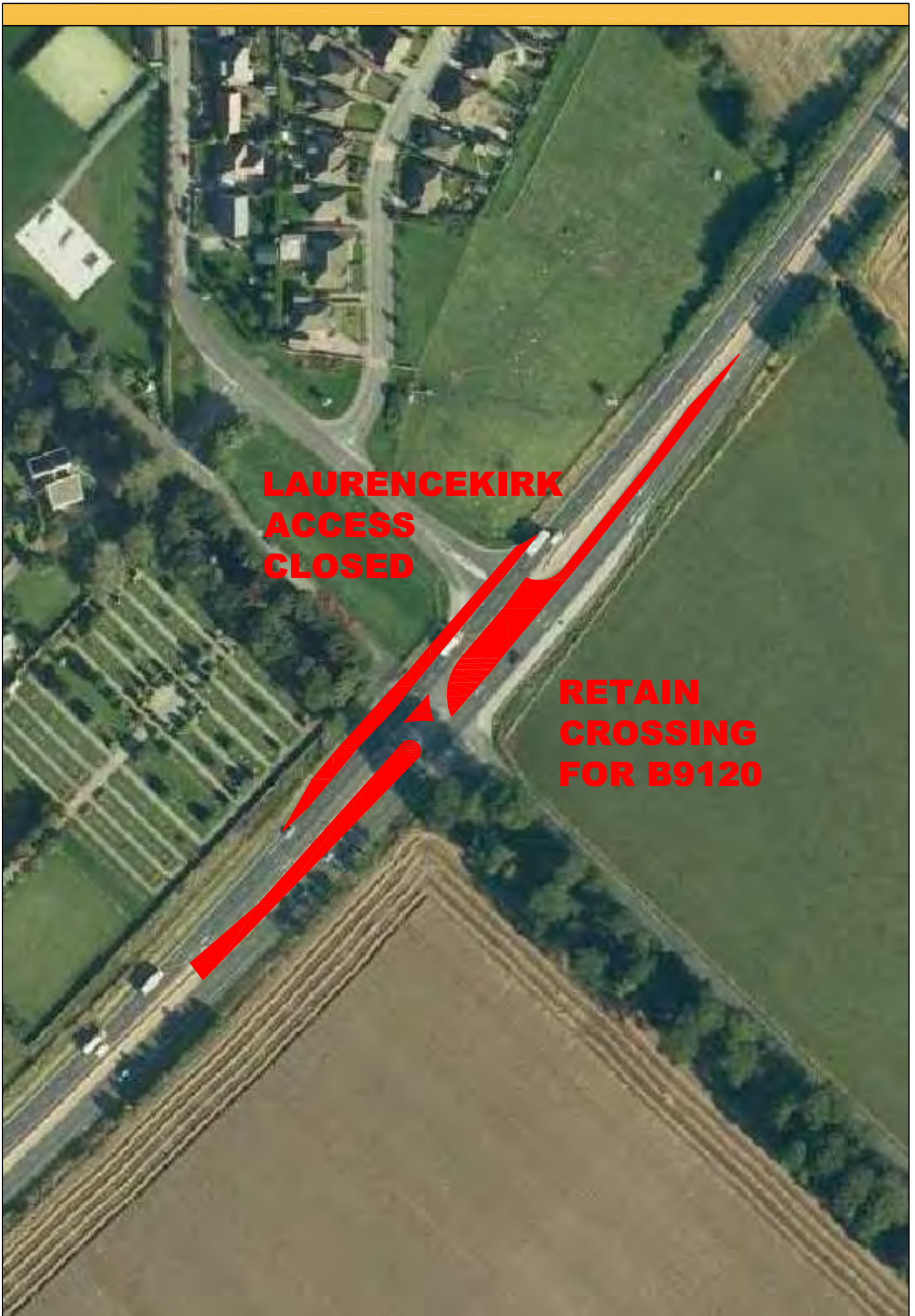
Figure 2





➤ South Junction - Compact Grade Separated Layout

Figure 3




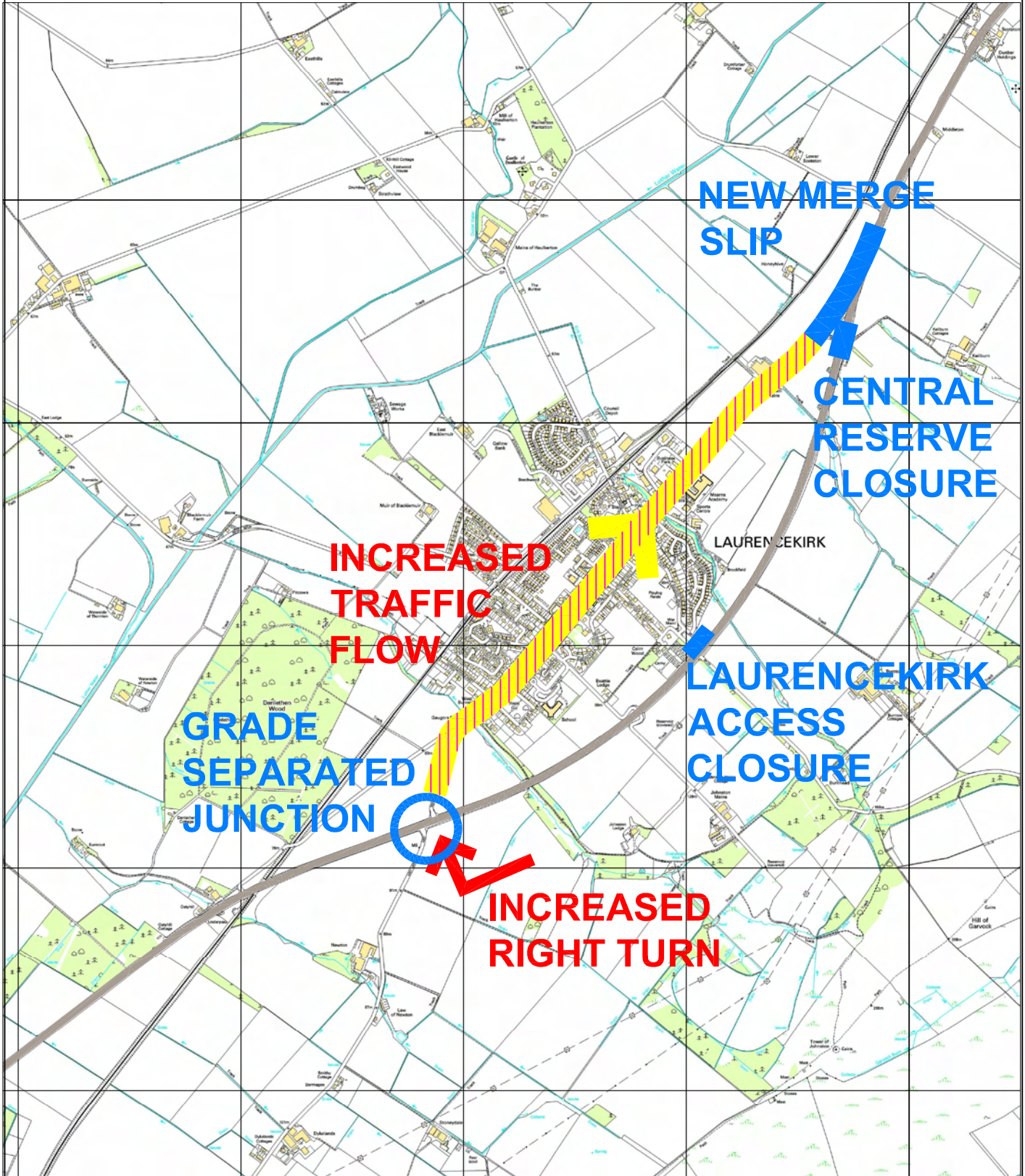
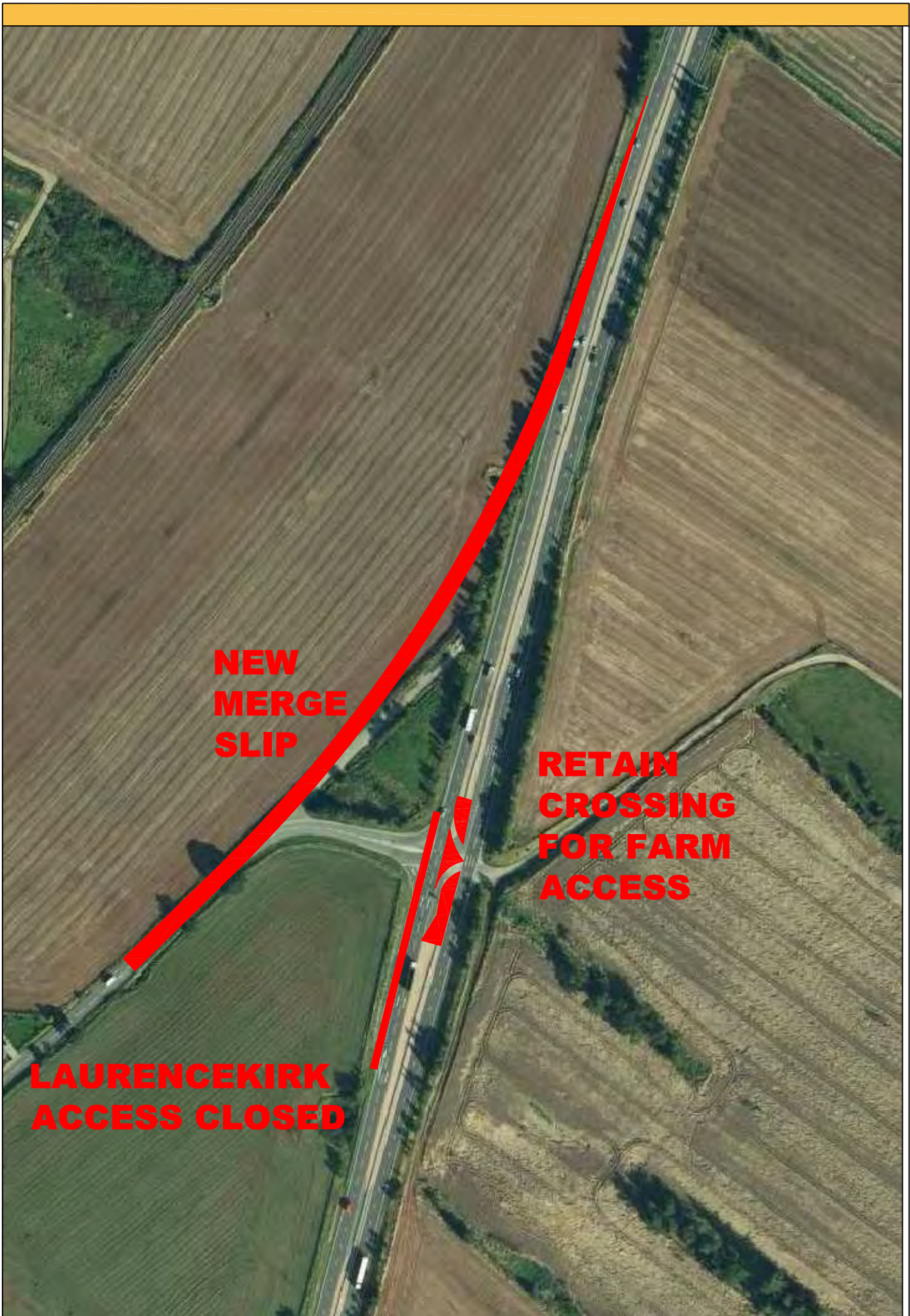
 Mid Junction - Partial Closure

Figure 4





➤ North Junction - Alternative Layout

Figure 6