



# Further Assessment of Air Quality Perth and Kinross Council

**Report to Perth and Kinross Council** 

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# **Executive summary**

The UK Government published its strategic policy framework for air quality management in 1995 establishing national strategies and policies on air quality which culminated in the Environment Act, 1995. The Air Quality Strategy provides a framework for air quality control through air quality management and air quality standards. These and other air quality standards<sup>1</sup> and their objectives<sup>2</sup> have been enacted through the Air Quality Regulations in 1997 and 2000 and the Air Quality (Amendment) Regulations 2002. The Environment Act 1995 requires Local Authorities to undertake an air quality review. In areas where the air quality objective is not anticipated to be met, Local Authorities are required to establish Air Quality Management Areas to improve air quality.

The intention is that local authorities should only undertake a level of assessment that is proportionate to the risk of air quality objectives being exceeded. The first step in the second round of review and assessment is an Updating and Screening Assessment (USA), which is to be undertaken by all authorities. Where the USA has identified a risk that an air quality objective will be exceeded, the authority is required to undertake a detailed assessment.

The Detailed Assessment, completed in 2004 by the former netcen for Perth and Kinross Council, found that it was likely that the annual mean  $NO_2$  objective for 2005 would be exceeded and the  $PM_{10}$  objectives for 2010 will be exceeded in areas where personal relevant exposure occurs. The report concluded that Perth and Kinross Council needed to declare an Air Quality Management Area to cover the area of exceedence in the Atholl Street/Barrack Street Junction and possibly other areas of Perth City. Subsequently the whole of the city of Perth was declared an AQMA for  $NO_2$  and  $PM_{10}$ .

The Updating and Screening Assessment for Perth and Kinross was completed in 2006. The monitoring data and DMRB modelling indicated a number of exceedences of the annual mean objective for nitrogen dioxide at busy junctions in Perth and no exceedences of the 2004 objectives for  $PM_{10}$  in the Perth and Kinross Council area. Projections to 2010 indicated that the annual mean objective of  $18\mu g m^{-3}$  for  $PM_{10}$  is unlikely to be met at a number of locations close to junctions in central Perth. All predicted and measured exceedences were inside the existing AQMA. The report concluded that Perth and Kinross Council was not required to carry out a Detailed Review and Assessment for carbon monoxide, benzene, 1,3-butadiene, lead, nitrogen dioxide,  $PM_{10}$  or sulphur dioxide.

The objective of this Further Assessment was to confirm the conclusions of the detailed assessment and to test out action planning scenarios to assess the likely impact they may have on pollutant concentrations in future years, and therefore their likely effectiveness.

The present report therefore constitutes a Further Assessment for Perth and Kinross Council. Only the impact of  $NO_2$  and  $PM_{10}$  emissions are considered in this report. This report investigates current and potential future nitrogen dioxide and  $PM_{10}$  levels through an examination of the location and size of principal traffic emission sources, emissions modelling exercises and by reference to monitored air quality data.

# Nitrogen Dioxide

It is recommended that Perth and Kinross Council retain their city wide air quality management area for NO<sub>2</sub>, and proceed with preparation of their action plan to reduce NO<sub>2</sub> concentrations in this area. In summary:

<sup>&</sup>lt;sup>1</sup> Refers to standards recommended by the Expert Panel on Air Quality Standards. Recommended standards are set purely with regard to scientific and medical evidence on the effects of the particular pollutants on health, at levels at which risks to public health, including vulnerable groups, are very small or regarded as negligible.
<sup>2</sup> Refers to objectives in the Strategy for each of the eight pollutants. The objectives provide policy targets by outlining what

<sup>&</sup>lt;sup>2</sup> Refers to objectives in the Strategy for each of the eight pollutants. The objectives provide policy targets by outlining what should be achieved in the light of the air quality standards and other relevant factors and are expressed as a given ambient concentration to be achieved within a given timescale.

#### NO<sub>2</sub> 2005 Base Case

This Further Assessment has confirmed a significant risk of exceedance of the UK annual mean objective for  $NO_2$  in 2005 in central Perth only. Both monitoring and modelling generally indicate that in 2005, for the Base Case, concentrations were above the required concentration at a maximum of 14 monitoring locations in Perth City Centre. At one monitoring location it is possible that the hourly  $NO_2$  objective was exceeded.

#### NO<sub>2</sub> 2005 with the CCTMR

This Further Assessment has confirmed a significant risk of exceedance of the UK annual mean objective for  $NO_2$  in 2005, with the CCTMR in place, in central Perth only. Modelling generally indicates that in 2005, with the CCTMR in place, concentrations were above the required concentration at a maximum of 13 monitoring locations in Perth City Centre. At 3 monitoring locations it is possible that the hourly  $NO_2$  objective was exceeded.

#### NO<sub>2</sub> 2010

Concentrations in 2010, based on 2005 projected forward traffic data, are predicted to be lower, although the EU Limit Value for annual mean  $NO_2$  may still be exceeded at these city centre locations in that year.

#### NO<sub>2</sub> 2018

Modelling for 2018 with City Centre Management Review and Regional Bridge in place showed that again 13 monitoring locations would exceed the annual mean objective. The number of monitoring locations predicting a possible exceedance of the hourly mean is predicted to increase from 3 in 2005 with the CCTMR to 8 by 2018.

#### **NO<sub>2</sub> Source Apportionment**

Results for 2005 indicate that at the locations of highest predicted roadside concentrations, freeflowing traffic accounts for less than one eighth of the local NO<sub>x</sub> and NO<sub>2</sub> concentrations, and of this traffic contribution, HDVs account for approximately three quarters. Queuing traffic accounts for three quarters of the local NO<sub>x</sub> and NO<sub>2</sub> concentrations, and of this traffic contribution HDVs account for well over half. Total HDV traffic, both free flowing and queuing, therefore contributes to over three-fifths to the local NO<sub>2</sub> concentrations. Reductions in HDV queuing and congestion are therefore likely to lead to a significant reduction in roadside NO<sub>x</sub> and NO<sub>2</sub>.

# **PM**<sub>10</sub>

It is recommended that Perth and Kinross Council retain their city wide air quality management area for  $PM_{10}$ , and proceed with preparation of their action plan to reduce  $PM_{10}$  concentrations. Reductions in queuing and congestion, particularly aimed at HDV traffic, are needed to lead to a significant reduction in roadside  $PM_{10}$ . In summary:

#### PM<sub>10</sub> 2005 Base Case

Both monitoring and modelling indicate that in 2005 concentrations were below the required concentrations in both the city centre and city wide AQMA.

#### PM<sub>10</sub> 2005 with the CCTMR

Both monitoring and modelling indicate that in 2005, with the CCTMR in place, concentrations were below the required concentrations in both the city centre and city wide AQMA.

#### PM<sub>10</sub> 2010 Base Case

This Further Assessment has however, confirmed a significant risk of exceedance of the Scottish annual mean objective for  $PM_{10}$  in Perth. For 2010 Base Case projected from the 2005 Base Case concentrations are not predicted to exceed the daily mean objective set for Scotland.

#### $PM_{10}$ 2010 with the CCTMR

This Further Assessment has however, confirmed a significant risk of exceedance of the Scottish annual mean objective for  $PM_{10}$  in 2010 with the CCTMR in place in Perth. For 2010 with the CCTMR in place concentrations are not predicted to exceed the daily mean objective set for Scotland.

#### PM<sub>10</sub> 2018 with the CCTMR

Modelling for 2018 with the CCTMR and Regional Bridge in place confirmed a significant risk of exceedance of the both the 2010 Scottish annual mean objective for  $PM_{10}$  and the 2010 daily mean objective set for Scotland.

#### PM<sub>10</sub> Source apportionment

Results for 2005 indicate that at the location of highest predicted roadside concentrations, free-flowing traffic accounts for one tenth of the local  $PM_{10}$  concentrations, and of this traffic contribution, HDVs account for approximately half. Queuing traffic accounts for less than one fifth of the local  $PM_{10}$  concentration, and of this contribution HDVs account for over half. Total HDV traffic, for both free flowing and queuing, contributes to over one tenth to the local  $PM_{10}$  concentrations. Reductions in queuing and congestion, particularly aimed at HDV traffic, are therefore likely to lead to a significant reduction in roadside  $PM_{10}$ .

If local background is at or just below 18  $\mu$ g m<sup>-3</sup>, it will be necessary not only to reduce roadside PM<sub>10</sub> but also urban background concentrations generally. To this, the city wide AQMA should remain in force and action planning should seek to reduce city wide emissions of PM<sub>10</sub>.

#### City Centre Traffic Management Review and Regional Bridge

Conclusions on the impacts on air quality for these two measures illustrate that:

- The impacts on air quality of the CCTMR reveal little overall improvement in or difference to both NO<sub>2</sub> and PM<sub>10</sub> concentrations for 2005.
- Modelling of 2010 concentrations both with and without the CCTMR in place for PM<sub>10</sub> predicts exceedances of the 2010 PM<sub>10</sub> annual mean objective for Scotland. No exceedances of the 2010 daily mean objective are expected for this year.
- Predictions of NO<sub>2</sub> in the 2018 with the CCTMR and Regional Bridge scenario indicate exceedances of the 2005 NO<sub>2</sub> annual mean objective and an increase in the number of locations, from 3 to 8, which are likely to exceed the 2005 hourly mean NO<sub>2</sub> objective.
- The Regional Bridge in the 2018 scenario greatly improves the PM<sub>10</sub> concentrations across the whole of Perth, although, under the more stringent 2010 annual mean objective an exceedance area is predicted in the city centre.
- The Regional Bridge scenario sees a reduced re-directed flow on Perth's roads, but it is more likely that by 2018 the uptake of cleaner diesel vehicles through increasing Euro standards and the fitting of more particulate traps as standard reaps greater benefits on PM<sub>10</sub> concentrations. The model also now takes into account the new NO<sub>2</sub>: NO<sub>x</sub> relationship, which is revealing higher concentrations than originally modelled in previous years.
- Action planning is needed that targets congestion, particularly HDVs, along the more central Perth Streets namely Atholl Street and South Street where the highest NO<sub>2</sub> and PM<sub>10</sub> concentrations occur.

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# Acronyms and definitions

AADTF	annual average daily traffic flow
ADMS	an atmospheric dispersion model
AQDD	Common Position on Air Quality Daughter Directives
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
AURN	Automatic Urban and Rural Network
CNS	central nervous system
d.f.	degrees of freedom
DEFRA	Department for the Environment, Food and Rural Affairs
DETR	Department of the Environment, Transport and the Regions
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EPA	Environmental Protection Act
EPAQS	Expert Panel on Air Quality Standards
ERG	Environmental Research Group, Kings College, London
GIS	Geospatial Information System
kerbside	0 to 1 m from the kerb
n	number of pairs of data
NAEI	National Atmospheric Emission Inventory
NAQS	National Air Quality Strategy (now called the Air Quality Strategy)
NO <sub>2</sub>	Nitrogen dioxide
NO <sub>x</sub>	Oxides of nitrogen
NPL	National Physical Laboratory
NRTF	National Road Traffic Forecast
ppb	parts per billion
r	the correlation coefficient
roadside	1 to 5 m from the kerb
SD	standard deviation
SD	standard deviation
TEMPRO	A piece of software produced by the DfT used to forecast traffic flow increases
UWE	University of West of England

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- Appendix 3 Appendix 4
- Monitoring data Model Validation for NO<sub>2</sub> Model Validation for PM<sub>10</sub>
- Appendix 5 The UK Air Quality Strategy

# 1 Introduction

# 1.1 PURPOSE OF THE STUDY

Following the outcome of their Detailed Assessment report of July 2004, Perth and Kinross Council commissioned AEA Energy & Environment to undertake a Further Assessment for nitrogen dioxide and  $PM_{10}$  for the Perth city wide AQMA.

The detailed assessment concluded that the 2005 UK objective for annual mean  $NO_2$  and 2010 objectives for  $PM_{10}$  were likely to be exceeded in relevant years and that an air quality management area was required for  $NO_2$  and  $PM_{10}$  along Atholl Street/Barrack Street junction and the junction of Main Street and County Place. A city wide AQMA has now been declared and Perth and Kinross Council are now required to proceed to a further assessment to update and confirm the conclusions of the detailed assessment, and undertake essential source apportionment work to inform their associated action planning work.

The objective of this Further Assessment is to test out action planning scenarios and assess the likely impact they may have on pollutant concentrations, and therefore their likely effectiveness.

# 1.2 GENERAL APPROACH TAKEN

The approach taken in this study was to:

- Collect and interpret additional data to that already used in the screening and detailed assessments, in order to support the further assessment, including more detailed traffic flow data around the areas outlined above;
- Utilise the monitoring data from the Council's monitoring campaign to assess the ambient concentrations resulting from road traffic emissions, and to validate the output of the modelling studies;
- Model the concentrations of NO<sub>2</sub> around the selected roads, concentrating on the locations (receptors) where people might be exposed over the relevant averaging times of the air quality objectives;
- Present the concentrations as contour plots of concentrations and assess the uncertainty in the predicted concentrations.
- Undertake source apportionment work to allow action planning measures to be targeted appropriately.
- Model the potential impact of selected proposed action planning scenarios.

# 1.3 VERSION OF THE POLLUTANT SPECIFIC GUIDANCE USED IN THIS ASSESSMENT

This report has used the latest guidance in LAQM.TG(03), published in February 2003, and subsequent update dated January 2006.

# 1.4 NUMBERING OF FIGURES AND TABLES

The numbering scheme is not sequential, and the figures and tables are numbered according to the chapter and section that they relate to.

# **1.5 UNITS OF CONCENTRATION**

The units throughout this report are presented in  $\mu$ g m<sup>-3</sup> (which is consistent with the presentation of the new AQS objectives), unless otherwise noted.

## **1.6 STRUCTURE OF THE REPORT**

This document is a detailed Air Quality review for Perth and Kinross Council for nitrogen dioxide and  $PM_{10}$ . This chapter, Chapter 1 has summarised the need for the work and the approach to completing the study.

Chapter 2 contains details of the information used to conduct the Further Assessment for Perth and Kinross Council.

Chapter 3 introduces the latest standards and objectives for nitrogen dioxide and summarises the monitoring of  $NO_2$  that has taken place in Perth in the area of concern.

Chapter 4 describes the results of the modelling assessment and discusses whether the UK objectives and EU limit values for nitrogen dioxide are considered likely to be exceeded in Perth in 2005 and 2010 respectively. The results of the analysis are displayed in tabular form and as contour plots. It also presents the recommendations from the assessment.

Chapter 5 introduces the latest standards and objectives for  $PM_{10}$  and summarises the monitoring of  $PM_{10}$  that has taken place in Perth in the area of concern.

Chapter 6 describes the results of the modelling assessment and discusses whether the  $PM_{10}$  objectives are considered likely to be exceeded in Perth in 2005 and 2010. The results of the analysis are displayed in tabular form and as contour plots. It also presents the recommendations from the assessment.

Chapter 7 outlines the conclusions and recommendations for both  $NO_2$  and  $PM_{10}$  from the assessment.

# 1.7 GIS DATA USED

Perth and Kinross Council provided the Ordnance Survey landline data for use in this project.

# 1.8 EXPLANATION OF THE MODELLING OUTPUT

The contour maps generated in the modelling for this report are an indication of the predicted pollutant concentrations around the area modelled. They are not lines of absolute values and should not be considered as such. Care should also be taken, in cases where contours join up as enclosed loops. This is common, for example along a section of road. The contours may appear to circle a section of the road, rather than extend all the way along it. This is due to the input area over which the model was run being only a section of the road in question. No assumptions of pollutant concentrations can be made on locations outside of the area being modelled.

# 2 Information used to support this assessment

This Chapter presents the information used to support this review and assessment.

# 2.1 MAPS

Perth and Kinross Council provided OS Landline data of the areas in the county which needed to be modelled. This enabled accurate road widths and the distance of the housing to the kerb to be determined.

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# 2.2 ROAD TRAFFIC DATA

## Average flow, hourly fluctuations in flow, speed and fraction of HDVs.

Traffic consultants SiAS provided peak hour traffic flow data and percentage HDV for 2003 for the roads of concern. Site-specific diurnal traffic variation profile for the main roads in Perth was carried out with peak and AADT flows using the guidance given in TG.03. Following this the 2003 AADT was scaled to 2005 AADT using available SCOOT data for matching locations. 12 hours a day of queuing at selected locations in the city centre was assumed in the model runs.

## **Traffic Growth**

Traffic flow data from 2003 was used to estimate flows up to 2010 using traffic growth factors derived from the NRTF and the TEMPRO v5 model. TEMPRO provides regional traffic growth statistics. Details of the growth factors used in the assessment to predict traffic flows in Perth are given in Appendix 1. This has been used in the 2010 scenarios for  $PM_{10}$ . For all the other scenarios, such as 2018, individual traffic data was supplied by SiAS for their associated years.

## 2.3 METEOROLOGICAL DATA USED IN THE DISPERSION MODELLING

Hourly sequential meteorological data for the nearest suitable meteorological station with adequate data capture, Leuchars near St. Andrews, was obtained for 2005. The meteorological data provided information on wind speed and direction and the extent of cloud cover for each hour of 2005. Other sites closer to Perth have failed to record adequate data capture levels in recent years.

## 2.4 AMBIENT MONITORING

## Nitrogen dioxide

Nitrogen dioxide concentrations are monitored by diffusion tube at 34 roadside locations in Perth. Perth and Kinross Council also undertake automatic monitoring with triplicate co-located diffusion tubes at 2 locations. The monitoring locations are indicated in Chapter 3, Figure 3.1. Details of the type, locations, and concentrations recorded by the diffusion tubes are given in Appendix 2.

# 2.5 MODELLING METHODOLOGY

The air quality impact from road traffic emissions in this Further Assessment was calculated using AEA Energy & Environment's proprietary urban model. There are two parts to this model:

• The Local Area Dispersion System (LADS) model. This model was used to calculate background concentrations of oxides of nitrogen on a 1 km x 1 km grid. Estimates of emissions of oxides of nitrogen for each 1 km x 1 km area grid square were obtained from the 2004 National Atmospheric Emission Inventory disaggregated inventory, projected forward to 2005 and 2010 using factors in the defra Technical Guidance.

#### • The LADS-URBAN model. This model is a tool for calculating atmospheric

dispersion using a point-source kernel. Estimates of emissions from vehicles were calculated using the latest emission factors. The dispersion kernels for the LADS-URBAN model were derived from model runs using ADMS V3.3.

This advanced two-component model is suitable for modelling road traffic emissions as defined in "Review and assessment: Selection and Use of Dispersion Models, LAQM.TG3 (00)", and in the Technical Guidance LAQM.TG(03). Information regarding the validation of this modelling approach is given in Appendix 3.

Concentrations of  $NO_2$  from road traffic emissions were assessed using a high-resolution approach, with air quality modelled at 10 m intervals along all of the roads assessed. This high spatial resolution is recommended in LAQM.TG3 (00) and in the Technical Guidance LAQM.TG (03).

# 2.6 COMPUTER MODELLING

The modelling programmes used in this assessment make a number of assumptions during the calculations. These include no consideration of terrain relief, or direct consideration of buildings over the surface being modelled. Modelling of pollutant concentrations on roads can sometimes provide misleading information on produced contour maps. For example, polygons and circles on certain areas of the contour maps, e.g. roundabouts or the centres of roads, can be generated. This is not a deficiency in the model – it is an artefact of the data. As such, these additional features should be ignored and the wider context and implications of the contour maps be considered.

# 2.7 AIR QUALITY STRATEGY AND OBJECTIVES

Background information on the UK Air Quality Strategy, on the Local Air Quality Management regime, and on the UK air quality standards and objectives are provided in Appendix 4 and 5.

# 3 Nitrogen dioxide

# 3.1 INTRODUCTION

Nitrogen oxides are formed during high temperature combustion processes from the oxidation of nitrogen in the air or fuel. The principal source of nitrogen oxides, nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>), collectively known as NO<sub>x</sub> is road traffic, which is responsible for approximately half the emissions in Europe. NO and NO<sub>2</sub> concentrations are therefore greatest in urban areas where traffic is heaviest. Other important sources are power stations, heating plant and industrial processes.

Nitrogen oxides are released into the atmosphere mainly in the form of NO, which is then readily oxidised to  $NO_2$  by reaction with ozone. Elevated levels of  $NO_x$  occur in urban environments under stable meteorological conditions, when the air mass is unable to disperse.

Nitrogen dioxide has a variety of environmental and health impacts. It is a respiratory irritant, may exacerbate asthma and possibly increase susceptibility to infections. In the presence of sunlight, it reacts with hydrocarbons to produce photochemical pollutants such as ozone. In addition, nitrogen oxides have a lifetime of approximately 1-day with respect to conversion to nitric acid. This nitric acid is in turn removed from the atmosphere by direct deposition to the ground, or transfer to aqueous droplets (e.g. cloud or rainwater), thereby contributing to acid deposition.

# 3.2 LATEST STANDARDS AND OBJECTIVES FOR NITROGEN DIOXIDE

The National Air Quality Regulations (1997) set two provisional objectives to be achieved by 2005 for nitrogen dioxide:

- An annual average concentration of 40 μg m<sup>-3</sup> (21 ppb);
- A maximum hourly concentration of 286  $\mu$ g m<sup>-3</sup> (150 ppb).

In June 1998, the Common Position on Air Quality Daughter Directives (AQDD) agreed at Environment Council included the following objectives to be achieved by 31 December 2005 for nitrogen dioxide:

- An annual average concentration of 40 μg m<sup>-3</sup> (21 ppb);
- 200  $\mu$ g m<sup>-3</sup> (100 ppb) as an hourly average with a maximum of 18 exceedances in a year.

The National Air Quality Strategy was reviewed in 1999 (DETR, 1999). The Government proposed that the annual objective of 40  $\mu$ g m<sup>-3</sup> be retained as a provisional objective and that the original hourly average be replaced with the AQDD objective. The revised Air Quality Strategy for England, Scotland, Wales and Northern Ireland (DETR, 1999; 2000) included the proposed changes. Modelling studies suggest that in general achieving the annual mean of 40  $\mu$ g m<sup>-3</sup> is more demanding than achieving the hourly objective. If the annual mean is achieved, the modelling suggests the hourly objective swill also be achieved. Furthermore, monitoring studies suggest that the hourly objective is likely to be exceeded only in cases where the annual mean NO<sub>2</sub> concentration is of the order of 60  $\mu$ g/m<sup>3</sup> or greater.

# 3.3 THE NATIONAL PERSPECTIVE

The main source of  $NO_x$  in the United Kingdom is road transport, which, in 2003 accounted for approximately 40% of emissions. Power generation contributed approximately 30% and domestic sources 7%. In urban areas, the proportion of local emissions due to road transport sources is larger (NAEI, 2003).

National measures are expected to produce reductions in  $NO_x$  emissions and achieve the objectives for  $NO_2$  in many parts of the country. However, the results of the analysis set out in the National Air Quality Strategy suggest that for  $NO_2$  a reduction in  $NO_x$  emissions over and above that achievable by national measures will be required to ensure that air quality objectives are achieved everywhere. Local authorities with major roads, or highly congested roads, which have the potential to result in elevated levels of  $NO_2$  in relevant locations, are expected to identify a need to progress to a detailed assessment for this pollutant.

# 3.4 SUMMARY OF PREVIOUS AIR QUALITY REVIEW AND ASSESSMENT REPORTS

The Detailed Assessment for Perth and Kinross concluded that it was likely that the NO<sub>2</sub> annual mean objective for 2005 would be exceeded in areas where personal relevant exposure occurs. Specifically, the assessment found that exceedences of the 40  $\mu$ g m<sup>-3</sup> annual mean objective for NO<sub>2</sub> were likely at properties close to Atholl Street and possible at properties in Barrack Street close to the junction with Atholl Street in 2005. Additionally, concentrations in Main Street in Bridgend and County Place in Perth were predicted to be lower than, but close to, the 40  $\mu$ g m<sup>-3</sup> objective in 2005

The report concluded that Perth and Kinross Council needed to declare an Air Quality Management Area to cover the area of exceedence in the Atholl Street/Barrack Street Junction and possibly other areas of Perth City. Subsequently the whole of the city of Perth was declared an AQMA. That decision was taken to ensure that a holistic approach was adopted towards local environmental management through consideration of locations that were close to the objectives in addition to the locations of identified exceedence for these pollutants. It also helped to ensure that the Air Quality Action Plan (AQAP) would be integrated with other council policies.

The Updating and Screening Assessment concluded that Perth and Kinross Council was not required to carry out a Detailed Review and Assessment for carbon monoxide, benzene, 1,3-butadiene, lead, nitrogen dioxide,  $PM_{10}$  or sulphur dioxide.

Additional areas of exceedence of the annual mean objective for nitrogen dioxide that were not found in the Detailed Assessment were identified by the Updating and Screening Assessment within Perth City's AQMA. This vindicated the council's decision to designate the whole of Perth as an AQMA.

Monitoring data and DMRB modelling indicated a number of exceedences of the annual mean objective for nitrogen dioxide at busy junctions in Perth. All predicted and measured exceedences were inside the existing AQMA. There were no significant industrial sources of nitrogen dioxide found in the Perth and Kinross Council area. The DMRB modelling of traffic emissions indicated that in Crieff High Street the  $NO_2$  concentrations were much lower that the concentrations measured by the diffusion tube monitors, which were close to the objective. The report recommended that more detailed traffic monitoring be carried out, so that the  $NO_2$  concentrations could be more effectively modelled.

Figure 3.1 indicates the central area of the city wide boundary subsequently declared as an air quality management area (AQMA) in Perth City. It is this area, which is the subject of this Further Assessment.

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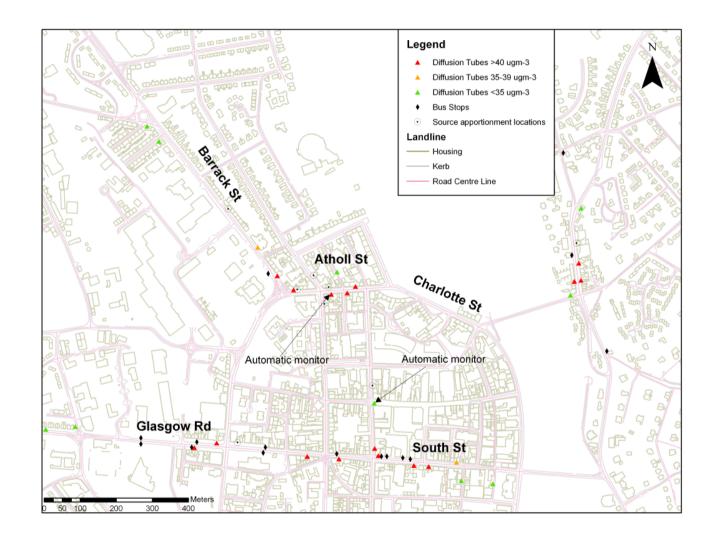


Figure 3.1 Monitoring and source apportionment locations in Perth.

# 3.5 PROPOSED ACTION PLANNING MEASURES

The following action plan scenarios are proposed to be implemented, all of which have been taken into account within the traffic modelling and are planned over the next 13 years, forming 3 scenarios to be modelled: 2005 Base Case, 2005 with City Centre Traffic Management Review (CCTMR) and 2018 with CCTMR and new regional bridge, the details of which are described below.

The preferred CCTMR option as advised by Perth and Kinross Council will include:

- High St (between Scott St and S. Methven St) 1 way westbound
- Murray St Taxis and Pedal Cycles only
- Charterhouse Lane one lane approach to King St and reversal of Priorities
- Traffic Calming in the New Row area

#### 2018 Local Plan Developments with new Regional Bridge. This includes

- New River Crossing from A9 North of Inveralmond to A93 and A94
- Inveralmond Improvements
- Broxden Improvements
- Crieff Rd Improvements
- New A9 Overbridge from Crieff Rd
- Localised Junction Improvements
- CCTMR Preferred Option

## 3.6 MONITORING DATA

Nitrogen dioxide concentrations are monitored at 36 roadside sites within Perth by diffusion tube monitoring. 2 automatic monitors with triplicate collocated tubes are also located in Perth City Centre: • Atholl Street (311689, 723628), 3.7m from the roadside, operating since June 2003.

High Street (311570, 723929), 4m from the roadside, operating since Suffer 2003.
 High Street (311570, 723929), 4m from the roadside, operating since October 2004.

Monitoring sites are shown in Figure 3.1. Both are roadside sites but the flows past the High Street automatic monitor are very low as it is a one-way street, and so concentrations are probably more typical of local background.

## **Continuous monitoring**

Concentrations of NO<sub>2</sub>, and PM<sub>10</sub> are recorded using 2 continuous monitoring stations located at Atholl Street and 176 High Street Perth. Figure 3.1 shows the automatic monitoring station.

#### NOx analyser

An API model M200 Chemiluminescent Nitrogen Oxides analyser was used for this study. This analyser provides continuous data for concentrations of both NO<sub>X</sub> and NO. Given that NO<sub>X</sub> = NO + NO<sub>2</sub> it can be seen that concentrations of NO<sub>2</sub> are easily derived from this method. This analyser is typical of those employed within the Department for Environment, Food and Rural Affairs' (DEFRA) Automatic Urban and Rural Network (AURN) of national air monitoring stations.

The NO<sub>x</sub> analyser was calibrated regularly throughout the monitoring period. Chemical scrubbers were used to provide a clean air sample, and a standard gas cylinder to provide span gas. Data from the instruments were scaled according to the instrument responses from these two point calibrations. The calibration gas cylinder used was calibrated at the **AEA** Gas Standards Calibration Laboratory (GSCL). **AEA's** GSCL holds UKAS accreditation (lab. no. 0401) for the calibration of NO, NO<sub>2</sub>, SO<sub>2</sub> and CO gas mixtures. Using this cylinder to calibrate the analyser at the Perth monitoring site ensures that the data are traceable to national metrology standards.

Table 3.1Summary of continuous nitrogen dioxide monitoring data at High Street and<br/>Atholl Street automatic monitors, Perth

High Street - Statistic		
	Year 2005	Estimate of Year 2010
Annual Mean NO <sub>x</sub> (as NO <sub>2</sub> ) ( $\mu$ g m <sup>-3</sup> )	63	52
Annual Mean NO <sub>2</sub> (µg m <sup>-3</sup> )	28	23
Maximum Hourly mean NO <sub>2</sub> ( $\mu$ g m <sup>-3</sup> )	149	123
Data Capture (%) NO <sub>2</sub>	99.2%	-
Atholl Street - Statistic		
	Year 2005	Estimate of Year 2010
Annual Mean NO <sub>x</sub> (as NO <sub>2</sub> ) ( $\mu$ g m <sup>-3</sup> )	153	126
Annual Mean NO <sub>2</sub> ( $\mu$ g m <sup>-3</sup> )	54	44
Maximum Hourly mean NO $_2$ (µg m <sup>-3</sup> )	187	154
Data Capture (%) NO <sub>2</sub>	99%	-

## Nitrogen Dioxide Diffusion tubes

Diffusion tubes at 34 roadside locations in Perth measure monthly average concentrations of nitrogen dioxide. The measurement data for 2005 and for the collocation period (January 2005 to December 2005) is summarised in Table 3.2 below. Appendix 2 provides a breakdown of the raw monitoring data on a monthly basis, OS grid co-ordinates of sites, and bias adjustment factors applied to the data.

Diffusion tubes can under or over-read and if possible should be referred to the results of continuous monitoring. 2 triplicate co-location studies were undertaken at the automatic monitors in central Perth from January 2005 to December 2005. The diffusion tubes are supplied and analysed by Dundee Scientific Services using the 20% v/v TEA in water method.

Information regarding the typical bias of these tubes was sought for year 2005 from the database of co-location studies issued by UWE on behalf of DEFRA (UWE (2006)). No results were available for 2005, and only single studies were available for 2002 to 2004 and 2006.

The local bias adjustment factors calculated using results from the local collocation studies and the netcen\_DifTPAB\_v02 spreadsheet for Atholl Street was 1.02 and; 0.93 for the High Street automatic monitor. Adjusting the January 2005 to December 2005 diffusion tube results by 1.02, exceedances of the annual mean objective is predicted at 16 central Perth sites with 2 sites close to the objective. As the High Street automatic monitor is 4m away from the kerb on the edge of a pedestrian zone, the Atholl Street roadside automatic monitor bias adjustment was used as a more conservative approach, and the diffusion tubes were adjusted by 1.02.

It should be taken into account that diffusion tubes are spot measurements and may be very sensitive to distance from the road as concentrations change rapidly with distance from the kerbside when comparing them with modelled results.

To predict the diffusion tube concentrations in 2010 from measurements in 2005, the latest adjustment factors published in January 2006 have been applied.

2005 Nitro	gen Dio	kide Diffusion Tube R	esults				
x		Site ID	Site Name	2005 unadjusted annual mean NO <sub>2</sub>	Bias Adjustment Factor*	2005 adjusted annual mean NO2	2010 annual mean NO₂ estimate based on 2005 adjusted (μgm³)
308289	724892	P47	5 East Huntingtower, Perth, PH1 3JJ	22	1.02	22	18
308924	724287	P7	257 Rannoch Rd/Newhouse Road Roundabout, Perth, PH1 2DW	20	1.02	20	16
309327	724878	P46	204 A Crieff Rd, Perth, PH1 2PE	29	1.02	30	25
310509	725767	P6	41 Mull Place, Perth, PH1 3DP	15	1.02	15	12
310646	722783	P3 L, P3 R	15 Murray Cres, Perth, PH2 0HU	21	1.02	22	18
310778	723556	P36	51 Glasgow Rd, Perth, PH2 0PE	34	1.02	34	28
310860	723563	P37	Riggs Rd, Perth, PH1 1PR	32	1.02	32	26
311059	724394	P20	2 Crieff Road Perth PH1 5RT	30	1.02	30	25
311092	724352	P45	Ballantine Place, Perth PH1 5RR	28	1.02	28	23
311190	723505	P28	28 York Place Perth PH2 8EH	45	1.02	46	38
311252	723518	P29	37 York Place Perth PH2 8EH	40	1.02	40	33
311366	724059	P19	St Ninian's School ,Dunkeld Rd, Perth, PH1 5RF	34	1.02	35	28
311420	723980	P44 L, P44 R	22 Barrack St, Perth, PH1 5RD	43	1.02	44	36
311465	723941	P41 L, P41 R	76 Atholl St, Perth, PH1 5NL	51	1.02	52	43
311492	721849	P48	30 Edinburgh Rd, Perth, PH2 8BX	26	1.02	27	22
311503	723481	P34 L, P34 R	10 County Place, Perth, PH2 8EE	49	1.02	50	41
311570	723929	P61L, P61 C, P61 R	Atholl St, Perth real time monitor	53	1.02	54	45
311586	723991	P5 L, P5 R	8 Stormont St, Perth, PH1 5NW	23	1.02	24	20
311591	723474	P33	216 South Street Perth PH2 8NY	39	1.02	40	33
311614	723933	P43 L, P43 C, P43 R	17 Atholl St, Perth, PH1 5NH	52	1.02	53	44
311637	723951	P42	26-28 Atholl St, Perth, PH1 6NP	48	1.02	49	41
311689	723628	P54L, P54 C, P54 R	Real Time Monitor adjacent to 176 High St. Perth PH1 5EW	31	1.02	32	26
311690		P1 L, P1 C, P1 R	42 Scott St, Perth, PH1 5PH	43	1.02	44	36
311700			135 South St, Perth, PH2 8PA	42	1.02	42	35
311799			104 South St, Perth, PH2 8PA	42	1.02	43	36
311840		P13 L, P13 R	86/88 South Street Perth PH2 8PD	40	1.02	41	34
311917			45-47 South St, Perth, PH2 8PD	34	1.02	35	29
311930	723414		17 Princes St, Perth, PH2 8NG	33	1.02	33	27
312018			17 Spevgate, Perth, PH2 8PJ	27	1.02	28	23
312233	723927		2 West Bridge St, Bridgend, Perth, PH2 7HA	32	1.02	33	27
312244		P40 L, P40 R	18 Main St, Bridgend, PH2 7HB	45	1.02	46	38
312256		P39 L, P39 R	39 Main St, Bridgend, PH2 7HD	45	1.02	46	38
312262			9 Main St, Bridgend, Perth, PH2 7HD	40	1.02	41	34
			93-109 Main St Bridgend, PH2 7HE	32	1.02	32	26

# Table 3.2 Nitrogen dioxide diffusion tube survey 2005 results for Perth, corrected for bias with predictions for 2010

Predicted exceedances of UK objective or EU Limit Value in BOLD

\* Bias adjustment factor derived from netcen spreadsheet

#### Comparison of monitoring data with AQ objectives

The results of the diffusion tube monitoring both in 2005 and during the collocation study suggest that the UK annual mean objective for  $NO_2$  in 2005 is likely to be exceeded in Perth City Centre. Predictions for 2010 suggest that the corresponding EU limit value for that year may also be exceeded at 5 of the above locations in Atholl Street and County Place.

# 4 Further Assessment for NO<sub>2</sub>

This further assessment has been undertaken by means of computer dispersion modelling verified using automatic and diffusion tube monitoring. The locations at which detailed modelling was carried out are Perth City Centre focusing on Atholl Street and South Street. AQMA wide modelling was also completed.

# 4.1 METEOROLOGICAL DATA

Hourly sequential meteorological data for the nearest suitable meteorological station with adequate data capture; Leuchars near St. Andrews, some 29 miles northeast of Perth, was obtained for 2005. The meteorological data provided information on wind speed and direction and the extent of cloud cover for each hour of 2005.

# 4.2 TRAFFIC MODELLING SUMMARY

In this study, the concentrations of  $NO_2$  at receptors close to the roads and junctions of interest have been modelled using ADMS-3.3 as a dispersion kernel model.

The roads were defined as volume sources, 3m deep, and were broken up in to a series of adjoining segments. The length of these segments was dictated by the way in which the OS LandLine data was digitised and varied from one or two metres in length (where the road rapidly changed direction) to hundreds of metres in length (where the road was essentially straight). The OS LandLine data was used to provide the co-ordinates of the centre line of the road, and the road widths. Therefore, the position of the volume sources (here the roads) were accurate to approximately a metre.

Where queuing of vehicles was reported, emissions from stationary vehicles exhausts were estimated on the basis that the engine power output and hence emissions were the same as those at a speed of 5 kph. Queuing vehicles were assumed to be 5 m apart.

# 4.3 SOURCES OF BACKGROUND (NON-TRAFFIC) EMISSIONS DATA

Background emissions of oxides of nitrogen  $(NO_x)$  from sources not modelled in detail have been taken from the UK National Atmospheric Emissions Inventory 2004 (<u>www.naei.org.uk</u>) and scaled to the year of interest where necessary following the recommended procedure in LAQM.TG(03). The contribution to emissions from the roads modelled in detail have been omitted where this would lead to double counting of the local impact of emissions.

# 4.4 MODEL BIAS AND VERIFICATION

Agreement between the raw model and 2 automatic monitors was generally acceptable with the model underpredicting at Atholl Street by 17% and overpredicting at the High Street by 10%; with an average underprediction of 17% across all the diffusion tube monitoring locations (Table 4.1). To improve this, a fixed offset of + 3  $\mu$ g/m<sup>3</sup> was applied to the raw modelling results. This fixed offset was derived by the average difference between what the model predicted and the monitoring results at each of the 2 automatic monitoring locations. Figure 4.1 shows the model-monitor agreement, before (top) and following model bias correction (bottom), with Table 4.1 showing the Atholl Street automatic monitor underpredicting by 11% and the automatic monitor at the High Street overpredicting by 21% and now only underpredicting across all the other monitoring locations by 7%.

#### Table 4.1: Comparison of modelled and measured concentrations for 2005 (Base Case)

			Before model bia	as correctio	n	After model bias	correctio	n		
Monitoring Site	Туре	Location	% Error of model relative to monitor	NO₂ concentration, μg m <sup>⁻3</sup>		μg m <sup>-3</sup> mode		% Error of model relative to monitor	-	centration, I m <sup>-3</sup>
				Modelled	Measured		Modelled	Measured		
Automatic	R	High Street	10	31	28	21	34	28		
Automatic	R	Atholl Street	-17	45	54	-11	48	54		

R - Roadside

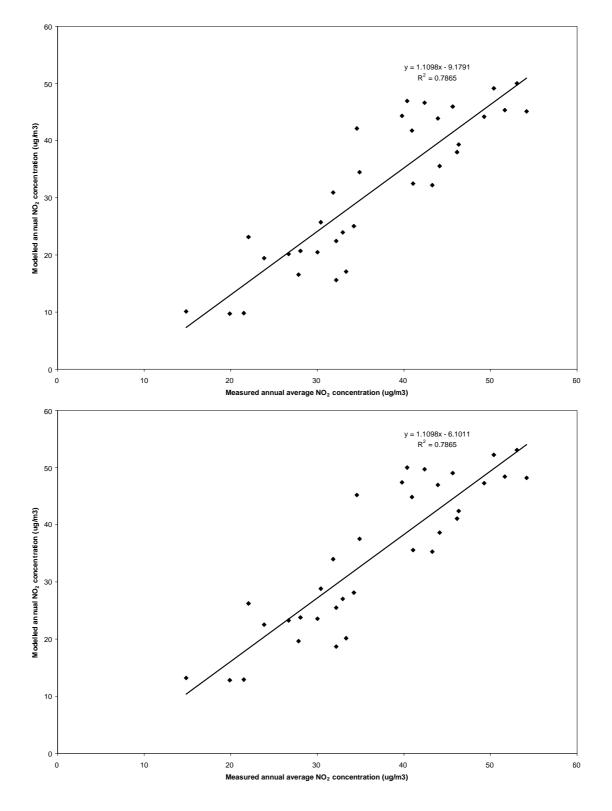


Figure 4.1: Top: Model – Monitor Agreement for Nitrogen Dioxide before model bias correction Bottom: Model – Monitor Agreement for Nitrogen Dioxide following model bias correction

# 4.5 MODEL VALIDATION

In simple terms, model validation is where the model is tested at a range of locations and is judged suitable to use for a given application. The modelling approach used in this assessment has been validated, and used in numerous AEA Energy & Environment air quality review and assessments. Statistical techniques have been used to assess the likelihood that there will be an exceedance of the air quality objectives given the modelled concentration. The validation statistics are given in Appendix 3. Confidence limits for the predicted concentrations were calculated based on the validation studies by applying statistical techniques based on Student's t distribution. The confidence limits took account of uncertainties resulting from:

- Model errors at the receptor site;
- Model errors at the reference site;
- Uncertainty resulting from year to year variations in atmospheric conditions.

The confidence limits have been used to estimate the likelihood of exceeding the objectives at locations close to the roads. The following descriptions have been assigned to levels of risk of exceeding the objectives.

It would be recommended that Perth and Kinross Council generally consider declaring an AQMA where the probability of exceedance in 2005 is greater than 50% ("Probable").

Description	Chance of exceeding	Modelled annual average concentrations, μg/m <sup>3</sup>		
	objective	Likelihood of exceeding annual average objective	Likelihood of exceeding hourly average objective	
Very unlikely	Less than 5%	<28	<38	
Unlikely	5-20%	28-34	38-52	
Possible	20-50%	34-40	52-67	
Probable	50-80%	40-46	67-82	
Likely	80-95%	46-52	82-95	
Very likely	More than 95%	>52	>95	

#### Table 4.2: Uncertainties in the modelled concentrations for NO<sub>2</sub>.

The confidence limits for the 'probable' and 'likely' annual average and hourly objective concentrations have been set equal to those for 'possible' and 'unlikely', respectively. In reality, the intervals of concentration increase as the probability of exceeding the annual and hourly objective increases from 'unlikely' to 'likely'. The advantage to setting symmetrical concentration intervals is that the concentration contours on the maps become simpler to interpret. This is a mildly conservative approach to assessing the likelihood of exceedances of the  $NO_2$  objectives since a greater geographical area will be included using the smaller confidence intervals.

A simple linear relationship can be used to predict the  $99.8^{th}$  hourly percentile concentration of NO<sub>2</sub> from the annual concentration: the  $99.8^{th}$  percentile is three times the annual mean at kerbside/roadside locations. Therefore, plots of the modelled annual mean NO<sub>2</sub> concentrations can be used to show exceedances of both the annual and hourly NO<sub>2</sub> objectives. However, the magnitude of the concentrations used to judge exceedances of the hourly objective need to be adjusted so they may be used directly with the plots of annual concentration. This has been performed by simply dividing the concentrations of the confidence limits by three.

# 4.6 RESULTS OF MODELLING

## Perth - NO<sub>2</sub> for 2005 Base Case

Figure 4.1 shows modelled nitrogen dioxide annual mean concentrations in the area of Perth City Centre in 2005. The model predicts that the UK annual average objective of 40  $\mu$ g m<sup>-3</sup> for nitrogen dioxide will be exceeded at the façade of buildings at 14 city centre locations. Table 4.3 below shows the risk of exceeding the annual average objective for nitrogen dioxide at the monitoring locations in 2005. At most it is "very likely" that the annual objective will be exceeded at 1 monitoring location. The maximum concentration modelled is 53  $\mu$ g m<sup>-3</sup> therefore; it is at most "possible" that the hourly mean objective for NO<sub>2</sub> will be exceeded. When compared with the monitoring results, the modelling supports the likelihood that the UK annual average objective for NO<sub>2</sub> was exceeded in 2005 at properties close alongside Atholl Street, Main Street, York Place, County Place, Barrack Street, Dunkeld Road and South Street. Predictions for 2010 made on the basis of projecting forward monitoring results indicate that exceedances may still remain in the city centre (see Table 3.1).

Elsewhere, outside of the city centre, it is not predicted likely that the either the  $NO_2$  annual mean or  $NO_2$  hourly mean objective will be exceeded.

Probabili	ty of Exc	eedance			
x	Y	Site ID	Site Name	Modelled 2005 NO <sub>2</sub> concentration (ug/m3)	Probability of exceeding NO <sub>2</sub> annual average objective
308289	724892	P47	5 East Huntingtower, Perth, PH1 3JJ	26	Very unlikely less than 5%
308924	724287	P7	257 Rannoch Rd/Newhouse Road Roundabout, Perth, PH1 2DW	13	Very unlikely less than 5%
309327	724878	P46	204 A Crieff Rd, Perth, PH1 2PE	24	Very unlikely less than 5%
310509	725767	P6	41 Mull Place, Perth, PH1 3DP	13	Very unlikely less than 5%
310646	722783	P3 L, P3 R	15 Murray Cres, Perth, PH2 0HU	13	Very unlikely less than 5%
310778	723556	P36	51 Glasgow Rd, Perth, PH2 0PE	28	Very unlikely less than 5%
310860	723563	P37	Riggs Rd, Perth, PH1 1PR	19	Very unlikely less than 5%
311059			2 Crieff Road Perth PH1 5RT	29	Unlikely 5-20%
311092	724352	P45	Ballantine Place, Perth PH1 5RR	24	Very unlikely less than 5%
311190	723505	P28	28 York Place Perth PH2 8EH	49	Likely 80-95%
311252	723518		37 York Place Perth PH2 8EH	50	Likely 80-95%
311366	724059		St Ninian's School ,Dunkeld Rd, Perth, PH1 5RF	45	Probable 50-80%
311420	723980	P44 L, P44 R	22 Barrack St. Perth. PH1 5RD	47	Likely 80-95%
311465	723941	P41 L, P41 R	76 Atholl St. Perth. PH1 5NL	48	Likely 80-95%
311492		1	30 Edinburgh Rd, Perth, PH2 8BX	23	Very unlikely less than 5%
311503	723481	P34 L, P34 R	10 County Place, Perth, PH2 8EE	52	Likely 80-95%
311570	723929	P61L, P61 C, P61 R	Atholl St. Perth real time monitor	48	Likely 80-95%
311586		P5 L, P5 R	8 Stormont St, Perth, PH1 5NW	23	Very unlikely less than 5%
311591	723474		216 South Street Perth PH2 8NY	47	Likely 80-95%
311614		P43 L, P43 C, P43 R	17 Atholl St, Perth, PH1 5NH	53	Very likely More than 95%
311637			26-28 Atholl St. Perth. PH1 6NP	47	Likely 80-95%
311689			Real Time Monitor adjacent to 176 High St, Perth PH1 5EW	34	Possible 20-50%
311690		P1 L, P1 C, P1 R	42 Scott St, Perth, PH1 5PH	39	Possible 20-50%
311700			135 South St, Perth, PH2 8PA	50	Likely 80-95%
311799			104 South St, Perth, PH2 8PA	35	Possible 20-50%
311840		P13 L, P13 R	86/88 South Street Perth PH2 8PD	36	Possible 20-50%
311917	723465		45-47 South St, Perth, PH2 8PD	38	Possible 20-50%
311930	723414	P35	17 Princes St, Perth, PH2 8NG	20	Very unlikely less than 5%
	723405		17 Spevgate, Perth, PH2 8PJ	20	Very unlikely less than 5%
312233	723927		2 West Bridge St, Bridgend, Perth, PH2 7HA	27	Very unlikely less than 5%
312244		P40 L, P40 R	18 Main St. Bridgend, PH2 7HB	42	Probable 50-80%
312256		P39 L, P39 R	39 Main St, Bridgend, PH2 7HD	41	Probable 50-80%
312262			9 Main St, Bridgend, Perth, PH2 7HD	45	Probable 50-80%
312262			93-109 Main St Bridgend, PH2 7HE	26	Very unlikely less than 5%

#### Table 4.3Probability of exceeding the objectives for nitrogen dioxide in 2005 in Perth.

Predicted exceedances of UK objective or EU Limit Value in BOLD

## Perth – NO<sub>2</sub> for 2005 with City Centre Management Review

Figure 4.2 shows modelled annual mean nitrogen dioxide concentrations in the area of Perth City Centre in 2005 with the City Centre Management Review in place. The model predicts that the UK annual average objective of 40  $\mu$ g m<sup>-3</sup> for nitrogen dioxide will be exceeded at the façade of buildings at 13 city centre locations, one less than without the CCTMR. Table 4.4 below shows the risk of exceeding the annual average objective for nitrogen dioxide at the monitoring locations in 2005. Again, as without the CCTMR, it is at most "very likely" that the annual objective will be exceeded at 3 monitoring locations. The maximum concentration modelled is higher than for the 2005 Base Case at 54  $\mu$ g m<sup>-3</sup> therefore; it is at most "possible" that the hourly mean objective for NO<sub>2</sub> will be exceeded.

Elsewhere, outside of the city centre, it is not predicted likely that the NO<sub>2</sub> objectives will be exceeded.

CCTMR improvements in air quality are seen in the extent of the exceedance area at the Dunkeld Road/Barrack Street junction and along Kinnoull Street; however, there are still exceedances of the annual  $NO_2$  objective. Other areas of the city centre see increased  $NO_2$  concentrations namely along Caledonian Road and New Row.

# Table 4.4Probability of exceeding the objectives for nitrogen dioxide in 2005 with<br/>CCTMR in Perth.

				Modelled 2005+CCTMR NO 2	Probability of exceeding NO <sub>2</sub> annual
X	Y	Site ID	Site Name	concentration (ug/m3)	average objective
308289	724892	P47	5 East Huntingtower, Perth, PH1 3JJ	22	Very unlikely less than 5%
308924	724287	P7	257 Rannoch Rd/Newhouse Road Roundabout, Perth, PH1 2DW	13	Very unlikely less than 5%
309327	724878	P46	204 A Crieff Rd, Perth, PH1 2PE	22	Very unlikely less than 5%
310509	725767	P6	41 Mull Place, Perth, PH1 3DP	13	Very unlikely less than 5%
310646		P3 L, P3 R	15 Murray Cres, Perth, PH2 0HU	13	Very unlikely less than 5%
310778	723556	P36	51 Glasgow Rd, Perth, PH2 0PE	28	Very unlikely less than 5%
310860	723563	P37	Riggs Rd, Perth, PH1 1PR	19	Very unlikely less than 5%
311059	724394	P20	2 Crieff Road Perth PH1 5RT	25	Very unlikely less than 5%
311092	724352	P45	Ballantine Place, Perth PH1 5RR	23	Very unlikely less than 5%
311190	723505	P28	28 York Place Perth PH2 8EH	53	Very likely More than 95%
311252	723518	P29	37 York Place Perth PH2 8EH	52	Very likely More than 95%
311366	724059	P19	St Ninian's School ,Dunkeld Rd, Perth, PH1 5RF	46	Probable 50-80%
311420		P44 L, P44 R	22 Barrack St. Perth. PH1 5RD	46	Likely 80-95%
311465	723941	P41 L, P41 R	76 Atholl St, Perth, PH1 5NL	48	Likely 80-95%
311492	721849	P48	30 Edinburgh Rd, Perth, PH2 8BX	18	Very unlikely less than 5%
311503	723481	P34 L, P34 R	10 County Place, Perth, PH2 8EE	54	Very likely More than 95%
311570	723929	P61L, P61 C, P61 R	Atholl St, Perth real time monitor	48	Likely 80-95%
311586	723991	P5 L, P5 R	8 Stormont St, Perth, PH1 5NW	22	Very unlikely less than 5%
311591	723474	P33	216 South Street Perth PH2 8NY	49	Likely 80-95%
311614			17 Atholl St, Perth, PH1 5NH	52	Likely 80-95%
311637	723951	P42	26-28 Atholl St, Perth, PH1 6NP	47	Likely 80-95%
311689			Real Time Monitor adjacent to 176 High St, Perth PH1 5EW	33	Unlikely 5-20%
311690	723503	P1 L, P1 C, P1 R	42 Scott St, Perth, PH1 5PH	39	Possible 20-50%
311700	723483	P32	135 South St, Perth, PH2 8PA	50	Likely 80-95%
311799			104 South St, Perth, PH2 8PA	35	Possible 20-50%
311840	723453	P13 L, P13 R	86/88 South Street Perth PH2 8PD	35	Possible 20-50%
311917	723465	P31	45-47 South St, Perth, PH2 8PD	37	Possible 20-50%
311930	723414		17 Princes St, Perth, PH2 8NG	20	Very unlikely less than 5%
312018	723405		17 Speygate, Perth, PH2 8PJ	20	Very unlikely less than 5%
312233	723927		2 West Bridge St. Bridgend, Perth. PH2 7HA	27	Very unlikely less than 5%
312244		P40 L, P40 R	18 Main St. Bridgend, PH2 7HB	41	Probable 50-80%
312256		P39 L, P39 R	39 Main St, Bridgend, PH2 7HD	36	Possible 20-50%
312262			9 Main St, Bridgend, Perth, PH2 7HD	45	Probable 50-80%
312262	724167		93-109 Main St Bridgend, PH2 7HE	21	Very unlikely less than 5%

Predicted exceedances of UK objective or EU Limit Value in BOLD

# Perth – NO<sub>2</sub> 2018 with City Centre Management Review and Regional Bridge

Figure 4.3 shows modelled annual average nitrogen dioxide concentrations in the area of Perth City Centre in 2018 with the CCTMR and Regional Bridge in place. The model predicts that the UK annual average objective of 40  $\mu$ g m<sup>-3</sup> for nitrogen dioxide will be exceeded at the façade of buildings at 13 city centre locations, one less than without the CCTMR. Table 4.5 below shows the risk of exceeding the annual average objective for nitrogen dioxide at the monitoring locations in 2005. Again as with 2005 and 2005 with the CCTMR, it is at most "very likely" that the annual objective will be exceeded at 8 monitoring locations. The maximum concentration modelled is higher than both the 2005 Base Case and 2005 with the CCTMR, at 58  $\mu$ g m<sup>-3</sup> therefore; it is at most "possible" that the hourly mean objective for NO<sub>2</sub> will be exceeded for this 2018 scenario.

Elsewhere, outside of the city centre, it is not predicted likely that the NO<sub>2</sub> objectives will be exceeded.

Improvements are seen in the extent of exceedance area along Main Street and Gowrie Street to the east of the city centre as West Bridge Street improves; however, there are still exceedances of the annual  $NO_2$  objective. Other areas of the city centre see increased  $NO_2$  concentrations namely along Caledonian Road and New Row (as with the 2005 CCTMR). The Atholl Street/Caledonian Road junction, along Atholl Street and Kinnoull Street show a widening of all the contours over the annual mean objective, which envelops more properties, increasing the exceedance area.

Table 4.5	Probability of exceeding the objectives for nitrogen dioxide in 2018 with CCTMR
and Regional	Bridge in Perth.

Probabili	Probability of Exceedance						
х	Y	Site ID	Site Name	Modelled 2018+CCTMR+Bridge NO <sub>2</sub> concentration (ug/m3)	Probability of exceeding NO <sub>2</sub> annual average objective		
308289	724892	P47	5 East Huntingtower, Perth, PH1 3JJ	36	Possible 20-50%		
308924	724287	P7	257 Rannoch Rd/Newhouse Road Roundabout, Perth, PH1 2DW	11	Very unlikely less than 5%		
309327	724878	P46	204 A Crieff Rd, Perth, PH1 2PE	32	Unlikely 5-20%		
310509	725767	P6	41 Mull Place, Perth, PH1 3DP	12	Very unlikely less than 5%		
310646	722783	P3 L, P3 R	15 Murray Cres, Perth, PH2 0HU	12	Very unlikely less than 5%		
310778	723556	P36	51 Glasgow Rd, Perth, PH2 0PE	26	Very unlikely less than 5%		
310860			Riggs Rd, Perth, PH1 1PR	18	Very unlikely less than 5%		
311059	724394	P20	2 Crieff Road Perth PH1 5RT	32	Very unlikely less than 5%		
311092	724352	P45	Ballantine Place, Perth PH1 5RR	26	Very unlikely less than 5%		
	723505		28 York Place Perth PH2 8EH	54	Very likely More than 95%		
311252	723518	P29	37 York Place Perth PH2 8EH	56	Very likely More than 95%		
311366	724059	P19	St Ninian's School ,Dunkeld Rd, Perth, PH1 5RF	52	Likely 80-95%		
311420	723980	P44 L, P44 R	22 Barrack St, Perth, PH1 5RD	55	Very likely More than 95%		
311465	723941	P41 L, P41 R	76 Atholl St, Perth, PH1 5NL	54	Very likely More than 95%		
311492	721849	P48	30 Edinburgh Rd, Perth, PH2 8BX	23	Very unlikely less than 5%		
311503	723481	P34 L, P34 R	10 County Place, Perth, PH2 8EE	55	Very likely More than 95%		
311570	723929	P61L, P61 C, P61 R	Atholl St, Perth real time monitor	53	Very likely More than 95%		
311586	723991	P5 L, P5 R	8 Stormont St, Perth, PH1 5NW	24	Very unlikely less than 5%		
	723474		216 South Street Perth PH2 8NY	51	Likely 80-95%		
311614	723933	P43 L, P43 C, P43 R	17 Atholl St, Perth, PH1 5NH	58	Very likely More than 95%		
311637	723951	P42	26-28 Atholl St, Perth, PH1 6NP	52	Likely 80-95%		
311689	723628	P54L, P54 C, P54 R	Real Time Monitor adjacent to 176 High St, Perth PH1 5EW	35	Possible 20-50%		
311690	723503	P1 L, P1 C, P1 R	42 Scott St, Perth, PH1 5PH	41	Probable 50-80%		
311700	723483	P32	135 South St, Perth, PH2 8PA	53	Very likely More than 95%		
			104 South St, Perth, PH2 8PA	38	Possible 20-50%		
311840	723453	P13 L, P13 R	86/88 South Street Perth PH2 8PD	39	Possible 20-50%		
311917	723465	P31	45-47 South St, Perth, PH2 8PD	41	Probable 50-80%		
	723414		17 Princes St, Perth, PH2 8NG	20	Very unlikely less than 5%		
312018	723405	P2	17 Speygate, Perth, PH2 8PJ	19	Very unlikely less than 5%		
312233	723927	P51	2 West Bridge St, Bridgend, Perth, PH2 7HA	23	Very unlikely less than 5%		
		P40 L, P40 R	18 Main St, Bridgend, PH2 7HB	37	Possible 20-50%		
312256	724015	P39 L, P39 R	39 Main St, Bridgend, PH2 7HD	33	Possible 20-50%		
312262	723968	P14 L, P14 C, P14 R	9 Main St, Bridgend, Perth, PH2 7HD	39	Possible 20-50%		
312262	724167	P38	93-109 Main St Bridgend, PH2 7HE	20	Very unlikely less than 5%		

Predicted exceedances of UK objective or EU Limit Value in BOLD

#### Unrestricted AEA/ED49360001/Draft

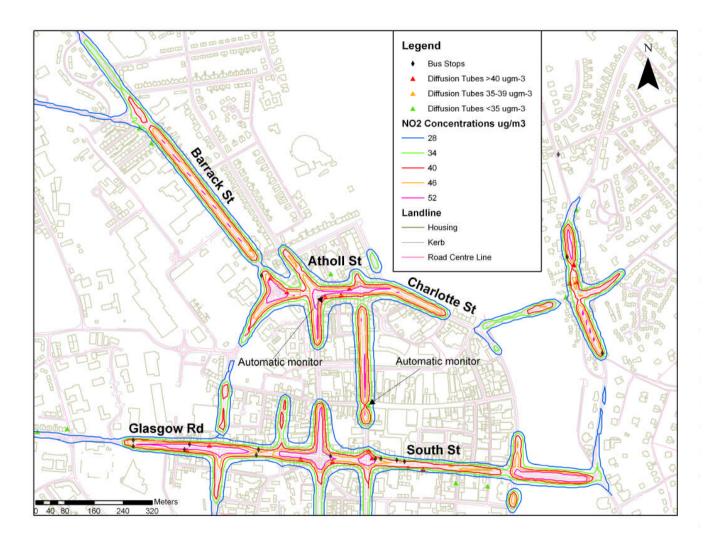


Figure 4.1 Predicted Annual Mean Nitrogen Dioxide concentrations in Perth, 2005.

#### Unrestricted AEA/ED48360001/Draft

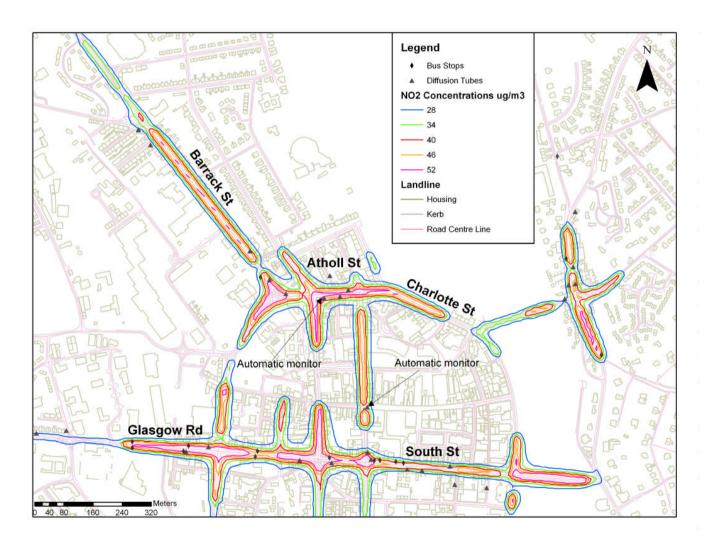


Figure 4.2 Predicted Annual Mean Nitrogen Dioxide concentrations in Perth, 2005 with City Centre Management Review.

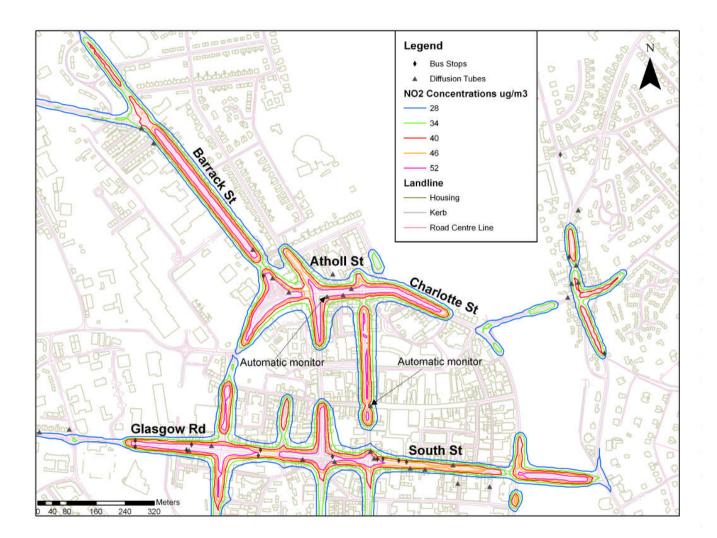


Figure 4.3 Predicted Annual Mean Nitrogen Dioxide concentrations in Perth, 2018 with City Centre Management Review and Regional Bridge.

# 4.7 SOURCE APPORTIONMENT OF PREDICTED EXCEEDANCES

Source apportionment is the process whereby the contributions from different sources of a pollutant are determined. In local air quality, the relevant sources could include: traffic; local background; industrial and domestic. Contributions from the different types of vehicles (for example, cars, lorries and buses) can also be considered to highlight which class of vehicle is contributing most to the emissions from traffic. Source apportionment allows the most important source or sources to be identified and options to reduce ambient concentrations of pollutants can then be considered and assessed. The concentrations have been calculated using the new traffic emission factors.

The source apportionment should:

- > Confirm that exceedances of NO<sub>2</sub> are due to road traffic
- Determine the extent to which different vehicle types are responsible for the emission contributions to NO<sub>2</sub> within predicted areas of exceedance. This will allow traffic management scenarios to be modelled/tested to reduce the exceedances
- Quantify what proportion of the exceedances of NO<sub>2</sub> is due to background emissions, or, local emissions from busy roads in the local area. This will help determine whether local traffic management measures could have a significant impact on reducing emissions in the area of exceedance, or, whether national measures would be a suitable approach to achieving the air quality objectives

## **Receptors considered**

Source apportionment has been considered at those locations in Perth where the model has predicted the highest concentration of  $NO_2$  in 2005 at or near to a relevant receptor. These are points on the 10m x 10m receptor point grid used in the modelling, and have not been necessarily selected owing to their proximity to monitoring points. Figure 3.1 indicates the 8 locations in question:

- 1. Barrack Street (311284, 724165)
- 2. Atholl Street 1 (311476, 723942)
- 3. Melville Street (311521, 723981)
- 4. North Methven Street (311551, 723902)
- 5. Atholl Street 2 (311563, 7235949)
- 6. Main Street (312250, 724070)
- 7. York Place (311310, 723520)
- 8. Kinnoull Street (311684, 723676)

## Sources of pollution considered

We have considered the effect of the following sources in this assessment at the receptor considered:

- Background concentrations used in the assessment;
- Traffic Light Duty Vehicles on main roads in the 1 km square local area;
- Traffic Heavy Goods Vehicles on main roads in the 1 km square local area;
- Traffic Buses on main roads in the 1 km square local area.

It should be noted that the modelling has explicitly considered traffic on Atholl Street, York Place and Main Street in Perth. Reference in Tables 4.6 to 4.13 to 'traffic' refers to the contribution to pollutant concentrations of these traffic movements. Emissions from traffic movements on other roads in Perth and outside Perth have not been explicitly modelled. However, their contribution to pollutant concentrations in Perth is included in the modelled background concentrations. Background concentrations from traffic.

There is a complex relationship between oxides of nitrogen and nitrogen dioxide concentrations. The modelling assumed that the contribution to nitrogen dioxide concentration from road traffic could be estimated by using the relationships provided in LAQM.TG(03) and the AQEG report of 2004 (AQEG(2004)): the same relationships have been applied for source apportionment calculations.

The concentrations apportioned to each source category and the fraction of the total concentrations are shown in Tables 4.6 to 4.13.

Table 4.6:	Site 1, P	Perth: Source	e apportionment	of c	oncentrations	of	NO <sub>2</sub> and	NO <sub>x</sub> ir	1 2005	at
Barrack Street.										

Barrack St	NO <sub>2</sub> concentration,		NOx concentration,		
(311284 724165)	Contril	oution	Contrib	oution	
Source category	μ <b>g m</b> <sup>-3</sup>	%	μg m <sup>-3</sup>	%	
Car	4.3	8.8%	13.0	9.3%	
LGV	1.6	3.3%	4.9	3.5%	
HGV rigid	2.8	5.7%	8.4	6.0%	
HGV artic	2.0	4.1%	6.1	4.4%	
Bus & Coach	2.9	6.0%	8.9	6.4%	
Car (queuing)	7.1	14.7%	21.8	15.7%	
LGV (queuing)	2.2	4.6%	6.8	4.9%	
HGV rigid (queuing)	6.5	13.3%	19.7	14.2%	
HGV artic (queuing)	4.6	9.6%	14.2	10.2%	
Bus & coach (queuing)	6.6	13.6%	20.1	14.5%	
Total traffic free flowing	13.5	27.9%	41.2	29.7%	
Total traffic queuing	27.1	55.9%	82.5	59.5%	
Total traffic	40.6	84%	123.7	89%	
Background	7.8	16%	15.0	11%	
Total	48.4	100%	138.7	100%	

Figures are rounded to the nearest 1 decimal place

**Table 4.7:**Site 2, Perth: Source apportionment of concentrations of  $NO_2$  and  $NO_x$  in 2005 at<br/>Atholl Street 1.

Atholl St 1 (311476 723942)	NO <sub>2</sub> concentration, Contribution		NOx concentration, Contribution		
Source category					
	μg m <sup>-3</sup>	%	μg m <sup>-3</sup>	%	
Car	4.3	9.2%	12.9	9.9%	
LGV	1.5	3.3%	4.6	3.6%	
HGV rigid	2.8	5.9%	8.4	6.4%	
HGV artic	1.9	4.2%	5.9	4.5%	
Bus & Coach	3.5	7.5%	10.6	8.1%	
Car (queuing)	6.5	13.9%	19.6	15.0%	
LGV (queuing)	2.0	4.4%	6.1	4.7%	
HGV rigid (queuing)	5.1	11.0%	15.5	11.9%	
HGV artic (queuing)	3.6	7.7%	10.8	8.3%	
Bus & coach (queuing)	6.4	13.8%	19.4	14.9%	
Total traffic free flowing	14.0	30.1%	42.3	32.5%	
Total traffic queuing	23.7	50.8%	71.5	54.9%	
Total traffic	37.7	81%	113.8	87%	
Background	8.9	19%	16.3	13%	
Total	46.6	100%	130.2	100%	

Figures are rounded to the nearest 1 decimal place

Melville St	NO <sub>2</sub> conc	entration,	NOx concentration,		
(311521 723981)	Contribution		Contribution		
Source category	μ <b>g m</b> -3	%	μ <b>g m</b> <sup>-3</sup>	%	
Car	0.8	1.8%	2.3	1.9%	
LGV	0.3	0.6%	0.8	0.7%	
HGV rigid	0.3	0.8%	1.0	0.8%	
HGV artic	0.3	0.6%	0.7	0.6%	
Bus & Coach	0.7	1.5%	1.9	1.6%	
Car (queuing)	8.8	20.1%	25.9	21.9%	
LGV (queuing)	2.5	5.8%	7.5	6.3%	
HGV rigid (queuing)	5.8	13.3%	17.1	14.4%	
HGV artic (queuing)	4.3	9.9%	12.8	10.8%	
Bus & coach (queuing)	11.0	25.1%	32.4	27.3%	
Total traffic free flowing	2.3	5.2%	6.7	5.7%	
Total traffic queuing	32.5	74.3%	95.6	80.8%	
Total traffic	34.8	79%	102.4	86%	
Background	9.0	21%	16.0	14%	
Total	43.8	100%	118.4	100%	

**Table 4.8:** Site 3, Perth: Source apportionment of concentrations of  $NO_2$  and  $NO_x$  in 2005 at Melville Street.

Figures are rounded to the nearest 1 decimal place

**Table 4.9:**Site 4, Perth: Source apportionment of concentrations of  $NO_2$  and  $NO_x$  in 2005 at<br/>North Methven Street.

N Methven St	NO <sub>2</sub> conc	entration,	NOx concentration,		
(311551 723902)	Contribution		Contribution		
Source category	μ <b>g m</b> <sup>-3</sup>	%	μ <b>g m</b> <sup>-3</sup>	%	
Car	1.4	2.9%	4.4	3.1%	
LGV	0.5	1.0%	1.6	1.1%	
HGV rigid	1.5	3.0%	4.5	3.2%	
HGV artic	1.1	2.1%	3.3	2.3%	
Bus & Coach	1.1	2.2%	3.4	2.4%	
Car (queuing)	6.9	14.1%	21.5	15.1%	
LGV (queuing)	2.0	4.2%	6.4	4.5%	
HGV rigid (queuing)	10.8	21.9%	33.5	23.5%	
HGV artic (queuing)	7.7	15.5%	23.8	16.7%	
Bus & coach (queuing)	7.7	15.6%	23.9	16.8%	
Total traffic free flowing	5.5	11.2%	17.2	12.0%	
Total traffic queuing	35.2	71.3%	109.1	76.5%	
Total traffic	40.7	83%	126.3	88%	
Background	8.6	17%	16.4	12%	
Total	49.4	100%	142.7	100%	

Figures are rounded to the nearest 1 decimal place

Table 4.10:	Site 5, Perth: Source apportionment of concentrations of $NO_2$ and $NO_x$ in 2	2005 at
Atholl Street 2.		

Atholl St 2	NO <sub>2</sub> concentration,		NOx concentration,		
(311563 723949)	Contril	oution	Contrik	oution	
Source category	μ <b>g m</b> <sup>-3</sup>	%	μg m <sup>-3</sup>	%	
Car	2.8	6.6%	8.0	7.2%	
LGV	1.0	2.5%	3.0	2.7%	
HGV rigid	1.0	2.3%	2.8	2.5%	
HGV artic	1.6	3.8%	4.7	4.2%	
Bus & Coach	2.4	5.7%	6.9	6.2%	
Car (queuing)	6.4	15.2%	18.5	16.7%	
LGV (queuing)	2.0	4.8%	5.8	5.2%	
HGV rigid (queuing)	3.1	7.3%	8.9	8.0%	
HGV artic (queuing)	5.1	12.2%	14.9	13.4%	
Bus & coach (queuing)	7.4	17.7%	21.5	19.3%	
Total traffic free flowing	8.7	20.9%	25.3	22.9%	
Total traffic queuing	24.0	57.2%	69.5	62.7%	
Total traffic	32.7	78%	94.8	86%	
Background	9.2	22%	16.0	14%	
Total	41.9	100%	110.9	100%	

Figures are rounded to the nearest 1 decimal place

Table 4.11:Site 6, Perth: Source apportionment of concentrations of  $NO_2$  and  $NO_x$  in 2005 at<br/>Main Street.

Main St	NO <sub>2</sub> conc	entration,	NOx conc	entration,
(312250 724070)	Contribution		Contribution	
Source category	μ <b>g m</b> <sup>-3</sup>	%	μg m <sup>-3</sup>	%
Car	5.3	10.7%	15.9	11.1%
LGV	2.0	4.0%	5.9	4.1%
HGV rigid	3.0	6.0%	9.0	6.3%
HGV artic	2.2	4.5%	6.8	4.7%
Bus & Coach	3.0	6.1%	9.1	6.4%
Car (queuing)	8.0	16.2%	24.2	16.9%
LGV (queuing)	2.5	5.1%	7.5	5.3%
HGV rigid (queuing)	6.3	12.8%	19.1	13.3%
HGV artic (queuing)	4.7	9.6%	14.3	9.9%
Bus & coach (queuing)	6.2	12.6%	18.8	13.1%
Total traffic free flowing	15.5	31.3%	46.7	32.6%
Total traffic queuing	27.7	56.2%	83.9	58.5%
Total traffic	43.2	88%	130.6	91%
Background	6.1	12%	12.9	9%
Total	49.4	100%	143.4	100%

Figures are rounded to the nearest 1 decimal place

York Place	NO <sub>2</sub> conc	entration,	NOx concentration,		
(311310 723519)	Contribution		Contribution		
Source category	μ <b>g m</b> -3	%	μ <b>g m</b> <sup>-3</sup>	%	
Car	1.2	3.6%	3.3	4.1%	
LGV	0.5	1.4%	1.3	1.6%	
HGV rigid	0.9	2.7%	2.4	3.1%	
HGV artic	0.5	1.6%	1.4	1.8%	
Bus & Coach	1.0	3.1%	2.9	3.6%	
Car (queuing)	3.9	11.6%	10.7	13.4%	
LGV (queuing)	1.2	3.7%	3.4	4.2%	
HGV rigid (queuing)	4.8	14.5%	13.3	16.7%	
HGV artic (queuing)	2.8	8.5%	7.8	9.8%	
Bus & coach (queuing)	5.4	16.1%	14.8	18.6%	
Total traffic free flowing	4.1	12.3%	11.3	14.2%	
Total traffic queuing	18.2	54.3%	50.0	62.6%	
Total traffic	22.3	67%	61.3	77%	
Background	11.2	33%	18.5	23%	
Total	33.5	100%	79.8	100%	

**Table 4.12:**Site 7, Perth: Source apportionment of concentrations of  $NO_2$  and  $NO_x$  in 2005 at YorkPlace.

Figures are rounded to the nearest 1 decimal place

**Table 4.13:** Site 8, Perth: Source apportionment of concentrations of  $NO_2$  and  $NO_x$  in 2005 at Kinnoull Street.

Kinnoull St (311684 723676)	NO <sub>2</sub> concentration, Contribution		NOx concentration, Contribution	
Source category	$\mu g m^{-3}$ %		μg m <sup>-3</sup>	%
Car	1.0	2.1%	3.2	2.2%
LGV	0.4	0.7%	1.2	0.8%
HGV rigid	0.8	1.6%	2.4	1.7%
HGV artic	1.1	2.1%	3.4	2.3%
Bus & Coach	1.1	2.3%	3.6	2.5%
Car (queuing)	6.3	12.5%	19.6	13.4%
LGV (queuing)	1.8	3.7%	5.8	3.9%
HGV rigid (queuing)	7.6	15.2%	24.0	16.3%
HGV artic (queuing)	10.4	20.7%	32.7	22.3%
Bus & coach (queuing)	10.7	21.3%	33.6	22.9%
Total traffic free flowing	4.4	8.8%	13.8	9.4%
Total traffic queuing	36.9	73.4%	115.7	78.9%
Total traffic	41.3	82%	129.6	88%
Background	9.0	18%	17.2	12%
Total	50.2	100%	146.7	100%

Figures are rounded to the nearest 1 decimal place

From the above it may be seen that at these locations free-flowing traffic accounts for less than one eighth of the local NOx and  $NO_2$  concentrations, and of this traffic contribution, HDVs account for approximately three quarters.

Queuing traffic accounts for three quarters of the local  $NO_x$  and  $NO_2$  concentrations, and of this traffic contribution HDVs account for well over half.

Total HDV traffic, both free flowing and queuing, therefore contributes to over three-fifths to the local  $NO_2$  concentrations.

## 4.8 CONCLUSIONS AND RECOMMENDATIONS FOR NO<sub>2</sub>

#### NO<sub>2</sub> 2005 Base Case

This Further Assessment has confirmed a significant risk of exceedance of the UK annual mean objective for  $NO_2$  in 2005 in central Perth only. Both monitoring and modelling generally indicate that in 2005, for the Base Case, concentrations were above the required concentration at a maximum of 14 monitoring locations in Perth City Centre. At one monitoring location it is possible that the hourly  $NO_2$  objective was exceeded.

#### NO<sub>2</sub> 2005 with the CCTMR

This Further Assessment has confirmed a significant risk of exceedance of the UK annual mean objective for  $NO_2$  in 2005, with the CCTMR in place, in central Perth only. Modelling generally indicates that in 2005, with the CCTMR in place, concentrations were above the required concentration at a maximum of 13 monitoring locations in Perth City Centre. At 3 monitoring locations it is possible that the hourly  $NO_2$  objective was exceeded.

#### NO<sub>2</sub> 2010

Concentrations in 2010, based on 2005 projected forward traffic data, are predicted to be lower, although the EU Limit Value for annual mean  $NO_2$  may still be exceeded at these city centre locations in that year.

#### NO<sub>2</sub> 2018

Modelling for 2018 with City Centre Management Review and Regional Bridge in place showed that again 13 monitoring locations would exceed the annual mean objective. The number of monitoring locations predicting a possible exceedance of the hourly mean is predicted to increase from 3 in 2005 with the CCTMR to 8 by 2018.

#### NO<sub>2</sub> Source apportionment

Results for 2005 indicate that at the locations of highest predicted roadside concentrations, freeflowing traffic accounts for less than one eighth of the local NOx and NO<sub>2</sub> concentrations, and of this traffic contribution, HDVs account for approximately three quarters. Queuing traffic accounts for three quarters of the local NO<sub>x</sub> and NO<sub>2</sub> concentrations, and of this traffic contribution HDVs account for well over half. Total HDV traffic, both free flowing and queuing, therefore contributes to over three-fifths to the local NO<sub>2</sub> concentrations. Reductions in HDV queuing and congestion are therefore likely to lead to a significant reduction in roadside NOx and NO<sub>2</sub>.

#### NO<sub>2</sub> Recommendations

It is therefore recommended that Perth and Kinross Council retain their city wide air quality management area for NO<sub>2</sub>, and proceed with preparation of their action plan to reduce NO<sub>2</sub> concentrations in this area. Perth and Kinross Council should continue to monitor at this location.

# 5 **PM**<sub>10</sub>

Airborne  $PM_{10}$  varies widely in its physical and chemical composition, source and particle size. Particles are often classed as either primary (those emitted directly into the atmosphere) or secondary (those formed or modified in the atmosphere from condensation and growth).  $PM_{10}$  particles (the fraction of particulates in air of very small size, <10 µm aerodynamic diameter) can potentially pose significant health risks, as they are small enough to penetrate deep into the lungs. Larger particles are not readily inhaled.

A major source of fine primary particles is combustion processes, in particular diesel combustion, where transport of hot exhaust vapour into a cooler tailpipe or stack can lead to spontaneous nucleation of "carbon" particles before emission. Secondary particles are typically formed when low volatility products are generated in the atmosphere, for example the oxidation of sulphur dioxide to sulphuric acid. The atmospheric lifetime of  $PM_{10}$  is strongly related to particle size, but may be as long as 10 days for particles of about 1 µm in diameter.

Concern about the potential health impacts of  $PM_{10}$  has increased very rapidly over recent years. Increasingly, attention has been turning towards monitoring the smaller particle fraction,  $PM_{2.5}$ , which is capable of penetrating deepest into the lungs, or to even smaller size fractions or total particle numbers.

## 5.1 LATEST STANDARDS AND OBJECTIVES FOR PM<sub>10</sub>

The Air Quality Regulations, 1997 set the objective for  $PM_{10}$  particulate material of 50 µg m<sup>-3</sup>, measured as the 99<sup>th</sup> percentile of the daily maximum running 24 hour mean (equivalent to 4 exceedences per year) to be achieved by 31 December 2005. The objective was based on measurements carried out using the TEOM analyser, or equivalent.

The Government published its proposals for review of the National Air Quality Strategy in early 1999 (DETR, 1999). The review presented proposals for revised and additional objectives for  $PM_{10}$ . Revised objectives for  $PM_{10}$  were proposed because:

- work carried out by the Airborne Particles Expert Group (APEG) indicated that the original objective was unrealistic;
- the Common Position agreed on the Air Quality Daughter Directive (AQDD) at Environment Council in June 1998 included different objectives for PM<sub>10</sub>.

These included a 24 hour limit value of 50  $\mu$ g m<sup>-3</sup>, not to be exceeded more than 35 times per year and an annual limit of 40  $\mu$ g m<sup>-3</sup> to be achieved by 1 January 2005 (EU Stage 1 objectives). The AQDD specifies that the transfer reference method for determining compliance is to be a gravimetric<sup>3</sup> measuring method.

The Air Quality Strategy replaced the original objective for  $PM_{10}$  with the AQDD objectives. The current objectives to be achieved in Scotland are:

- > An annual average concentration of 40  $\mu$ g m<sup>-3</sup> (gravimetric);
- > By 2010 an annual average concentration of 18  $\mu$ g m<sup>-3</sup> (gravimetric);
- A 24 hour mean concentration of 50 µg m<sup>-3</sup> (gravimetric) not to be exceeded more than 35 times a year in 2004, and 7 times by 2010.

## 5.2 THE NATIONAL PERSPECTIVE

National UK emissions of primary  $PM_{10}$  have been estimated as totalling 184,000 tonnes in 1997. Of this total, around 25% were derived from road transport sources. It should be noted that, in general, the emissions estimates for  $PM_{10}$  are less accurate than those for the other pollutants with prescribed objectives, especially for sources other than road transport.

<sup>&</sup>lt;sup>3</sup> Comparison of UK monitoring data determined with TEOM instruments with the European Union Directive limit values is not straightforward since the EU limits are based on measurements of PM<sub>10</sub> by other instrumental techniques which yield higher concentrations (APEG, 1999).

The Government established the Airborne Particles Expert Group (APEG) to advise on sources of  $PM_{10}$  in the UK and current and future ambient concentrations. Their conclusions were published in January 1999 (APEG, 1999). APEG concluded that a significant proportion of the current annual average  $PM_{10}$  is due to the secondary formation of particulate sulphates and nitrates, resulting from the oxidation of sulphur and nitrogen oxides. These are regional scale pollutants and the annual concentrations do not vary greatly over a scale of tens of kilometres. There are also natural or seminatural sources such as wind-blown dust and sea salt particles. The impact of local urban sources is superimposed on this regional background. Such local sources are generally responsible for winter episodes of hourly mean concentrations of  $PM_{10}$  above 100 µg m<sup>-3</sup> associated with poor dispersion. However, it is clear that many of the sources of  $PM_{10}$  are outside the control of individual local authorities and the estimation of future concentrations of  $PM_{10}$  are in part dependent on predictions of the secondary particle component.

## 5.3 Monitoring Data

#### TEOM

The particle analyser used to measure  $PM_{10}$  concentration is a Rupprecht & Patashnick (R&P) Tapered Element Oscillating Microbalance (TEOM). It provides measurements in real time which are recorded on the datalogger. The system measures  $PM_{10}$  concentration by continuously determining the particle mass deposited on a filter. The filter is attached to a hollow tapered element that vibrates at its natural frequency of oscillation. As particles collect on the filter, the frequency changes by an amount inversely proportional to the square root of the mass deposited. This analyser is typical of the type used in the AURN.

Table 5.1 shows the measured concentrations during this period. These data are provisional from 01/07/2005 and may be subject to further quality control. The results of the automatic monitoring in Perth indicate that at both roadside automatic monitors,  $PM_{10}$  concentrations recorded at these sites have met the 2004 annual mean objective of 40 µg m<sup>-3</sup>. Results suggest that as regards the 2004 UK daily objective, the daily mean will not exceed 50 µg m<sup>-3</sup> more than the 35 times set for the objective. By 2010, annual mean concentrations are likely to have declined to levels close to the 18 µg m<sup>-3</sup> concentration for 2010 set for Scotland, and the daily mean objective for 2010 is also unlikely to be exceeded in that year.

The location of the automatic TEOM PM<sub>10</sub> monitor is shown in Figure 3.1.

## Automatic Monitoring

Table 5.1 shows the measured concentrations in 2005.

Table 5.1Summary of continuous PM10 ratified data 2005 for High Street and Atholl<br/>Street Automatic TEOM PM10 Monitors

High Street - Statistic		
	Year 2005	Estimate of Year 2010
Annual Mean PM <sub>10</sub> (μg m <sup>-3</sup> )	18	16
Number of Days over 50 µg m <sup>-3</sup>	1	-
Data Capture (%) PM <sub>10</sub>	99.2%	-
Atholl Street - Statistic		
	Year 2005	Estimate of Year 2010
Annual Mean PM <sub>10</sub> (μg m <sup>-3</sup> )	25	20
Number of Days over 50 µg m <sup>-3</sup>	4	-
Data Capture (%) PM <sub>10</sub>	98%	-

\* Estimated following the methodology in TG(03)

TEOM measurements corrected by factor of 1.3 to estimate µg/m<sup>3</sup> (Gravimetric)

# 6 Further Assessment for PM<sub>10</sub>

This further assessment has been undertaken by means of computer dispersion modelling validated using diffusion tube monitoring. The locations at which detailed modelling was carried out are Perth City Centre focusing on Atholl Street and South Street and AQMA wide modelling was also completed.

# 6.1 METEOROLOGICAL DATA

Hourly sequential meteorological data for the nearest suitable meteorological station with adequate data capture; Leuchars near St. Andrews, some 29 miles northeast of Perth, was obtained for 2005. The meteorological data provided information on wind speed and direction and the extent of cloud cover for each hour of 2005.

# 6.2 TRAFFIC MODELLING SUMMARY

In this study, the concentrations of  $PM_{10}$  at receptors close to the roads and junctions of interest have been modelled using ADMS-3.3 as a dispersion kernel model.

The roads were defined as volume sources, 3m deep, and were broken up in to a series of adjoining segments. The length of these segments was dictated by the way in which the OS LandLine data was digitised and varied from one or two metres in length (where the road rapidly changed direction) to hundreds of metres in length (where the road was essentially straight). The OS LandLine data was used to provide the co-ordinates of the centre line of the road, and the road widths. Therefore, the position of the volume sources (here the roads) were accurate to approximately a metre.

Where queuing of vehicles was reported, emissions from stationary vehicles exhausts were estimated on the basis that the engine power output and hence emissions were the same as those at a speed of 5 kph. Queuing vehicles were assumed to be 5 m apart.

# 6.3 SOURCES OF BACKGROUND (NON-TRAFFIC) EMISSIONS DATA

Background emissions of oxides of  $PM_{10}$  from sources not modelled in detail have been taken from the UK National Atmospheric Emissions Inventory 2004 (<u>www.naei.org.uk</u>) and scaled to the year of interest where necessary following the recommended procedure in LAQM. TG(03). The contribution to emissions from the roads modelled in detail have been omitted where this would lead to double counting of the local impact of emissions.

# 6.4 MODEL BIAS AND VERIFICATION

For  $PM_{10}$  the LADSUrban model does not include background, this has to be added either from the background maps or using the automatic monitoring available. The average background difference of 18 µg m<sup>-3</sup> between the 2 automatic monitors and the model was used and added as background to the modelling results. This gave good agreement, with the model under predicting at Atholl Street by 9% and overpredicting at the High Street automatic monitor by 12% (Table 6.1). In comparison, the background PM<sub>10</sub> maps gave a concentration of 15 µg m<sup>-3</sup> for 2005 for Perth. As the model results now includes both roads and background, the added fixed background of 18 µg m<sup>-3</sup> may therefore report an additional component of local urban background resulting from the relatively high rise nature of the town.

				With 15 µg m <sup>-3</sup> for background			With 18 $\mu$ g m <sup>-3</sup> fo	r backgroun	d	
Monitori Site	ng Ty	/pe	Location	% Error of model relative to monitor	10		% Error of model relative to monitor	10	PM <sub>10</sub> concentration, μg m <sup>-3</sup> (gravimetric)	
					Modelled	Measured		Modelled	Measured	
Automat	ic I	R	High Street	-5	17	18	12	20	18	
Automat	ic I	R	Atholl Street	-21	20	25	-9	23	25	

Table 6 1: Com	narison of modelled and	I measured concentratio	ns for 2005	(Base Case)
	parison or modelled and	i measureu concenti atio	113 101 2003	(Dase Case)

R - Roadside

# 6.5 MODEL VALIDATION

In simple terms, model validation is where the model is tested at a range of locations and is judged suitable to use for a given application. The modelling approach used in this assessment has been validated, and used in numerous AEA Energy & Environment air quality review and assessments. Statistical techniques have been used to assess the likelihood that there will be an exceedance of the air quality objectives given the modelled concentration. The validation statistics are given in Appendix 3. Confidence limits for the predicted concentrations were calculated based on the validation studies by applying statistical techniques based on Student's t distribution. The confidence limits took account of uncertainties resulting from:

- Model errors at the receptor site;
- Model errors at the reference site;
- Uncertainty resulting from year to year variations in atmospheric conditions.

The confidence limits have been used to estimate the likelihood of exceeding the objectives at locations close to the roads. The following descriptions have been assigned to levels of risk of exceeding the objectives.

It would be recommended that Perth and Kinross Council generally consider declaring an AQMA where the probability of exceedance in 2005 or 2010 is greater than 50% ("Probable").

Description	Chance of exceeding daily objective for 2005	Predicted number of days PM <sub>10</sub> over 50 μg/m <sup>3</sup> gravimetric
Very unlikely	Less than 5%	<12
Unlikely	5-20%	12-24
Possible	20-50%	24-35
Probable	50-80%	35-50
Likely	80-95%	50-73
Very likely	More than 95%	>73

Table 6.2: Uncertainties in the modelled concentrations for PM<sub>10</sub> in 2004

#### Table 6.3: Uncertainties in the modelled concentrations for PM<sub>10</sub> in 2010

Description	Chance of exceeding annual mean objective for 2010	Modelled annual average PM <sub>10</sub> (μg/m <sup>3</sup> gravimetric)
Very unlikely	Less than 5%	<11
Unlikely	5-20%	11-15
Possible	20-50%	15-18
Probable	50-80%	18-21
Likely	80-95%	21-25
Very likely	More than 95%	>25

The confidence limits for the 'probable' and 'likely' daily objective concentrations have been set equal to those for 'possible' and 'unlikely', respectively. In reality, the intervals of concentration increase as the probability of exceeding the annual and hourly objective increases from 'unlikely' to 'likely'. The advantage to setting symmetrical concentration intervals is that the concentration contours on the maps become simpler to interpret. This is a mildly conservative approach to assessing the likelihood of exceedances of the  $PM_{10}$  objectives since a greater geographical area will be included using the smaller confidence intervals.

# 6.6 RESULTS OF MODELLING

# **PM<sub>10</sub> – 2005 Base Case (BC)**

### 2004 Annual Mean Objective

Figure 6.1 shows modelled annual mean PM<sub>10</sub> concentrations in the area of central Perth in 2005. The model predicts that the UK 2004 annual average objective of 40  $\mu$ g m<sup>-3</sup> for PM<sub>10</sub> will not be exceeded in the city centre or city wide AQMA as the model predicts a maximum concentration of 24  $\mu$ g m<sup>-3</sup> at a relevant receptor. When compared with the automatic monitor's annual means (Table 5.1), the monitoring supports the likelihood that the 2004 annual average objective for PM<sub>10</sub> was not exceeded in 2005.

#### 2004 Daily Mean Objective

Figure 6.2 shows modelled number of days exceeding 50  $\mu$ g m<sup>-3</sup> in the area of central Perth. The model predicts that the UK 2004 daily mean objective not to be exceeded more than 35 times a year will not be exceeded in the AQMA as the model predicts a maximum number of days of 10 at a relevant receptor. It is at most "very unlikely" that the daily mean objective will be exceeded at all of the 2005 monitoring locations. When compared with the automatic monitors' number of days over 50  $\mu$ g m<sup>-3</sup> (Table 5.1), the monitoring supports the likelihood that the 2004 daily mean objective for PM<sub>10</sub> was not exceeded in 2005.

## PM<sub>10</sub> – 2005 with CCTMR

#### 2004 Annual Mean Objective

Figure 6.3 shows the annual mean  $PM_{10}$  concentrations in the area of central Perth in 2005 with the CCTMR in place. Again, like the 2005 BC modelling, the model predicts that 2004 UK annual mean objective for  $PM_{10}$  will not be exceeded at any location in Perth in this year.

#### 2004 Daily Mean Objective

Figure 6.4 the daily mean modelled  $PM_{10}$  concentrations in the area of central Perth in 2005 with the CCTMR in place. Again, like the 2005 BC modelling, the model predicts that the 2004 UK daily mean objective for  $PM_{10}$  will not be exceeded at any location in Perth in this year.

#### Impact of measures

The CCTMR slightly reduces pollutant concentrations in the northeast of Perth City Centre and reduces the extent of the 22  $\mu$ g m<sup>-3</sup> concentration at the Barrack Street/Dunkeld Road. For the daily mean objective, the CCTMR improves Kinnoull Street by reducing the extent of the 7 days over 50  $\mu$ g m<sup>-3</sup>, but reveals increased concentrations at the Glasgow Road/ Caledonian Road junction.

## PM<sub>10</sub> - 2010

#### 2010 Annual Mean Objective

Figure 6.5 shows modelled annual mean  $PM_{10}$  concentrations in the central Perth area in 2010. The model predicts that the more stringent 2010 annual mean objective of 18 µg m<sup>-3</sup> for Scotland will be exceeded in the city centre only, with the model predicting a maximum of 20 µg m<sup>-3</sup> at a relevant receptor. It is at most "probable" that the 2010 annual mean objective will be exceeded (Table 6.4).

#### 2010 Daily Mean Objective

There are no exceedances of the number of days over 50  $\mu$ g m<sup>-3</sup> predicted; therefore no map has been displayed. The maximum number of days over 50  $\mu$ g m<sup>-3</sup> predicted for 2010 is 3 at a relevant receptor.

## $PM_{10} - 2010$ with CCTMR

#### 2010 Annual Mean Objective

Figure 6.6 shows modelled annual mean  $PM_{10}$  concentrations in the central Perth area in 2010 with the CCTMR in place. The model predicts that the more stringent 2010 annual mean objective of 18  $\mu$ g m<sup>-3</sup> for Scotland will be exceeded in the city centre only, with the model predicting a maximum of 20  $\mu$ g m<sup>-3</sup> at a relevant receptor. It is at most "probable" that the 2010 annual mean objective will be exceeded (Table 6.5).

#### 2010 Daily Mean Objective

There are no exceedances of the daily mean objective predicted; therefore no map has been displayed. The maximum number of days over 50  $\mu$ g m<sup>-3</sup> predicted for 2010 is 3 at a relevant receptor.

### PM<sub>10</sub> – 2018 with CCTMR and Regional Bridge

#### 2010 Annual Mean Objective

Figure 6.7 shows modelled annual mean  $PM_{10}$  concentrations in central Perth in 2018 with the CCTMR and Regional Bridge in place. The model predicts that the Scottish 2010 annual mean objective of 18  $\mu$ g m<sup>-3</sup> will be exceeded in the city centre only, with the model predicting a maximum concentration of 23  $\mu$ g m<sup>-3</sup> at a relevant receptor. It is at most "likely" that the 2010 annual objective will be exceeded (Table 6.6).

#### 2010 Daily Mean Objective

Figure 6.8 shows modelled number of days exceeding 50  $\mu$ g m<sup>-3</sup> in central Perth. The model predicts that the 2010 daily mean objective not to be exceeded more than 7 times a year for Scotland will be slightly exceeded in the city centre, with the model predicting a maximum number of 8 days at a relevant receptor.

#### Impact of measures

The Regional Bridge improves the  $PM_{10}$  concentration across the AQMA, compared to 2005, with only the city centre now showing exceedances of both 2010 objectives. 22 out of the 34 2005 monitoring locations are predicted to be at most "likely" to exceed the 2010  $PM_{10}$  annual mean objective (Table 6.6).

Probability of E	xceedance			_	
x	Y	Site ID	Site Name	2010 PM <sub>10</sub> Annual Mean	Probability of exceeding 2010 PM <sub>10</sub> annual mean objective
308289	724892	P47	5 East Huntingtower, Perth, PH1 3JJ	17	Possible 20-50%
308924	724287	P7	257 Rannoch Rd/Newhouse Road Roundabout, Perth, PH1 2DW	16	Possible 20-50%
309327	724878		204 A Crieff Rd, Perth, PH1 2PE	17	Possible 20-50%
310509	725767	P6	41 Mull Place, Perth, PH1 3DP	16	Possible 20-50%
310646	722783	P3 L, P3 R	15 Murray Cres, Perth, PH2 0HU	16	Possible 20-50%
310778	723556	P36	51 Glasgow Rd, Perth, PH2 0PE	17	Possible 20-50%
310860	723563	P37	Riggs Rd, Perth, PH1 1PR	17	Possible 20-50%
311059	724394		2 Crieff Road Perth PH1 5RT	18	Possible 20-50%
311092	724352	P45	Ballantine Place, Perth PH1 5RR	17	Possible 20-50%
311190	723505	P28	28 York Place Perth PH2 8EH	19	Probable 50-80%
311252	723518	P29	37 York Place Perth PH2 8EH	19	Probable 50-80%
311366	724059	P19	St Ninian's School ,Dunkeld Rd, Perth, PH1 5RF	19	Probable 50-80%
311420	723980	P44 L, P44 R	22 Barrack St, Perth, PH1 5RD	19	Probable 50-80%
311465	723941	P41 L, P41 R	76 Atholl St, Perth, PH1 5NL	19	Probable 50-80%
311492	721849	P48	30 Edinburgh Rd, Perth, PH2 8BX	17	Possible 20-50%
311503	723481	P34 L, P34 R	10 County Place, Perth, PH2 8EE	19	Probable 50-80%
311570	723929	P61L, P61 C, P61 R	Atholl St, Perth real time monitor	19	Probable 50-80%
311586	723991	P5 L, P5 R	8 Stormont St, Perth, PH1 5NW	17	Possible 20-50%
311591	723474		216 South Street Perth PH2 8NY	19	Probable 50-80%
311614		P43 L, P43 C, P43 R	17 Atholl St, Perth, PH1 5NH	20	Probable 50-80%
311637	723951	P42	26-28 Atholl St, Perth, PH1 6NP	19	Probable 50-80%
311689	723628	P54L, P54 C, P54 R	Real Time Monitor adjacent to 176 High St, Perth PH1 5EW	18	Possible 20-50%
311690	723503	P1 L, P1 C, P1 R	42 Scott St. Perth. PH1 5PH	18	Probable 50-80%
311700	723483	P32	135 South St, Perth, PH2 8PA	19	Probable 50-80%
311799		P30 L, P30 C, P30 R	104 South St, Perth, PH2 8PA	18	Possible 20-50%
311840	723453	P13 L, P13 R	86/88 South Street Perth PH2 8PD	18	Possible 20-50%
311917	723465		45-47 South St, Perth, PH2 8PD	18	Probable 50-80%
311930	723414	P35	17 Princes St. Perth. PH2 8NG	17	Possible 20-50%
312018	723405		17 Spevgate, Perth, PH2 8PJ	17	Possible 20-50%
312233	723927		2 West Bridge St, Bridgend, Perth, PH2 7HA	17	Possible 20-50%
312244		P40 L, P40 R	18 Main St, Bridgend, PH2 7HB	19	Probable 50-80%
312256	724015	P39 L, P39 R	39 Main St, Bridgend, PH2 7HD	19	Probable 50-80%
312262		P14 L, P14 C, P14 R	9 Main St, Bridgend, Perth, PH2 7HD	19	Probable 50-80%
312262	724167		93-109 Main St Bridgend, PH2 7HE	17	Possible 20-50%

Table 6.4Probability of exceeding the 2010 annual mean objective for PM10 in Perth for2010.2010.

Figures in bold show predicted exceedances of the annual average objective

Table 6.5	Probability of exceeding the 2010 annual mean objective for PM <sub>10</sub> in Perth for
2010 with CCT	MR.

bability of E X	Y	Site ID	Site Name	2010+CCTMR PM <sub>10</sub> Annual Mean	Probability of exceeding 2010 PM <sub>10</sub> annua mean objective
308289	724892	P47	5 East Huntingtower, Perth, PH1 3JJ	17	Possible 20-50%
308924	724287	P7	257 Rannoch Rd/Newhouse Road Roundabout, Perth, PH1 2DW	16	Possible 20-50%
309327	724878	P46	204 A Crieff Rd, Perth, PH1 2PE	17	Possible 20-50%
310509	725767	P6	41 Mull Place, Perth, PH1 3DP	16	Possible 20-50%
310646	722783	P3 L, P3 R	15 Murray Cres, Perth, PH2 0HU	16	Possible 20-50%
310778	723556	P36	51 Glasgow Rd, Perth, PH2 0PE	17	Possible 20-50%
310860	723563	P37	Riggs Rd, Perth, PH1 1PR	17	Possible 20-50%
311059	724394	P20	2 Crieff Road Perth PH1 5RT	17	Possible 20-50%
311092	724352		Ballantine Place, Perth PH1 5RR	17	Possible 20-50%
311190	723505		28 York Place Perth PH2 8EH	19	Probable 50-80%
311252	723518	P29	37 York Place Perth PH2 8EH	19	Probable 50-80%
311366	724059		St Ninian's School ,Dunkeld Rd, Perth, PH1 5RF	19	Probable 50-80%
311420		P44 L, P44 R	22 Barrack St, Perth, PH1 5RD	19	Probable 50-80%
311465	723941	P41 L, P41 R	76 Atholl St, Perth, PH1 5NL	19	Probable 50-80%
311492	721849	P48	30 Edinburgh Rd, Perth, PH2 8BX	17	Possible 20-50%
311503	723481	P34 L, P34 R	10 County Place, Perth, PH2 8EE	19	Probable 50-80%
311570	723929	P61L, P61 C, P61 R	Atholl St, Perth real time monitor	19	Probable 50-80%
311586	723991	P5 L, P5 R	8 Stormont St, Perth, PH1 5NW	17	Possible 20-50%
311591	723474	P33	216 South Street Perth PH2 8NY	19	Probable 50-80%
311614		P43 L, P43 C, P43 R	17 Atholl St, Perth, PH1 5NH	20	Probable 50-80%
311637	723951	P42	26-28 Atholl St, Perth, PH1 6NP	19	Probable 50-80%
311689		P54L, P54 C, P54 R	Real Time Monitor adjacent to 176 High St, Perth PH1 5EW	18	Possible 20-50%
311690	723503	P1 L, P1 C, P1 R	42 Scott St, Perth, PH1 5PH	18	Possible 20-50%
311700	723483	P32	135 South St, Perth, PH2 8PA	19	Probable 50-80%
311799	723456	P30 L, P30 C, P30 R	104 South St, Perth, PH2 8PA	18	Possible 20-50%
311840	723453	P13 L, P13 R	86/88 South Street Perth PH2 8PD	18	Possible 20-50%
311917	723465	P31	45-47 South St, Perth, PH2 8PD	18	Possible 20-50%
311930	723414	P35	17 Princes St, Perth, PH2 8NG	17	Possible 20-50%
312018	723405	P2	17 Speygate, Perth, PH2 8PJ	17	Possible 20-50%
312233	723927	P51	2 West Bridge St, Bridgend, Perth, PH2 7HA	17	Possible 20-50%
312244	723965	P40 L, P40 R	18 Main St, Bridgend, PH2 7HB	19	Probable 50-80%
312256	724015	P39 L, P39 R	39 Main St, Bridgend, PH2 7HD	18	Probable 50-80%
312262	723968	P14 L, P14 C, P14 R	9 Main St, Bridgend, Perth, PH2 7HD	19	Probable 50-80%
312262	724167	P38	93-109 Main St Bridgend, PH2 7HE	17	Possible 20-50%

Figures in bold show predicted exceedances of the annual average objective

# Table 6.6 Probability of exceeding the 2010 annual mean objective for $PM_{10}$ in Perth for the 2018 Scenario (with CCTMR and Regional Bridge).

Probabili	ity of Exc	eedance			
x	Y	Site ID	Site Name	2018+CCTMR+Bridge PM <sub>10</sub> Annual Mean	Probability of exceeding 2010 PM 10 annual average objective
308289	724892	P47	5 East Huntingtower, Perth, PH1 3JJ	18	Probable 50-80%
308924	724287		257 Rannoch Rd/Newhouse Road Roundabout, Perth, PH1 2DW	16	Possible 20-50%
309327	724878	P46	204 A Crieff Rd, Perth, PH1 2PE	18	Possible 20-50%
310509	725767	P6	41 Mull Place, Perth, PH1 3DP	16	Possible 20-50%
310646	722783	P3 L, P3 R	15 Murray Cres, Perth, PH2 0HU	16	Possible 20-50%
310778	723556	P36	51 Glasgow Rd, Perth, PH2 0PE	17	Possible 20-50%
310860	723563	P37	Riggs Rd, Perth, PH1 1PR	16	Possible 20-50%
311059	724394	P20	2 Crieff Road Perth PH1 5RT	18	Probable 50-80%
311092	724352	P45	Ballantine Place, Perth PH1 5RR	17	Possible 20-50%
311190	723505	P28	28 York Place Perth PH2 8EH	21	Likely 80-95%
311252	723518	P29	37 York Place Perth PH2 8EH	22	Likely 80-95%
311366	724059		St Ninian's School ,Dunkeld Rd, Perth, PH1 5RF	21	Likely 80-95%
311420		P44 L, P44 R	22 Barrack St. Perth. PH1 5RD	22	Likely 80-95%
311465		P41 L, P41 R	76 Atholl St, Perth, PH1 5NL	22	Likely 80-95%
311492	721849		30 Edinburgh Rd, Perth, PH2 8BX	17	Possible 20-50%
311503		P34 L, P34 R	10 County Place, Perth, PH2 8EE	22	Likely 80-95%
311570		P61L, P61 C, P61 R	Atholl St, Perth real time monitor	22	Likely 80-95%
311586		P5 L, P5 R	8 Stormont St, Perth, PH1 5NW	17	Possible 20-50%
311591	723474		216 South Street Perth PH2 8NY	21	Probable 50-80%
311614	723933	P43 L, P43 C, P43 R	17 Atholl St, Perth, PH1 5NH	23	Likely 80-95%
311637	723951	P42	26-28 Atholl St, Perth, PH1 6NP	21	Likely 80-95%
311689		P54L, P54 C, P54 R	Real Time Monitor adjacent to 176 High St, Perth PH1 5EW	18	Probable 50-80%
311690	723503	P1 L, P1 C, P1 R	42 Scott St. Perth. PH1 5PH	19	Probable 50-80%
	723483		135 South St, Perth, PH2 8PA	21	Likely 80-95%
311799		P30 L, P30 C, P30 R	104 South St, Perth, PH2 8PA	19	Probable 50-80%
311840		P13 L, P13 R	86/88 South Street Perth PH2 8PD	19	Probable 50-80%
311917	723465		45-47 South St, Perth, PH2 8PD	19	Probable 50-80%
311930	723414	-	17 Princes St, Perth, PH2 8NG	17	Possible 20-50%
312018	723405		17 Speygate, Perth, PH2 8PJ	16	Possible 20-50%
312233	723927		2 West Bridge St, Bridgend, Perth, PH2 7HA	17	Possible 20-50%
312244	723965	P40 L, P40 R	18 Main St, Bridgend, PH2 7HB	19	Probable 50-80%
312256		P39 L, P39 R	39 Main St, Bridgend, PH2 7HD	18	Probable 50-80%
312262		P14 L, P14 C, P14 R	9 Main St. Bridgend, Perth. PH2 7HD	19	Probable 50-80%
	724167		93-109 Main St Bridgend, PH2 7HE	17	Possible 20-50%

Figures in bold show predicted exceedances of the annual average objective

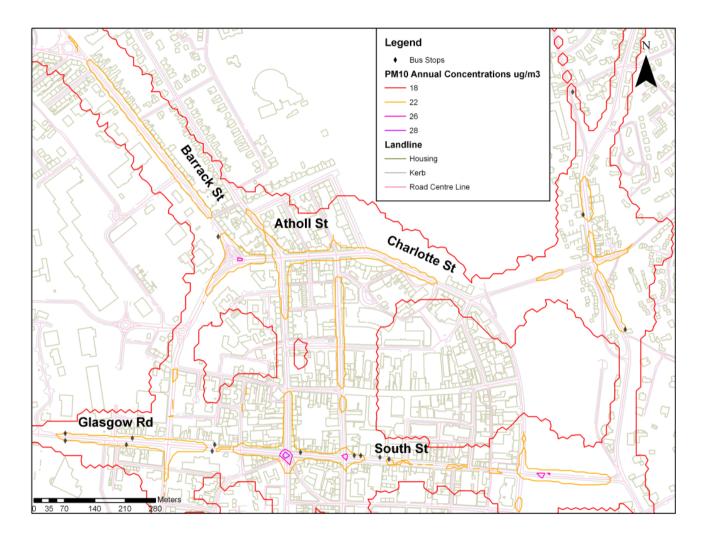


Figure 6.1 Predicted Annual Mean PM<sub>10</sub> concentrations for Perth City Centre, 2005.

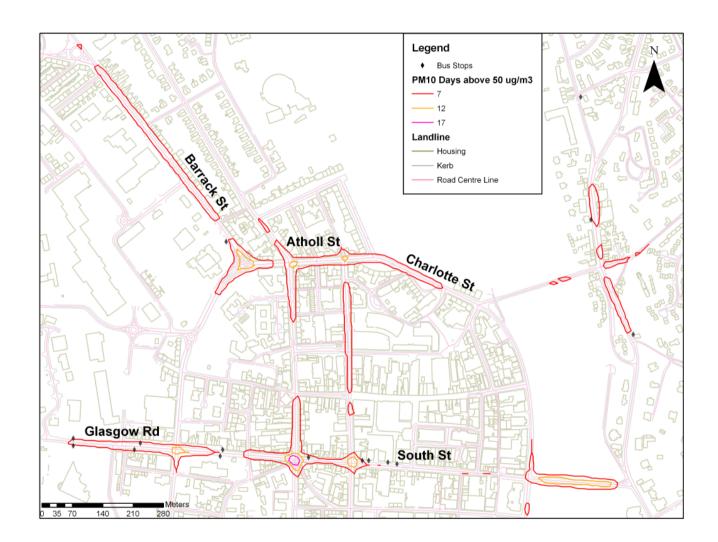


Figure 6.2 Predicted Number of Days Exceeding Daily Mean PM<sub>10</sub> objective concentrations for Perth City Centre, 2005.

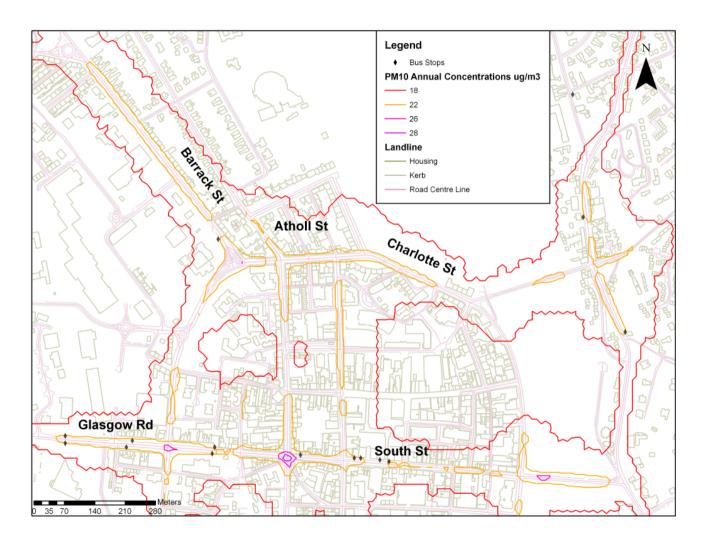


Figure 6.3 Predicted Annual Mean PM<sub>10</sub> concentrations for Perth City Centre, 2005 with City Centre Management Review.

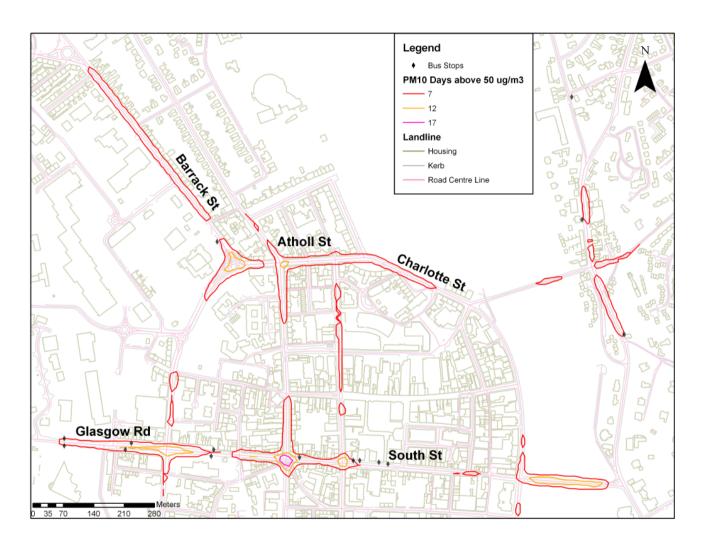


Figure 6.4 Predicted Number of Days Exceeding Daily Mean PM<sub>10</sub> objective concentrations for Perth City Centre, 2005 with City Centre Management Review.

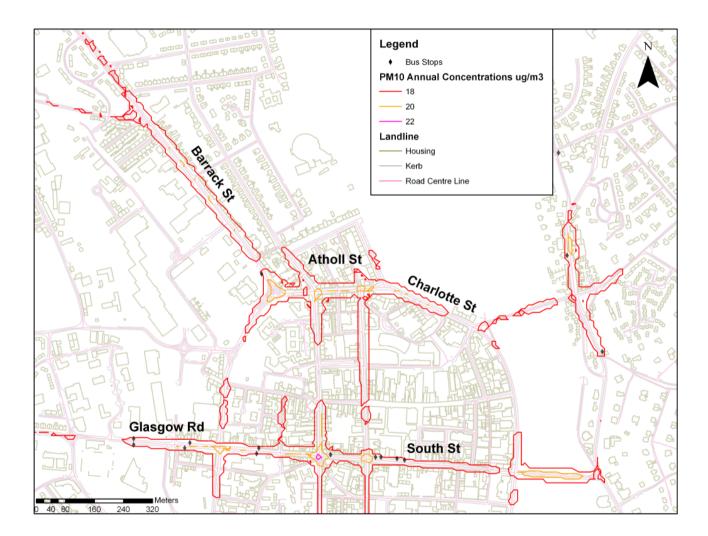


Figure 6.5 Predicted Annual Mean PM<sub>10</sub> concentrations for Perth City Centre, 2010.

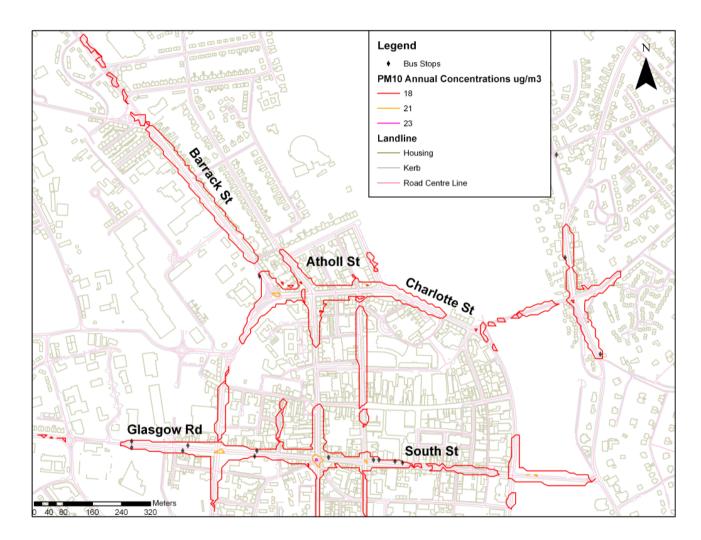


Figure 6.6 Predicted Annual Mean PM<sub>10</sub> concentrations for Perth City Centre, 2010 with City Centre Management Review.

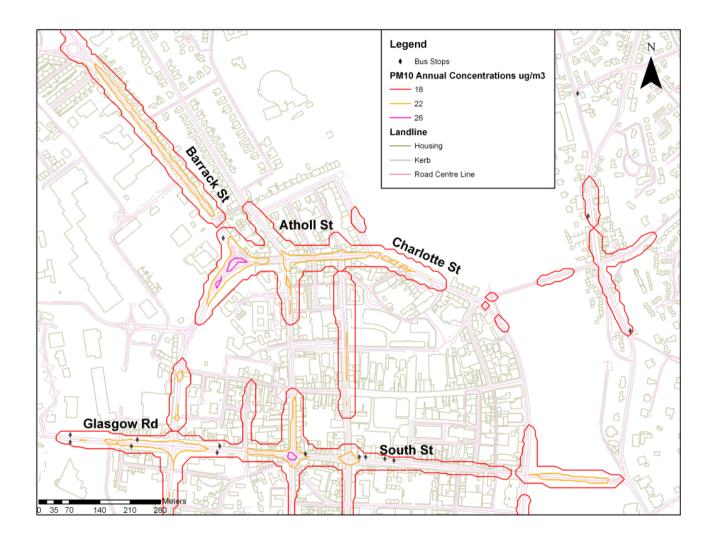


Figure 6.7 Predicted Annual Mean PM<sub>10</sub> concentrations for Perth City Centre, 2018 with City Centre Management Review and Regional Bridge.

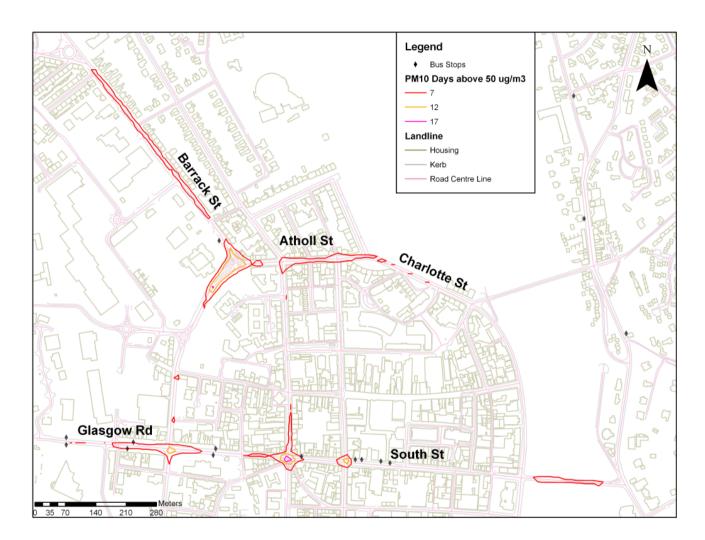


Figure 6.8 Predicted Number of Days Exceeding Daily Annual PM<sub>10</sub> objective concentrations for Perth City Centre, 2018 with City Centre Management Review and Regional Bridge.

## 6.7 SOURCE APPORTIONMENT OF PREDICTED EXCEEDANCES

Source apportionment is the process whereby the contributions from different sources of a pollutant are determined. In local air quality, the relevant sources could include: traffic; local background; industrial and domestic. Contributions from the different types of vehicles (for example, cars, lorries and buses) can also be considered to highlight which class of vehicle is contributing most to the emissions from traffic. Source apportionment allows the most important source or sources to be identified and options to reduce ambient concentrations of pollutants can then be considered and assessed. The concentrations have been calculated using the new traffic emission factors.

The source apportionment should:

- > Confirm that exceedances of PM<sub>10</sub> are due to road traffic
- Determine the extent to which different vehicle types are responsible for the emission contributions to PM<sub>10</sub> within predicted areas of exceedance. This will allow traffic management scenarios to be modelled/tested to reduce the exceedances
- Quantify what proportion of the exceedances of PM<sub>10</sub> is due to background emissions, or, local emissions from busy roads in the local area. This will help determine whether local traffic management measures could have a significant impact on reducing emissions in the area of exceedance, or, whether national measures would be a suitable approach to achieving the air quality objectives

### **Receptors considered**

Source apportionment has been considered at those locations in Perth where the model has predicted the highest concentration of  $PM_{10}$  in 2005 at or near to a relevant receptor. These are points on the 10m x 10m receptor point grid used in the modelling, and have not necessarily been selected owing to their proximity to monitoring points. Figure 3.1 indicates the 8 locations in question:

- 1. Barrack Street (311284, 724165)
- 2. Atholl Street 1 (311476, 723942)
- 3. Melville Street (311521, 723981)
- 4. North Methven Street (311551, 723902)
- 5. Atholl Street 2 (311563, 7235949)
- 6. Main Street (312250, 724070)
- 7. York Place (311310, 723520)
- 8. Kinnoull Street (311684, 723676)

## Sources of pollution considered

We have considered the effect of the following sources in this assessment at the receptor considered:

- Background concentrations used in the assessment;
- Traffic Light Duty Vehicles on main roads in the 1 km square local area;
- Traffic Heavy Goods Vehicles on main roads in the 1 km square local area;
- Traffic Buses on main roads in the 1 km square local area.

It should be noted that the modelling has explicitly considered traffic on Atholl Street, York Place and Main Street in Perth City Centre. Reference in Tables 6.6 to 6.13 to 'traffic' refers to the contribution to pollutant concentrations of these traffic movements. Emissions from traffic movements on other roads in Perth and outside Perth have not been explicitly modelled. However, their contribution to pollutant concentrations in Perth is included in the modelled background concentrations. Background concentrations from traffic.

The modelling assumed that the contribution to  $PM_{10}$  concentration from road traffic could be estimated by using the relationships provided in LAQM.TG(03) and the AQEG report of 2005 (AQEG(2005)): the same relationships have been applied for source apportionment calculations.

The concentrations apportioned to each source category and the fraction of the total concentrations are shown in Tables 6.6. to 6.13.

Table 6.6:	Site 1, Perth: Source apportionment of concentrations of PM <sub>10</sub> in 2005 at Barrack
Street.	

Barrack St	PM <sub>10</sub> concentration,		
(311284 724165)	Contribution		
Source category	μ <b>g m</b> <sup>-3</sup>	%	
Car	0.6	2.5%	
LGV	0.5	1.9%	
HGV rigid	0.3	1.4%	
HGV artic	0.3	1.1%	
Bus & Coach	0.3	1.2%	
Car (queuing)	1.2	5.0%	
LGV (queuing)	0.7	2.8%	
HGV rigid (queuing)	0.7	3.0%	
HGV artic (queuing)	0.6	2.3%	
Bus & coach (queuing)	0.7	2.8%	
Total traffic free flowing	1.9	8.2%	
Total traffic queuing	3.8	15.9%	
Total traffic	5.7	24%	
Background	18.0	76%	
Total	23.7	100%	

Figures are rounded to the nearest 1 decimal place

 Table 6.7:
 Site 2, Perth: Source apportionment of concentrations of PM<sub>10</sub> in 2005 at Atholl Street

 1.
 Atholl St 1

Atholl St 1	PM <sub>10</sub> concentration,			
(311476 723942)	Contribution			
Source category	μ <b>g m</b> <sup>-3</sup>	%		
Car	0.6	2.4%		
LGV	0.4	1.9%		
HGV rigid	0.3	1.2%		
HGV artic	0.2	0.9%		
Bus & Coach	0.3	1.2%		
Car (queuing)	1.1	4.8%		
LGV (queuing)	0.6	2.7%		
HGV rigid (queuing)	0.6	2.5%		
HGV artic (queuing)	0.4	1.9%		
Bus & coach (queuing)	0.7	2.8%		
Total traffic free flowing	1.8	7.7%		
Total traffic queuing	3.4	14.7%		
Total traffic	5.2	22%		
Background	18.0	78%		
Total	23.2	100%		

Melville St	PM <sub>10</sub> cond	centration,
(311521 723981)	Contril	oution
Source category	μ <b>g m</b> <sup>-3</sup>	%
Car	0.1	0.4%
LGV	0.1	0.3%
HGV rigid	0.0	0.1%
HGV artic	0.0	0.1%
Bus & Coach	0.0	0.2%
Car (queuing)	1.4	6.3%
LGV (queuing)	0.7	3.3%
HGV rigid (queuing)	0.6	2.7%
HGV artic (queuing)	0.5	2.2%
Bus & coach (queuing)	1.1	4.7%
Total traffic free flowing	0.3	1.1%
Total traffic queuing	4.4	19.3%
Total traffic	4.6	20%
Background	18.0	80%
Total	22.6	100%

**Table 6.8:**Site 3, Perth: Source apportionment of concentrations of  $PM_{10}$  in 2005 at MelvilleStreet.

Figures are rounded to the nearest 1 decimal place

**Table 6.9:** Site 4, Perth: Source apportionment of concentrations of  $PM_{10}$  in 2005 at North Methven Street.

N Methven St	PM <sub>10</sub> cond	centration,
(311551 723902)	Contril	oution
Source category	μ <b>g m</b> <sup>-3</sup>	%
Car	0.2	0.7%
LGV	0.1	0.6%
HGV rigid	0.1	0.6%
HGV artic	0.1	0.5%
Bus & Coach	0.1	0.3%
Car (queuing)	1.2	5.1%
LGV (queuing)	0.6	2.8%
HGV rigid (queuing)	1.2	5.3%
HGV artic (queuing)	1.0	4.1%
Bus & coach (queuing)	0.8	3.4%
Total traffic free flowing	0.6	2.7%
Total traffic queuing	4.8	20.6%
Total traffic	5.5	23%
Background	18.0	77%
Total	23.5	100%

Atholl St 2	PM <sub>10</sub> cond	centration,
(311563 723949)	Contril	oution
Source category	μg m <sup>-3</sup>	%
Car	0.3	1.4%
LGV	0.3	1.3%
HGV rigid	0.1	0.4%
HGV artic	0.2	0.7%
Bus & Coach	0.2	0.8%
Car (queuing)	1.0	4.7%
LGV (queuing)	0.6	2.7%
HGV rigid (queuing)	0.3	1.5%
HGV artic (queuing)	0.6	2.7%
Bus & coach (queuing)	0.7	3.3%
Total traffic free flowing	1.0	4.5%
Total traffic queuing	3.3	14.7%
Total traffic	4.3	19%
Background	18.0	81%
Total	22.3	100%

Figures are rounded to the nearest 1 decimal place

 Table 6.11:
 Site 6, Perth: Source apportionment of concentrations of PM<sub>10</sub> in 2005 at Main Street.

Main St	PM <sub>10</sub> cond	entration,
(312250 724070)	Contril	oution
Source category	μg m <sup>-3</sup>	%
Car	0.6	2.5%
LGV	0.5	2.2%
HGV rigid	0.3	1.1%
HGV artic	0.2	1.0%
Bus & Coach	0.2	0.9%
Car (queuing)	1.3	5.5%
LGV (queuing)	0.7	3.1%
HGV rigid (queuing)	0.7	2.9%
HGV artic (queuing)	0.6	2.3%
Bus & coach (queuing)	0.6	2.6%
Total traffic free flowing	1.8	7.8%
Total traffic queuing	3.9	16.4%
Total traffic	5.7	24%
Background	18.0	76%
Total	23.7	100%

York Place	PM <sub>10</sub> cond	centration,
(311310 723519)	Contril	oution
Source category	μ <b>g m</b> <sup>-3</sup>	%
Car	0.1	0.5%
LGV	0.1	0.5%
HGV rigid	0.1	0.3%
HGV artic	0.0	0.2%
Bus & Coach	0.1	0.3%
Car (queuing)	0.6	2.9%
LGV (queuing)	0.3	1.6%
HGV rigid (queuing)	0.5	2.4%
HGV artic (queuing)	0.3	1.5%
Bus & coach (queuing)	0.5	2.4%
Total traffic free flowing	0.4	1.9%
Total traffic queuing	2.2	10.8%
Total traffic	2.6	13%
Background	18.0	87%
Total	20.6	100%

**Table 6.12:**Site 7, Perth: Source apportionment of concentrations of  $PM_{10}$  in 2005 at Barrack YorkPlace.

Figures are rounded to the nearest 1 decimal place

**Table 6.13:**Site 8, Perth: Source apportionment of concentrations of  $PM_{10}$  in 2005 at KinnoullStreet.

Kinnoull St	PM <sub>10</sub> cond	centration,
(311684 723676)	Contril	oution
Source category	µg m⁻³	%
Car	0.1	0.5%
LGV	0.1	0.5%
HGV rigid	0.1	0.3%
HGV artic	0.1	0.5%
Bus & Coach	0.1	0.3%
Car (queuing)	1.1	4.8%
LGV (queuing)	0.6	2.5%
HGV rigid (queuing)	0.9	3.8%
HGV artic (queuing)	1.3	5.7%
Bus & coach (queuing)	1.2	4.9%
Total traffic free flowing	0.5	2.1%
Total traffic queuing	5.1	21.7%
Total traffic	5.6	24%
Background	18.0	76%
Total	23.6	100%

Total traffic contribution to  $PM_{10}$  ranges from 13% to 18%. The split between free flowing and queuing varies greatly (compare NO<sub>2</sub>) across the locations from 1.1% to 8.2% for free flowing and 10.8% to 21.7% for queuing traffic contribution.

From the above it may be seen that at these locations free-flowing traffic accounts for one tenth of the local  $PM_{10}$  concentrations, and off this traffic contribution, HDVs account for approximately half.

Queuing traffic accounts for less than one fifth of the local  $PM_{10}$  concentration, and of this contribution HDVs account for over half.

Total HDV traffic, for both free flowing and queuing, contributes to over one tenth to the local  $PM_{10}$  concentrations.

## 6.8 CONCLUSIONS AND RECOMMENDATIONS FOR PM<sub>10</sub>

#### PM<sub>10</sub> 2005 Base Case

Both monitoring and modelling indicate that in 2005 concentrations were below the required concentrations in both the city centre and city wide AQMA.

#### $PM_{10}\ 2005$ with the CCTMR

Both monitoring and modelling indicate that in 2005, with the CCTMR in place, concentrations were below the required concentrations in both the city centre and city wide AQMA.

#### PM<sub>10</sub> 2010 Base Case

This Further Assessment has however, confirmed a significant risk of exceedance of the Scottish annual mean objective for  $PM_{10}$  in Perth. For 2010 Base Case projected from the 2005 Base Case concentrations are not predicted to exceed the daily mean objective set for Scotland.

#### $PM_{10}$ 2010 with the CCTMR

This Further Assessment has however, confirmed a significant risk of exceedance of the Scottish annual mean objective for  $PM_{10}$  in 2010 with the CCTMR in place in Perth. For 2010 with the CCTMR in place concentrations are not predicted to exceed the daily mean objective set for Scotland.

#### PM<sub>10</sub> 2018 with the CCTMR

Modelling for 2018 with the CCTMR and Regional Bridge in place confirmed a significant risk of exceedance of the both the 2010 Scottish annual mean objective for  $PM_{10}$  and the 2010 daily mean objective set for Scotland.

#### PM<sub>10</sub> Source apportionment

Results for 2005 indicate that at the location of highest predicted roadside concentrations, free-flowing traffic accounts for one tenth of the local  $PM_{10}$  concentrations, and of this traffic contribution, HDVs account for approximately half. Queuing traffic accounts for less than one fifth of the local  $PM_{10}$  concentration, and of this contribution HDVs account for over half. Total HDV traffic, for both free flowing and queuing, contributes to over one tenth to the local  $PM_{10}$  concentrations. Reductions in queuing and congestion, particularly aimed at HDV traffic, are therefore likely to lead to a significant reduction in roadside  $PM_{10}$ .

If local background is at or just below 18  $\mu$ g m<sup>-3</sup>, it will be necessary not only to reduce roadside PM<sub>10</sub> but also urban background concentrations generally. To this, the city wide AQMA should remain in force and action planning should seek to reduce city wide emissions of PM<sub>10</sub>.

#### PM <sub>10</sub> Recommendations

It is therefore recommended that Perth and Kinross Council retain their city wide air quality management area for  $PM_{10}$ , and proceed with preparation of their action plan to reduce  $PM_{10}$  concentrations. Perth and Kinross Council should continue to monitor in this area. Reductions in queuing and congestion, particularly aimed at HDV traffic, are needed to lead to a significant reduction in roadside  $PM_{10}$ .

# 7 Conclusions and Recommendations

# 7.1 CONCLUSIONS FOR NO<sub>2</sub> AND PM<sub>10</sub>

#### NO<sub>2</sub> 2005 Base Case

This Further Assessment has confirmed a significant risk of exceedance of the UK annual mean objective for  $NO_2$  in 2005 in central Perth only. Both monitoring and modelling generally indicate that in 2005, for the Base Case, concentrations were above the required concentration at a maximum of 14 monitoring locations in Perth City Centre. At one monitoring location it is possible that the hourly  $NO_2$  objective was exceeded.

#### NO<sub>2</sub> 2005 with the CCTMR

This Further Assessment has confirmed a significant risk of exceedance of the UK annual mean objective for  $NO_2$  in 2005, with the CCTMR in place, in central Perth only. Modelling generally indicates that in 2005, with the CCTMR in place, concentrations were above the required concentration at a maximum of 13 monitoring locations in Perth City Centre. At 3 monitoring locations it is possible that the hourly  $NO_2$  objective was exceeded.

#### NO<sub>2</sub> 2010

Concentrations in 2010, based on 2005 projected forward traffic data, are predicted to be lower, although the EU Limit Value for annual mean  $NO_2$  may still be exceeded at these city centre locations in that year.

#### NO<sub>2</sub> 2018

Modelling for 2018 with City Centre Management Review and Regional Bridge in place showed that again 13 monitoring locations would exceed the annual mean objective. The number of monitoring locations predicting a possible exceedance of the hourly mean is predicted to increase from 3 in 2005 with the CCTMR to 8 by 2018.

#### NO<sub>2</sub> source apportionment

Results for 2005 indicate that at the locations of highest predicted roadside concentrations, freeflowing traffic accounts for less than one eighth of the local NO<sub>x</sub> and NO<sub>2</sub> concentrations, and of this traffic contribution, HDVs account for approximately three quarters. Queuing traffic accounts for three quarters of the local NO<sub>x</sub> and NO<sub>2</sub> concentrations, and of this traffic contribution HDVs account for well over half. Total HDV traffic, both free flowing and queuing, therefore contributes to over three-fifths to the local NO<sub>2</sub> concentrations. Reductions in HDV queuing and congestion are therefore likely to lead to a significant reduction in roadside NO<sub>x</sub> and NO<sub>2</sub>.

#### PM<sub>10</sub> 2005 Base Case

Both monitoring and modelling indicate that in 2005 concentrations were below the required concentrations in both the city centre and city wide AQMA.

#### $PM_{10}$ 2005 with the CCTMR

Both monitoring and modelling indicate that in 2005, with the CCTMR in place, concentrations were below the required concentrations in both the city centre and city wide AQMA.

#### PM<sub>10</sub> 2010 Base Case

This Further Assessment has however, confirmed a significant risk of exceedance of the Scottish annual mean objective for  $PM_{10}$  in Perth. For 2010 Base Case projected from the 2005 Base Case concentrations are not predicted to exceed the daily mean objective set for Scotland.

#### PM<sub>10</sub> 2010 with the CCTMR

This Further Assessment has however, confirmed a significant risk of exceedance of the Scottish annual mean objective for  $PM_{10}$  in 2010 with the CCTMR in place in Perth. For 2010 with the CCTMR in place concentrations are not predicted to exceed the daily mean objective set for Scotland.

#### PM<sub>10</sub> 2018 with the CCTMR

Modelling for 2018 with the CCTMR and Regional Bridge in place confirmed a significant risk of exceedance of the both the 2010 Scottish annual mean objective for  $PM_{10}$  and the 2010 daily mean objective set for Scotland.

#### PM<sub>10</sub> Source apportionment

Results for 2005 indicate that at the location of highest predicted roadside concentrations, free-flowing traffic accounts for one tenth of the local  $PM_{10}$  concentrations, and of this traffic contribution, HDVs account for approximately half. Queuing traffic accounts for less than one fifth of the local  $PM_{10}$  concentration, and of this contribution HDVs account for over half. Total HDV traffic, for both free flowing and queuing, contributes to over one tenth to the local  $PM_{10}$  concentrations. Reductions in queuing and congestion, particularly aimed at HDV traffic, are therefore likely to lead to a significant reduction in roadside  $PM_{10}$ .

If local background is at or just below 18  $\mu$ g m<sup>-3</sup>, it will be necessary not only to reduce roadside PM<sub>10</sub> but also urban background concentrations generally. To this, the city wide AQMA should remain in force and action planning should seek to reduce city wide emissions of PM<sub>10</sub>.

# 7.2 CITY CENTRE MANAGEMENT REVIEW AND REGIONAL BRIDGE

The impacts on air quality of the CCTMR reveal little overall improvement in or difference to both  $NO_2$  and  $PM_{10}$  concentrations for 2005.

Modelling of 2010 concentrations both with and without the CCTMR in place for  $PM_{10}$  predicts exceedances of the 2010  $PM_{10}$  annual mean objective for Scotland. No exceedances of the 2010 daily mean objective are expected for this year.

Predictions of NO<sub>2</sub> in the 2018 with the CCTMR and Regional Bridge scenario indicate exceedances of the 2005 NO<sub>2</sub> annual mean objective and an increase in the number of locations, from 3 to 8, which are likely to exceed the 2005 hourly mean NO<sub>2</sub> objective.

The Regional Bridge in the 2018 scenario greatly improves the  $PM_{10}$  concentrations across the whole of Perth, although, under the more stringent 2010 annual mean objective an exceedance area is predicted in the city centre.

The Regional Bridge scenario sees a reduced re-directed flow on Perth's roads, but it is more likely that by 2018 the uptake of cleaner diesel vehicles through increasing Euro standards and the fitting of more particulate traps as standard reaps greater benefits on  $PM_{10}$  concentrations. The model also now takes into account the new NO<sub>2</sub>: NO<sub>x</sub> relationship, which is revealing higher concentrations than originally modelled in previous years.

Action planning is needed that targets congestion, particularly HDVs, along the more central Perth Streets namely Atholl Street and South Street where the highest  $NO_2$  and  $PM_{10}$  concentrations occur.

## 7.3 RECOMMENDATIONS AND FURTHER ACTIONS TO BE TAKEN

It is recommended that Perth and Kinross Council retain their city wide air quality management area for  $NO_2$ , and proceed with preparation of their action plan to reduce  $NO_2$  concentrations, specifically aimed at HDV traffic and queuing and congestion. Perth and Kinross Council should continue to monitor at this location.

It is also recommended that Perth and Kinross Council retain their city wide air quality management area for  $PM_{10}$ , and proceed with preparation of their action plan to reduce  $PM_{10}$  concentrations. Perth and Kinross Council should continue to monitor in this area. Reductions in queuing and congestion, particularly aimed at HDV traffic, are needed to lead to a significant reduction in roadside  $PM_{10}$ .

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# **Appendices**

- Appendix 1: Road Traffic Data
- Appendix 2: Monitoring Data
- Appendix 3: Model Validation for NO<sub>2</sub>
- Appendix 4: Model Validation for PM<sub>10</sub>
- Appendix 5: The UK Air Quality Strategy

# **Appendix 1**

# **Road Traffic Data**

# Contents

Traffic Data Traffic Growth Factors

## Table A1.1a – 2005 AADT for Perth City Centre

005 Base Average Peak- City Centre	, ,, a tac	A	в	c	D	E	F	G	н	
inction Junction Name	Arm	Caledonian Rd Nthbnd Exit	York Place Exit	Caledonian Rd Sthbnd Exit	Glasgow Road Exit	York Place Appreach	Caledonian Rd Nthbnd Approach	Caledonian Rd Sthond Approach	Glasgow Rd Approach	
28 Glasgow Road / Caledonian Rd /	Car	3766		3 2024	5069	3727		9 4268	5438	
York Place Crossroads	LGV	493	3 65	3 312	045	405	29	5 565	5 774	
	0GV1	95	5 19	4 62	150	135	5	1 121	189	
	0GV2	40		9 20	68					
	Single Decker Bus	50	9 20	7 35	264	165	8	8 97	216	
	Double Decker Bus		0	0 0	0	0		0 0	, D	
	Minibus	1	0	0 0	4	2	2	0 2	1 0	
	Coach	7	2	7 2	4			3 0	2	
	Total	4455			6204				6653	
	96HDV	59	6 99	6 5%	9%	10%	69	6 5%	7%	
	Speed (mph)	17	7 2	5 17	20	9		3 5	5 12	
	Speed (kmph)	28						5 8	19	
iction Junction Name	Arm	York Place Estbrid Approach				York Place Wstbrid Exit	New Row Nthbnd Approach	York Place Wetbrid Approach	New Row Sthbnd Approach	
	Car	5053			1164					
	LGV	653			136					
	0GV1	194			33					
	OGV2	28	2	0 42	7	66				
	Single Decker Bus	203			26					
	Double Decker Bus	20	r T	209	20	100	1	0 1/4	0	
	Minibus		0	0 0	13			0 15	0	
	Coach		7	0 7	13	-		0 00	0	
		414	2 200	4 6017		4543	100	0 5	10	
	Total 96HDV	6149	2 200		1379		199		3 2545	
	Speed (mph)	99	9 1		6%					
	Speed (kmph)	47			20			0 33	10	
action Junction Name	Arm	South St Estbrid Exit	Scott St Sthond Exit	Scott St Nthond Exit	Scott St Sthbrid Approach	Scott St Nthond Approach	South St Estbrid Approach	-		
	Car	6954			2565					
	LGV	818	8 34	3 312	250	279	97	0		
	0GV1	284			48					
	OGV2	00								
	Single Decker Bus	154	4 15	8 84	121	77	18	S		
	Double Decker Bus		0	0 0	0			0		
	Minibus	1	2	2 11	2	11		2		
	Coach		7	0 0	0			7		
	Total	8285	5 324	5 2600	3021	2653	866	1		
	96HDV	89	6 139	6 1196	11%	10%	89	6		
	Speed (mph)	1								
	Speed (kmph)	23				3	1			
nction Junction Name	Arm		Sth Methven St Exit			County Place Estiond Approach	South St Exit			
31 County Place / Sth Methven St	Car	382*			2493			6		
King St	LGV	460		5 695	323			7		
and the	0GV1	143			139					
	OGV2	66			40					
	Single Decker Bus	174			152		19			
		17		0 109	152	209				
	Double Decker Bus Minibus			0						
		18	5	0 4	13	0		0		
	Coach		0	U U		/		/		
	Total	4068			3159	6917	855			
	%HDV	109			12%					
	Speed (mph)	20			3	10				
	Speed (kmph)	35		9 17	5	26				
ction Junction Name	Arm	South St Approach	Tay St Nthbrid Exit	Queens Bridge Exit	Tay St Sthbnd Exit	Tay St Sthond Approach	Tay St Nthond Approach	Queens Bridge Approach		
32 South St / Tay St	Car	813:		2 8290	7355					
	LGV	913	3 20	2 893	964	205				
	0GV1	38:			418			8 343		
	0GV2	99	9 2	0 110	163		3	7 141		
	Single Decker Bus	200	0 0	5 143	200	44	5	5 130	1	
	Double Decker Bus	0		0 0	0			0 0		
	Minibus		7	4 2	0	0		0 0	1	
	Coach			0 7	9	0		0 9	1	
	Total	9746	6 195	9832	9108	2216	240	0 6534	i i i i i i i i i i i i i i i i i i i	
	96HDV	99			9%					
	Speed (mph)		7 2					6 0	1	
	Speed (kmph)	1			22			9 15		
iction Junction Name	Arm		Atholi St Estbrid Exit			Barossa St Exit	Atholi St Estond approach		Barossa St Approach	
		Stron St Wstenia Approach			6415					
	Car LGV	803	3 56	3 2102	873	62	67.	3 257	350	
33 Atholl St / Kinnoull St	OGV1	50								
	0041									
		26					1			
	OGV2		7 7	3 152	222	7	14	s 110	15	
	Single Decker Bus	183			0			0 0	/ D	
	Single Decker Bus Double Decker Bus	18	0	J U	0					
	Single Decker Bus Double Decker Bus Minibus	18	4	0 2	2	0		0 0	0	
	Single Decker Bus Double Decker Bus Minibus Coach	( 4 (	0	0 0	2	0		0 C		
	Single Decker Bus Double Decker Bus Minibus Coach Total	0 0 0705	0 9 498	0 0 3 2651	2 0 7709	C 537	607			
	Single Decker Bus Double Decker Bus Minibus Coach	( 4 (	0 9 498	0 0 3 2651	2	C 537	607			
	Single Decker Bus Double Decker Bus Minibus Coach Total	0 0 0705	0 9 498	0 0 3 2651 6 796	2 0 7709 6%	C 537	607 39	6 12%		

Junction Junction Name	Arm	Atholl St Approach	Atholl St Exit	N Methven St Exit Caledonian Rd Exit	Melville St E	uit b	N Methwen St Approach	Mehrile St Approach	Caledonian Rd Approach	
34 Atholi St / N Methven St /	Car	642			8096	1135	2160			4
Melville St	LGV	871	8 67		1098	139	262		1054	-
	0GV1	14	5 2	163	224	22	95			
	0GV2	5	1 1	46	81	11	44	7	51	
	Single Decker Bus	22			268	51	97			
	Double Decker Bus			0	0	0	6	0	0	
	Minibus	( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	2	0	13	0	11		0	
	Coach		0	0	0	0	0		0	
	Total	772	4 606	4118	9781	1357	2673	1533	9533	
	96HDV	69	6 39	8%	6%	7%	10%	7%	496	
	Speed (mph)		3 1	21	11	23		. 3	5	
	Speed (kmph)	1	5 2		18	36	6	i 4	. 8	
Junction Junction Name	àrm.	Atholl St Wstbrid	Atholl St Estbrid Exit	Atholi St Wstbnd Exit Atholi St Estbnd Approach	n					
35 Atholi St / Starmant St	Car	641			5210					
	LGV	87			673					
	0GV1	14			24					
	0GV2	5	1 1		11					
	Single Decker Bus	222		222	145					
	Double Decker Bus		0	0	0					
	Minibus		2	2	0					
	Coach				0					
	Total	770			6063					
	96HD/V	69			3%					
	Speed (mph)		7 1:		17					
	Speed (kmph)	11	2 1		28					
Junction Junction Name	àrm	Atholl St Estbrid Exit	Atholl St Wstbnd Exit		h Atholi St Ws	tbnd Approach F	Rose Terrace Approach			
36 Atholl St / Rose Terrace	Car	5021			4323	7225	843			
	LGV	63	8 80	216	563	999	99			
	0GV1	2			20	95	15			
	0GV2		9 2		4	31				
	Single Decker Bus	8			73	207	24	6		
	Double Decker Bus	(	0 1	0	0	0				
	Minibus		0	0	0	4				
	Coach		0		0	0 8560				
	Total 96HDV	579			4983		986			
		29	6 49	3%	2%	4%	5%			
	Speed (mph)	11			21	11				
tunching Augusting Manage	Speed (kmph)	Caledonian Road Exit	Atholl St Approach	16 Atholi Street to Barrack Street turn Caledonian Rd Approach t	34 Decembro Calendarian I	17	Namesh Chronik damasak ka Caladanian Dd	Remark Characteria ha dahat Ch	Laboration Parks	D+C
Junction Junction Name 37 Barrack Street / Atholi St /	Arm Car	Caledonian Road Exit 474			2724	2724	2044 2044			
Caledonian Road	LGV	64			361	361	204-		1054	
Carterina ( Porta	0GV1	12			46	46	00			
	06V2	3			22	22	15	46	51	
	Single Decker Bus	12	3 20		31	31	33			209
	Double Decker Bus	10		110	0	01	51	101	109	0
	Minibus	1		11	0	0	11			11
	Coach		0		2	2	1		0	2
	Total	566	3 978	6558	3195	3196	2460	6730	9533	9744
	96HDV	59			396	396	5%			
	Speed (mph)	18		31	3	35	3		5	17
	Speed (kmph)	2	8 1	50	5	56	-		8	26
Junction Junction Name	Arm	Bridge Lane Approach	Perth Bridge Exit	Tay St Exit Charlotte St Exit	Tay 5t Appr		Charlotte St Approach	Perth Bridge Approach		
38 Charlotte St / Tay St /	Car	143			7258	1243	5047	6217		
West Bridge St / Bridge Lane	LGV	170		266	1001	154	649	884		
	0GV1					44		51		
		1			95		25			
	0GV2		4	11	31	7		22		
	Single Decker Bus	7:	4 1 3 12	11 40	31 207	7	5	22		
	Single Decker Bus Double Decker Bus		4 1 3 12	11 40	31	7 15 0		22		
	Single Decker Bus Double Decker Bus Minibus	7:	4 1 3 12	11 40	31 207 0 4	7 15 0 0	5	22 198 0		
	Single Decker Bus Double Decker Bus Minibus Coach	7:	4 12 3 12 0 1 2 2		31 207 0 4 0	7 15 0 0 0	5 86 0 0 0	22		
	Single Decker Bus Double Decker Bus Minibus Coach Total	7: () () () () () () ()	4 12 3 12 0 12 2 2 3 522	0 111 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	31 207 0 4 0 8595	7 15 0 0 1463	5 86 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	22 i 198 i 0 i 0 i 0 i 7377		
	Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV	7:	4 12 3 12 0 1 2 1 3 <u>522</u> 6 39	11 40 0 0 0 0 0 2537 4%	31 207 0 4 0 8595 496	7 15 0 0 0 1463 5%	5 86 0 0 0	22 100 4 0 7377 49		
	Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV Speed (mph)	7: () () () () () () ()	4 12 3 12 2 12 3 522 3 522 6 39 1 1 1	0 11 440 0 0 0 2537 4% 23	31 207 0 4 0 8595 4%6 24	7 15 0 0 1463 5% 4	5 86 0 0 0 5915 2%	22 196 0 4 0 7377 499 10		
	Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV Speed (mph) Speed (imph)	77 ( ) ( ) 170 129	4 1 3 12 0 12 0 5 3 5222 6 39 1 1 1 1 2 11	9 111 440 9 0 2255 7255 700 700 737	31 207 4 8505 496 24 39	7 15 0 0 1463 5% 4 6	5 86 6 5 1 5 815 294 2 7 1 1 1 1	222 1996 4 7377 7377 4796 100 100		
	Single Decker Bus Double Decker Bus Minibus Coach Total 9HDV Speed (mph) Speed (imph) Arm	7: ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (	4 12 3 12 0 12 0 12 3 5229 6 39 1 1 1 2 West Bridge St Exit	11 40 0 0 2537 4% 237 4% 37 0 0 10 10 10 10 10 10 10 10 10 10 10 10	31 207 0 4 0 8595 4% 24 39 Eact Bridge	7 15 0 0 1463 5% 4 5 5 4 5 5 4 5 5 6 5 5 6 5 5 6 5 5 6 5 5 6 5 5 6 6 5 5 6 5 5 6 5	s Be C C SB15 SB15 SB15 SB15 SB15 SB15 SB15 SB15	22 198 4 0 7977 498 10 10 West Bridge St Approach	Cowrie St Exit	
39 Main St / Gowrie St /	Single Decker Bus Double Decker Bus Minibus Coach Total Speed (mph) Speed (imph) Arm Car	1700 129 East Bridge St Exit	4 12 3 12 0 12 2 52 6 39 1 1 2 West Bridge St Exit 2 6 021	11 40 0 2 2537 49 49 49 49 49 49 49 49 49 49 49 49 49	31 207 4 4 8595 4% 24 39 East Bridge 4849	7 15 0 0 1463 5% 5% 5% 5% 5% 5% 5% 1170	e Be C SBII SBII SBII SBII SBII SBII SBII SB	22 300 4 707 4% 10 West Bridge St Approach	Cowrie St Exit	
	Single Dacker Bus Double Decker Bus Minibus Coach Total 9HDV Speed (imph) Speed (imph) Arm Car LaV	7: ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (	4 12 3 12 0 12 0 52 3 522 6 39 1 1 1 2 12 West Bridge St Exit 2 621 4 68	11 40 0 0 2537 4% 23 7 Man St Exit 77 Genfo St Approach 999	31 2007 4 8505 4% 24 24 39 East Bridga 4649 574	7 15 0 1463 5% 4 3t Approach 1170 1158	s Be C Seis Seis Seis Seis Seis Seis Seis Seis	222 199 0 4 0 7377 498 10 West Bridge St Approach 4500	Gowrie St Exit 4399 671	
39 Main St / Gowrie St /	Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV Speed (imph) Arm Car LGV OGV1	1700 129 East Bridge St Exit	4 12 3 12 0 14 2 522 6 39 1 1 2 63 2 63 3 522 6 39 1 1 2 10 1 1 2 63 3 522 6 39 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2	111 40 0 2 0 2 2537 4% 2 2 2 7 7 Main St Exit 920 286	31 207 4 6 8595 44 39 East Bridge 4049 574 290	7 15 0 0 1463 5% 4 5 8 4 5 15 0 1170 1170 1170 1158 33	9 88 6 6 6 7 8 11 11 11 11 11 11 255 255	222 300 4 0 4 7377 48 10 10 10 400 50 50 50 50 50 50 50 50 50 50 50 50 5	Cowrie St Exit 4398 671 240	
39 Main St / Gowrie St /	Single Decker Bus Double Decker Bus Minibus Coach Total 99HDV Speed (imph) Speed (imph) Arm Car LGV OGV1 OGV2	1700 129 East Bridge St Exit	4 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	11 40 0 2537 4% 23 7 Gavrio St Approach 17 97 280 280 280 70	31 207 0 4 0 8895 4% 24 39 East Bridge 4049 574 286 70	7 15 0 0 1463 5% 4 3t Approach 31170 158 33 226	е В В С С 5911 2912 7 3 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	22 3090 4 4 73777 20 West Bridge St Approach 4500 500 500 500 500 500 500 500 500 50	Cowrie St Exit 4399 671 240 86	
39 Main St / Gowrie St /	Single Decker Bus Double Oecker Bus Minbus Cosch Total 96HDV Speed (Imph) Speed (Imph) Car LGV CGY LGV CGV DGV1 OGV1 OGV2 Decker Bus	1700 129 East Bridge St Exit	4 12 3 12 0 14 2 522 6 39 1 1 2 63 2 63 3 522 6 39 1 1 2 10 1 1 2 63 3 522 6 39 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2	11 40 0 2537 4% 23 7 Gavrio St Approach 17 97 280 280 280 70	31 207 0 4 0 8595 4% 24 5% East Bridge 5% 5% 5% 280 70 101	7 15 0 0 1463 5% 4 5 8 4 5 15 0 1170 1170 1170 1158 33	9 88 6 6 6 7 8 11 11 11 11 11 11 255 255	22 3090 4 4 73777 20 West Bridge St Approach 4500 500 500 500 500 500 500 500 500 50	Cowrie St Exit 4399 671 240 86	
39 Main St / Gowrie St /	Single Decker Bus Double Decker Bus Minibus Coach Total Speed (imph) Speed (imph) Arm Car Läv OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus	77 0 17000 129 East Bridge St Exit 0 0 0 0	4 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	11 40 0 2537 4% 23 7 Gavrio St Approach 17 97 280 280 280 70	31 207 0 4 5595 24 39 East Bridge 4049 549 59 208 209 209 200 200 0	7 15 0 0 1463 5% 4 5 5% 5% 5% 1170 158 33 266 48 0 0	е В В С С 5911 2912 7 3 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	22 3090 4 4 73777 20 West Bridge St Approach 4500 500 500 500 500 500 500 500 500 50	Cowrie St Exit 4399 671 240 86	
39 Main St / Gowrie St /	Single Decker Bus Double Oecker Bus Minibus Cooch Total 96HDV Speed (kmph) Speed (kmph) Speed (kmph) Car LGV OGV1 OGV1 OGV1 OGV1 Single Decker Bus Double Decker Bus Double Decker Bus	77 77 10 110 120 East Bridge St Exit 44 9 9	4 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	11 40 50 6 7 7 40% 23 7 Man St Exit 7 6 7 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7	31 207 0 4 0 8595 4% 24 73 574 574 575 576 576 0 70 101 0 0	7 15 0 0 1463 5% 4 3t Approach 31170 158 33 226	е В В С С 5911 2912 7 3 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	22 3090 4 4 73777 20 West Bridge St Approach 4500 500 500 500 500 500 500 500 500 50	Cowrie St Exit 4399 671 240 86	
39 Main St / Gowrie St /	Single Decker Bus Double Decker Bus Minibus Coach Total weHDV Speed (kmph) Arm Cer LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach	7 7 170 129 Eact Bridge St Exit 444	4 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	11 40 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	31 207 0 4 850 850 75 4 4949 574 295 70 70 205 201 0 0 0	77 01 15 00 0 0 0 1460 5 5 8 5 8 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	а в с с 511 291 191 191 191 191 191 191 6 6 6 6 6 6 6	22 1000 0 0 7377 1947 1947 1947 1947 1947 1947 1947 19	Cowrie St Exit 4799 671 240 66 0 0 0 0 0 0 0	
39 Main St / Gowrie St /	Single Dacker Bus Double Decker Bus Minibus Coach Total 94HDV Speed (Imph) Speed (Imph) Arm Gov LGV OGV1 OGV1 OGV1 OGV1 OGV1 Docker Bus Double Dacker Bus Double Dacker Bus Double Dacker Bus Total	2017 120 East Bridge St Exit 440 0	4 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	11 40 40 41 40 4 4 4 4 4 4 4 4 4 4 4 4 4	31 207 0 4 6595 4% 24 4949 East bridge 4949 Fast bridge 70 70 101 0 0 5991	77 0 3463 88 Approach 13170 138 48 49 40 40 40 40 40 40 40 40 40 40 40 40 40	8 88 6 5911 98 98 910 111 255 89 199 199 199 6 6 6 6 6 6 6 6 6 6 6 6 6	22 3990 0 7277 4907 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Cowrie St Exit 1399 671 240 66 66 0 0 0 0 0 0 540 540 540	
	Single Dacker Bus Double Decker Bus Minibus Coach Total 94HDV Speed (imph) Arm Car Lov Lov Lov Lov Lov Lov Lov Lov Lov Lov	7 7 3700 129 Eact Bridge St Exit 9 9 9 9 9 9 9 9 9 9 9 9	4 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	11 40 0 0 2537 4% 57 Main St Exit Covins St Approach 999 209 199 0 199 0 199 0 199 0 199 0 199 0 199	31 207 0 68595 4% 24 79 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	77 01 15 00 0 0 0 1460 5 5 8 5 8 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	s 8 6 5 5 11 7 11 11 11 11 11 11 11 11 11 11 11 1	22 3090 C C 7277 44 20 20 5020 5020 5020 5020 5020 5020	Cowne St Exit 4399 671 200 66 66 60 9 9 9 9 9 9 9 9 9 9 9 9 9 9	
39 Main St / Gowrie St /	Single Deckar Bus Doukle Deckar Bus Minbus Coach Hetty Speed (imph) Speed (imph) Speed (imph) Car LGV OGV1 OGV1 OGV1 OGV2 Single Deckar Bus Minbus Coach Total Hetty Speed (imph)	77 710 120 Eact Bridge St Exit 641 641 641 641 641 641 641 641 641 641	4 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	11 40 40 40 40 40 40 40 40 40 40 40 40 40	31 207 0 4 6595 4% 24 4949 East bridge 4949 Fast bridge 70 70 101 0 0 5991	77 0 3463 88 Approach 13170 138 48 49 49 40 40 40 40 40 40 41 441	е В В С 5911 2911 2911 2911 2911 2911 2911 2911	22 3999 4 4 7377 7377 9 4500 502 502 502 502 502 502 502 502 502	Cowrie St Exit 1999 499 66 66 66 60 0 0 790 790 25	
39 Main St / Gowrie St /	Single Dacker Bus Double Decker Bus Minibus Coach Total 94HDV Speed (imph) Arm Car Lov Lov Lov Lov Lov Lov Lov Lov Lov Lov	7 7 3700 129 Eact Bridge St Exit 9 9 9 9 9 9 9 9 9 9 9 9	4 4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	11 40 40 40 40 40 40 40 40 40 40 40 40 40	31 207 0 68595 4% 24 79 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	77 0 3463 88 Approach 13170 138 48 49 49 40 40 40 40 40 40 41 441	s 8 6 5 5 11 7 11 11 11 11 11 11 11 11 11 11 11 1	22 3999 4 4 7377 7377 9 4500 502 502 502 502 502 502 502 502 502	Cowne St Exit 4399 671 200 66 66 60 9 9 9 9 9 9 9 9 9 9 9 9 9 9	

## Table A1.1b – 2005 AADT for Perth other major roads

005 Base Average Peak - Major Road	Arm	A Dunkeld Rd Approach	A9 North Approach	C A9 Western Bypass Approach	Dunkeld Rd Exit	E A9 Western Bypass Exit	F Industrial Estate Exit	G A9 North Exit	H Industrial Estate Approach	I
	Car	Dunkeld kö Approach 1261								
1 Inverainforid Rodindabout	LGV	168								
	OGV1	16		998				781		
		6								
	OGV2		525	368	///			2/0		
	Single Decker Bus	16				742				
	Double Decker Bus		0 0	) 0	1 0	) C		C	0	
	Minibus		0 r	, 0	1 0	) C		0	. 0	
	Coach		4 0	) 0	) r	) C	(	4	+ 0	
	Total	1468	16832	21242	2 16419	18459	7743	17315	5 7179	
	%HDV	39								
			12 22	33						
	Speed (mph)	1	19 35		20				7	
	Speed (kmph)							62	. /	
	Arm	Bute Drive Exit	Dunkeld Rd South Exit	Dunkeld Rd North Exit	Dunkeld Road South Approach		Bute Drive Approach			
2 Dunkeld Road / Bute Drive	Car	448		11382	2 11760					
	LGY	55	57 1687	1540	1558	1586	64			
	OGV1	6	i0 175	154	4 175	140	74			
	OGV2		18 56	67	7 70					
	Single Decker Bus		12 144							
		4	<u>e</u> 144	161	196	119	40			
	Double Decker Bus		<u>u</u> (	0	<u>(</u>	, C	(			
	Minibus		0	) 0	1 C	) C				
	Coach		0 0	, 4	+ 4	- C	(			
	Total	515	59 15712	13307	7 13752	14613	581-			
	96HDV	39								
	Speed (mph)		2 24							
							-			
	Speed (kmph)	3	35 39	45	5 21	14				
	Arm	Dunkeld Rd South Approach	Gowans Terrace Exit	Dunkeld Rd North Approach			Dunkeld Rd North Exit			
3 Dunkeld Rd / Gowans Terrace	Car	1182	20 5138	12936	5 4298	11739	11624			
	LGY	162	28 648	1561	1 511	1421	1540			
	OGV1	20	32			203				
	OGV2		74 14							
	Single Decker Bus	20	39	154	4 32	147	186			
	Double Decker Bus		0 0	. 0	( C	) C	(			
	Minibus		0 r	, 0	) (	) C				
	Coach		4 /	0	1 6	) (				
	Total	1393	30 5870	14889	9 4904	13563	13598			
	96HDV	49								
		47	λ <sup>0</sup> 2π							
	Speed (mph)	1	12 24	4						
	Speed (kmph)		19 39		7 25					
oction Junction Name	Arm	Ballantine Place Approach	Crieff Rd Approach	Dunkeld Rd North Approach	Dunkeld Rd South Exit	Dunkeld Rd South Approach	Ballantine Place Exit	Crieff Rd Exit	Dunkeld Rd North Exit	
4 Dunkeld Rd / Crieff Rd	Car	49							12170	
	LGV		1085					1131		
	OGV1	1	18 214	256	5 389	277	(	140	235	
	OGV2		7 74	81	1 116	105	1	63	88	
	Single Decker Bus		270	182	2 357	319		186		
				104		515		100	230	
	Double Decker Bus		0 (	0					U	
	Minibus		0 18	. 0	18	18		16		
	Coach		0 0	0	1 6	) 4	(	0	) 4	
		58	0 0	16755	0 0 5 16951	) 4	(		) 4	
	Total					4	63	10794	) 4 § 14462	
	Total %HDV	58		396	6 5%	4 15183 5%	- () 63 09	10794	4 4 14462 4%	
	Total %HDV Speed (mph)		% 6% 6 7	3%	6 5% 1 10	4 15183 5%	0 63 09 15	10794 496 13	0 4 4 14462 5 4% 8 8	
	Total %HDV Speed (mph) Speed (kmph)	69	% 6% 6 7 9 12	396 111 18	6 5% 1 10 3 16	) 4 15183 5 5 7 6 14	( 65 09 11 2	10794 4%	0 4 4 14462 5 4% 8 8	
ction Junction Name	Total %HDV Speed (mph) Speed (kmph) Arm	69 Dunkeld Road South Exit	% 6% 6% 6% 7 9 St Catherines Road Exit	396 11 2 Dunkeld Rd North Exit	6 5% 1 10 3 St Catherines Road Entry	) 4 15183 5% 5% 0 5% 14 Dunkeld Rd South Entry	( 63 09 11 24 Dunkeld Rd North Entry	10794 496 13 20	0 4 4 14462 5 4% 8 8	
ction Junction Name 5 Dunkeld Rd / St Catherines Rd /	Total %HDV Speed (mph) Speed (kmph) Arm Car	59 Dunkeld Road South Exit 1240	% 6% 6 7 5 St Catherines Road Exit 12 3475	3% 11 Dunkeld Rd North Exit 13073	6 5% 1 10 3 St Catherines Road Entry 1663	0 4 15183 5 5% 0 5 5 14 Dunkeld Rd South Entry 12873	( 63 09) 11 24 Dunkeld Rd North Entry 14424	10794 4% 13 20	0 4 4 14462 5 4% 8 8	
ction Junction Name S Dunkeld Rd / St Catherines Rd / Barrack Street	Total %HDV Speed (mph) Speed (kmph) Arm Car LGV	59 Dunkeld Road South Exit 1240 162	% 6% 6% 6 77 9 12 St Catherines Road Exit 18 3475 11 400	3% 111 Dunkeld Rd North Exit 13073 1771	6 5% 1 10 3 St Catherines Road Entry 3 1663 1 207	) 4 15183 5% 5% 5% 5% 5% 5% 5% 5% 5% 5% 5% 5% 5%	0 ( 61 09 11 24 Dunkeld Rd North Entry 1442- 182-	10794 4% 13 20	0 4 4 14462 5 4% 8 8	
ction Junction Name S Dunkeld Rd / St Catherines Rd / Barrack Street	Total %HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1	09 Dunkeld Road South Exit 1240 162 355	%         6%         6%           9         7         9           St Catherines Road Exit         12         12           10         3475         14         4075	3% 3% 3% 3% 3% 2000 2000 2000 2000 2000	6 5% 1 10 St Catherines Road Entry 3 1663 1 207 3 2 1	4 4 15183 5% 5 0 00000000000000000000000000000000	( ( 65 09) 11 24 Dunkeld Rd North Entry 14424 1824 393	10794 4% 13 20	0 4 4 14462 5 4% 8 8	
ction Junction Name S Dunkeld Rd / St Catherines Rd / Barrack Street	Total %HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1	09 Dunkeld Road South Exit 1240 162 355	%         6%         6%           9         7         9           St Catherines Road Exit         12         12           10         3475         14         4075	3% 3% 3% 3% 3% 2000 2000 2000 2000 2000	6 5% 1 10 St Catherines Road Entry 3 1663 1 207 3 2 1	4 4 15183 5% 5 0 00000000000000000000000000000000	( ( 65 09) 11 24 Dunkeld Rd North Entry 14424 1824 393	10794 4% 13 20	0 4 4 14462 5 4% 8 8	
ction Junction Name 5 Dunkeld Rd / St Catherines Rd / Barrack Street	Total %HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1 OGV1 OGV2	09 Dunkeld Road South Exit 1240 162 35 111	% 6% 6 77 9 St Catherines Road Exit 18 14 44 747 74 45 74 77 72	9% 11 Dunkeld Rd North Exit 18073 13073 13073 13073 13073 13073 13073 13073 13073 13073 13073 13073 13073 13073 140	6 598 1 10 3 St Catherines Road Entry 1 663 1 207 3 21 0 0	) 4 4 15183 5 90 5 000 5 0000 5 000 5 0000 5 000 5 000 5 000 5 000 5 000 5 000 5 000 5 000 5 000	0 ( 6; 09 11 22 Dunkeld Rd North Entry 1424 192 39 115 115	10794 4% 13 20	0 4 4 14462 5 4% 8 8	
S Dunction Name 5 Dunkeld Rd / St Catherines Rd / Barrack Street	Total %HDV Speed (mph) Speed (kmph) Arm Car LGV UGV1 UGV1 UGV2 Single Decker Bus	69 Dunkeld Road South Exit 1240 162 35 11 34	% 6% 6 77 9 St Catherines Road Exit 18 14 44 747 74 45 74 77 72	9% 11 Dunkeld Rd North Exit 18073 13073 13073 13073 13073 13073 13073 13073 13073 13073 13073 13073 13073 13073 140	6 5% 1 10 3 St Catherines Road Entry 1 207 3 207 3 21 3 0 1 207 3 10 1 207 3 11 1 207 1	) 4 4 15183 5 90 5 000 5 0000 5 000 5 0000 5 000 5 000 5 000 5 000 5 000 5 000 5 000 5 000 5 000	0 ( 6) 09 11 22 Dunkeld Rd North Entry 162 390 111 360	10794 4% 13 20	0 4 4 14462 5 4% 8 8	
iction Junction Name 5 Dunkeld Rd / St Catherines Rd / Barrack Street	Total %HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus	69 Dunkeld Road South Exit 1240 162 35 111 34	% 6% 6% 7 3 9 3C Catherines Road Exit 90 91 44 94 94 94 94 94 94 94 94 94	> 39% 11 2 Dunkeld Rd North Exit 3 1771 5 349 140 3 333 0 0 0	6 5% 1 10 3 St Catherines Road Entry 3 1663 1 2073 3 21 0 0 1 10 1 207 3 21 1 207 1 207	4 4 15183 5% 0 Unkeld Rd South Entry 1287 1774 344 344 343 30 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	00 66 09 11 22 24 1422 1122 112 112 112 112 112	10794 4% 13 20	0 4 4 14462 5 4% 8 8	
stion Junction Name S Dunkeld Rd / St Catherines Rd / Barrack Street	Total %HDV Speed (mph) Speed (kmph) Am Car LGV OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	69 Dunkeld Road South Exit 1240 162 35 111 34	%         6%           9         12           9         51 Catherines Road Exit           91         34           91         44           92         42           14         492           12         7           12         7           13         7	9% 7 111 2 Dunkeid Pd North Exit 13073 1771 343 140 333 0 188 189 189 189 189 189 189 189 189 189	6 588 1 10 3 Catherines Road Entry 1 207 2 21 3 21 3 21 3 21 3 21 3 21 4 207 5 22 5 22 5 23 5 24 5	0 4 15183 589 59 14 Dunkeld Rd South Entry 12073 1784 344 344 333	00 66 09 11 22 24 1422 1122 112 112 112 112 112	10794 4% 13 20	0 4 4 14462 5 4% 8 8	
S Dunkeld Rd / St Catherines Rd / Barrack Street	Tatal 96HDV Speed (mph) Speed (kmph) Arm Car Car OGV1 OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach	69 Dunkeld Road South Exit 1240 152 35 35 34 34 1	%         64%         64%           7         9         Catherines Road Exit         12           91         1         947         12           91         1         947         14         90           92         2         7         7         7         22         7         7         22         1         7         22         1	9% 107 Dunkeld Rd North Exit 1077 11771 343 140 333 0 0 188 4 4 1977 1	6 500 3 Catherines Road Entry 3 Catherines Road Entry 4 Catherines Road Entry 4 Catherines Road Entry 1 Catherines R	4 15/88 5% Dunkeld Rd South Entry 12877 1784 344 345 333 0 0 1 18 14 14 14 14 14 14 14 14 14 14 14 14 14	( 6) 99 11 22 24 24 24 23 23 39 39 39 31 39 39 30 30 6 ( 11 2 2 2 11 2 30 30 11 30 6 11 11 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	10794 4495 15 20	0 4 4 14462 5 4% 8 8	
stion Junction Name S Dunkeld Rd / St Catherines Rd / Barrack Street	Total Speed (mph) Speed (mph) Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total	69 Dunkeld Road South Exit 1240 152 35 111 34 4 1485	%         6%           6         77           9         51 Catherines Road Exit           90         3475           11         403           44         55           77         22           0         22           0         22           0         20           0         20           0         20           0         20           0         27	3% 2000 20	6 588 5 Catherines Road Entry 5 Catherines R	4 15)82 5 200 200 200 200 200 200 200 200 200	( 66) 98 11 20 Dunkeid Rd North Entry 12422 12622 131 30 30 30 30 30 30 30 30 30 30 30 40 30 40 30 40 40 40 40 40 40 40 40 40 40 40 40 40	10794 4% 15 20	0 4 4 14462 5 4% 8 8	
stion Junction Name S Dunkeld Rd / St Catherines Rd / Barrack Street	Tatal 96HDV Speed (mph) Speed (kmph) Arm Car Car OGV1 OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach	69 Dunkeld Road South Exit 1240 152 35 35 34 34 1	%         6%           6         77           9         51 Catherines Road Exit           90         3475           11         403           44         55           77         22           0         22           0         22           0         20           0         20           0         20           0         20           0         27	3% 2000 20	6 588 5 Catherines Road Entry 5 Catherines R	4 15)82 5 200 200 200 200 200 200 200 200 200	( 66) 98 11 20 Dunkeid Rd North Entry 12422 12622 131 30 30 30 30 30 30 30 30 30 30 30 40 30 40 30 40 40 40 40 40 40 40 40 40 40 40 40 40	10794 4% 15 20	0 4 4 14462 5 4% 8 8	
tion Junction Name S Dunkeld Rd / St Catherines Rd / Barrack Street	Tatal 96HDV Speed (mph) Speed (kmph) Arm Car CGV OGV1 OGV1 OGV1 OGV1 Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV	69 Dunkeld Road South Exit 1240 152 35 111 34 4 1485	%         64%         64%           9         St Catherines Road Exit         72           91         99         99           91         99         99           91         99         99           91         99         99           92         99         99           92         99         99           93         99         99           94         99         997           95         99         997           96         98         98	3% Dunkeld Rd North Exit 1077 1777 1777 1777 1777 1777 1777 177	6 5% 5 Catherines Road Entry 3 Catherines Road Entry 4 Co 5 Catherines Road Entry 5 Catherines Road Entry 6 Catherines Road Entry 5 Catheri	4 151825 5% 20mkeld Pd South Entry 12077 1764 3444 344 344 344 344 345 344 345 346 344 346 346 346 346 346 346 346 346	0 66 99 0 20 0 0 0 0 0 1 1 1 1 2 3 99 3 9 1 1 1 3 8 6 1 1 1 1 3 8 6 1 1 1 1 2 1 1 2 1 2 1 2 1 2 1 2 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10794 4 % 13 20 20	0 4 4 14462 5 4% 8 8	
tion Junction Name 5 Dunkeld Rd / 8t Catherines Rd / Barrack Street	Total           Syeed (mph)           Speed (kmph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Coach           Total           Speed (mph)	693 Dunkeld Road South Exit 1240 162 35 111 39 39 10 1405 09 09	%         6%           7         7           61 Cathernes Road Exit         12           71         347           71         402           72         7           70         7           71         60           70         7           71         7           72         7           73         7           74         50           75         7	2 3% 111 2 0/00000000000000000000000000000000000	6 5% 5 Catherines Road Entry 3 Catherines Road Entry 3 Catherines Road Entry 3 Catherines Road Entry 3 Catherines Road Entry 4 Catherines Road Entry 4 Catherines Road Entry 5 Catherines Road Entry 6 Catherines Road Entry 5 Catherines Road Entry 6 Catherines Road Entry 7 Catherines Road Entry 8 Catherines Ro	4 15/86 2000 2000 2000 2000 2000 2000 2000 20	( 65) 98 20 0 Uunkeld Rd North Entry 14442 300 309 309 309 309 309 309 309 309 309	10794 4% 15 20	0 4 4 14462 5 4% 8 8	
tor Anction Name S Durkeld Rd / St Catherines Rd / esrack Street	Tatal           SetEUX           Speed (mph)           Speed (kmph)           Arm           Car           Car           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Double Decker Bus           Minibus           Coach           Total           SHOV           Speed (mph)           Speed (mph)	097 Dunkeld Road South Exit 1240 155 155 155 155 155 155 11 1445 05 11	%         6%           6         7           9         81 Catherines Road Exit           21         94           22         97           24         400           20         0           <	3% 3% 20ukeid Rd North Exit 30 30 30 30 30 30 30 30 30 30 30 30 30	6 5% 5 Catherines Road Entry 10 5 Catherines Road Entry 10 10 10 10 10 10 10 10 10 10	4 15182 5% Cunkeid Rd South Entry 27 Cunkeid Rd South Entry 27 1764 346 346 346 346 346 346 346 346 346 3	() 66 99 11 20 12 12 12 12 12 12 12 12 12 12 12 12 12	10794 4% 15 20	0 4 4 14462 5 4% 8 8	
tion Junction Name S Dunkeld Rd / St Catherines Rd / Barrack Street	Total           Syneed (mph)           Speed (kmph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           Speed (kmph)           Speed (mph)           Speed (kmph)	0 000 000 000 000 000 000 000 000 000	%         6%           9         R Catherines Road Exit         77           91         97         97           11         97         97           12         97         97           12         97         97           13         97         97           14         90         97           15         97         97           16         97         97           17         97         97           18         97         97           19         97         97           10         0         0         0           10         0         10         10           10         0         10         10           11         100         10         10           11         100         10         10           11         100         10         10           12         100         10         10           13         100         10         10           14         100         10         10           15         100         10         10           16 <td>3% 11 2unkeid Pd North Exit 130707 1471 140 140 140 140 140 140 140 14</td> <td>6 5% 6 Catherines Road Entry 1 Catherines Road Entry 1 207 1 207 2 1 2</td> <td>4 15/88/25/89 2004/00/2007 1764 1764 1764 1764 1767 1764 1767 1764 1767 1767</td> <td>0 66 99 09 11 20 14442 192 192 192 193 10 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td> <td>1.07974 494 15 20</td> <td>0 4 4 14462 5 4% 8 8</td> <td></td>	3% 11 2unkeid Pd North Exit 130707 1471 140 140 140 140 140 140 140 14	6 5% 6 Catherines Road Entry 1 Catherines Road Entry 1 207 1 207 2 1 2	4 15/88/25/89 2004/00/2007 1764 1764 1764 1764 1767 1764 1767 1764 1767 1767	0 66 99 09 11 20 14442 192 192 192 193 10 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.07974 494 15 20	0 4 4 14462 5 4% 8 8	
ton Junction Name 5 Dunkeld Rd / St catherines Rd / Barrack Street	Total           Speed (mph)           Speed (mph)           Arm           CGV           OGV1           OGV2           Double Decker Bus           Double Decker Bus           Mmbus           Coach           Total           SHEV           Speed (mph)           Speed (mph)           Arm           Car	Dunkeld Road South Exit 2240 313 31 34 44 46 66 46 46 46 46 46 46 46 46 46 46	%         6%           %         77           9         51 Catherines Road Exit           81         44           82         44           82         42           82         77           83         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           0         00           00         00           00         00           00         00           00         00           00         00           00         00           00         00           00         00	3% 111 2000	6 5% 5 Catherines Road Entry 165 5 Catherines Road Entry 165 1 2055 1 2055 2 205 2 205	4 15162 55 5 152 5 15 15 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0	107070 498 13 20	0 4 4 14462 5 4% 8 8	
tion Junction Name Barrack Street Barrack Street Comparison Street	Total         %HOV           Speed (mph)         Speed (mph)           Arm         Car           LGV         OGV1           OGV2         Single Decker Bus           Minibus         Coach           Total         %HOV           Speed (imph)         Speed (imph)           Arm         Car           LGV         LGV	Dunkeld Road South Exit 1240 362 362 362 362 362 362 362 362	%         6%         6%           9         B Cathernes Road Exit         72           91         99         73           11         97         94           12         97         72           12         77         72           13         99         73           14         50         60           15         70         22           16         77         22           17         22         73           18         99         397           19         1000         22           10         23         1000	3% 111 Dunkeid Rd North Exit 100707 1771 140 140 140 140 140 140 140 14	6 5% 6 Catherines Road Entry 1 Catherines Road Entry 1 200 1 200 2 0 200 2 0 200 2 0 200 3 0 0 0 4 0 0 5	4 151825 5% 5 Dunkeld Pd South Entry 12077 1764 144 144 144 144 144 144 144 1	0 6 6 9 9 9 9 9 9 9 11 12 12 12 12 12 12 12 12 12	107970 498 1 20	0 4 4 14462 5 4% 8 8	
ton Junction Name 5 Dunkeld Rd / St Catherines Rd / Barrack Street 100 Junction Name 6 Junction Name 6 Junction Name 0 Junction Name	Total           Speed (mph)           Speed (mph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Minbus           Cotal           Systed (mph)           Speed (mph)           Speed (mph)           Arm           Car	Dunkeld Road South Exit 2240 352 351 344 445 446 446 446 446 446 446 446 446 4	%         6%           7         7           6         7           7         12           9         7           11         347           12         7           14         50           10         6           10         6           11         7           12         7           13         7           14         50           14         50           15         121	3% Dunkeld Pd North Exit 1007 100	6 598 51 Catherines Road Entry 1 Catherines Road Entry 1 207 2 21 3 0 12 3 0 0 5 0 0	4 15/86/20 5% 5% 5% 5% 5% 5% 5% 5% 5% 5% 5% 5% 5%	Cheff Rd Westbound Exit Cheff Rd Westbound Exit Cheff Rd Westbound Exit Cheff Rd Westbound Exit 201 Cheff Rd Westbound Exit 201 201 201 201 201 201 201 201 201 201	107904 4% 12 20	0 4 4 14462 5 4% 8 8	
tion Junction Name 5 Dunkled Rd / St Catherines Rd / Barrack Street 5 Dunkled Rd / St Catherines Rd / Barrack Street 6 Junction Name 6 Junction Name 0 Obbies Roundabout	Total           Speed (mph)           Speed (mph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Minbus           Cotal           Systed (mph)           Speed (mph)           Speed (mph)           Arm           Car	Dunkeld Road South Exit 2240 352 351 344 445 446 446 446 446 446 446 446 446 4	%         6%         6%           9         B Cathernes Road Exit         72           91         99         73           11         97         94           12         97         72           12         77         72           13         99         73           14         50         60           15         70         22           16         77         22           17         22         73           18         99         397           19         1000         22           10         23         1000	3% Dunkeld Pd North Exit 1007 100	6 598 51 Catherines Road Entry 1 Catherines Road Entry 1 207 2 21 3 0 12 3 0 0 5 0 0	4 15/86/20 5% 5% 5% 5% 5% 5% 5% 5% 5% 5% 5% 5% 5%	Cheff Rd Westbound Exit Cheff Rd Westbound Exit Cheff Rd Westbound Exit Cheff Rd Westbound Exit 201 Cheff Rd Westbound Exit 201 201 201 201 201 201 201 201 201 201	107904 4% 12 20	0 4 4 14462 5 4% 8 8	
ction Junction Name 5 Durkeld / St Catherines Rd / Barrack Street ction Junction Name 6 A9 / Creff nd Roundabout Dobbles Roundabout	Total           Speed (mph)           Speed (mph)           Arm           Car           Lor           Lor           Double Decker Bus           Double Decker Bus           Double Decker Bus           Double Decker Bus           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           GoV1           GOV2	Dunkeld Road South Exit 2240 152 152 152 152 152 152 152 153 153 154 1485 164	%         6%           %         77           9         5 Cathernes Road Exit           11         97           12         97           14         50           17         22           0         0           16         0           17         22           0         0           19         0           10         0           10         0           11         10           12         0           12         0           14         10           15         11           16         11           17         22           10         0           10         0           10         0           10         0           10         0           10         0           10         0           11         11           12         12           13         14	3% 111 Dunkeid Rd North Exit 120 1371 140 140 140 140 140 140 140 14	6 598 51 Catherines Road Entry 51 Catherines Road Entry 52 Catherines Road Entry 53 Catherines Road Entry 53 Catherines Road Entry 54 Catherines Road Entry 54 Catherines Road Entry 54 Catherines Road Entry 54 Catherines Road Entry 55 Catherines Road Entry 56 Catherin	4 151812 58 58 58 58 58 58 58 58 58 58 58 58 58	0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.07970 49% 13 20	0 4 4 14462 5 4% 8 8	
cton Junction Name 5 Durkleld Rd / Bt Catherines Rd / Barrack Street 5 Durkleld Rd / Bt Catherines Rd / Barrack Street 5 do / Creff Rd Roundabout Dobbies Roundabout	Total           Systed (mph)           Speed (mph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Minibus           Caech           Total           Speed (imph)           Speed (imph)           Arm           Car           Car           Code/1           Odv2           Single Decker Bus	Dunkeld Road South Exit 2240 152 152 152 152 152 152 152 153 153 154 1485 164	%         6%           7         7           6         7           7         12           9         7           11         347           12         7           14         50           10         6           10         6           11         7           12         7           13         7           14         50           14         50           15         121	3% 111 Dunkeid Rd North Exit 120 1371 140 140 140 140 140 140 140 14	6 598 51 Catherines Road Entry 51 Catherines Road Entry 52 Catherines Road Entry 53 Catherines Road Entry 53 Catherines Road Entry 54 Catherines Road Entry 54 Catherines Road Entry 54 Catherines Road Entry 54 Catherines Road Entry 55 Catherines Road Entry 56 Catherin	4 151812 58 58 58 58 58 58 58 58 58 58 58 58 58	Cheff Rd Westbound Ext Cheff Rd Westbound Ext Creff Rd Westbound Ext 11 11 11 11 11 11 11 11 11 1	1.07970 49% 13 20	0 4 4 14462 5 4% 8 8	
tion Junction Name 5 Durkled Rd / St Catherines Rd / Barrack Street	Total           Sysed (mph)           Speed (mph)           Arm           Lav           Lav           Dodde Dacker Bus           Double Dacker Bus           Double Dacker Bus           Speed (mph)           Strage Order           System (mph)           Speed (mph)           Arm           Gör           Gör           OGV1           OGV2           Single Dacker Bus           Double Dacker Bus           Double Dacker Bus           Double Dacker Bus	Dunkeld Road South Exit 2240 152 152 152 152 152 152 152 153 153 154 1485 164	%         6%           %         77           %         9           %         1302           %         1302           %         1302           %         1302           %         1302           %         1302           %         1302           %         1302           %         1302           %         1302           %         1302      %         1302      %	3% 3% 20ukeid Rd North Exit 307 307 307 307 307 307 307 307 307 307	6 598 102 51 Catherines Road Entry 103 104 105 107 107 107 107 107 107 107 107	4 15162 55 5 152 5 152 120 120 120 120 120 120 120 120 120 12	Creff Rd Westbound Ext Creff Rd Westbound Ext	1.0700 495 13 20	0 4 4 14462 5 4% 8 8	
tion Junction Name Darrack Street	Total Speed (mph) Speed (mph) Arm GGV GGV GGV GGV1 GGV2 Single Decker Bus Double Decker Bus Minbus Speed (mph) Speed (mph) Speed (mph) GGV GGV GGV GGV Speed (mph) Speed (mph) Spee	Dunkeld Road South Exit 2240 152 152 152 152 152 152 152 153 153 154 1485 164	%         6%           %         77           9         5 Cathernes Road Exit           11         97           12         97           14         50           17         22           0         0           16         0           17         22           0         0           19         0           10         0           10         0           11         10           12         0           12         0           14         10           15         11           16         11           17         22           10         0           10         0           10         0           10         0           10         0           10         0           10         12           10         12           10         14	3% 3% 20ukeid Rd North Exit 307 307 307 307 307 307 307 307 307 307	6 598 51 Catherines Road Entry 51 Catherines Road Entry 52 Catherines Road Entry 53 Catherines Road Entry 53 Catherines Road Entry 54 Catherines Road Entry 54 Catherines Road Entry 54 Catherines Road Entry 54 Catherines Road Entry 55 Catherines Road Entry 56 Catherin	4 15162 55 5 152 5 152 120 120 120 120 120 120 120 120 120 12	Creff Rd Westbound Exet Creff	1.0700 495 13 20	0 4 4 14462 5 4% 8 8	
tion Junction Name 5 Dunked Rd / St Catterines Rd / Barrack Street barrack Street tion Junction Name 0 A/ Creff na Roundabout Dobbers Roundabout	Total         9640V           Speed (mph)         Speed (mph)           Speed (mph)         Gar           Car         Gar           Covid Decker Bus         Gar           Cosch         Speed (mph)           Speed (mph)         Speed (mph)           Speed (mph)         Speed (mph)           Speed (mph)         Speed (mph)           Speed (mph)         Speed (mph)           Smigb Decker Bus         Smigb Decker Bus	Dunkeld Road South Exit 2240 1250 1251 1262 1265	%         6%           7         7           6         7           7         1           1         34           12         40           14         50           15         7           16         60           17         1           18         0           19         60           10         10           11         10           12         10           13         10           14         10           14         10           15         10           16         10           17         11           10         10           10         10           11         10           12         10           13         10           14         10           14         10           14         10           14         10           14         10           14         10           14         10           14         10           14         10	3% Durkeld Rd North Exit 100 110 110 110 110 110 110 11	6 598 6 Catherines Road Entry 1 Catherines Road Entry 1 207 1 207 2 0 207 3 0 0 0 4 0 0 5 0 0 0 5 0 0 0 6 0 0 6 0 0 7 0 6 0 0 7 0 7 0 7 0 7 0 7 0 7 0 7 0	4 15/66/25 2004 15/66/25 2004 2004 2004 2004 2004 2004 2004 20	Cheff Rd Westbound Exit Cheff Rd Westbound Exit 0 0 0 0 0 0 0 0 0 0 0 0 0	107904 4% 15 20	0 4 4 14462 5 4% 8 8	
tion Junction Name 5 Durkledh Rd / St Catherines Rd / Barrack Street  ition Junction Name 6 A 9 / Creff Rd Roundabout Dobbles Roundabout	Total         %450'           Speed (mph)         Speed (mph)           Speed (mph)         Gar           Car         Car           Double Decker Bus         Minibus           Minibus         Cosch           Total         Speed (mph)           Arm         Car           OGV1         OGV2           Single Decker Bus         Minibus           Double Decker Bus         Minibus           OGV1         OGV1           OGV2         Single Decker Bus           Mozach         Total	Ounkeld Road South Exit 21240 202 202 202 202 202 202 202	%         6%           %         77           9         8 Catherines Road Exit           11         97           12         97           14         50           17         22           0         0           17         22           19         0           10         0           10         0           10         0           10         0           10         0           10         0           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         110	3% 111 Dunkeid Rd North Exit 2070 140 140 140 140 140 140 140 14	6 598 6 Catherines Road Entry 1 Catherines Road Entry 1 207 1 207 2 0 207 3 0 0 0 4 0 0 5 0 0 0 5 0 0 0 6 0 0 6 0 0 7 0 6 0 0 7 0 7 0 7 0 7 0 7 0 7 0 7 0	4 15/82 58 26 27 27 27 27 27 27 27 27 27 27 27 27 27	Crieff Rd Westbound Exit Crieff Rd Westbound E	107904 4% 15 20	0 4 4 14462 5 4% 8 8	
ion Junction Name 6 Doukeld Rd / St Catherines Rd / Barrack Street ion Junction Name 6 Ad / Crieff Rd Roundabout Dobbies Roundabout	Total         9640V           Speed (mph)         Speed (mph)           Speed (mph)         Gar           Car         Gar           Covid Decker Bus         Gar           Cosch         Speed (mph)           Speed (mph)         Speed (mph)           Speed (mph)         Speed (mph)           Speed (mph)         Speed (mph)           Speed (mph)         Speed (mph)           Smigb Decker Bus         Smigb Decker Bus	Dunkeld Road South Exit 2240 1250 1251 1262 1265	%         6%           %         77           9         8 Catherines Road Exit           11         97           12         97           14         50           17         22           0         0           17         22           19         0           10         0           10         0           10         0           10         0           10         0           10         0           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         110	3% 111 Dunkeid Rd North Exit 2070 140 140 140 140 140 140 140 14	6 5% 6 Catherines Road Entry 1 Catherines Ro	4 15/82 58 26 27 27 27 27 27 27 27 27 27 27 27 27 27	Crieff Rd Westbound Exit Crieff Rd Westbound E	107904 4% 12 20	0 4 4 14462 5 4% 8 8	
cton Junction Name Barrack Street	Total         Speed (mph)           Speed (mph)         Andrew (mph)           Andrew (mph)         Andrew (mph)           Addrew (mph)         Speed (mph)           Double Decker Bus         Double Decker Bus           Double Decker Bus         Speed (mph)           Speed (mph)         Speed (mph)           Speed (mph)         Speed (mph)           Spingle Decker Bus         Double Decker Bus           Double Decker Bus         Double Decker Bus           Double Decker Bus         Double Decker Bus           Monoch         Total           YetHOV         YetHOV	Dunkeld Road South Exit 2240 325 325 321 348 448 448 448 448 448 448 448	%         6%           %         77           %         71           %         71           %         71           %         71           %         71           %         72           %         73           %         73           %         74           %         74           %         74           %         74           %         74           %         74           %         74           %         74	3% ounkeid Rd Nerth Exit 130 140 140 140 140 140 140 140 14	6 5% 6 Cathernes Road Entry 1 Cathernes Road Entry	4 15/86/20 20 20 20 20 20 20 20 20 20 20 20 20 2	Crieff Rd Westbound Exit Crieff Rd Westbound E	107904 4% 12 20	0 4 4 14462 5 4% 8 8	
nction Junction Name 5 Dunkeld Rd / St Catherines Rd / Barrack Street nction Junction Name 6 JA9 / Cneff Rd Roundabout Dobbies Roundabout	Total         %450'           Speed (mph)         Speed (mph)           Speed (mph)         Gar           Car         Car           Double Decker Bus         Minibus           Minibus         Cosch           Total         Speed (mph)           Arm         Car           OGV1         OGV2           Single Decker Bus         Minibus           Double Decker Bus         Minibus           OGV1         OGV1           OGV2         Single Decker Bus           Mozach         Total	Dunkeid Road South Exit 2200 200 200 200 200 200 200 200 200 2	%         6%           %         77           9         8 Catherines Road Exit           11         97           12         97           14         50           17         22           0         0           17         22           19         0           10         0           10         0           10         0           10         0           10         0           10         0           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         110	3% 111 Dunkeid Rd North Exit 2070 140 140 140 140 140 140 140 14	6	4 151625 55 2014 15162 55 2014 15162 1297 1297 1297 1297 1297 1297 1297 129	Crieff Rd Westbound Ext Crieff Rd Westbound Ext Crieff Rd Westbound Ext 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.07004 495 13 20	0 4 4 14462 5 4% 8 8	

## Further Assessment of Air Quality

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7 A9 / Crieff Rd Roundabout	Arm Car	Crieff Rd Eastbound Entry 1182	Crieff Rd Eastbound Exit 23 765:	Newhouse Rd Approach 8061	A9 On / Off slip approach 4375	Crieff Rd westbound Approach 811	Newhouse Rd Exit 8120	Crieff Rd Westbound Exit 11316	A9 On / Off Slip Exit 4680	
Newhouse Rd Roundabout	LGV	1182								
Newhouse ku koundabout										
	OGV1	17								
	OGV2	30								
	Single Decker Bus Double Decker Bus		15 14-			15		221	109	
	Minibus		21 16			10			0	
			1 10	· · · · · ·	U	10	4	21	0	
	Coach		0 0					L	U	
	Total	1396								
	96HDV	59								
	Speed (mph)		8 1:			11				
	Speed (kmph)	1	13 17			15				
nction Junction Name	Arm	Fairfield Avenue Approach	Crieff Rd Westbound Entry	Crieff Rd Eastbound Entry		Crieff Rd Eastbound Exit	Feus Rd Exit	Crieff Rd Westbound Exit	Fairfield Avenue Exit	
8 Crieff Rd / Feus Rd Roundabou		103								
	LGV	10								
	OGV1	16								
	OGV2		60 67							
	Single Decker Bus	8	189	182	2 133			144	95	
	Double Decker Bus		0 1	0	0			C	0	
	Minibus		0 18	18	3 0	18	3 C	16	0	
	Coach		0 (	0	0		0 0		0	
	Total	144								
	%HDV	229								
	Speed (mph)		6 10			10				
	Speed (kmph)		9 1							
ction Junction Name	Arm	M90 Edinburgh Approach	M90 Edinburgh Exit (not Inc traffic from Glasgow Rd)	A9 Stirling Exit		Glasgow Road Exit	A9 Western Bypass Approach		Glasgow Road Approach (not inc traffic to M90)	
9 Broxden Roundabout	Car	1872	9 1458							
	LGV	281								
	OGV1	100								
	OGV2	41								
	Single Decker Bus	67	9 936	3 970	620	29:	812	1057	270	
	Double Decker Bus		0 0	0	) 0		0	0	0	
	Minibus		0 0	0	) 0		0	0	0	
	Coach		0 0	) 7	· 0		· 0	4	7	
	Total	2364	3 1933-	19418	21389	1102	18949	20503	8068	
	96HDV	99	% 159	i 1496	9%	79	13%	16%	9%	
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10 Glasgow Rd / Necessity Brae	Car	739	96 8851				3861			
Roundabout	LGV	108			1089					
	OGV1	21								
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Junction Junction Name	Arm			Isla Road Exit	Strathmore St Approach	Isla Road Approach	Main St Approach		
21 Dundee Rd / Strathmore St / Isk	a Car	8505		323	F 9971				
Crossroads	LGV	1029	2090	34	138	3 700	1589		
	0GV1	336	410	10	5 311	2 96	455		
	0GV2	70	130	3	8	4 46	112		
	Single Decker Bus	256							
	Double Decker Bus	0	0			0 0	0		
	Minibus						4		
	Coach	0				0	0		
	Total	10199	17273	378	1199	5 5324			
	96HDV	8%		79	59				
	Speed (mph)	28	14	3	1	0 8	10		
	Speed (kmph)	45	23	4		5 7	16		
Junction Junction Name	Arm	Dundee Rd Exit	Gowrie St Exit	Bowerswil Rd Approach	Dundee Rd Approach	Gowrie St Approach			
22 Gowrie St / Bowerswell Rd /	Car	7585	8638	114		2 6983			
Dundee Rd T Junction	LGV OGV1	1113	1026	14	F 94				
	0GV1	427	497	4		7 382			
	0GV2	165	123	2	12:	3 137			
	Single Decker Bus	119	161	2	5 15:	1 105			
	Double Decker Bus	0				o c			
	Minibus	0	0		)	4 C			
	Coach		0		1				
	Total	9408	10444	138	987	7 8670			
	96HDV	100	9%	79		1 0070			
		8% 17	10		1	6 7% 7 25			
	Speed (mph)	17	10		1	/ 25			
	Speed (kmph)	28							
Junction Junction Name	Arm	Edinburgh Rd Nthland Esit	Edinburgh Rd Sthbnd Exit	Gleneam Rd Exit	Edinburgh Rd Nthlond Approach	Glenearn Rd Approach	Edinburgh Rd Sthond Approach		
23 Edinburgh Road / Glenearn Rd	Car	6493	9282	615	1016-	4 5556 2 707	6391		
	LGV	875	1103			2 707	763		
	0GV1 0GV2	347	427	27	3 55	3 161	336		
		130	126	6	175	5 49	102		
	Single Decker Bus	259	224	13		7 95	182		
	Double Decker Bus	0	0		)	0 0	0		
	Minibus	n	0		1		0		
	Coach		4			a	4		
	Total	0106	11145	741	1253	4 6570	7777		
	TOTA .	8106	11165	740	1203-	4 05/0	100		
	96HDV	9%	8%	79			10%		
	Speed (mph)	17	29	1			9		
	Speed (kmph)	28		3	1		14		
Junction Junction Name	Arm	Tesco Exit	Tesco Approach	Breadalbane Terrace Approach	Edinburgh Rd Nthbnd Approach	Edinburgh Rd Sthbnd Approach	Breadalbane Terrace Exit	Edinburgh Rd Sthbrid Exit	Edinburgh Rd Nthond Exit
24 Edinburgh Rd / Tesco /	Car	3385	2800			3 9282	756	6619	10164
Breadalbane Terrace	LGV OGV1	347	378	17	9 90	7 1103	84	844	1299 553 175 347
	06V1	28	35	9	47:	3 427	88	364	553
	OGV2	7	7	2	15		25	105	175
	Single Decker Bus	21	21	9	261	6 224	46	182	347
	Double Decker Bus							0	
	Minibus	0	0				0	0	
	MINICO	0	0			-	0	0	
	Coach Total	0	0	167	935	9 11165	998	* 8117	
	Total	3787	3241						12534
	96HDV	2%	3%	129	5 109			9%	
	Speed (mph)	2%	3%	129	i 109	6 8% 5 7	16%	9% 5	99
	96HDV Speed (mph) Speed (kmph)	2%	3% 14 22	129 11	5 109 7	6 8% 5 7	8	9% 5	99
Junction Junction Name	Speed (mph) Speed (kmph) Arm	2% 18 29 Friarton Rd Exit	3% 14 Edinburgh Rd Sthbind Exit	129	5 109 7	6 8% S 7 9 Friarton Rd Approach	16% 8 Edinburgh Rd Sthond Approach	9% 5	99
Junction Junction Name 25 Edinburgh Rd / Frierton Rd	Speed (mph) Speed (kmph) Arm	2% 18 29 Friarton Rd Exit	3% 14 Edinburgh Rd Sthbrid Exit 9104	129 30 Edinburgh Rd Nthland Exit 912	Edinburgh Rd Nthlond Approach	6 8% S 7 9 Friarton Rd Approach	16% 8 Edinburgh Rd Sthond Approach	9% 5	99
Junction Junction Name 25 Edinburgh Rd / Friarton Rd	Speed (mph) Speed (kmph) Arm Car LGV	2% 18 29 Friarton Rd Exit 1859	3% 14 Edinburgh Rd Sthbrid Exit 9104	129 30 Edinburgh Rd Nthland Exit 912	Edinburgh Rd Nthlond Approach	6 8% S 7 9 Friarton Rd Approach	16% 8 Edinburgh Rd Sthond Approach	9% 5	99
Junction Junction Name 25 Edinburgh Rd / Friarton Rd	Speed (mph) Speed (kmph) Arm Car LGV	2% 18 Friarton Rd Exit 1859 245	3% 14 22 Edinburgh Rd Sthbind Exit 9104 1150	129 iii Edinburgh Rd Nthland Exit 912 100	Edinburgh Rd Nthbrid Approach 874	6 896 5 7 7 9 123 7 Friarton Rd Approach 7 2345 8 280	Edinburgh Rd Sthond Approach	9% 5	99
Junction Junction Name 25 Edinburgh Rd / Frierton Rd	Speed (mph) Speed (kmph) Arm Car LGV	2% 18 29 Friarton Rd Exit 1859 245 137	3% 14 Edinburgh Rd Sthbrid Exit 9104 1159 581	129 30 Edinburgh Rd Nthlond Exit 912 109 522	Edinburgh Rd Nthbrid Approach 874 1 106	6 896 5 7 7 9 123 7 Friarton Rd Approach 7 2345 8 280	Edinburgh Rd Sthond Approach	9% 5	99
Junction Junction Nama 25 Edinburgh Rd / Frierton Rd	Speed (mph) Speed (kmph) Arm Car LGV 0GV1 0GV1 0GV2	2% 18 29 Friarton Rd Exit 1859 245 137 49	3% 14 22 Edinburgh Rd Sthbind Exit 9104 1159 501 231	129 31 Edinburgh Rd Nthbrid Exit 912 109 82 16	5 109 Edinburgh Rd Nthlond Approach 1061 5 1061 5 1081 8 18	6 899 5 77 Friarton Rd Approach 2345 8 290 0 277 2 112	10% 8 Edinburgh Rd Sthond Approach 9999 1152 441 158	9% 5	99
lunction Junction Name 25 Edmburgh Rd / Frierton Rd	Speed (mph) Speed (kmph) Arm Car LGV 0GV1 0GV1 0GV2 Single Decker Bus	2% 18 29 Friarton Rd Exit 1859 245 137	3% 14 22 Edinburgh Rd Sthbind Exit 9104 1159 501 231	129 31 Edinburgh Rd Nthbrid Exit 912 109 82 16	5 109 Edinburgh Rd Nthlond Approach 1061 5 1061 5 1081 8 18	6 89% 5 7 9 Priarton Rd Approach 7 2345 8 286 0 270 2 112 1 143	16% 8 Edinburgh Rd Sthland Approach 1152 441 158 252	9% 5	91
Junction Junction Name 25 Edinburgh Rd / Frierton Rd	Speed (mph) Speed (kmph) Arm Car LGV 0GV1 0GV2 Single Decker Bus Double Decker Bus	2% 18 29 Friarton Rd Exit 1859 245 137 49	3% 14 22 Edinburgh Rd Sthbind Exit 9104 1159 501 231	129 31 Edinburgh Rd Nthbrid Exit 912 109 82 16	5 109 Edinburgh Rd Nthlond Approach 1061 5 1061 5 1081 8 18	6 899 5 77 Friarton Rd Approach 2345 8 290 0 277 2 112	16% 8 Edinburgh Rd Sthland Approach 1152 441 158 282 0 0	9% 5	91
Junction Junction Name 25 Edinburgh Rd / Frierten Rd	Speed (mph) Speed (kmph) Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	2% 18 29 Friarton Rd Exit 1859 245 137 49	3% 14 22 Edinburgh Rd Sthbind Exit 9104 1159 501 231	129 31 Edinburgh Rd Nthbrid Exit 912 109 82 16	5 109 Edinburgh Rd Nthlond Approach 1061 5 1061 5 1081 8 18	6 89% 5 7 9 Priarton Rd Approach 7 2345 8 286 0 270 2 112 1 143	16% 8 Edinburgh Rd Sthland Approach 1152 441 158 252	9% 5	99
Junction Junction Name 25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (kmph) Arm Car LGV OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus Double Decker Bus Coach	2% 18 76arton 9d Exit 1855 245 127 49 70 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3% 144 Edinburgh Rd Sthbnd Exit 2014 1199 109 201 201 201 201 201 201 201 201 201 201	129 91 Edinburgh Rd Nithbrid Exit 912 100 525 166 344	5 109 Edinburgh Rd Nithbind Approach 1974 102 102 102 102 102 102 102 102 102 102	6 899 5 7 7 Fiartan Rd Approach 7 2345 0 2975 0 2975 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10% 8 8 Ediriburgh Rd Stihland Approach 9999 115 145 252 0 0 0 4 4 4 4 4 4 4 4	9% 5	99
Junction Junction Name 25 Edirburgh Rd / Frisrton Rd	Speed (mph) Speed (imph) Arm Car LGV 0GV1 0GV1 0GV2 Single Decker Bus Double Decker Bus Double Decker Bus Total	2% 18 18 29 245 137 07 07 07 07 0 0 0 0 0 2359 2359	3% 144 Edinburgh Pd Sthbind Exit 9104 801 200 303 303 304 303 305 305 305 305 305 305 305 305 305	129 Edinburgh Rd Nthibrid Exit 912 1009 520 100 100 100 100 100 100 100 100 100 1	Edinburgh Rd Mithord Approach 874 106 185 37 37 3 1099	6 89% 7 Fiartan Rd Approach 7 2345 8 2945 0 277 1 111 1 111 0 2 0 277 0 2947 0 2945 0 297 0 2945 0 297 0 2945 0	10% 6 8 23 24 25 25 25 20 20 20 20 20 20 20 20 20 20 20 20 20	9% 5	91
Junction Junction Name 25 Edmburgh Rd / Frierton Rd	Speed (mph) Speed (imph) Arm Cor LGV 0GV1 0GV1 0GV2 Single Decker Bus Double Dacker Bus Minbus Coach Total SeHDV	2%% 18 Filanton Rd Exit 1955 145 145 147 149 149 10 0 0 235% 119 15 15 15 15 15 15 15 15 15 15 15 15 15	3% 144 22 Edinburgh Fid Sthbind Exit 201 201 201 201 201 201 201 201 201 201	129 31 Edinburgh Rd Nithbod Exit 100 522 166 34 4 1 124 9 9 9 9 9	Edirburgh Rd Nithbrid Approach 874 106 20 188 37 37 37 1099 1099 1099	6 898 5 7 7 Firston Rd Approach 7 8 2845 0 2845 0 287 2 112 1 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	16% 8 33 Edinburgh Rd Sithbrid Approach 135 1451 1452 252 0 0 4 13004 9 8 9 9 9 9 9 9 9	9% 5	99
lanction Junction Name 25 Edmburgh Rd / Priorten Rd	Speed (mph) Speed (kmph) Arm Car LGV 06V1 06V2 Single Decker Bus Double Decker Bus Double Decker Bus Touble Decker Bus Coach Total SHDV Speed (mph)	2% 18 Friarton Rd Exit 245 2454 117 40 70 0 0 22555 13% 122	3% 14 Edinburgh Edi Sthbod Exit 22 500 500 500 500 500 500 500 500 500	129 31 12 12 160 160 160 160 160 160 160 160 160 160	Edirburgh Rd Mithord Approach 874 106 108 108 109 109 109 109 109 109 109 109 109 109	6 898 7 7 7 2 7 12 7 224 7 8 2245 8 360 0 277 0 112 112 0 12 0 277 0 112 0 277 0 277 0 277 0 277 0 315 0	16% 8 33 Edinburgh Rd Sithbrid Approach 135 1451 1452 252 0 0 4 13004 9 8 9 9 9 9 9 9 9	9% 5	99
25 Edinburgh Rd / Friarton Rd	Speed (mph) Speed (imph) Arm Cor LGV GGV1 GGV2 Single Decker Bus Double Decker Bus Double Decker Bus Double Decker Bus Minibus Coach Total Speed (mph) Speed (mph)	2% 18 Franton Rd Exit 255 2645 2645 2645 2645 2645 2645 270 0 0 0 0 0 0 0 0 0 12 15 12 12 12 12 12 12 12 12 12 12 12 12 12	3% 144 Ednburgh 7d 5thbnd Exit 90 1155 1155 1155 1155 1155 1155 1155 1	129 31 Edinburgh Rid Hittbrid Eini 92 100 100 100 100 100 100 100 100 100 10	Edirburgh Rd Mithord Approach 974 90 90 90 90 90 90 90 90 90 90 90 90 90	6 898 77 9 19 224 7 224 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	10% 6 8 23 24 25 25 25 20 20 20 20 20 20 20 20 20 20 20 20 20	9% 5	99
25 Edinburgh Rd / Frierten Rd	Speed (mph) Speed (kmph) Arm Cor LGV 0GV1 0GV2 Single Decker Bus Double Decker Bus Double Decker Bus Coach Total 96HDV Speed (mph) Speed (kmph) Arm	2% 18 Franton Bd Exit 1955 245 1977 40 0 0 0 2555 198 19 19 19 19 19 19 19 19 19 19 19 19 19	3% 144 Edinburgh Fid Sthbind Exit 201 201 201 201 201 201 201 201 201 201	Lifeburgh Rid Hithend Exit Billionary Rid Hithend Exit Store	Edirburgh Rd Mithand Approach Edirburgh Rd Mithand Approach 1066 107 107 107 107 107 107 107 107	s 9985 771200 Approach 72 800 2000 1120 20000000000	19% 6thourgh Pol Sithend Approach 91 142 142 142 143 143 143 143 143 143 143 143 143 143	9% 5	99
25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (imph) Arm Cor LGV 0GV1 0GV2 Single Decker Bus Double Decker Bus Double Decker Bus Double Decker Bus Shufby Coach Total Shufby Speed (imph) Speed (imph) Arm Car	2% 18 Franton Rd Exit 255 2645 2645 2645 2645 2645 2645 270 0 0 0 0 0 0 0 0 0 12 15 12 12 12 12 12 12 12 12 12 12 12 12 12	3% 144 Edinburgh Fid Sthbind Exit 201 201 201 201 201 201 201 201 201 201	Lifeburgh Rid Hithend Exit Bill Edinburgh Rid Hithend Exit Store S	Edirburgh Rd Mithand Approach Edirburgh Rd Mithand Approach 1066 107 107 107 107 107 107 107 107	s 9985 771200 Approach 72 800 2000 1120 20000000000	19% 6/hburgh Pid Sithend Approach 91 195 195 195 195 195 195 195 195 195	9% 5	99
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25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (imph) Arm LGV Cor LGV GOV1 GOV1 GOV1 GOV1 GOV1 Coach Total Speed (mph) Speed (imph) Arm Arm LGV GOV1	2% 18 Féarton Rd Euit 1855 245 245 245 245 245 245 245 245 245 2	3% 14 Edinburgh Ed Sthand Exit 22 500 500 500 500 500 500 500	Edinburgh Rod Hithond Exet Edinburgh Rod Hithond Exet 100 100 100 100 100 100 100 100 100 10	Edinburgh Rd Mithand Approach Edinburgh Rd Mithand Approach 1066 102 102 102 102 102 102 102 102	6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	19% Editburgh Pod Sithand Appraach 91 1152 1152 1152 1152 1152 1152 1152 1	9% 5	99
25 Edinburgh Rd / Priorton Rd	Spead (mph)           Spead (mph)           Arm           Car           LGV           OGV1           OGV1           Single Decker Bus           Minbus           Coach           Total           Spead (imph)           Spead (imph)           Car           LGV           OGV1           OGV2           OGV2	2% 18 Friarton Rd Exit 245 1945 1945 1949 1949 1949 255 1949 19 Rhynd Rosd Approach 255 255 1949 19 255 255 255 255 255 255 255 255 255 25	3% 144 144 22 Edinburgh Pd Sthbnd Exit 90 1155	129 31 20 20 20 20 20 20 20 20 20 20 20 20 20	Edirburgh Rd Nithond Approach - 1066 - 1066	6	19% 6 8 26/burgh Rd Stitbod Approach 9 1152 1152 1152 1152 1152 1152 1152 11	9% 5	99
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25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (mph) Arm Cer OF/1 OF/1 OF/1 OF/1 OF/1 OF/1 OF/1 OF/1	2% 18 Friarton Rd Exit 245 1945 1945 1949 1949 1949 255 1949 19 Rhynd Rosd Approach 255 255 1949 19 255 255 255 255 255 255 255 255 255 25	3% 144 22 Edinburgh Fd Sthbnd Exit 23 4 904 90 500 500 30 0 4 114 14 14 14 14 14 14 14 14 14 14 14	129 31 20 20 20 20 20 20 20 20 20 20 20 20 20	Edirburgh Rd Nithond Approach - 1066 - 1066	6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	19% Editikurgh Pid Sithand Appraach 91 195 195 195 195 195 195 195 195 195	9% 5	99
25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (mph) Arm Car LGV LGV Could Decker Bus Double Decker Bus Double Decker Bus Double Decker Bus Double Decker Bus Coach Total Speed (mph) Speed (mph) Speed (mph) Speed (mph) Speed (mph) Speed (mph) Speed (mph) Speed Speed Factor Double Decker Bus Double Decker Bus Double Decker Bus Shabus	2% 18 Ffanton Bd Exit 195 Ffanton Bd Exit 195 14 10 10 10 10 10 10 10 10 10 10 10 10 10	3% 14 Edinburgh Fd Sthbnd Exit 22 501 233 233 234 234 235 235 235 235 235 235 235 235	Edirburgh Rod Hithond Ext Edirburgh Rod Hithond Ext 109 109 109 109 109 109 109 109 109 109	2000 Edirburgh Rd Mithand Approach 1006 1007 1007 1007 1007 1007 1007 1007	6	10% Editburgh Pod Sittend Apprach 90 1152 1152 1152 1152 1152 1152 1152 115	9% 5	99
25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (mph) Arm Car Uor Uor Uor Single Decker Bus Double Decker Bus Double Decker Bus Double Decker Bus Minbus Coach Total Speed (mph) Speed (mph) Spe	2% 18 Filarton Rd Exit Filarton Rd Exit 137 14 17 14 17 14 17 15 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 18 18 18 18 18 18 18 18 18 18 18 18	3% 144 22 Edinburgh Pd Sthbnd Exit 23 23 23 23 24 24 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	129 31 20 20 20 20 20 20 20 20 20 20 20 20 20	Edirburgh Rd Nithbrid Approach 5 5 5 5 5 5 5 5 5 5 5 5 5	s	19% 6 6 26/burgh Pid Sithord Approach 9 1152 1152 1152 1152 1152 1152 1152 11	9% 5	91
25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (mph) Arm CGV CGV CGV CGV CGV1 CGV1 CGV1 CGV2 Single Decker Bus Double Dacker Bus MinDua MinDua Speed (mph) Speed (mph) Speed (mph) Speed (mph) CGV CGV1 CGV1 CGV1 CGV1 CGV1 CGV1 CGV1	2% 18 Filarton Rd Exit Filarton Rd Exit 137 14 17 14 17 14 17 15 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 17 18 18 18 18 18 18 18 18 18 18 18 18 18	3% 144 22 Edinburgh Pd Sthbnd Exit 23 23 23 23 24 24 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	129 31 20 20 20 300 300 300 300 300 300 300 20 20 20 20 20 20 20 20 20 20 20 20 2	2 30%	s	19% 6 6 26/burgh Pid Sithord Approach 9 1152 1152 1152 1152 1152 1152 1152 11	9% 5	99
25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (mph) Am Cov Cov Cov Cov Cov Cov Cov Cov Cov Cov	2% 18 Franton Bd Exit 185 1955 1957 1	3% 144 Edinburgh Pd Sthbnd Exit 22 Edinburgh Pd Sthbnd Exit 300 60 10 10 14 14 14 20 20 20 20 20 20 20 20 20 20 20 20 20	Edirburgh Rid Hithond Exit Edirburgh Rid Hithond Exit Edirburgh Rid Hithond Exit Edirburgh Rosel Northbound Exit Exit Edirburgh Rosel Northbound Exit Exit Edirburgh Rosel Northbound Exit Exit Edirburgh Rosel Northbound Exit Exit Exit Edirburgh Rosel Northbound Exit Exit Exit Exit Edirburgh Rosel Northbound Exit Exit Exit Exit Exit Exit Exit Exit	5 30% Edirburgh Rd Mithord Approach 6 20% 5 20%	6	19% Editburgh Pid Stitund Approach 99% 1152 1152 1152 1152 1152 1152 1152 115	9% 5	91
25 Edinburgh Rd / Priorton Rd	Spead (mph) Spead (mph) Arca Arca Arca Arca Arca Arca Arca Arca	2% 18 Fifarton Bd Exit 127 Fifarton Bd Exit 127 14 15 127 14 10 10 10 1 15 15 15 15 15 15 15 15 15 15 15 15 1	3% 144 22 Edinburgh Fid Sthbind Exit 231 231 231 231 231 232 232 232 232 232	129 33 34 34 34 34 34 34 34 34 34 34 34 34	2000 Edirburgh Rd Nithord Approach 1000 1000 1000 1000 1000 1000 1000 10	s	19% 6 6 6 6 7 192 192 192 192 192 192 192 192 192 192	9% 5	91
25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (mph) Am CGV CGV CGV CGV CGV CGV CGV CGV CGV CGV		3% 144 Edinburgh Pd Sthbnd Exit 22 Edinburgh Pd Sthbnd Exit 304 0 0 0 14 1419 Edinburgh Pd Sthbnd Exit 85 Edinburgh Pd Sthbnd Exit 85 Edinburgh Pd Sthbnd Exit 85 Edinburgh Pd Sthbnd Exit 84 Edinburgh Pd Sthbnd Exit 85 Edinbur	Edirburgh Rod Hithond Exit Edirburgh Rod Hithond Exit Edirburgh Rosel Northbaund Exit Edirburgh Rosel Northbaund Exit Edirburgh Rosel Northbaund Exit Sthered On Silp, from Edinbaunh 20 1000 1	Edirburgh Rd Mithand Approach Edirburgh Rd Mithand Approach 1066 1020	Comparison (Comparison)     Firston (Comparison)     Firston (Comparison)     Comparison	19% 6 Birburgh Pol Stitund Approach 999 1152 1155	9% 5	99
25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (mph) Am Cover Cover Cover Cover Cover Cover Single Dasker Bus Minbus Coach StatU Coach StatU Coach Speed (mph) Am Coach Speed (mph) Cover Single Docker Bus Double Decker Bus Double Decker Bus Double Cover Speed (mph) Speed (mph) Speed (mph) Speed (mph) Speed (mph) Speed (mph) Speed (mph) Speed (mph) Speed (mph)	2%           11           Friantion Rd Exit         28           1155         125           12         125           12         125           12         125           12         125           12         125           13%         125           14         265           15%         125           16         265           17%         265           18%         265           19%         262           21         262           22         21           14         265           21         14           13         14           14         14           15%         25%           14         14           15%         25%           16%         25%           17%         26%           18%         26%           19%         26%           21%         26%           21%         26%           21%         26%           21%         26%           21%         26% <t< td=""><td>3% 144 Edinburgh Pd Sthbnd Exit 80 903 10144 114 1019 1017 101 1017 101 1017 101 101 101 101</td><td>Edirburgh Rid Hithbrid End Edirburgh Rid Hithbrid End Edirburgh Rid Hithbrid End 100 100 100 100 100 100 100 10</td><td>Edirburgh Rd Nithand Approach 5 Edirburgh Rd Nithand Approach 1066 1070 1087 1099 1</td><td>s</td><td>Striburd off sip to Broxden</td><td>9% 5</td><td>91</td></t<>	3% 144 Edinburgh Pd Sthbnd Exit 80 903 10144 114 1019 1017 101 1017 101 1017 101 101 101 101	Edirburgh Rid Hithbrid End Edirburgh Rid Hithbrid End Edirburgh Rid Hithbrid End 100 100 100 100 100 100 100 10	Edirburgh Rd Nithand Approach 5 Edirburgh Rd Nithand Approach 1066 1070 1087 1099 1	s	Striburd off sip to Broxden	9% 5	91
25 Edinburgh Rd / Priorton Rd	Spead (mph) Spead (mph) ACC ACC ACC ACC ACC ACC ACC ACC ACC AC		3% 3% 144 22 Edinburgh Pd Sthbnd Exit 20 150 20 20 20 20 20 20 20 20 20 20 20 20 20	129 23 24 24 24 24 24 24 24 24 24 24 24 24 24	Edirburgh Rd Nithand Approach 5 Edirburgh Rd Nithand Approach 1066 1070 1087 1099 1	s	Stitzend off sigs to Broaden	9% 5	9
25 Edinburgh Rd / Priorton Rd	Spead (mph) Spead (mph) ACC ACC ACC ACC ACC ACC ACC ACC ACC AC		3% 3% 144 22 Edinburgh Pd Sthbnd Exit 20 150 20 20 20 20 20 20 20 20 20 20 20 20 20	129 23 24 24 24 24 24 24 24 24 24 24 24 24 24	Comparison of the second	s	19%     6     6     6     6     7	9% 5	9
25 Edinburgh Rd / Priorton Rd	Spead (mph) Spead (mph) ACC ACC ACC ACC ACC ACC ACC ACC ACC AC		3% 3% 54 Sthand Exit 54 Sthand Exit 54 Sthand Exit 54 Sthand Exit 55 State	Edirburgh Pid Hithond Exit Edirburgh Pid Hithond Exit Edirburgh Pid Hithond Exit Edirburgh Rosel Northbaund Exit Edirburgh Rosel	Edirburgh Rd Mithord Approach Edirburgh Rd Mithord Approach 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	s	19%     6     6     6     6     7	9% 5	9
25 Edirburgh Rd / Priorton Rd	Spead (mph) Spead (mph) Arc Arc Arc Arc Arc Arc Arc Arc Arc Arc	2%           18           Ffarton Bd Euit         195           195         245           117         40           100         0           118         100           119         111           110         255           111         112           111         263           112         21           113         11           114         263           115         21           110         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111 <td>3% 3% 144 22 Edinburgh Rd Sthbind Exit 201 201 201 201 201 201 201 201 201 201</td> <td>129 33 24 24 24 24 24 24 24 24 24 24 24 24 25 24 24 24 24 24 25 25 24 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25</td> <td>Edirburgh Rd Nithand Approach Edirburgh Rd Nithand Approach 1066 107 1086 1099 1099 1099 1099 1099 1090 1097</td> <td>s</td> <td>5thbrid off sip to Broaden 1995 1997 19</td> <td>9% 5</td> <td>9</td>	3% 3% 144 22 Edinburgh Rd Sthbind Exit 201 201 201 201 201 201 201 201 201 201	129 33 24 24 24 24 24 24 24 24 24 24 24 24 25 24 24 24 24 24 25 25 24 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	Edirburgh Rd Nithand Approach Edirburgh Rd Nithand Approach 1066 107 1086 1099 1099 1099 1099 1099 1090 1097	s	5thbrid off sip to Broaden 1995 1997 19	9% 5	9
25 Edirburgh Rd / Priorton Rd	Speed (mph)           Speed (mph)           Am           Am           CV           OV1           OCV2           Double Decker Bus		3% 3% 144 22 Edinburgh Rd Sthbind Exit 201 201 201 201 201 201 201 201 201 201	Edirburgh Pid Hithond Exit Edirburgh Pid Hithond Exit Edirburgh Pid Hithond Exit Edirburgh Rosel Northbaund Exit Edirburgh Rosel	Edirburgh Rd Nithand Approach Edirburgh Rd Nithand Approach 1066 107 1086 1099 1099 1099 1099 1099 1090 1097	s	5thbrid off sip to Broaden 1995 1997 19	9% 5	9
25 Edinburgh Rd / Priorton Rd	Speed (mph)         Speed (mph)           Am         Am           Am         Am           Am         Am           Am         Am           Am         Am           CoV         CoV           OGV1         OGV2           OGV2         Speed (mph)           Am         Coach           Totel         Speed (mph)           Am         Coach           Doke         Doke           Doke         Doke           Doke         Doke           MinDua         Speed (mph)           Speed (mph)         Speed (mph)           Speed (mph)         Speed (mph)           Speed (mph)         Speed (mph)           Cor         Cor           Cor         Cor           Cor         Cor           Cor         Cor           Doke         Doke           Doke	2%           18           Ffarton Bd Euit         195           195         245           117         40           100         0           118         100           119         111           110         255           111         112           111         263           112         21           113         11           114         263           115         21           110         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111 <td>3% 3% 144 22 Edinburgh Rd Sthbind Exit 201 201 201 201 201 201 201 201 201 201</td> <td>129 33 24 24 24 24 24 24 24 24 24 24 24 24 25 24 24 24 24 24 25 25 24 24 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25</td> <td>Edirburgh Rd Nithand Approach Edirburgh Rd Nithand Approach 1066 107 1086 1099 1099 1099 1099 1099 1090 1097</td> <td>s</td> <td>19% 6 6 17 17 182 182 182 182 182 182 182 182 182 182</td> <td>9% 5</td> <td>9</td>	3% 3% 144 22 Edinburgh Rd Sthbind Exit 201 201 201 201 201 201 201 201 201 201	129 33 24 24 24 24 24 24 24 24 24 24 24 24 25 24 24 24 24 24 25 25 24 24 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	Edirburgh Rd Nithand Approach Edirburgh Rd Nithand Approach 1066 107 1086 1099 1099 1099 1099 1099 1090 1097	s	19% 6 6 17 17 182 182 182 182 182 182 182 182 182 182	9% 5	9
25 Edinburgh Rd / Priorton Rd	Spead (mph) Spead (mph) ACC ACC ACC ACC ACC ACC ACC ACC ACC AC	2%           18           Ffarton Bd Euit         195           195         245           117         40           100         0           118         100           119         111           110         255           111         112           112         112           113         112           114         263           115         245           116         116           117         263           118         10           119         10           110         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           111         10           11	3% 3% 144 22 Edinburgh Rd Sthbind Exit 201 201 201 201 201 201 201 201 201 201	129 33 24 24 24 24 24 24 24 24 24 24 24 24 25 24 24 24 24 24 25 25 24 24 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	Edirburgh Rd Nithand Approach Edirburgh Rd Nithand Approach 1066 107 1086 1099 1099 1099 1099 1099 1090 1097	s	5thbrid off sip to Broaden 1995 1997 19	9% 5	9
25 Edinburgh Rd / Priorton Rd	Speed (mph) Speed (mph) Am Cover Cov		3% 144 Edinburgh Pd Sthbod Exit 22 Edinburgh Pd Sthbod Exit 300 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Edirburgh Pid Hithond Exit Edirburgh Pid Hithond Exit Edirburgh Pid Hithond Exit 500 100 100 1124 Edirburgh Rosel Northbound Exit 100 100 100 100 100 100 100 10	30%           Edirburgh Rd Mithord Apprach           60%           10% <t< td=""><td>6</td><td>19% Editburgh Put Stitland Approach 195 195 195 195 195 195 195 195 195 195</td><td>9% 5</td><td>9</td></t<>	6	19% Editburgh Put Stitland Approach 195 195 195 195 195 195 195 195 195 195	9% 5	9
25 Edinburgh Rd / Priorton Rd	Spead (mph)     Spead (mph)     Arc     Spead (mph)     Arc     A		3% 144 144 145 145 145 145 145 145 145 145	Edinburgh Ad hithend Exit 9 Edinburgh Ad hithend Exit 9 500 500 500 500 500 500 500 50	Edirburgh Rd Nithand Approach Edirburgh Rd Nithand Approach 1066 107 1086 1099	s	19%     6     6     7	9% 5	99
25 Edinburgh Rd / Priorton Rd	Spead (mph)     Spead (mph)     Arc     Spead (mph)     Arc     A		3% 14 22 24 24 24 24 24 24 24 24 24 24 24 24	Edinburgh Ad hithend Exit 9 Edinburgh Ad hithend Exit 9 500 500 500 500 500 500 500 50	Edirburgh Rd Nithand Approach Edirburgh Rd Nithand Approach 1066 107 1086 1099	s	19%     6     6     7	9% 5	99
25 Edinburgh Rd / Priorton Rd	Speed (mph)           Arm           Arm           Arm           CV           CV           OV1           OCV2           Emple Decker Bus           Dokad Decker Bus           Doker           Doker		3% 14 22 24 24 24 24 24 24 24 24 24 24 24 24	Edirburgh Rod Hithond Exit Edirburgh Rod Hithond Exit Edirburgh Rosel Morthbaumd Exit Edirburgh Rosel Morthbaumd Exit Edirburgh Rosel Morthbaumd Exit 500 Edirburgh Rosel Morthbaumd Exit 500 1000	Comparison of the second	s	5thand off sig to browden 5thand off sig to browden 5thand off sig to browden 0 0 0 0 0 0 0 0 0 0 0 0 0	9% 5	99
25 Edinburgh Rd / Priorton Rd	Speed (mph)         Arm           Arm         Arm           Arm         Arm           Arm         Arm           Arm         Arm           CoV         OcV1           OCV2         Decker Bus           Double Oscier Bus         Minbus           Coach         Total           Speed (mph)         Arm           Car         OV2           Double Decker Bus         Double Decker Bus           Double Decker Bus         Double Bus           Speed (mph)         Herl	2%           11           Frianton Bd Exit         185           11         195           245         125           12         125           13         125           14         125           15         125           16         125           17         12           18         12           19         12           10         12           11         12           12         12           13         12           14         13           15         12           16         12           17         12           18         12           19         12           10         12           10         12           10         12           10         12           100         12           101         12           102         12           103         12           104         12           105         12           106         12           107         12 <td>3% 14 Edinburgh Pd Sthbnd Exit Edinburgh Pd Sthbnd Exit 200 200 200 200 200 200 200 20</td> <td>Edirburgh Rid Hithbrid Eut Edirburgh Rid Hithbrid Eut Edirburgh Rod Hithbrid Eut 100 100 100 100 100 100 100 10</td> <td>5 30% Edirburgh Rd Mithord Approach 6 20% 5 20%</td> <td>s</td> <td>5thand off sig to browden 5thand off sig to browden 5thand off sig to browden 0 0 0 0 0 0 0 0 0 0 0 0 0</td> <td>9% 5</td> <td>9%</td>	3% 14 Edinburgh Pd Sthbnd Exit Edinburgh Pd Sthbnd Exit 200 200 200 200 200 200 200 20	Edirburgh Rid Hithbrid Eut Edirburgh Rid Hithbrid Eut Edirburgh Rod Hithbrid Eut 100 100 100 100 100 100 100 10	5 30% Edirburgh Rd Mithord Approach 6 20% 5 20%	s	5thand off sig to browden 5thand off sig to browden 5thand off sig to browden 0 0 0 0 0 0 0 0 0 0 0 0 0	9% 5	9%
25 Edinburgh Rd / Priorton Rd	Speed (mph)           Arm           Arm           Arm           CV           CV           OV1           OCV2           Emple Decker Bus           Dokad Decker Bus           Doker           Doker		3% 14 Edinburgh Pd Sthbnd Exit Edinburgh Pd Sthbnd Exit 200 200 200 200 200 200 200 20	Edirburgh Rid Hithbrid Eut Edirburgh Rid Hithbrid Eut Edirburgh Rod Hithbrid Eut 100 100 100 100 100 100 100 10	5 30% Edirburgh Rd Mithord Approach 6 20% 5 20%	s	19% Editburgh Put Stitund Approach 9% 9% 9% 9% 9% 9% 9% 9% 9% 9% 9% 9% 9%	9% 5	

## Table A1.1c – 2005 with CCTMR AADT for Perth City Centre

005 Base Average Peak - City Ce unction Junction Name	Arm	Γ Α ΄	в	с	D	E	F	G	н	I
	Arm	Caledonian Rd Nthbnd Exit	York Place Exit	Caledonian Rd Sthbnd Exit			Caledonian Rd Nthbnd Approach			-
					Glasgow Road Exit	York Place Approach	Caledonian kd Nthond Approach	Caledonian Rd Sthbnd Approa Gl	isgow kd Approach	
28 Glasgow Road / Caledonian F		3892	2 478		4961				5229	
	LGV									
	OGV1	14:			3 200			7 132	121	
	OGV2	53			18 75			9 42	59	
	Single Decker Bus	90	22	9 4	4 233	17		9 68	253	
	Double Decker Bus	(	1	D	0 0		0	0 0	0	
	Minibus	(	1	D	0 4		2	0 2	0	
	Coach		2	7	2 4		0 1	3 0	2	
	Total	471	7 579			445			6351	
	%HDV	79			36 109				7%	
		13					70 97	0 370	11	
	Speed (mph)				7 20		8	3 5		
	Speed (kmph)	28			32		13	6 8	18	
	Arm		New Row Nthbnd Exit	York Place Estbrid Exit	New Row Sthbnd Exit	York Place Wstbnd Exit	New Row Nthbnd Approach	York Place Wstbnd Approach Ne		
29 York Place / New Row	Car	478				362			1641	
	LGV	596							260	
	OGV1	12:	1 6	B 16	53 40	16	35 5	5 227	53	
	OGV2	62	2 3.	5 7	70 11	-	27 2	4 92	15	
	Single Decker Bus	229						2 169	29	
	Double Decker Bus				0 0			0 0	0	
	Minihus									
		(	3		0 13		2	0 15	0	
	Coach	-	/	U	/ C		U	u 0	0	
	Total	5795							1998	
	%HDV	99							5%	
	Speed (mph)	30	1	1	9 12	1	2	6 19	5	
	Speed (kmph)	40	9 1		14 20		35	9 31	8	
	Arm	South St Estbnd Exit	Scott St Sthbnd Exit	Scott St Nthbnd Exit	Scott St Sthbnd Approach	Scott St Nthbnd Approach	South St Estbnd Approach	01		
30 South St / Scott St	Car	6690						4		
	LGV	803								
	OGV1	24-					95 28			
	OGV2	99					35 11			
	Single Decker Bus	147	7 15	D 12	25 88	1 7	77 23	5		
	Double Decker Bus	(	1	D	0 0		0	0		
	Minibus		2	2 1	1 2	, , , , , , , , , , , , , , , , , , , ,	1	2		
	Coach		7		0 0		0	7		
	Total	799								
	%HDV	89								
	Speed (mph)	39						1		
	Speed (kmph)	63			2 18		14 3	4		
ction Junction Name	Arm	County Place Wstbnd Exit	Sth Methven St Exit	King St Approach	Sth Methven St Approach	County Place Estbnd Approach	South St Exit			
31 County Place / Sth Methve King St	n Car	4253	3 153	3 568	3021	. 552	29 729	3		
	LGV	530	19	1 70	365	70	91	7		
	OGV1	22								
	OGV2	92					0 12			
	Single Decker Bus	169								
	Double Decker Bus				0 0			0		
	Minibus	15	5	D	4 13		0	0		
	Coach	(	1	D	0 0		7	7		
	Total	528	7 190	5 704	9 3755	671	19 889	9		
	%HDV	129	6 109	6 104	% 11%	8	96 99	*		
	Speed (mph)	12.9			11 3			1		
han blan han blan hear	Speed (mph) Speed (kmph)	3:			18 5		26 1	7		
			2							
	Arm	South St Approach	Tay St Nthbnd Exit	Queens Bridge Exit	Tay St Sthbnd Exit	Tay St Sthbnd Approach	Tay St Nthbnd Approach	Queens Bridge Approach		
32 South St / Tay St	Car	808								
	LGV	98:			997					
	OGV1	365					54 10			
	OGV2	163	3 4	B 13	36 165	i i	15 3	5 136		
	Single Decker Bus	205					6			
	Double Decker Bus				0 0			0 0		
	Minibus	-	7		2 0			0 0		
	Coach									
			7		·			0 9		
	Total	9816								
	%HDV	99			% 9%	6				
	Speed (mph)		7 2		18 14			6 10		
	Speed (kmph)	15			29 22		4 1			
	Arm	Atholl St Wstbnd Approach	Atholl St Estbnd Exit	Kinnoull St Exit	Atholl St Wstbnd Exit	Barossa St Exit	Atholl St Estond approach		rossa St Approach	
33 Atholl St / Kinnoull St	Car	S458				Balussa SCEXIC	34 527		440	
	LGV	713		6 28			51 75		37	
	OGV1	10:						9 66	11	
	OGV2	3:	1		2 46			2 15	4	
	Single Decker Bus	130	7				0 15		0	
	Double Decker Bus	150			0 0			0 0	0	
			4		2 2			0 0	0	
	Minibus	-							0	
	Coach				0 0			0 0	0	
		6433	7 509	5 236	39 7924	39	94 621	5 2702	493	
	Total									
	%HDV	49	6 29	6 79	% 5%	2	96 39	6 9%	4%	
	%HDV	49					96 39		4%	
		49	6 29 4 2' 7 4	9 1	% 5% 17 7 27 11	1	19 1	6 9% 5 3 3 4	4% 6 10	

	Speed (kmph)			33 3		9 35		5 5	8		
unction Junction Name	Arm	Atholl St Wstbnd	Atholl St Estbnd Exit	Atholl St Wstbnd Exit	Atholl St Estbnd Approach						
35 Atholl St / Stormont St	Car	67	3 52	73 671	7 526	3					
	LGV	8	43 7	59 84	5 75'	2					
	OGV1			29 15							
	OGV2		46	2 4	6	2					
	Single Decker Bus			52 17							
	Double Decker Bus		0		0	1					
	Minibus		2	0	2	1					
	Coach		2		0						
	Total	79									
	%HDV			5 / 194 %							
				70 51 L5	3 21						
	Speed (mph)				5 3:						
	Speed (kmph)										
unction Junction Name	Arm	Atholl St Estbnd Exit	Atholl St Wstbnd Exit	Rose Terrace Exit	Atholl St Estbnd Approach	Atholl St Wstbnd Approach	Rose Terrace Approach				
36 Atholl St / Rose Crescen		52	45 54								
	LGV			13 24							
	OGV1			31 3							
	OGV2			31 1							
	Single Decker Bus		95 1	30 3	5 7	9 165	11	5			
	Double Decker Bus		0	0	0	) (	(				
	Minibus		0	4	0	3 4		3			
	Coach		0	0	0	) C		0			
	Total	60	74 64	239	1 509						
	%HDV			% 31							
	Speed (mph)		25	4 1							
	Speed (kmph)		41	7 1							
lunction Junction Name	Arm	Caledonian Road Exit	Atholl St Approach	Atholl Street to Barrack Street			Barrack Street Approach to Caledonia		Aball China I	D+C	E+G
			Action St Approach		Caleuunian ku Approach tu Barrack S	r caleuonian ku xpproach to barrack	Barrack Street Approach to Caledonia	r barraux St Approach to Athon A			
37 Barrack Street / Atholl S		51	50 81			2829	2200	5661	8030	8010	78
Caledonian Road	LGV		20 10						1111	1045	
	OGV1	1		18 15					172	233	
	OGV2			75 5					57	81	
	Single Decker Bus			18 16					169	209	
	Double Decker Bus		0		0	) C	(	0 0	0	0	
	Minibus		13	13 1	1	0 0	1:	1 0	0	11	
	Coach		0	0	0	2 2		0 0	0	2	
	Total	60	39 96	3 623	9 335	3353	258	5 6794	9539	9592	93
	96HDV	9		96 69	6 59	5%	59	6 596	4%	6%	5
	Speed (mph)		21	9 3						17	
	Speed (kmph)			15 5							
lunction Junction Name	Arm							4 5	9	28	
38 Charlotte St / Tay St /									8	28	
		Bridge Lane Approach	Perth Bridge Exit	Tay St Exit	Charlotte St Exit	Tay St Approach	Charlotte St Approach	Perth Bridge Approach	8	28	
	Car	Bridge Lane Approach 12	Perth Bridge Exit 32 45	Tay St Exit 14 237	Charlotte St Exit 8 746	Tay St Approach 1375	Charlotte St Approach 5260	Perth Bridge Approach 6486	8	28	
West Bridge St / Bridge	Car LaneLGV	Bridge Lane Approach 12 1	Perth Bridge Exit 32 45 78 5	Tay St Exit L4 237 34 33	Charlotte St Exit 8 7460 9 950	Tay St Approach 1375 143	Charlotte St Approach 5260 708	Perth Bridge Approach 6486 8 845	8	28	
	Car LaneLGV OGV1	Bridge Lane Approach 12 1	Perth Bridge Exit 32 45 78 5 24	Tay St Exit 14 237 74 33 0 5	Charlotte St Exit 8 746 0 95 9 13	Tay St Approach 1375 143 2 64	Charlotte St Approach 5260 700 20	Perth Bridge Approach 6486 845 5 77	8	28	
	Car LaneLGV OGV1 OGV2	Bridge Lane Approach 12 1	Perth Bridge Exit 32 45 78 5 24 15	Tay St Exit 237 44 237 34 33 0 5 0 1	Charlotte St Exit 8 746 9 95 9 13 8 4	Tay St Approach 1375 2 64 5 26	Charlotte St Approach 5260 700 20	Perth Bridge Approach 5 6486 5 77 4 18	8	28	
	Car LaneLGV OGV1 OGV2 Single Decker Bus	Bridge Lane Approach 12 1	Perth Bridge Exit 32 45 78 5 24 15 48 1	Tay St Exit 14 237 74 33 0 5	Charlotte St Exit 8 746 9 95 9 13 8 4	Tay St Approach 1375 1475 266 266 266 1575 1975	Charlotte St Approach 5260 700 20 20 9	Perth Bridge Approach 6486 8 845 5 77 4 18 5 172	8	28	
	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus	Bridge Lane Approach 12 1	Perth Bridge Exit 32 45 78 5 24 15	Tay St Exit 237 44 237 34 33 0 5 0 1	Charlotte St Exit 8 746 9 95 9 13 8 4	Tay St Approach 1375 144 2 64 5 26 5 15 0	Charlotte St Approach 5266 700 200 91	Perth Bridge Approach 6496 8 845 777 4 18 5 172 0 0	8	28	
	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	Bridge Lane Approach 12 1	Perth Bridge Exit 32 45 78 5 24 15 48 1	Tay St Exit 237 44 237 34 33 0 5 0 1	Charlotte St Exit 8 746 9 95 9 13 8 4	Tay St Approach 1375 1475 266 266 266 1575 1975	Charlotte St Approach 5266 700 200 91	Perth Bridge Approach 6496 8 845 777 4 18 5 172 0 0	8	28	
	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus	Bridge Lane Approach 12 1	Perth Bridge Exit 32 45 36 5 24 5 24 8 8 1 0 2 0	Tay St Exit         237           1         237           24         33           0         5           0         1           28         3           0         2           0         0	Charlotte St Exit         7460           0         955           9         133           8         44           7         16           0         0	Tay St Approach 1375 145 2 64 5 26 5 16 6 26 6 26 6 26 6 26 6 26 6 26 6 26 7	Charlotte St Approach 5266 700 22 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Perth Bridge Approach 6496 5 77 4 18 5 172 0 0 4 4 0 0 0	8 8	28	
	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	Bridge Lane Approach 12 1	Perth Bridge Exit 32 45 36 5 24 5 24 8 8 1 0 2 0	Tay St Exit         237           1         237           24         33           0         5           0         1           28         3           0         2           0         0	Charlotte St Exit         7460           0         955           9         133           8         44           7         16           0         0	Tay St Approach 1375 145 2 64 5 26 5 16 6 26 6 26 6 26 6 26 6 26 6 26 6 26 7	Charlotte St Approach 5266 700 22 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Perth Bridge Approach 6496 5 77 4 18 5 172 0 0 4 4 0 0 0	8	28	
	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach	Bridge Lane Approach	Perth Bridge Exit 453 32 455 78 5 24 60 1 0 2 0 0 52 0 55 0 5 0 0 52 0 5 0 5 5 0 5 5 5 5	Tay St Exit         237           1         237           24         33           0         5           0         1           28         3           0         2           0         0	Ichariotte St Exit           0         95           9         133           8         44           7         16           0         1           0         1           3         875	Tay St Approach 1375 142 2 64 5 22 6 5 22 6 5 22 6 6 7 6 7 7 7 8 7 7 7 7 7 7 7 7 7 7 7 7 7	Charlotte St Approach 700 22 99 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Perth Bridge Approach 6486 5 845 5 777 4 118 5 172 0 0 1 4 1 0 0 4 7601	8	28	
	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total %HDV	Bridge Lane Approach 12 1	Perth Bridge Exit 453 32 455 78 5 24 60 1 0 2 0 0 52 0 55 0 5 0 0 52 0 5 0 5 5 0 5 5 5 5	Tay St Ewit           237           94         237           94         33           0         1           10         1           20         3           2         3           0         2           0         2           0         2           0         2           0         2           0         2           0         4           3         3           3         3           4         3           5         4	Charlotte St Exit           0         9540           0         9543           8         44           7         16           0         1           0         1           3         8755           6         49	Tay St Approach 1375 142 144 26 145 26 145 26 145 26 145 145 145 145 145 145 145 145	Charlotte St Approach 5265 ( 99) ( ( ( 0 ( 0 0 99) 29 29	Perth Bridge Approach 6485 845 77 4 18 5 172 0 0 4 0 4 7601 6 4%	3 8	28	
	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total %HDV Speed (mph)	Bridge Lane Approach	Perth Bridge Exit 76 4 5 78 4 5 79 0 1 79 0 1 70 0 2 70 0 5 70 5 70 5 70 5 70 5 70 5 70 5 70	Tay St Exit           237           44         233           90         33           0         13           128         33           0         2           0         32           0         32           0         33           0         33           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         34           35         34           36         34           37         34           38         34           39         34           30	Icharlotte St Exit           0         95           0         93           8         4           7         10           0         0           0         0           3         875           6         49           5         22	Tay St Approach 1375 144 145 145 145 145 145 145 145 145 14	Charlotte St Approach 5264 700 22 99 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Perth Bridge Approach 6480 8485 845 8477 4 118 5 1272 0 0 4 0 4 7601 6 4%7 10 10 10 10 10 10 10 10 10 10	3 8	28	
West Bridge St / Bridge	Car LanéLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total %HOV Speed (mph) Speed (kmph)	Bridge Lane Approach 12 1 1 1 1 1 1 15 10	Perth Bridge Exit 45 76 78 84 84 15 15 10 10 10 10 10 10 10 10 10 10	Tay St Eait           237           24           233           0           33           0           34           35           0           37           1	Charlotte St Exit 7460 9 756 9 133 8 4 4 7 16 0 7 8 8 875 6 995 6 995 6 995 6 995 6 995 6 995 8 22 0 4	Tay St Approach 1375 147 2 64 2 64 165 165 165 165 165 165 165 165 165 165	Charlotte St Approach 700 22 99 60 609 89 28 29 11	Perth Bridge Approach 646 645 645 777 416 00 0 0 4 7 6 4 7 0 0 0 0 0 0 0 0 0 0 0 0 0	awia St Evit	28	
West Bridge St / Bridge unction Junction Name	Car Lané LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total %HDV Speed (kmph) Arm	Bridge Lane Approach 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Perth Bridge Exit 45 4 78 0 45 79 0 5 79 0 1 70 0 0 1 0 0 52 5 5 5 6 7 8 9 9 9 9 9 9 9 9 9 9 9 9 9	Tay St Exit           237           4         237           50         35           0         35           0         35           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         33           0         32           0         32           0         32           0         32           0         32           0         32           0         32           0         44           10         44           10         44           10         44           10         44           10         44           10         44           10     <	Charlotte St Exit         7460           0         95           0         13           7         10           0         13           0         13           0         13           0         10           1         10           1         10           2         97           3         97           4         10           5         2           2         2           0         40           2         2           0         4           0         4           0         4           0         4           0         4           0         4           0         4           0         4           0         4           0         4           0         4           0         4           0         4	Tay St Approach 13737 442 445 52 145 64 52 52 54 50 54 54 54 54 54 54 54 54 54 54	Charlotte St Approach 700 22 99 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Perth Bridge Approach 5 6496 5 777 4 178 5 1722 0 0 4 4 7601 6 445 7 10 2 10 4 2 10 6 445 7 10 16 West Bridge St Approach 16 16 16 16 17 17 17 16 17 17 17 16 17 17 17 16 17 17 17 17	sowrie St Exit	28	
West Bridge St / Bridge unction Junction Name 39 Main St / Covrie St /	Car Cor Cor Cor Cor Cor Cor Cor Cor Cor Co	Bridge Lane Approach 12 1 1 1 1 1 1 1 1 1 1 East Bridge St Ewit	Perth Bindge Exit         45           78         45           78         5           15         5           10         0           10         2           10         5           10         5           10         5           10         5           10         5           10         5           10         5           10         5           10         5           10         5           10         5	Tay St Exit         237           4         237           4         33           0         5           0         5           0         5           0         5           0         5           0         5           0         9           0         9           0         9           0         9           0         9           0         9           0         4           0         4           0         4           0         6           0         99	Charlotte St Ewit 7460 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Tay St Approach 13737 142 64 5 142 64 64 142 64 142 142 142 142 142 142 142 14	Charlotte St Approach 5580 20 20 20 20 20 20 20 20 20 20 20 20 20	Perth Bridge Approach 9 6496 9 777 4 718 5 777 4 718 9 0 4 7601 6 9496 7 10 9 4 7601 6 9496 7 10 9 4 7601 6 9496 7 10 9 4 7601 6 9496 7 10 9 4 7601 10 777 10 7777 10 77777 10 77777 10 77777 10 77777 10 777777 10 777777777777777777777777777777777777	4299	28	
West Bridge St / Bridge	Car Lanc LSV OGV1 OGV2 Double Decker Bus Minibus Coach Total Speed (kmph) Speed (kmph) Arm Car LGV	Bridge Lane Approach 12 1 1 1 1 1 1 1 1 1 1 East Bridge St Ewit	Perth Bridge Exit 454 6 70 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Tay St Exit           237           4         237           50         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         33           0         34           0         35           0         35           0         34           0         34           0         34           0         34           0         34           0         34           0         34           0         35           0         35           0         35           0         35           0         35           0         35           0         35           0	Charlotte St Exit 0 7640 9 133 7 4 7 4 7 4 7 4 7 4 9 0 0 18 0 0 0 19 0 19 0 49 0 49 0 49 0 49 0 5 99 0 49 0 5 99 0 49 0 49 0 49 0 49 0 59 0 59	Tay St Approach 1177 142 143 144 145 145 145 145 145 145 145 145 145	Charlotte St Approach S5806 22 9 9 0 0 0 0 0 0 0 0 0 0 9 2 9 1 0 0 0 0 0 0 0 0 9 2 9 1 0 0 0 0 0 0 0 9 1 0 0 0 0 0 0 0 0 0	Perth Bridge Approach	4299 605	28	
West Bridge St / Bridge	Car           LaneLGV           OGV1           OGV2           Single Decker Bus           Minibus           Coach           Total           Speed (mph)           Speed (mph)           Car           Car           Car           Car           Car           Coach           Coach           Car           Car           Car           Car           CGV1	Bridge Lane Approach 12 1 1 1 1 1 1 1 1 1 1 East Bridge St Ewit	Perth Bridge Exit 945 - 45 15 16 16 10 10 10 10 10 10 10 10 10 10	Tay St Eak           237           4         237           4         33           0         5           0         5           28         3           2         9           58         988           988         988           988         988           989         988           981         988           982         100           983         100           984         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985         100           985<	Charlotte St Exit         764           0         769           8         13           7         16           0         17           5         29           0         17           10         10           11         10           12         17           13         175           14         10           15         29           16         10           17         10           18         11           19         12           10         12           10         12           11         12           12         12           13         12           14         12           15         12           16         12           17         12	Tay St Approach 1377 143 143 143 143 145 145 145 145 145 145 145 145 145 145	Charlotte St Approach S2864 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Perth Bridge Approach      6496      6495      775      77      0      77      0      70      70      70      0      4      700      10      West Bridge St Approach      16      4      54      4      5      5	4299 605 251	28	
West Bridge St / Bridge unction Junction Name 39 Main St / Covrie St /	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Totale Ged (kmph) Speed (kmph) Arm Car LGV OGV2	Bridge Lane Approach 12 13 15 15 16 East Bridge St Exit 5	Perth Bridge Exit 45 4 46 - 5 47 - 5 47 - 5 48	Tay St Eakt           237           4         237           50         35           0         13           2         37           0         38           0         28           0         28           0         28           0         24           6         22           20         24           36         24           36         24           36         29           36         109           36         109           377         22           38         29           39         30           30         30           31         30           32         30           33         30           34         30           35         100           36         30           35         30           36         30           37         30           38         30           39         30           30         30           30         30      30<	Charlotte St Exit 0 7640 9 783 9 133 0 14 0 16 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Tay St Approach  1377  142  143  4  6  6  6  6  6  6  6  6  6  6  6  7  7	Charlotte St Approach 55262 20 9 9 0 0 0 0 0 0 0 0 0 100 100 100 100	Perth Bridge Approach 9 6496 9 777 4 178 9 045 172 172 172 0 04 4 7601 6 4495 7 10 West Bridge St Approach 6 594 9 594 9 597 10 6 10 6 10 7 10	4299 605 251 79	28	
West Bridge St / Bridge	Car LaneLGV OGV1 OGV2 Single Decker Bus Minibus Coach Total Speed (mph) Speed (mph) Arm Car Car CGV1 OGV1 OGV2 Single Decker Bus	Bridge Lane Approach 12 13 15 15 16 East Bridge St Exit 5	Perth Bidge Exit           90         45           91         55           92         10           93         10           94         10           90         52           91         22           92         22           90         52<	Tay St Eakt           237           4         237           4         33           0         35           0         35           0         35           0         35           0         35           0         35           0         35           0         36           4         46           9         42           10         44           10         46           10         47           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100           10         100	Charlotte St Exit         7640           0         769           0         133           7         10           0         10           0         10           0         10           0         10           0         975           2         29           0xmis St Approach         400           10         235           10         97	Tay St Approach 1377 143 143 143 145 145 145 145 145 145 145 145 145 145	Charlotte St Approach 5586 700 22 9 9 0 0 0 0 0 0 0 0 10 10 10 10 10 7 7 10 10 7 7 10 10 10 10 10 10 10 10 10 10 10 10 10	Perth Bridge Approach 9 045 9 045 9 075 5 172 9 07 5 172 9 07 6 7700 6 7700 6 7000 6 7000 7 16 7 4594 7 594 7 597 6 4514 7 597 7 59 7 00 7 59 7 5 8 19 7 75 8 19 7 75 7 75 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	4299 605 251 79 77	28	
West Bridge St / Bridge	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Totalu Speed (mph) Speed (mph) Arm Car Car Car Coav Coav Single Decker Bus Double Decker Bus	Bridge Lane Approach 12 13 15 15 16 East Bridge St Exit 5	Perth Bindge Exit         46           9         64           91         5           92         0           93         0           94         0           95         0           96         2           97         2           98         2           9         0           9         0           9         0           9         0           9         0           9         0           9         0           9         0	Tay St Eakt           237           4         237           4         33           0         5           0         5           0         5           0         5           0         5           0         5           0         5           0         9           0         9           0         9           0         9           0         9           0         44           Main St Exit         4           0         6           0         23           0         24           0         23           0         23           0         23	Charlotte St Exit 0 7440 0 959 0 1959 0 197 0 197 0 197 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9	Tay Bt Approach 1377 143 143 143 143 143 143 143 143 143 143	Charlotte St Approach SEEC 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 1	Perth Bridge Approach  Perth Bridge Approach  Beta  Beta  Beta Beta Beta Beta Beta B	4299 605 251 79 777 0	28	
West Bridge St / Bridge	Car LaneLGV OGV1 OGV2 Single Decker Bus Minibus Coach Total Speed (mph) Speed (mph) Arm Car Car CGV1 OGV1 OGV2 Single Decker Bus	Bridge Lane Approach 12 13 15 15 16 East Bridge St Exit 5	Perth Bidge Exit           90         45           91         55           92         10           93         10           94         10           90         52           91         22           92         22           90         52<	Tay St Eakt           237           4         237           4         33           0         5           0         5           0         5           0         5           0         5           0         5           0         5           0         9           0         9           0         9           0         9           0         9           0         44           Main St Exit         4           0         6           0         23           0         24           0         23           0         23           0         23	Charlotte St Exit         7640           0         769           0         133           7         10           0         10           0         10           0         10           0         10           0         975           2         29           0xmis St Approach         400           10         235           10         97	Tay St Approach 1377 143 143 143 145 145 145 145 145 145 145 145 145 145	Charlotte St Approach SEEC 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 1	Perth Bridge Approach  Perth Bridge Approach  Beta  Beta  Beta Beta Beta Beta Beta B	4299 605 251 79 77	29	
West Bridge St / Bridge	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Totalu Speed (mph) Speed (mph) Arm Car Car Car Coav Coav Single Decker Bus Double Decker Bus	Bridge Lane Approach 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Perth Bindge Exit         46           0         45           1         5           40         1           40         1           40         1           40         1           40         1           40         1           40         1           40         1           41         1           42         1           43         1           44         1           45         1           46         1           47         1           48         1           49         1           49         1           40         1           40         1           40         1           40         1           40         1           40         1	Tay St Eakt           237           4         237           50         33           0         35           0         35           0         37           0         37           0         38           0         39           0         39           0         292           0         49           4         49           4         49           4         29           0         22           0         22           0         22           0         22           0         22           0         22           0         22           0         22           0         22           0         22           10         20           20         22           21         22           22         24	Charlotte St Exit 0 7440 0 959 0 1959 0 197 0 197 0 197 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9	Tay Bt Approach 1377 143 143 143 143 143 143 143 143 143 143	Charlotte St Approach 55800 700 22 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Perth Bridge Approach 9 6496 9 770 5 127 5 127 9 0 4 9 0 10 10 10 10 10 10 10 10 10 10 10 10 1	4299 605 251 79 777 0	28	
West Bridge St / Bridge unction Junction Name 39 Main St / Covrie St /	Car LaneLGV OGV1 OGV2 Single Decker Bus Double Decker Bus Monus Total Speed (mph) Speed (mph) Speed (mph) Car Car Car Car Car Car Single Decker Bus Double Decker Bus Minbus	Bridge Lane Approach 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Perth Bidge Exit           90         45           91         55           92         1           93         1           94         1           94         1           95         1           96         1           97         1           98         1           99         2           90         1           90         1           90         1           90         1           90         1           90         1           90         1           90         1           90         1           90         1	Tay 91 Eak           1297           4         237           4         33           0         35           0         35           2         3           2         3           2         9           9         988	Charlotte SF Exit 0 7640 0 7650 0 10 0 20 0 00wie St Approach 0 00wie St Approach 0 00 0 22 0 0 9 0 20 0 9 0 20 0 9 0 10 0	Tay St Approach	Chafotte St Approach 5866 99 99 00 00 00 99 99 99 10 100 100 100	Perth Bridge Approach	4299 605 251 79 77 0 0	29	
West Bridge St / Bridge unction Junction Name 39 Main St / Covrie St /	Car           OGV1         OGV1           OGV2         Development           Duble Decker Bus         Duble Decker Bus           Minbus         Total           Steped (mph)         Arm           Car         LaV           LaV         Octop           Octop         Core           Core         Core           Core         Core           Core         Core           Double Decker Bus         Minibus           Coach         Total	Indge Lane Approach	Perth Bindge Exit           78         4           58         -           59         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           51         -           52         -           53         -           54         -           55         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -           50         -      10	Tay St Eakt           237           2           24           33           0           38           0           2           0           2           0           2           0           2           0           2           0           2           3           0           2           3           0           2           3           4           0           1           10002	Charlotte St Exit 0 7640 0 895 9 133 7 4 7 4 7 3 0 8 0 8 0 8 0 8 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9	Tay St Approach	Charlotte St Approach 5580 20 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Perth Bridge Approach	4299 605 251 79 77 0 0 0 5311	29	
West Bridge St / Bridge	Car           David         OGV1           OGV2         Single Davis and Single Dav	Indge Lane Approach	Perth Bindge Exit           90         45           91         5           92         1           93         1           94         1           95         1           96         5           97         1           98         5           99         52           90         52           91         54           92         1           93         6           94         1           95         4	Tay 51 Eak           237           4         237           24         33           0         35           0         35           0         35           0         35           0         35           0         35           0         35           0         36           4         46           9         22           10         44           100         46           100         100           10         1000           10         1000           11         1000	Charlotte St Exit 9 7640 9 7640 9 70 757 9 70 7577 9 70 7577 9 70 7577 9 70 757	Tay St Approach	Chafotte St Approach 5886 700 22 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Perth Bridge Approach 9 045 9 045 9 075 9 077 9 077 9 077 9 077 9 077 9 077 9 077 9 077 9 077 9 07 9	4299 605 251 79 77 0 0 0 0 5311 8%	29	
West Bridge St / Bridge unction Junction Name 39 Main St / Covrie St /	Car           OGV1         OGV1           OGV2         Development           Duble Decker Bus         Duble Decker Bus           Minbus         Total           Steped (mph)         Arm           Car         LaV           LaV         Octop           Octop         Core           Core         Core           Core         Core           Core         Core           Double Decker Bus         Minibus           Coach         Total	Endge Lane Approach	Perth Bindge Exit         46.8           9         6.8           9         5.1           80         0           90         0           90         0           90         0           90         0           90         0           90         0           90         0           90         0           90         0	Tay St Eakt           237           2           24           33           0           38           0           2           0           2           0           2           0           2           0           2           0           2           3           0           2           3           0           2           3           4           0           1           10002	Charlotte SE Exit 0 7440 0 959 0 1959 0 197 197 197 197 197 197 197 197	Tay St Approach	Charlotte St Approach 5580 20 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Perth Bindge Approach 9 645 9 645 9 705 9 705	4299 605 251 79 77 0 0 0 5311	29	

	Arm Arm	A Dunkeld Rd Approach	B A9 North Approach	C A9 Western Bypass Approach	D Dunkeld Rd Exit	E A9 Western Bypass Exit	F Industrial Estate Exit	G A9 North Exit	H Industrial Estate Approach
	Car	8411		1090					
	LGV	1264	4 1540						
	OGV1	168	8 396	65	298	3 69	0 175	620	399
	OGV2	56						224	
	Single Decker Bus	179	9 259	371	3 165	5 43	1 102	364	4 259
	Double Decker Bus	C	0 0	1	) (	1	0 0	(	0
	Minibus	[	n r		1	1	0 0	ſ	1 0
	Coach	4		1			n n		
	Total	10080				7 1199		1206	1 8607
	96HDV	4%							
	Speed (mph)	15						22	
	Speed (kmph)	24						36	5 13
nction Junction Name	Arm	Bute Drive Exit	Dunkeld Rd South Exit	Dunkeld Rd North Exit	Dunkeld Road South Approach	Dunkeld Rd North Approach	Bute Drive Approach		
2 Dunkeld Road / Bute Drive	Car	6489	9 7865	5 1013	5299	9 957	6 3598		
	LGV	697							
	OGV1	119							
	OGV2	56	6 42						
	Single Decker Bus	63				3 14			
	Double Decker Bus	0	0 0	1	) (	1	0 0		
	Minibus	6	0 0	1	1		0 0		
	Coach			1		4	0 0		
	Total	7424				1137			
	%HDV	3%							
	Speed (mph)	24							
	Speed (kmph)	39	9 27	7 21	2:		3 8		
	Arm		Gowans Terrace Exit	Dunkeld Rd North Approach	Gowans Terrace Approach	Dunkeld Rd South Exit	Dunkeld Rd North Exit		
3 Dunkeld Rd / Gowans Terrac	Car	11711	1 5268	694					
	LGV	1425							
	OGV1								
	OGVI	242	2 81	21			9 250		
	OGV2	109							
	Single Decker Bus	140	0 74	1 12:	2:	1 10	5 168		
	Double Decker Bus	0	a	) (	) (	1	0 0		
	Minibus		0 0	1	1	1	0 0		
	Coach		4 0						
							0 4		
	Total	13629							
	%HDV	4%							
	Speed (mph)	17	7 19	9 1:	3 10		9 13		
	Speed (kmph)	27				5 1.			
	Arm	Ballantine Place Approach	Crieff Rd Approach	Dunkeld Rd North Approach	Dunkeld Rd South Exit	Dunkeld Rd South Approach		Crieff Rd Exit	Dunkeld Rd North Exit
	Car	4893		5 1154					
Porneta (a) enerrita	LGY	539							
	OGV1	137	7 168	103		+ 131			
				3 45					
	OGV2	46			126	5 8-	4 84	(	53
					126	5 8-	4 84		53
	OGV2 Single Decker Bus Double Decker Bus	46	1 196		120	5 8-	4 84	(	53 9 84
	Single Decker Bus Double Decker Bus	46 81	1 196 0 0	23	+ 120 1 23: 0 0	5 8- 1 21- 2	4 84 4 91 0 0	105	53 9 84 0 0
	Single Decker Bus Double Decker Bus Minibus	46 81 0	1 196 0 0 0 18	3	+ 120 1 233 0 0 18	5 8- 1 21- 2	4 84 4 91 0 0 8 0	( 109 ( 18	3 53 9 84 3 0 8 0
	Single Decker Bus Double Decker Bus Minibus Coach	46 83 C C C C	1 196 0 0 18 0 0	5 23 3 1	+ 120 1 23 3 0 1 10 1 10	5 8 1 21 3 1 3 1 1	4 84 4 91 0 0 8 0 4 0	( 109 ( 18 (	53 9 84 0 0 3 0 4
	Single Decker Bus Double Decker Bus Minibus Coach Total	46 81 0 0 0 0 5695	1 196 0 0 0 18 0 0 5 6713	5 233 3 1 3 1 3 1 4071	+ 12( 23) 0 0 10 1 0 10 1 112(	5 8 1 21 3 1 3 1 5 1198	4 84 4 91 0 0 0 8 0 4 0 1 8414	( 109 ( 18 ( 372)	0 53 9 04 0 0 8 0 9 4 1 6262
	Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV	46 83 0 0 0 0 5695 29%	1 196 0 0 0 0 18 0 0 0 5 6713 6 7%	5 23 7 1 8 1 9 1407 5 69	+ 120 1 23: 0 0 0 0 10 10 11320 5 79	5 8 1 21 3 1 3 1 5 1 5 1 98 6 49	4 84 4 91 0 0 8 0 1 81 4 81 4 81 4 6 236	( 10) ( 18) ( 372) 499	0 53 9 84 0 0 0 0 0 4 1 6262 6 4%
	Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV Speed (mph)	4 6 61 0 0 0 0 5695 2% 2 12	1 196 0 0 0 0 18 0 0 0 5 6713 6 7% 2 13	5 23 3 1 5 1 6 1407 5 1407 6 69 8 11	+ 124 233 0 0 11 0 11 0 0 0 11326 5 79 2 7	5 88 21221 3 11 3 11 3 11 5 1198 6 49 7 12	4 84 4 91 0 0 0 8 00 4 00 1 8414 6 2% 4 13	( 105 ( 116 ( 372) 490 1	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
	Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV	4 4 81 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 196 0 0 0 0 18 0 0 0 5 6713 6 7% 2 13	5 23 3 1 5 1 6 1407 5 1407 6 69 8 11	+ 124 233 0 0 11 0 11 0 0 0 11326 5 79 2 7	5 88 21221 3 11 3 11 3 11 5 1198 6 49 7 12	4 84 4 91 0 0 0 8 00 4 00 1 8414 6 2% 4 13	( 10) ( 18) ( 372) 499	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
	Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV Speed (mph)	4 6 61 0 0 0 0 5695 2% 2 12	1 1990 0 0 1990 0 180 5 6713 6 796 2 13 0 21	5 233 3 1 5 1407 6 1407 6 11 1 1 Dunkeld Rd North Exit	<ul> <li>122</li> <li>123</li> <li>1</li> <li>1<td>5 88 21221 3 11 3 11 3 11 5 1198 6 49 7 12</td><td>4 844 4 911 0 0 01 4 0 1 8414 6 2% 4 13 2 21 211 0unkeld Rd North Entry</td><td>( 105 ( 116 ( 372) 490 1</td><td>1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8</td></li></ul>	5 88 21221 3 11 3 11 3 11 5 1198 6 49 7 12	4 844 4 911 0 0 01 4 0 1 8414 6 2% 4 13 2 21 211 0unkeld Rd North Entry	( 105 ( 116 ( 372) 490 1	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name	Single Decker Bus Double Decker Bus Minibus Coach Total %HDV Speed (mph) Speed (kmph) Arm	44 81 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1         196           0         0           0         0           5         6713           6         7%           13         13           0         St Catherines Road Exit	5 233 3 1 5 1407 6 1407 6 11 1 1 Dunkeld Rd North Exit	<ul> <li>122</li> <li>123</li> <li>1</li> <li>1<td>5 8 8 1 222 3 11 5 119 6 419 6 419 6 419 6 419 1 1 1 Dunkeld Rd South Entry</td><td>4 844 911 0 0 0 4 0 1 8414 6 2% 91 2 2 2 2 1 3 3 2 2 2 2 1 3 3 2 2 2 1 3 3 2 2 2 1 3 3 2 2 1 3 3 3 2 2 1 3 3 3 2 2 1 3 3 3 2 2 1 3 3 3 2 3 3 3 3</td><td>( 105 ( 116 ( 372) 490 1</td><td>1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8</td></li></ul>	5 8 8 1 222 3 11 5 119 6 419 6 419 6 419 6 419 1 1 1 Dunkeld Rd South Entry	4 844 911 0 0 0 4 0 1 8414 6 2% 91 2 2 2 2 1 3 3 2 2 2 2 1 3 3 2 2 2 1 3 3 2 2 2 1 3 3 2 2 1 3 3 3 2 2 1 3 3 3 2 2 1 3 3 3 2 2 1 3 3 3 2 3 3 3 3	( 105 ( 116 ( 372) 490 1	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 5 Dunkleid Rd / St Catherines F	Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV Speed (mph) Speed (kmph) Arm Car	44 81 560 2% 12 200 200 200 200 200 200 200 200 200	1 996 0 0 0 0 18 0 6 771 6 77% 2 13 8 Catherines Road Exit 4 2804	5 233 5 1407 5 1407 5 69 5 10 10 Unikeld Rd North Exit 2 1414	• 122 233 23 23 2 1 1 1 1 1 1 1 1 1 1 1 1	9 8 8 1 212 3 1 4 5 1 7 4 7 4 9 9 9 9 9 9 9 9 9 9 9 9 9	4 84 4 91 0 0 0 4 0 2 24 4 2 2 24 4 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 10 372: 472 1 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name S Dunkield Rd / St Catherines F Barrack Street	Single Decker Bus Double Decker Bus Minibus Coach Total %HDV Speed (mph) Speed (mph) Arm Car LGV	44 83 0 509 289 28 28 28 28 28 28 20 28 20 28 20 28 20 20 20 20 20 20 20 20 20 20 20 20 20	1 1995 0 00 5 6711 6 7716 7716 7716 7717 7717 8 7717 8 7717 9 77777 9 77777 9 777777 9 7777777777	5 23 7 1407 8 1407 9 1407 9 1407 9 1407 141 9 141 141 141 141 147 147	122 233 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	5 6 8 1 22 3 11 5 1198 6 49 749 1 1000 100000000000000000000000000000	4 84 4 91 0 0 0 4 0 1 84 2 4 2 5 4 5 5 7 7 9 8 8 7 9 8 8 7 9 9 8 7 9 9 8 7 9 9 8 7 9 9 8 7 9 9 8 7 9 9 8 7 9 9 8 7 9 9 7 9 9 7 9 9 7 9 7	0 1000 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 5 Dunkeid Rd / ST Catherines F Barrack Street	Single Decker Bus Double Decker Bus Minibus Coach Total 9HDV Speed (mph) Speed (mph) Speed (kmph) Arm Car LGV OGV1	44 81 62 60 60 7 80 7 80 7 80 7 80 7 80 7 80 80 80 80 80 80 80 80 80 80 80 80 80	1 1999 0 0 0 5 6713 6 773 8 773 7 774 7 7777 77777777	5 23 6 1407 5 200 6 200 6 200 1417 2 200 2 2	2 122 233 3 1 122 3 1 122 4 1132 7 7 8 Cotherines Road Entry 5 604 766 3 300	8 8 8 8 9 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1	4 89 4 91 0 0 0 4 0 0 2 5	0 1000 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name S Dunkeld Rd / St Catherines F Barrack Street	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           %HDV           Speed (mph)           Speed (mph)           Car           LGV           OGV1           OGV2	44 81 500 500 2% 2% 20 20 20 20 20 20 20 20 20 20 20 20 20	1 1990 0 00 5 6713 6 0713 6 0713 7 0715 7 0705 7 0715 7 07070 7 0700000000000000000000000000	5 233 4 1407 5 1407 6 1407 6 1407 6 1414 6 1414 7 1414 7 177 7 12	122 233 3 1 1132 3 1132 7 7 3 1 3 8 4 5 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	9 8 8 8 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 2 2	4 88 4 91 5 91 6 91 1	( 1000 ( 11) ( 3722 49) 149 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Nome S Durkeid Rd / ST Catherines F Barrack Street	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           %HDV           Speed (mph)           Speed (kmph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus	44 88 20 5995 21 20 20 20 20 20 20 20 20 20 20 20 20 20	1 990 0 00 5 6713 6 7713 7 00 7 00 8 778 8 0713 8 0778 8 0778 9 078 8 078 9 079 9 079 0 070 0 070 00000000	23 4 5 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	122 23 23 24 25 25 25 25 25 25 25 25 25 25 25 25 25	9 8 8 1 221 3 11 4 11 5 119 6 49 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 884 9 001 9 001 1 844 9 001 1 844 9 000 1 845 9 000 1 845 9 000 1 845 9 000 1 845 9 000 1 845 9 000 1 845 1 845	( 1000 ( 11) ( 3722 49) 149 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 8 Dunield Ruf, / St Catherines P Barrack Street	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           Speed (mph)           Speed (hmph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus	44 83 599 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	1 396 0 00 5 6713 8 Cotherines Road Exit 20 4 4 91 5 195 6 0 00 7 8 20 8 10 20 8 10 20 9 10 20 10 20 10 10 20 10 20 10 20 10 10 10 10 10 10 10 10 10 10 10 10 10	23 4 5 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	122 23 23 24 25 25 25 25 25 25 25 25 25 25 25 25 25	9 8 8 1 221 3 11 4 11 5 119 6 49 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 88 4 91 0 0 0 4 0 0 0 4 0 0 0 4 0 0 0 0 0 0 0 0	( 1000 ( 11) ( 3722 49) 149 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 8 Dunield Ruf, / St Catherines P Barrack Street	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           %HDV           Speed (mph)           Speed (kmph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus	44 88 50 50 50 2% 12 20 12 20 20 12 20 20 20 20 20 20 20 20 20 20 20 20 20	1 396 0 00 5 6713 8 Cotherines Road Exit 20 4 4 91 5 195 6 0 00 7 8 20 8 10 20 8 10 20 9 10 20 10 20 10 10 20 10 20 10 20 10 10 10 10 10 10 10 10 10 10 10 10 10	5 223 4 1407 5 1407 6 1407 6 1407 6 1407 1407 1407 1417 1	2 122 23 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	9 8 8 1 221 3 11 4 11 5 119 6 49 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 88 4 91 5 92 6 93 6 93 6 93 7 93 7 93 7 93 9 9 9 9	( 1000 ( 11) ( 3722 49) 149 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 5 Dunkeid Rd / St Catherines F Barrack Street	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           %HDV           Speed (mph)           Speed (mph)           Car           Car           Car           Car           Car           Car           Car           Car           Car           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Minibus	44 83 599 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	1 396 0 0 18 0 377 6 377 7 2 377 7 2 377 7 2 377 7 2 377 7 3 4 377 7 4 4 289 4 4 289 4 4 410 5 3 111 5 111 5 111 5 111 5 1111 5 11115 5 11111111	a 223 414 524 534 544 545 546 547 547 547 547 547 547 547 547	2 122 23 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	9 8 1 21 3 11 5 1199 6 9 9 7 9 10 unkeld Rd South Entry 2 21 2 744 7 44 7 3 2 2 21 3 2 21 4 2 21 2 1199 4 3 5 3 7 44 1 3 3 2 21 5 3 7 44 1 3 2 2 7 44 1 3 2 2 7 44 1 3 2 2 1 4 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5	4 88 4 91 5 92 6 93 6 93 6 93 7 93 7 93 7 93 9 9 9 9	( 1000 ( 11) ( 3722 49) 149 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Norme S Duralel Rd / St Catherines F Barrack Street	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           %HDV           Speed (hmph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Double Decker Bus           Minibus           Coach	44 88 00 5899 11 12 0000000000000000000000000000000	1 1990 0 000 5 0711 8 7790 9 KCatherines Road Exit 4 000 5 1990 4 000 5 1990 5 1990 6 000 6 000 7 0000 7 000 7 000 7 000 7 000 7 000 7 000 7 000 7 0000 7 00000000	2 23 4 407 5 40 7 10 7 10	2 122 233 30 30 30 30 30 30 30 30 30 30 30 30 3	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	4	( 100) 11 11 372 49 49 27 27	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 5 Dunkeid Bd / St Catherines P Barrack Street	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           90HOV           Speed (mph)           Speed (mph)           Arm           Car           LGV           OGV1           Single Decker Bus           Double Decker Bus           Double Decker Bus           Coach           Total	44 88 509 28 28 28 28 28 28 28 28 28 28 28 28 28	1 396 0 00 0 075 2 713 5 Cotherines Road Exit 5 Cotherines Road Exit 4 4 410 5 15 28 4 4 410 5 28 4 4 6 0 7 28 6 0 7 28 7 28 7 28 7 28 7 28 7 28 7 28 7 28	а 23 3 1407 4 1407 5 1407 5 1407 6 1414 6 1414 6 1414 7 127 7 127 9 2 27 9 2 7 9 141 1414 1414 1414 1417 1414 1417 1414 1417 1414 1417 1414 1417 1414 1417 141	122 233 3 1 1133 3 8t Catherines Road Entry 5 5 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5	9 8 8 8 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2	4 88 4 99 4 99 5 90 6 99 1	( 100) ( 372) 497 14 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 5 Durield Rd / St Catherines P Borreck Street	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           Speed (mph)           Arm           Car           LGY           Double Decker Bus           Minibus           Coach           Total           ShellOY	44 88 00 5899 11 12 0000000000000000000000000000000	1 1960 0 00 0 00 1960 00 1970	2 23 4 1407 5 467 5 467 6 477 6 477 6 477 7 4777 7 4777 7 4777 7 4777 7 4777 7 4777 7 4777 7 4777 7	122 23 23 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	9 8 8 8 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2	4 884 9 01 9 01 1 844 9 20 1 844 9 20 1 845 9 20 1 845 1	( 100) ( 372) 497 14 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
htton Junction Name 5 Dunkeld Föd / St Catherines F Barrack Street	Single Decker Bus           Double Decker Bus           Minibus           Obuble Decker Bus           Speed (mph)           Speed (mph)           Speed (truph)           Single Decker Bus           Double Decker Bus           Speed (mph)	44 88 509 28 28 28 28 28 28 28 28 28 28 28 28 28	1 1990 0 100 0	2 23 4 1407 5 1407 6 1407 6 1407 7 2 0 1407 7 2 1414 1414 1414 1414 1414 1414 1414 1414 1414 1414 1417	122 233 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	9 8 8 8 9 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2	4 88 4 91 5 92 6 92 1 93 1 94 6 92 7 194 7 93 7 93 8 93 9 94 9 95 9 95	( 100) ( 372) 497 14 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name S Dunied Rd / St Catherines F Barrack Street	Single Decker Bus           Double Decker Bus           Minibus           Minibus           Speed (mph)           Speed (mph)           Speed (mph)           Speed (corp)           Car           LGAVI           Car           Double Decker Bus           Double Decker Bus           Double Decker Bus           Speed (mph)           Speed (mph)           Speed (mph)	44 89 500 20 20 20 20 20 20 20 20 20 20 20 20 2	1 1990 0 0 0 5 0777 8 0777 9 0 0 0 9 0 0777 9 0 0777 9 0 0 0 9 0	5 223 4 147 5 2 147 5 2 147 6 2 147 6 147 6 177 7 2 147 7 2 147 7 2 147 7 2 147 7 2 147 7 2 147 7 3 147 8 147 9 1	122 233 244 255 255 255 255 255 255 255	9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	4 88 4 91 5 92 4 92 1	( 100) ( 372) 497 14 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name S Duried Rd / St Catherines F Barrack Street	Single Decker Bus Double Decker Bus Minibus Coach Total Seped (mph) Seped (mph) Car Car Car Car Car Cov2 Cov2 Cov2 Cov2 Cov2 Cov4 Cov4 Cov4 Cov4 Cov4 Cov4 Cov4 Cov4	44 83 599 28 28 28 28 28 29 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	1	2 23 4 14207 5 14207 6 14207 7 2 7 2 7 2 7 2 7 2 7 2 7 2 7	223 233 24 25 25 25 25 25 25 25 25 25 25 26 26 26 26 27 27 27 27 27 27 27 27 27 27 27 27 27	8 8 1 2 2 1 2 1 2 1 2 1 2 2 2 2 2 2 2 2	4	0 1000 11 372 99 9 9 1 1 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 5 Dunkiel Rd / St Catherines F Barrack Street nction Junction Name 6 JA9 / Crieff Rd Roundabout	Single Decker Bus           Double Decker Bus           Minibus           Minibus           Speed (mph)           Speed (mph)           Speed (mph)           Speed (corp)           Car           LGAVI           Car           Double Decker Bus           Double Decker Bus           Double Decker Bus           Speed (mph)           Speed (mph)           Speed (mph)	46 88 500 20 20 20 20 20 20 20 20 20 20 20 20 2	1 3960 0 0 0 6 9777 7780 7790 7790 7790 7790 7790 7790	5 23 4 140 5 140 6 140 6 141 6 141 6 141 7 1	223 233 24 25 25 25 25 25 25 25 25 25 25 26 26 26 26 27 27 27 27 27 27 27 27 27 27 27 27 27	8 8 1 2 2 1 2 1 2 1 2 1 2 2 2 2 2 2 2 2	4 88 4 99 4 99 4 99 4 99 4 99 5 99 6 99 7 99 8 99	0 1000 372: 472 47 12 27	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 5 Durkeid Raf / St Catherines F Barrack Street nction Junction Name 6 A9 / Crieff Rd Roundabout	Single Decker Bus Minbus Double Decker Bus Minbus Gooden Speed (mph) Speed (mph) Car Car Double Decker Bus Minbus Cach Total Single Decker Bus Minbus Cach Total Speed (mph) Speed (mph) Arm Car	44 83 599 28 28 28 28 28 29 28 29 20 20 20 20 20 20 20 20 20 20 20 20 20	1 3960 0 0 0 6 9777 7780 7790 7790 7790 7790 7790 7790	223 411 521 531 531 531 531 531 531 531 53	122 233 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	4 88 4 99 4 99 4 99 4 99 4 99 5 99 6 99 7 99 8 99	0 1000 372: 472 47 12 27	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name Boriald 7d / St Catherines F Boriack Street Junction Name E A9 / Creff 6d Roundabout Dobbies Roundabout	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           Speed (imph)           Speed (imph)           Speed (imph)           Car           Car           Cor           Cor           Cor           Cor           OGV1           OGV2           Single Decker Bus           Minbus           Cach           Total           Speed (imph)           Speed (imph)           Speed (imph)           Am           Car           Car	44 83 500 200 200 200 200 200 200 200 200 200	1 1990 0 000 5 071 8 077% 2 100 8 Rotherines Road Exit 9 Rotherines Road Exit 9 0 100 5 100 6 025 0 000 9 00000000	2 23 4 1407 5 4407 6 4407 6 4407 6 4407 7 4407	122 23 23 24 25 25 25 25 25 25 25 25 25 25 25 25 25	5 8 8 8 8 1 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2	4	0 100 772: 494 1 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 5 Dunkeid Fd / St Catherines F Barrack Street nction Numeten Neme 6 /45 / Cett Fits Foundabout Dobbes Foundabout	Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           Speed (mph)           Speed (kmph)           Arm           Car           LGV           OcV2           Single Decker Bus           Double Decker Bus           Double Decker Bus           Double Decker Bus           Double Decker Bus           OcV1           Car	44 88 509 28 28 20 20 28 28 28 28 28 28 28 28 28 28 28 28 28	1 1990 0 100 5 071 8 071 4 Cotherines Road Exit 2 100 6 0 100 7 10	2 23 1407 2 1407 2 1407 2 1407 2 1407 2 1417 3 1417 4 1414 3 1414 4 1414 3 1414 4 1414 3 1414 4	122 233 3 3 4 5 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	9 8 8 8 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2	4 88 4 99 5 90 6 99 1	0 1000 372 372 47 47 1 2 2 2	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name S Durield Rd / St Catherines F Barrack Street nction Junction Name 6 A9 / Creff Rd Roundabout Dobbles Roundabout	Single Decker Bus           Double Decker Bus           Minbus           Octob           Speed (mph)           Speed (mph)           Speed (mph)           Single Decker Bus           OGV1           OGV1           Speed (mph)           Oct/1           Oct/2           Oct/2	46 80 5695 27% 20mkeld Road South Exit 1620 1622 162	1 1960 0 00 1970 1970 1970 1970 1970 1970 1970 19	23 4 5 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	122 23 23 24 25 25 25 25 25 25 25 25 25 25 25 25 25	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	4 4 4 4 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7	0 100 372: 4% 1 23	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name S Duniells Rd / St Catherines F Barrack Street nction Junction Name 6 A9 / Crieff Rd Roundabout Dobbies Roundabout	Single Decker Bus           Double Decker Bus           Minibus           Total           Speed (mph)           Speed (mph)           Speed (mph)           Double Decker Bus           Double Decker Bus           Single Decker Bus           Minibus           Cach           Cach           Car           Car           Car           Cave           Cave           Car           Cave           Cave <td>44 88 599 28 28 28 28 28 28 28 28 28 28 28 28 28</td> <td>1 1990 0 000 0 0000 0 000 000000</td> <td>2 23 4 1407 5 1407 6 1407 6 1407 6 1407 7 1407 7 141 7 147 7 14</td> <td>122 233 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3</td> <td>9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9</td> <td>4 88 4 99 5 90 6 99 1 99 4 99 5 90 6 99 6 99 6 99 7 99 8 99 9 99 9 99 1 99 9 99 1 99 9 99 1 99 1</td> <td>0 100 372: 4% 1 23</td> <td>1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8</td>	44 88 599 28 28 28 28 28 28 28 28 28 28 28 28 28	1 1990 0 000 0 0000 0 000 000000	2 23 4 1407 5 1407 6 1407 6 1407 6 1407 7 1407 7 141 7 147 7 14	122 233 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	4 88 4 99 5 90 6 99 1 99 4 99 5 90 6 99 6 99 6 99 7 99 8 99 9 99 9 99 1 99 9 99 1 99 9 99 1	0 100 372: 4% 1 23	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
Inction Junction Name S Duritel Rd / St Catherines F Barack Street nction Junction Name 6 A9 / Creff Rd Roundabout Dobbies Roundabout	Single Decker Bus Double Decker Bus Minbus Ocacin Stead (Minph) Speed (Minph) Arm Arm Car UaV1 Cav UaV1 Cav UaV1 Cav Double Decker Bus Minbus Caach Minbus Caach C	44 89 20 20 20 20 20 20 20 20 20 20	1 1990 0 000 5 0777 8 0777 9 2 01777 9 2 01777 9 2 01777 9 2 017777 9 2 017777 9 2 017777 9 2 017777 9 0177777 9 01777777 9 01777777 9 01777777777777777777777777777777777777	223 414 524 5254 5254 525555 525555 525555 525555 525555 525555 525555 525555 52	122 23 23 24 24 25 25 26 26 27 26 27 26 27 26 27 26 27 26 27 27 27 27 27 27 27 27 27 27 27 27 27	9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	4	0 1000 372: 497 11 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name S Dunkeid Rd / St Catherines F Barrack Street nction Junction Name 6 A9 / Cneff Rd Roundabout Dobbies Roundabout	Single Decker Bus Double Decker Bus Minbus Ocacin Stead (Minph) Speed (Minph) Arm Arm Car UaV1 Cav UaV1 Cav UaV1 Cav Double Decker Bus Minbus Caach Minbus Caach C	44 89 20 20 20 20 20 20 20 20 20 20	1	223 414 524 5254 5254 525555 525555 525555 525555 525555 525555 525555 525555 52	122 233 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	4	0 1000 372: 497 11 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name B Dunald Rd / St Catherines F Barrack Street nction Junction Name 6 A9 / Crieff Rd Roundabout Dobbies Roundabout	Single Decker Bus           Double Decker Bus           Minbus           Total           Speed (mph)           Speed (mph)           Speed (mph)           Single Decker Bus           Double Decker Bus	44 89 20 20 20 20 20 20 20 20 20 20	1 1990 0 000 5 0777 8 0777 9 2 01777 9 2 01777 9 2 01777 9 2 017777 9 2 017777 9 2 017777 9 2 017777 9 0177777 9 0177777 9 01777777 9 01777777777777777777777777777777777777	223 414 524 5254 5254 525555 525555 525555 525555 525555 525555 525555 525555 52	122 23 23 24 24 25 25 26 26 27 26 27 26 27 26 27 26 27 26 27 27 27 27 27 27 27 27 27 27 27 27 27	9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	4	0 1000 372: 497 11 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 5 Dunked Fd / St Catherines F Barrack Street nction Junction Name 6 AG / Creff RJ Faundabout Debles Foundabout	Single Decker Bus           Double Decker Bus           Menbus           Total           Speed (mph)           Speed (mph)           Speed (mph)           Double Decker Bus           Corv           Corv           Single Decker Bus           Double Decker Bus           Double Decker Bus           Speed (mph)           Double Decker Bus           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Double Decker Bus	44 68 5095 28 20 28 28 28 28 28 28 28 28 28 28	1 1990 10 100 10 100	2 3 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4	122 233 34 35 36 37 38 40 40 57 57 57 57 57 57 57 57 57 57	9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	4	( 100) ( 372) 372 374 4 4 1 2 2 2 2 2 2	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name 8 Dorisid Rd / St Catherines P Barrack Street 9 Dorisid Rd Paulation 9 A9 / Creff Rd Roundabout Dobbies Roundabout	Single Decker Bus           Double Decker Bus           Minbus           Minbus           Double Decker Bus           Speed (mph)           Speed (mph)           Speed (mph)           Single Decker Bus           Double Decker Bus           Double Decker Bus           Menbus           Speed (mph)           Double Decker Bus           Double Decker Bus           Double Decker Bus           Double Decker Bus           Total	46 80 27 27 20 28 29 29 29 29 29 29 29 29 29 29	1 1990 0 000 0 0000 0 0000 0000 000000	223 344 345 345 345 345 345 345 345 345 34	122 23 23 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	9         8           1         21           1         1198           2         13           0         49           4         14           5         744           6         744           7         2           7         2           8         6           9         137           10         137           11         137           12         137           13         137           14         137           15         137           15         137           16         137           17         137           18         137           19         140           10         137	4	0 100 372: 49 1 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
nction Junction Name S Durkeld Rd / St Catherines F Barrack Street nction Junction Name 6 A9 / Creff Rd Roundabout Dobbies Roundabout	Single Decker Bus Menbus Double Decker Bus Double Decker Bus Total %HOV Speed (mph) Speed (mph) Speed (mph) Cov1 Cov1 Cov1 Cov1 Cov1 Cov1 Cov1 Cov1	44 68 60 599 28 28 28 28 28 28 28 28 28 28	1 1990 1 1990 19	2 3 3 3 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4	122 233 3 3 4 5 5 8 Cotherines Road Entry 8 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	9 8 8 8 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9	4	0 100 372: 49 1 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
Inction Junction Name 8 Conviet Rd / St Catherines P barrack Street Inction Junction Name 6 As / Creff Rd Roundabout Dobbes Roundabout	Single Decker Bus Double Decker Bus Minbus Speed (mph) Speed (mph) Speed (mph) Speed (mph) Car Car Car Cov1 Cov1 Cov2 Cov1 Cov2 Cov1 Cov2 Cov1 Cov3 Cov1 Cov3 Cov1 Cov3 Cov1 Cov4 Cov1 Cov4 Cov1 Cov4 Cov1 Cov4 Cov1 Cov2 Cov4 Cov4 Cov4 Cov4 Cov4 Cov4 Cov4 Cov4	44 89 20 20 20 20 20 20 20 20 20 20	1 1990 0 000 1990 1990 1900 1900 1900 19	0         23           0         1407           0         1497           0         120           0         21           0         22           0         121           1         1141           1         121           1 <t< td=""><td>122 33 3 4 5 5 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7</td><td>9 8 8 8 8 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8</td><td>4</td><td>( 100) ( 372: 494 11 22</td><td>1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8</td></t<>	122 33 3 4 5 5 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	9 8 8 8 8 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8	4	( 100) ( 372: 494 11 22	1         53           2         84           0         0           3         0           0         4           1         6262           6         4%           4         8
unction Junction Name S Durkled Rd / St Caberines F Barract Street Barract Street Junction Junction Name 6 / A/ Crieff Rd Roundabout Dobbies Roundabout	Single Decker Bus Menbus Double Decker Bus Double Decker Bus Total %HOV Speed (mph) Speed (mph) Speed (mph) Cov1 Cov1 Cov1 Cov1 Cov1 Cov1 Cov1 Cov1	44 68 60 599 28 28 28 28 28 28 28 28 28 28	1 1990 0 000 1990 1990 1900 1900 1900 19	0         23           0         1407           0         1497           0         120           0         21           0         22           0         121           1         1141           1         121           1 <t< td=""><td>122 33 3 4 5 5 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7</td><td>9 8 8 8 8 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8</td><td>4</td><td>( 100) ( 372: 494 11 22</td><td>1         53           9         84           0         0           3         0           0         4           1         6262           6         4%           4         8</td></t<>	122 33 3 4 5 5 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	9 8 8 8 8 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8	4	( 100) ( 372: 494 11 22	1         53           9         84           0         0           3         0           0         4           1         6262           6         4%           4         8

### Table A1.1d – 2005 with CCTMR AADT for Perth other major roads

Transition Transition Commo		Crieff Rd Eastbound Entry	Crieff Rd Eastbound Exit	Newhouse Rd Approach	A9 On / Off slip approach	Crieff Rd westbound Approach	Residences Ref Ford	Crieff Rd Westbound Exit	A9 On / Off Slip Exit	1
	Am						Newhouse Rd Exit 5 4020			
Newhouse Rd Poundabout	Get	10861	1 825 5 107:	122	3 9300 8 1198	388		632	7 9331	
PREPARENT AND POLLFELARDED		294	4 8	11		11				
	06V1 06V2	229				11		11	5 46	
	Single Decker Bus	235				16		21		
	Double Decker Bus	4.01	2 10		n 101	10	0 113	13	70	1
	Minibus	21			6 D					
	Coach	<u> </u>	1 1	2	• U	1		2		
		L		1			UL		UU	
	Total	12925								
	96HDV	5%	6 39	49	6 496	64	6 5%	49		
	Streed (mph)	c	0 1/	1		1			9 11	
	Speed (kmph)	9	2	2	5 19	2	G 14		5 18	
	Arm		Crieff Rd Westbound Entry	Crieff Rd Eastbound Entry	Feus Rd Approach	Crieff Rd Eastbound Ealt	Feus Rd Ealt	Crieff Rd Westbound Exit	Fairfield Avenue Exit	
8 Crieff Rd / Faus Rd Roundab	Car	6654		1038	5 6983	300	0 2595	272		
	LGV	680				57		61	8 53	
	0071	226				10			3 53	
	OGV2	74					2 14			
	Single Decker Bus	126	6 16	20	7 170	15	1 25	14	7 53	
	Double Decker Bus		0 1							
	Minibus		0 1	3		1		1		
	Caech	r								
	Total	7765		1224	7 8194	407		346	G 441	
	%HDV	13%	6 39							
	Speed (mph)	1	6 1	1			15	1		
	Speed (kmph)	F F	9 9	1		1	1 24		2 27	
lunction Junction Nome	Arm	M90 Edinburgh Approach	M90 Edinburgh Exit	A9 Stirling Exit	A9 Inverness Exit	Glasgow Road Exit	A9 Western Bypass Approach	A0 Stirling Approach	Glasgow Road Approach	Glasgow Rd - M
	Cot	14180	5 1032	788				793		and the second s
P DECEMBER OF ALL DECOME	LGV	102								
	OGV1	441		3 66				109		
	0GV2	197		20						
								69		
	Single Decker Bus	273	80	ed1.	1 007	20		b.*	6 137	
	Double Decker Bus									
	Minibus				UU		U U		U U	
	Conch		1 1401-	1	4 15761		a DA40	1100	• /	
		16961				1284				1
	96HDV	4%	6 129			64		199		
	Streed (mph)	15		aa		2				
	Speed (kmph)	25	2 2	4	8 60	4		1	3 32	1
	Arm		Clasgow Rd Westbound Appr		Glesgow Rd Westbound Ealt	Clasgow Rd Eastbound Approach	Necessity Bree Exit			
10 Glasgow Rd / Necessity Bree	Car	8054		502	6 5824					
Roundebout	LGV	1019	9 135	1 87	6 749		0 707			
	0971	205								
	OGVZ		1 14	4						
		91								
	Singla Dacker Bus	294	4 39			8				
	Double Decker Bus		4 39							
	Double Decker Bus Minibus	294	4 39							
	Dauble Decker Bus Minibus Gaech	2294 C C 4	4 38 0 1 1	2 2 7	201 0 0 7 0 7	27	7 60 0 0 4 0			
	Double Decker Bus Minibus Goech Total	264 0 0 0 0 0 0 0 0 0 0 0	4 39 0 1 1 4 3 1227	20000000000000000000000000000000000000	2 201 0 0 7 0 77 1 7214	27	7 60 0 0 0 0 0 0 0 3 5000			
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	Double Decket Bus Minibus Coech Total %HDV	264 0 0 0 0 0 0 0 0 0 0 0	4 39 0 1 1 4 3 1227	2 10 7 7 7 8 9 698 698	8 201 0 0 1 7 1 7214 6 8%	27	23 23 27 27 27 27 27 27 27 27 27 27 27 27 27			
	Double Decker Bus Minibus Goech Total 36HDY Speed (mph)	264 0 0 0 0 0 0 0 0 0 0 0	4 999 0 1 4 7 9 1927 6 99	2 10 7 7 7 8 9 698 698	8 201 0 0 1 7 1 7214 6 8%	27 	232 (7 2000) (7 2000			
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lunction Junction Name	Double Decker Hus Minihus Gosch Total 96HDV Speed (mph) Speed (mph) Arm	284 C 4 0655 7% 15 30	t 99 0 1 1 2 1927 5 1927 6 9 0 1 1 6 9 9 0 1 1 1 Glasgaw Rd Eastbaurd Exit	2 10 20 20 20 20 20 20 20 20 20 20 20 20 20	a 2000 0 7 1 7214 0 8 0 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	27 	7 66 9 0 0 9 0 9 0 9 0 9 0 9 0 9 0 9		Murray Crascent Approach	
	Double Decker Hus Minihus Gosch Total 96HDV Speed (mph) Speed (mph) Arm	201 0 4 3 6 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	4 39 0 1 4 39 6 99 9 1 1 1 6 Glasqaw Rd Easthaund Exit 1 7,77 4 7,77	10 688 22 22 23 24 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	2 200 0 7 1 7 2 7 2 7 2 8 3 8 4 8 5 8 6 8 6 8 7 7 1 8 7 2 14 7 2 14 7 2 14 7 2 14 7 2 14 7 2 14 7 2 14 7 7 2 14 7 2 14 7 7 2 14 7 7 2 14 7 7 2 14 7 7 7 2 14 7 7 7 7 7 7 7 7 7 7 7 7 7	27 B66 06 2 Marray Place Exit	7 66 9 0 0 9 0 9 0 9 0 9 0 9 0 9 0 9	Murray Place Approach		
unction Sunction Name 11 Glegow Rd / Murray Flece / Murray Drescant	Double Decker Hus Minihus Gosch Total 96HDV Speed (mph) Speed (mph) Arm	229 C C C C C C C C C C C C C C C C C C	4 390 0 1 2 1 2 1 2 1 2 1 2 1 2 1 3 1 3 1 4 1 4 1 5	2 10 2 688 27 2 2 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3	a 200 0 0 7 0 7 0 7214 0 8 0 8 0 8 0 8 0 8 0 8 0 8 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9	27 B66 00 2 Marray Place Exit 102	7 66 0 0 0 0 87 0 88 0 88 0 88 0 100 0 000 0 000 000 000000	Murray Place Approach 59	3 1141 8 209	
function Name 11 Glasgow Rd / Murray Flace / Murray Dressent	Double Decker Bus Minibus Coech Total Speed (Imph) Speed (Imph) Arm Cor Lav CoGV1	200 C C C C C C C C C C C C C C C C C C	4 39 0 1 1 2 2 3 3 3 4 3 5 5 6 39 0 4 1 2 5 6 39 0 4 7 7 7 7 1 2 7 7 7 1 2 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	10 600 22 22 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25	2 200 7 7 7 7 8 8 8 9 9 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0 9 0	27 000 2 Murray Place Exit 102 17 1	7 66 0 0 0 2 0 0 3 5500 6 398 6 6 898 6 8 0 398 6 8 7500 7500 77000 5 0000 8 10000 8 100000 8 100000000000000	Marray Place Approach 595 9	3 1141 8 209 4 33	
Junction Name 31 Glasgow Rd / Marray Place / Murray Crassent	Double Decker Bus Mrkbus Goech Total 9440V 9aead (mph) 9aead (mph) Steed (mph) Ger LEV CGV1 OGV1 OGV2	200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 399 0 397 3 49227 5 599 6 599 6 699 6 699 6 699 6 699 6 717 717 6 9 717 717 717 717 717 717 717 717 717 71	2   10 	2 999 999 999 999 999 999 999 999 999 99	27 Dece Marray Place Exit 100 12 13 13 13 13 13 13 13 13 13 13 13 13 13	7 66 0 0 0 4 0 0 23 6 39 6 8 7 12 12 12 12 12 12 12 12 12 12	Murray Place Approach	3 1141 8 209 4 33 8 24	
Junction Name 31 Glasgow Rd / Marray Place / Murray Crassent	Double Decker Bus Minibus Goech Total SHEUY Speed (Imph) Speed (Imph) Arm Cet LGV OGV1 OGV2 Single Decker Bus	200 0 0 0 0 0 0 0 0 0 0 0 0	4 399 0 397 3 49227 5 599 6 599 6 699 6 699 6 699 6 699 6 717 717 6 9 717 717 717 717 717 717 717 717 717 71	2   10 	2 999 999 999 999 999 999 999 999 999 99	27 Dece Marray Place Exit 100 12 13 13 13 13 13 13 13 13 13 13 13 13 13	2 66 2 67 4 75 6 75 6 75 6 75 6 75 755 755 755 755 755 755 755	Murray Place Approach	3 1141 8 209 4 33 8 24	
hundion Junction Nerra 11 Geogram Rd / Murray Pace / Murray Drescent	Double Decker Bus Minipus Conch Total SheUY Speed (mph) Steed (mph) Amn Car LDV OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus	200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 399 0 397 3 49227 5 599 6 599 6 699 6 699 6 699 6 699 6 717 717 6 9 717 717 717 717 717 717 717 717 717 71	2   10 	2 999 999 999 999 999 999 999 999 999 99	27 Dece Marray Place Exit 100 12 13 13 13 13 13 13 13 13 13 13 13 13 13	2 66 2 67 4 75 6 75 6 75 6 75 6 75 755 755 755 755 755 755 755	Murray Place Approach	3 1141 8 209 4 33 8 24	
hundion Junction Nerra 11 Geogram Rd / Murray Pace / Murray Drescent	Double Decket Bus Minisus Cosch Total Spead (httph) Spead (httph) Arm LGV CotV1 CotV1 CotV1 CotV1 CotV1 CotV1 CotV1 CotV1 CotV1 CotV1 CotV1 Minisus	200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 399 0 397 3 49227 5 599 6 599 6 699 6 699 6 699 6 699 6 717 717 6 9 717 717 717 717 717 717 717 717 717 71	10 Constant Ext Constant Ext	2 999 999 999 999 999 999 999 999 999 99	27 Dece Marray Place Exit 100 12 13 13 13 13 13 13 13 13 13 13 13 13 13	2 66 2 67 4 75 6 75 6 75 6 75 6 75 755 755 755 755 755 755 755	Murray Place Approach	3 1141 8 209 4 33 8 24	
tunction Norma 11 (Jacquer 194 / Murray Place / Murray Divisionit	Double Decket Bus Minisus Coasch Total SteOV Spaalt (mph) Spaalt (mph) Spaalt (mph) Spaalt (mph) Car LGV OGV1 OGV2 Single Decket Bus Double Decket Bus Double Decket Bus Double Decket Bus	2010 0000 1000 1000 1000 1000 1000 1000	4	4 19	2 900 77 8 77 6 8 77 6 8 77 77 77 77 77 77 77 77 77 77 77 77 77	27 0155 20 12 13 14 14 15 15 15 15 15 15 15 15 15 15 15 15 15	2 6.6 4 7.5 5 7.5 6 8 7.5 6 8 7.5 7 8 7.5 6 8 7.5 7 8 7.5 8 9 7.5 9 9 9 7 9 7.5 9 9 7 9 7.5 9 7.5	Varray Flace Appraach 55 1 1 1 1 1	a 1141 8 209 9 209 9 213 8 221 8 221 8 221 9 20 0 0 0 0	
unction Nome 11 Gargow Rd / Muray Place / Muray Dressent	Double Decket Bus Minisus Coech Total Spead (httph) Spead (httph) Arm LEV Cort LEV OGV1 OGV1 OGV1 OGV1 OGV1 Double Decket Bus Double Decket Bus Couch Total	200 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 390 0 4 4227 8 4227 1 5 1250 1	2	Source of the second seco	27 0155 20 12 13 14 14 15 15 15 15 15 15 15 15 15 15 15 15 15	<ul> <li>Constraints</li> <li>Constrai</li></ul>	Murray Flace Approach	a 1141 B 200 C	
Nordien Inerdien Norva 11 Ursepen Bil / Matray Flave / Murtay Crescord	Double Decket Bus Minisus Coasch Total SkHOV Speak (Imph) Speak (Imph) Speak (Imph) Speak (Imph) Car LGV OGV1 OGV2 Single Decket Bus Double Decket Bus Double Decket Bus Double Decket Bus Double Decket Bus Minibus Coasch Total ShHOV	Classaw fid Eastbaund Appro- 800 - 1	4 390 0 4 492 0 4 492 0 5 492 0 6 492 0 6 492 0 6 492 0 6 492 0 6 492 0 7 272 0 7 2	2	Source of the second seco	27 0155 20 12 13 14 14 15 15 15 15 15 15 15 15 15 15 15 15 15	7 66 8 67 8 7 9 8 9 8 9 8 9 8 9 8 9 8 9 9 9 9	Marray Place Appraach	a 1141 8 209 9 209 9 213 8 221 8 221 8 221 9 20 0 0 0 0	
Hendlien Norma 21 Glosgow Md / Morray Place / Murray Crescent	Double Decket Bus Ministas Cosoch Total Secol (mph) Stend (imph) Stend (imph) Ann Cor Single Decket Bus Double Decket Bus Double Decket Bus Double Decket Bus Double Decket Bus Double Decket Bus Double Decket Bus Single Decket Bus Double Decket Bus Single Decket Bus Cosoch Total Stend (mph)	Classaw fid Eastbaund Appro- 800 - 1	4 390 0 4 4227 8 4227 1 5 1250 1	2	Source of the second seco	27 005 2 4 Marriey Place Exit 12 12 13 13 12 12 12 12 12 12 12 12 12 12 12 12 12	7 66 8 67 8 7 9 8 9 8 9 8 9 8 9 8 9 8 9 9 9 9	Marray Place Appraach	a 1144 a 203 b 203 b 203 c	Image: Section 1         Image: Section 2           Image: Section 2
untion Iundion Norma 11 Eargen 62 / Marry Hann / Narwy Deniara	Double Decket Bus Marings Consth Total 384002 (mpth) Baread (mpth) Arrit Car Law Cost Cost Law Cost Law Cost Law Cost Cost Cost Cost Cost Cost Cost Cost	2010 0000 0000 0000 0000 0000 0000 0000	6 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	10 600 700 700 700 700 700 700 70	2 999 999 999 999 999 999 999 999 999 99	27 866 9 9 9 9 9 9 12 12 12 12 12 12 12 12 12 12 12 12 12	2	Murray Flake Approach	2 1141 2 200 4 200 2 20	Image: Section 1         Image: Section 2           Image: Section 2
unction Junction Norma 31 Gargen Rd / Marry Hace / Murry Dresont	Double Decker Has (Mrisus Coach Tetal SheQV SheQV SheQV Am Am Corr Coach Co	Glaver Breet Approch	4	2 11 511 22 23 24 24 24 24 24 24 24 24 24 24 24 24 24	2 900 77 1 77 1 77 1 77 1 77 1 77 1 77 1 77	27 005 07 07 07 18 19 19 19 19 19 19 19 19 19 19 19 19 19	2	Murray Flace Appraach	a 11141 2000 a 2000 2000 2000 2000 2000 2000 20	Image: Control of the second
Nandien Janutien Nerma 31 Georgen Rd / Marray Hace / Murray Dreasant Nano Descant	Double Decker Bas Ministra Creach Tetal Startor Star	Clawor Rate Approx 201		2	2 300 3 300 3 300 4 300 5 4 300 5 4 300 6 300 6 300 6 300 7 4 4 300 7 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5	27 000 000 000 000 000 000 000 000 000 0	2	Murray Flace Approach 50 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 11141 2020 2020 2020 2020 2020 2020 2020	Image: Section of the sectio
Aurician Janetiko Norma 31 Georgeo Ref. / Marray Piece / Murray Discont Hurray Discont Janetiko Norma 12 Giaccon Ref. / Figue Rif. Ref.	Double Decker Bas Minister Creach Teat // Teat // Stead (onth) Stead (onth) Arm Cer LGV Cer Cory Double Dacker Bas Minister Double Dacker Bas Minister Creach Tetal Speed (onth) Speed (onth) Sp	201 0 0 0 0 0 0 0 0 0 0 0 0 0	4	2	2 900 2 900 2 900 3 900 4 900 5	27 865 70 97 97 97 97 97 97 97 97 97 97 97 97 97	2         66           3         2500           4         2500           5         2500           6         2500           7         2000           8         2000           9         2000           9         2000           9         2000           9         2000           9         2000           9         2000           10         2000           10         2000           10         2000           10         2000           10         3000	Marray Flate Appraach BB 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 11141 200 3 200 3 200 3 200 3 200 4 200 4 200	Image: Section of the sectio
Austrian Annetian Norma 11 Gargeon Rd / Marray Place / Murray Dresont Murray Dresont 12 Grassing Rd / Riges Rd Ret	Double Decker Bay Minister Canada Minister Stend (mpr) Speed (mpr) Speed (mpr) Speed (mpr) Arm Orayla Canad	Clineer Bernet Approach		2 10 600 20 20 20 20 20 20 20 20 20	Source of the second seco	27 865 0 9 9 9 9 9 19 19 19 19 19 19 19 19 19 10 21 10 21 10 21 10 21 21 21 21 21 21 21 21 21 21 21 21 21	2	Yurrsy Flace Approach 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1	2 1141 200 2 14 2 15 2 14 2 15 2 16 2 16 2 16 2 16 2 16 2 16 2 16 2 16	Image: Section of the sectio
Austrian Annetian Norma 11 Gargeon Rd / Marray Place / Murray Dresont Murray Dresont 12 Grassing Rd / Riges Rd Ret	Double Decker Bay Minipat Contain Status Status Status Status Status Contain C	Clawor Renet Approx 201	4         38           4         32           5         32           6         32           7         32           8         32           9         32           9         32           9         32           9         32           9         32           9         32           9         32           9         32           9         32           9         32           9         4	2 10 600 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 900 2 900 2 900 3 900 4 900 5	27 005 72 4 Marray Place Exit 10 212 213 213 213 213 213 213 213 213 213	2         66           4         6           4         7           5         3           6         3           6         3           6         3           7         3           7         3           8         3           9         3           10         3           10         3           10         3           10         3           10         3           10         3           10         10           11         10           12         3	Murray Flace Approach	2 1141 200 2 200 2 00 2 00 0 0 0	Image: Section of the sectio
Anglien Nerns 31 Gargen Rd / Marry Hace / Mursy Descart Mursy Descart 20 Gascare Rd / Figs Rd Ret	Double Decker Bay Minister Carach Minister Second (men) Second (men) Second (men) Second (men) Area Second (men) Second (men) Secon	Clineer Bernet Approach		2 10 600 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 900 2 900 2 900 3 900 4 900 5	27 865 70 97 97 97 97 97 97 97 97 97 97 97 97 97	2	Murray Flace Approach	2 1141 200 2 14 2 15 2 14 2 15 2 16 2 16 2 16 2 16 2 16 2 16 2 16 2 16	-           -
andien Lendies Norma 11 Geogra MJ (Marry Pisce) Munay Descart Munay Descart M	Double Decker Bay Minister Canada Santa Based (one) Based (one) Based (one) Based (one) Based (one) Arm Ody Ody Ody Ody Ody Ody Ody Ody Ody Ody	Clancer Marcel Approach Clancer Approach		2 10 600 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	2 900 2 900 2 900 3 900 4 900 5	27 005 72 4 Marray Place Exit 10 212 213 213 213 213 213 213 213 213 213	2	Murray Flace Approach 50 51 52 52 53 54 54 55 55 55 55 55 55 55 55	2 1141 200 2 200 2	Image: Section of the sectio
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Junction	Junction Name	Arm	Caledonian Rd Sthbnd Aporo	a Galadonian Rd Northbound Er	e Alexandra St Exit	Caledonian Rd Sthand Exit	Caledonian Rd Nthond Approach	Alexandra St Approach			
13	Caledonian Rd / Alexandre S	Ger	130	9 139	0 18	6 100	5 110	1 Z5			
			25	2 20	4 4	6 20	23	6	7		
		OGV1 OGV2	7	7 7 7	2	8 8	3 <u>6</u>	1			
		Single Decker Bus	1	8 15	1	7 1	13		5		
		Double Decksr Bus	-								
		Minibus		0	0		2				
		Coach Total	100	4 2 6 190			2	1	1		
		95HDV	69	6 190	6 249	6 <u>127</u> 6 69	5 144	6 439			
		Speed (mph)	2	3 2	1 1	7 2	1 1				
		Spaad (kmph)	9	8 2	9 2		3 2	2			
	Junction Name St Andrew St / Leonard St	Arm		Leonard St Sthind Approach	St Andrew St Approach	Leonard St Nthand Exit	Leonard St Sthond Exit	St Andrew St Ealt 1 107	P		
14	St Andrew St / Leonard St	Car LTN	171		5 BS	4 15	4 39				
		OGV1		2 20	5 5	3 4	5 14	7 <u>61</u> 0 S			
			4			4 1	1 2	1 2			
		Sinda Datker Bus	0	1 14	4 1	4 1	4 10	5 19	0		
		Dauble Decker Bus Minibus									
		Goech		u <u> </u>	5 C	0 0		7 0			
		Total	233	1 160	4 108	2 90	7 261	1 154			
		96HD¥	109	5 199	6 79	6 89	6 123	6 169			
		Speed (mph)	9	4 2	5 1	6 9	4 2	2 1			
7	Junction Name	Speed (kmph) Arm	4 Bt Leonards Bank Approach	9 4	0 2 St Leonards Bank Exit	6 5 Kings Place Wsthnd Exit	3	Kings Pl Estand Approach	2		
15	Kings Place / Bt Leonards Ba	Car	at Countarius Barrik Approact	A STOR	at Liamanas dank cels	2 102	Kings PI Wstand Approach	A 165			
1.0			39	2 49	1 26	3 96	3 32				
			10	9 16	5 7	0 9	3 8	• 14			
		OGV2	4			2 4			1		
		Single Decker Bus Double Decker Bus	8	1 11	9 0	0 10	5 16	4 4			
		Minibus		4 Z	1	4	2	0 2	1		
		Coach		0	4	1	a <b>1</b>		4		
		Totol	249				1 209				
		96HDV	:09	6 129	6 99	6 129	6 149	6 119	6		
		Speed (mph) Speed (kmph)	1	6 2 6 4	5 2 1 0	• 2 8 0	1 2 3 4	- <u>1</u>			
Junctice	Junction Name	Arto	Marshall Place Estond Appro		Marshall Place Estbrid Ealt	Edinburgh Road Ealt	Marshall Place Wstbnd Exit	Marshell Place Wstbod Approach	Edinburgh Rd Approach		
15	Marshall Place / Edinburgh R	Car	198	5 00	4 125	7 294	2 263	2 217	4 3110		
		LGV	41			3 39	2 63	5 34	0 502		
		0674	16	5 4	6 10	6 11	5 18	2 19	7 238		
		OGVZ Single Decker Bus	2	8 3	2 6	3 2	7	7 0	7 96		
		Double Decker Bus									
		Minibus									
		Goech		4			+ 1		4 4		
		Total	258	5 190	2 187	3 295	1 353	2 278	3 4249		
		96HDV Speed (mph)	119	6 129 7 O	6 199 0 2		6 103 3 2		6 12%		
		Speed (kmph)	1	1 2	a a		a a	•	3		
		Service Online C									
Junction	Junction Name		Bouth Street Approach	Tay St Northbound Exit	Quaans Bridga Exit	Tay St Bouthbound Exit	Tay St Southbound Appproach	Tay St Northbound Approach	Queens Bridge Approach		
Junction 17	Junction Name Tay Bt / South St Crossroed	Arm Get	Bouth Street Approach 402		Queens Bridge Exit 7 371	Tay St Bouthbound Exit 4 520	Tay St Southbound Appproach	Tay St Northbound Approach	Queens Bridge Approach 8 4067		
Junction 17	Junction Name Tay Bt / South St Crossner	Get LGV	402	9 91 0 17	7 371 2 67	4 520 6 67	Tay St Southbound Appproach	3 99	9 4067 5 655		
Junction 17	Junction Name Tay Bt / South St Grossroed	GBI LGV OGV1	402 70 38	9 91 0 17: 9 6	7 371- 2 671 3 39	4 520 9 87 9 39	5 76 2 14 5 3	3 99	8 4067 5 655 2 203		
Junction 17	Tay Bt / South St Grossroed	GB7 LGV GGV1 OGV2	402 70 38	9 91 0 17: 9 6: 8 9:	7 371 2 67 3 39 5 15	4 520 6 67 5 339 1 39	5 76 0 14 5 3	3 99	9 4067 5 655		
Junction 17	Tay Bt / South St Grossroed	Ger LGV OGV1 OGV2 Single Decker Bus Double Decker Bus	402 70 38	9 91 0 17: 9 6: 8 9:	7 371 2 67 3 39 5 15	4 820 6 67 5 330 1 330	5 76 0 14 5 3	3 99	8 4067 5 655 2 203 9 61		
Junction 17	Tay Bt / South St Grossroad	Ger LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	402 70 38	9 91 0 17: 9 6: 8 9:	7 371 2 67 3 39 5 15 2 16 7	4         -800           6         -67           7         -6         -33           1         -100         -30           2         -100         -100           0         -000         -000	5 75 2 34 5 3 2 3 2 2 3 3 3	3 99	3 4057 5 655 2 293 3 655 2 293 2 295 2 2 293 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
Junction 17	Tay Bt / South St Crossroad	Ger LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach	402 702 38 15 27 1 1 1 1	9 91 911 0 177 9 6 6 8 9 111 0 11	7 371 2 67 3 39 5 15 2 16 7	•         500           9         87           1         10           8         10           0         70           1         1	5 76 2 14 5 3 2 2 1 5 5 4	a 999 92 22 2 111 7 39 8 77 0 1	3 405' 5 652 2 213 3 5 0 493 0 0 0 0 1 0 1 0 1 10 1		
hunction 17	Tay Bt / South St Grossraed	Ger LGV OGV1 OGV2 Single Desker Bus Double Desker Bus Minibus Coach Totel	402 700 88 15 23 23 1 1 1 1 1 3 553	9 9 91 0 91 9 8 9 8 9 10 11 1 1 1 1 1 1 1 1 1 1 1 1	7 311 2 67 3 39 5 15 2 16 7 7 0 11 5 5 6 5 7 1 0 11 10 10 10 10 10 10 10 10 10	4 500 9 87 5 38 5 100 8 100 9 100 9 100 9 100 1 00 4 100 1 00 4 100 1 00 1 0	5 76 0 14 5 3 2 2 2 3 4	8 999 0 262 2 111 7 9 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 9 145	9         406           5         203           2         203           2         203           0         9           0         0           0         0           0         14           0         6128		
hunction 17	Tay Bt / South St Grossraed	Cat LCV OGV1 OGV2 Single Deckst Bus Double Deckst Bus Minibus Coach Coach Total SHEU/V Steed (mph)	402 702 38 15 27 1 1 1 1	9 9 91 0 91 9 0 9 0 9 0 9 0 9 0 1 12 1 1 1 1 1 1 1 1 1 1 1 1 1	7 311 2 67 3 39 5 15 2 16 7 7 0 11 5 5 6 5 7 1 0 11 10 10 10 10 10 10 10 10 10	4 500 9 87 5 38 5 100 8 100 9 100 9 100 9 100 1 00 4 100 1 00 4 100 1 00 1 0	5 76 2 14 5 3 2 2 1 5 5 4	a 999 92 22 2 111 7 39 8 77 0 1	3 405' 5 652 2 213 3 5 0 493 0 0 0 0 1 0 1 0 1 10 1		
17	Tay Et / South St Grossroed	Cer LCV OGV1 OGV2 Single Decker Bus Double Decker Bus Minbus Coace Coace Total SHOV Speed (mph) Speed (mph)	402 702 389 389 389 389 389 389 389 389 389 389	9 9 91 0 127 9 0 67 9 0 70 1 0 127 0 127 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	7 371 7 37 8 47 9 39 8 19 9 19 19 19 19 19 19 19 19 19 19	4 800 6 67 8 7 9 7 9 7 9 7 9 7 1 7 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	5 16 16 16 16 16 16 16 16 16 16 16 16 16	3         99           2         22           2         11           2         2           3         7           0         7           0         1           0         1           1         1           1         1           1         1           2         1           3         1           4         1	9         406           5         203           2         203           2         203           0         9           0         0           0         0           0         14           0         6128		
Junction	Tay Et / South St Crossroad	Cer LGV OGV1 OGV2 Single Desker Bus Double Decker Bus Minibus Coach Total 94:E0V Speed (mph) Speed (mph) Arm	402 700 88 15 23 23 1 1 1 1 1 3 553	9 0 01 0 17 0 17 0 18 0 19 0 19	7 371 7 37 8 6 77 9 19 9 19 19 19 19 19 19 19 19 19 19 19 19 19 1	4 500 9 87 5 38 5 100 8 100 9 100 9 100 9 100 1 00 4 100 1 00 4 100 1 00 1 0	5 76 2 14 5 3 2 2 1 5 5 4	9 99 2 22 2 23 2 24 3 25 3 25 3 25 3 25 3 25 3 25 3 25 3 25	3         4867           655         2           2         21           3         48           3         0           3         0           3         0           4         53           5         53           6         89           9         7           9         1		
Junction	Tay Et / South St Crossrood	Cer LCV OGV1 OGV2 Single Decker Bus Double Decker Bus Minbus Coace Coace Total SHOV Speed (mph) Speed (mph)	402 702 38 45 50 1 1 1 503 503 503 503 1 55 503 7 7 7 7 7 7	9 9 91 91 0 177 9 0 76 8 9 9 0 112 1 1 4 120 8 129 8 129 8 129 8 129 9 12 9 12 9 12 12	7 371 7 37 8 6 77 9 19 9 19 19 19 19 19 19 19 19 19 19 19 19 19 1	4 800 6 67 8 7 9 7 9 7 9 7 9 7 1 7 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	5 16 16 16 16 16 16 16 16 16 16 16 16 16	9 999 1 11 2 11 2 11 3 11 4 11 5 111	1900         1900         1900           1900         1900         1900		
Junction	Tay Et / South St Crossroad	Cer LGV OGV1 OGV2 Single Desker Bus Double Decker Bus Minibus Coach Total 94:E0V Speed (mph) Speed (mph) Arm	402 702 389 389 389 389 389 389 389 389 389 389	9 9 91 91 0 177 9 0 76 8 9 9 0 112 1 1 4 120 8 129 8 129 8 129 8 129 9 12 9 12 9 12 12	7 371 7 37 8 6 7 9 15 9 15	4 800 6 67 8 7 9 7 9 7 9 7 9 7 1 7 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	5 16 16 16 16 16 16 16 16 16 16 16 16 16	9 99 2 22 2 23 2 24 3 25 3 25 3 25 3 25 3 25 3 25 3 25 3 25	1900         1900         1900           1900         1900         1900		
Junction	Tay Et / South St Crossroad	Cer LGV OGV1 OGV2 Single Deskre Bus Duable Deskre Bus Minibus Total Steat (mph) Steat (mph) Steat (mph) Steat (mph) Car LGV Car LGV OGV1 OGV1	402 702 38 45 50 1 1 1 503 503 503 503 1 55 503 7 7 7 7 7 7	9 9 91 91 0 177 9 0 76 8 9 9 0 112 1 1 4 120 8 129 8 129 8 129 8 129 9 12 9 12 9 12 12	7 2 212 7 477 8 5 777 8 6 12 9 7 7 9 7 9 7 10 12 10 12 1		5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 999 22 2 2 2 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	1900         1900         1900           1900         1900         1900		
Junction	Tay BL/ South St. Crossnae Junction Norme Tay Street / High Street	Cer LGV GGV1 GGV2 Single Decker Bus Double Decker Bus Minibus Coach Tatal 84507 Steed (mph) Steed (mph) Steed (mph) Car LGV Car LGV Cor Car Single Deckar Bus	402 702 38 45 50 1 1 1 503 503 503 503 1 55 503 7 7 7 7 7 7	9 9 91 91 0 177 9 0 76 8 9 9 0 112 1 1 4 120 8 129 8 129 8 129 8 129 9 12 9 12 9 12 12	7 371 7 37 8 6 7 9 15 9 15		5 16 16 16 16 16 16 16 16 16 16 16 16 16	2 999 22 2 2 2 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	1900         1900         1900           1900         1900         1900		
Junction	Tay Bt / South St Crossner Junction Nerrer Tay Street / High Street	Cer LEV COV2 Single Dacker Bus Double Dacker Bus Minktus Coach Intel Speed (mph) Speed (mph) Speed (mph) Speed (mph) Cer LEV Cer Cer Cer Cer Cer Cer Cer Cer Cer Cer	402 702 38 45 50 1 1 1 503 503 503 503 1 55 503 7 7 7 7 7 7	9 9 91 91 0 177 9 0 76 8 9 9 0 112 1 1 4 120 8 129 8 129 8 129 8 129 9 12 9 12 9 12 12	7 2 212 7 477 8 5 777 8 6 12 9 7 7 9 7 9 7 10 12 10 12 1		5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 999 22 2 2 2 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	1900         1900         1900           1900         1900         1900		
Junction	Tay Bf / South Sf Otoarnad	Cer LGV GGV1 GGV2 Single Decker Bus Double Decker Bus Minibus Coach Tatal 84507 Steed (mph) Steed (mph) Steed (mph) Car LGV Car LGV Cor Car Single Deckar Bus	4 00 30 34 35 35 35 35 35 35 35 35 35 35	2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7 2 21 8 20 8 20 9 20 9 15 9 15		5   11	2 999 2 100 2 111 2 1111 2 1111 2 1111 2 11111 2 11111111	1900         1900         1900           1900         1900         1900		
Junction	Tay Bt / South St Crossnee	Cet LEN COLV CRY2 Deckor Bus Grave Bus Craves Craves Testal SheDV SheDV SheDV Craves SheDV SheDV Craves SheDV	4 02 32 32 32 32 32 32 32 32 32 3	9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7 2 21 7 27 8 27 8 27 9 27 9 27 9 27 19 27 19 27 19 27 19 27 19 28 19 27 19 28 19 29 19 29		5   17	9 999 1 22 2 11 2 17 3 17 4 19 5 19	0         4017           653         653           0         653           0         75           0         75           0         70           0         133           0         133           0         133           0         133           0         133           0         132           0         132           0         132           0         132           0         132           0         132           0         133           0         133		
Junction	Tay Bt / South St Otoanne Junction Norte Tay Street / Hon Street	Cet Cons	4 00 30 30 30 30 30 30 30 30 30	9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7 2 21 7 27 8 27 8 27 9 27 9 27 9 27 19 27 19 27 19 27 19 27 19 28 19 27 19 28 19 29 19 29	4 500 6 707 6 707 6 707 6 707 7 707 7 1007 6 707 7 1007 8 707 8 707	5   17   1   2   2   2   2   2   2   2   2   2	9 999 1 22 2 11 2 17 3 17 4 19 5 19	0         4017           653         653           0         653           0         75           0         75           0         70           0         133           0         133           0         133           0         133           0         133           0         132           0         132           0         132           0         132           0         132           0         132           0         133           0         133		
Junction	Tay Bt / South St Otoanne Junction Norte Tay Street / Hon Street	Cert Convolution	4 02 32 32 32 32 32 32 32 32 32 3	9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7 2 21 7 27 8 27 8 27 9 27 9 27 9 27 19 27 19 27 19 27 19 27 19 28 19 27 19 28 19 29 19 29		5   17   1   2   2   2   2   2   2   2   2   2	9 999 1 22 2 11 2 17 3 17 4 19 5 19	0         4017           653         653           0         653           0         75           0         75           0         70           0         133           0         133           0         133           0         133           0         133           0         132           0         132           0         132           0         132           0         132           0         132           0         133           0         133		
Junction	Tay Bt / South St Courses	Cet Covid Covid Covid Covida Dealter Rus Covida Dealter Rus Covida Dealter Rus Recel (norh) Stevel (norh) Stevel (norh) Covid Stevel (norh) Covid Stevel Covid Stevel (norh) Stevel (norh)	4 02 3 3 3 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	4         \$500           6         600           1         600           2         600           3         600           4         600           6         600           6         600           1         600           1         600           1         600           1         600           1         600           1         600           1         600           1         600           1         600           1         600           1         600	5	2	0         4017           653         653           0         653           0         75           0         75           0         70           0         133           0         133           0         133           0         133           0         133           0         132           0         132           0         132           0         132           0         132           0         132           0         133           0         133		
Junction	Tay Bf / South St Coorner	Cert Convolution	4 02 3 3 3 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		5   1975 6   2975 7   20	a 999 1000 1100 1000	0         4017           603         603           0         603           0         2           0         60           0         60           0         61           0         61           0         61           0         10		
Junction	Tay B1/South S1 Courses Junction Notes Tay Street / Hot Street	Car Car Carvin Carvin Carvin Single Dasker Bus Charles Busker Bus Minchan Single Dasker Bus Michael Car Car Car Car Car Car Car Carvin	4 00 0 00	9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2         21         21           2         4         4           2         4         5           2         15         5           2         12         5           2         12         12           2         141         1           2         141         1           2         149         16           3         15         16           4         16         16           5         16         12           6         12         14           7         14         12           7         14         12           7         14         12           7         13         12           7         13         12           8         13         12           9         13         12           8         14         14           8         14         12           9         13         12           9         13         12           9         13         12           10         132	4         500           2         300           4         300           5         300           6         300           7         100           8         300           9         300           10         300           10         300           10         300           10         300           10         300           10         300           10         300           10         300           10         300           10         300           11         300           12         300           13         300           14         300           15         300           16         300           17         300           18         300           19         300           100         300           100         300           100         300           100         300           100         300           100         300           100         300      <	5	2	0         4017           0         601           0         70           0         70           0         152           0         152           0         152           0         152           0         152           0         172           0         172           0         172           0         172           0         172           0         172           0         172           0         172           0         172           0         173           0         173           0         173           0         174           0         174           0         174           0         174           0         174           0         174           0         174           0         174           0         174           0         174           0         174           0         174           0         174           174         <		
Junction	Junction Nome Tay Brief / South St Courses Tay Street / Hot Street Tay Street / Hot Street	Car Cont Carvin Carvin Carvin Single Dealton Bus Carvin Minhos Carvin Minhos Carvin Minhos Carvin Minhos Minhos Minhos Carvin Minhos Carvin Minhos Carvin Carvin Minhos Carvin Carvin Minhos Carvin	4 cm 20 20 20 20 20 20 20 20 20 20	2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2         21         21           2         4         4           2         4         5           2         15         5           2         12         5           2         12         12           2         141         1           2         141         1           2         149         16           3         15         16           4         16         16           5         16         12           6         12         14           7         14         12           7         14         12           7         14         12           7         13         12           7         13         12           8         13         12           9         13         12           8         14         14           8         14         12           9         13         12           9         13         12           9         13         12           10         132		1         1           2         1           2         2           3         3           4         9           7 av SI. Northbound Approach         12           4         12           5         12           4         12           5         12           6         12           7         12           12         12           13         12           14         12           15         12           16         12           17         12           18         12           19         12           10         12           10         12           11         12           12         13           13         14           14         15           15         12           16         12           17         13           18         14           19         14           10         14           10         14           10         14           10	9 999 919 10 10 10 10 10 10 10 10 10 10 10 10 10	0         (4)17           0         (4)17		
Junction	Tay Bf / South Sf Courses Junction Notes Tay Street / High Street Note for Notes Rough Sf / Young Sci Course	Car Car Carvin Carvin Carvin Single Dacker Bas Cingle Dacker Bas Minhas Single Dacker Bas Minhas Single Carvin Sized (orgh) Sized (orgh) Sized (orgh) Carvin Carvin Carvin Carvin Carvin Carvin Sized (orgh) Sized (orgh)	4 co constraints of the second secon	9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		5	2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0         4(1)           0         6(1)           0         6(1)           0         7           0         1           0         1           0         1           0         1           0         1           0         1           1         1           0         1           1		
Junction	Tay Bf / South Sf Courses Junction Notes Tay Street / High Street Note for Notes Rough Sf / Young Sci Course	Car Car Carlor Cardon Dealer Bas Crado Backer Bas Crado Backer Bas Crado Carlo Car Car Car Car Car Car Car Car Car Car	4 cm 20 20 20 20 20 20 20 20 20 20	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		5	2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0         4(1)           0         6(1)           0         6(1)           0         7           0         1           0         1           0         1           0         1           0         1           0         1           1         1           0         1           1		
Junction	Junction Nome Tay Brief / Hot Street Tay Street / Hot Street Street / Hot Street Street / Hot Street	Car Car Carvin Carvin Carvin Single Dacker Bus Charles Busker Bus Mindbar Single Dacker Bus Mindbar Car Car Car Car Car Car Car Car Car C	4 co constraints of the second secon	9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2         2         2         2         7           2         4         4         5		5	2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0         4(1)           0         6(1)           0         6(1)           0         7           0         1           0         1           0         1           0         1           0         1           0         1           1         1           0         1           1		
Junction	Tay B1/South S1 Coorner Tay B1/South S1 Coorner Tay Street / High Street Tay Street / High Street Donalien Name Boach S1 / Dunden S1 Createads	Car Core Carves Carves Corests Corests Corests Corests Corests Core Core Core Core Core Core Core Core	4 00 00 00 00 00 00 00 00 00 00	2	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	a         500           a         300           b         300           c         300	5         1         1           6         1         2           7         2         1           8         1         1           9         7         10         12           10         1         1         1           10         1         1         1           10         1         1         1           11         1         1         1           12         1         1         1           13         1         1         1           14         1         1         1           15         1         1         1           16         1         1         1         1           15         1         1         1         1           16         1         1         1         1           17         1         1         1         1           16         1         1         1         1           17         1         1         1         1           18         1         1         1         1           19         1         1	9         9           1         11           1         11           1         11           1         11           1         11           1         12           1         12           1         12           1         12           1         12           1         12           1         12           1         12           1         12           1         12           1         12           1         12           1         13           1         14           1         14           1         14           1         14           1         14           1         14           1         14           1         14           1         14	0         4(1)           0         6(1)           0         6(1)           0         7           0         1           0         1           0         1           0         1           0         1           0         1           1         1           0         1           1		
Junction	Tay B1/South S1 Courses Junction Nome Tay Street / High Street Fay Street / High Street South S1 / Junction Rd CrossFoods	Car Car Carvin Carv	4 00 30 30 30 30 30 30 30 30 30	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		5	2 999 919 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0         4017           0         6017           0         6017           0         7           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           1         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1		
Junction	Tay B1/South S1 Courses Junction Nome Tay Street / High Street Fay Street / High Street South S1 / Junction Rd CrossFoods	Car Car Cardon Carlos Cardon Engle Dealer Bas Crastin Backer Bas Michael Carlos Carlos Car Car Car Car Car Car Car Car Car Car	4 00 00 00 00 00 00 00 00 00 00	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	a         500           a         300           b         300           c         300	5         1           6         1           7         2           8         6           9         7           9         7           9         7           9         7           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1           1	2 999 919 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0         4017           0         6017           0         6017           0         7           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           1         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1		
Junction	Tay Br / South St Coorner Junction Nome Tay Struct / High Streat Tay Struct / High Streat Double Name Bouth Br / Dudge Bd Omstroads	Car Control Co	4 00 30 30 30 30 30 30 30 30 30	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		5	2 999 919 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0         4017           0         6017           0         6017           0         7           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           1         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1           0         1		
hareties 19	Tay B1 / South S1 Coorner Junction Notes Tay Street / High Street Junction Notes Bouch B1 / Junctes B1 Omstreed	Car Car Cardon Carlos Cardon Engle Dealer Bas Crastin Backer Bas Michael Carlos Carlos Car Car Car Car Car Car Car Car Car Car	4 00 0 00	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	7         21           8         6           8         15           9         15           9         15           9         15           9         12           9         12           9         12           9         12           9         14           1         12           9         14           1         15           1         15           1         15           1         15           1         15           1         15           1         15           1         15           1         15           1         15           1         17           1         17           1         17           1         17           1         17           1         17           1         17           1         17           1         17           1         17           1         17           1         17 <tr td=""></tr>	4         500           2         200           1         200           2         000           3         000           4         000           5         000           6         000           7         100           8         000           9         000           9         000           9         000           9         000           9         000           9         000           9         0000           9         0000           9         00000           9         00000           9         00000           9         000000           9         000000000000000000000000000000000000	5	P         99           1         11           1         11           1         11           2         11           3         11           4         12           7         15           1         15           1         15           1         15           1         15           1         15           1         15           1         15           2         10           1         10           1         10           1         10           1         10           1         10           1         10           1         10           1         11           1         11           1         11           1         11           1         11           1         11           1         11           1         11           1         11           1         11           1         11           1         11      1 <td>0         4017           0         6017           0         70           0         70           0         1           1         1</td> <td>Dunities 8d [stal] 19 Metaraway</td> <td></td>	0         4017           0         6017           0         70           0         70           0         1           1         1	Dunities 8d [stal] 19 Metaraway	
hareties 19	Tay B / South St Coorner Junction Nome Tay Street / High Street Fay Street / High Street South St / Your Street South St / Your Street Decision Notes Decision Notes Decision Notes	Car Control Co	4 as a second se	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	7         21           8         21           8         21           8         15           9         15           9         15           9         17           9         17           9         17           10         12           11         12           12         14           13         15           14         12           15         14           16         15           17         14           18         12           19         14           10         12           11         12           12         12           13         12           14         12           15         12           16         12           17         12           18         12           19         11           10         12           11         12           12         12           13         13           14         12           15         14 <td>•         500           •         600           •         <t< td=""><td>5</td><td>a         99           a         11           a         9           a         15           b         15           a         15           a         15           b         15           a         15           a         15           a         15           b         15           a         15           b         15           a         15           b         12           a         12           b         13           c         14           c         14           c         14           c         14           c         15           c         14           c         14           c         15           c         15           c         14           c         15</td><td>0         4017           0         6017           0         6017           0         6017           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         134           0         143           0         144           0         144           0         144           0         144</td><td>Decider 8d Total To Matarayey</td><td></td></t<></td>	•         500           •         600           • <t< td=""><td>5</td><td>a         99           a         11           a         9           a         15           b         15           a         15           a         15           b         15           a         15           a         15           a         15           b         15           a         15           b         15           a         15           b         12           a         12           b         13           c         14           c         14           c         14           c         14           c         15           c         14           c         14           c         15           c         15           c         14           c         15</td><td>0         4017           0         6017           0         6017           0         6017           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         134           0         143           0         144           0         144           0         144           0         144</td><td>Decider 8d Total To Matarayey</td><td></td></t<>	5	a         99           a         11           a         9           a         15           b         15           a         15           a         15           b         15           a         15           a         15           a         15           b         15           a         15           b         15           a         15           b         12           a         12           b         13           c         14           c         14           c         14           c         14           c         15           c         14           c         14           c         15           c         15           c         14           c         15	0         4017           0         6017           0         6017           0         6017           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         133           0         134           0         143           0         144           0         144           0         144           0         144	Decider 8d Total To Matarayey	
hareties 19	Tay B1/South S1 Coornel  Junction Nome Tay Street / High Street  Junction Nome Bouch B1 / Double B1  Direction Nome Database B2 / MOO/ AB1  Moretion Nome	Car Control Control Control Control Desire Data Control Desire Data Control Desire Data Control Contro	4 control of the second	2	2	a         500           a         200           b         200           c         200           c <t< td=""><td>5                                      </td><td>2        </td><td>0         4017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         70     <td>9960 • 627</td><td></td></td></t<>	5	2	0         4017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         70 <td>9960 • 627</td> <td></td>	9960 • 627	
hareties 19	Tay B1/South S1 Coornel  Junction Nome Tay Street / High Street  Junction Nome Bouch B1 / Double B1  Direction Nome Database B2 / MOO/ AB1  Moretion Nome	Car Control Co	4 as a second se	2	2   2   2   2   2   2   2   2   2   2	a         500           a         300           b         300           c         3000           c         <	5	a         99           a         11           a         9           a         15           b         15           a         15           a         15           b         15           a         15           a         15           a         15           b         15           a         15           b         15           a         15           b         12           a         12           b         13           c         14           c         14           c         14           c         14           c         15           c         14           c         14           c         15           c         15           c         14           c         15	0         4017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         70 <td>Ductifier Rd Total To Metorrany</td> <td></td>	Ductifier Rd Total To Metorrany	
hareties 10 hareties	Tay B1/South S1 Coornel  Junction Nome Tay Street / High Street  Junction Nome Bouch B1 / Double B1  Direction Nome Database B2 / MOO/ AB1  Monetion Nome	Car Control Control Co	4 control of the second	2	2	a         500           a         300           b         300           c         3000           c         <	5	2	0         4017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         70 <td>9960 623 193 60</td> <td></td>	9960 623 193 60	
hareties 10 hareties	Tay B1/South S1 Coornel  Junction Nome Tay Street / High Street  Junction Nome Bouch B1 / Double B1  Direction Nome Database B2 / MOO/ AB1  Monetion Nome	Car Car Carlor Cardon Declar Bas Crashe Baster Bas Crashe Baster Bas Michae Car Car Car Car Car Car Car Car Car Car	4 control of the second	2	2   2   2   2   2   2   2   2   2   2	a         500           a         300           b         300           c         3000           c         <	5	2	0         4017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         70 <td>9960 • 627</td> <td></td>	9960 • 627	
hareties 10 hareties	Junction Norma Tay Brief South St Common Tay Street / High Street Tay Street / High Street South St / Your Street South St / Your Street Daniel Br / Your Street Junction Norma Junction Norma	Car Carlor Control Con	4 control of the second	2	2   2   2   2   2   2   2   2   2   2	a         500           a         300           b         300           c         3000           c         <	5	2	0         4017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         6017           0         70 <td>9960 623 193 60</td> <td></td>	9960 623 193 60	
hareties 19	Junction Norma Tay Brief South St Common Tay Street / High Street Tay Street / High Street South St / Your Street South St / Your Street Daniel Br / Your Street Junction Norma Junction Norma	Car Cover Co	4 00 0 00	2	2	a         500           a         300           b         300           c         3000           c         <	5         1         1           6         1         2           7         20         1           8         1         1           9         1         1           10         1         1           11         1         1           12         1         1           13         1         1           14         1         1           15         1         1           16         1         1           17         1         1           18         1         1           19         1         1           10         1         1           11         1         1           12         1         1           13         1         1           14         1         1           15         1         1           16         1         1           17         1         1           18         1         1           19         1         1           10         1         1           10         1 <td>a         99           a         11           a         11           a         12           b         14           c         15           c         15           c         15           c         16           c         10           c         11           c         12           c         14           c         14</td> <td>a        </td> <td>3960 623 199 00 102 0 0 0 0</td> <td></td>	a         99           a         11           a         11           a         12           b         14           c         15           c         15           c         15           c         16           c         10           c         11           c         12           c         14	a	3960 623 199 00 102 0 0 0 0	
hareties 19	Junction Notes Tay Brief / South St Comment Tay Street / High Street Tay Street / High Street Tay Street / High Street Tay Street / High Street South Startes South Startes South Startes South Startes South Startes South Startes Street Startes Street Startes Startes Startes Startes Startes Startes Startes	Car Control Control Co	4 control of the second	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2         2         2         2           2         4         4         5           4         5         5         5           5         1         1         1           6         1         1         1         1           7         1         1         1         1         1           6         1	•         500           •         800           •         800           •         9000           •         9000           •         9000           •         9000           •         9000           •         9000           •         9000           •         9000           •         9000           •         9000           •         90000           • <td>5         1           6         1           7         1           8         9           9         9           9         9           9         9           9         9           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           1</td> <td>a         99           a         11           a         12           b         14           c         14           c         15           c         15           c         12           c         13           c         14           c         14</td> <td>0        </td> <td>03860 (223) (304) (305)</td> <td></td>	5         1           6         1           7         1           8         9           9         9           9         9           9         9           9         9           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           1	a         99           a         11           a         12           b         14           c         14           c         15           c         15           c         12           c         13           c         14	0	03860 (223) (304) (305)	
hareties 19	Junction Northe Tay BY Jonat Dr Charme Tay Street / High Street Tay Street / High Street Daniel Dr Charles Bi Draction Northe Daniel BJ / Daniel Bi Daniel BJ / WOO / ABI Michney Junction	Car Control Control Co	4 control of the second	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2         2         2         2           2         4         4         5           4         5         5         5           5         1         1         1           6         1         1         1         1           7         1         1         1         1         1           6         1	a         500           a         200           b         200           c         200	5	a         99           a         11           a         11           a         12           b         14           c         15           c         15           c         15           c         16           c         10           c         11           c         12           c         14	0	03860 (223) (304) (305)	
hareties 19	Junction Norme Tay Street / High Street Tay Street / High Street Days Street / High Street / High Street / High Street Days Street / High Street / High Street / High Street Days Street / High Stre	Car Control Control Co	4 00 0 00	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2         2         2         2           2         4         4         5           4         5         5         5           5         1         1         1           6         1         1         1         1           7         1         1         1         1         1           6         1	a         500           a         300           b         300           c         3000           c         <	5	a         99           a         11           a         12           b         14           c         14           c         15           c         15           c         12           c         13           c         14	0	3960 623 199 00 102 0 0 0 0	

### Further Assessment of Air Quality

Non-stars Non-stars Stars		Objective and Object 5	Market OF Facility	Tala paradirada	Oberther and Ob Americant	Tele Deed Assured	Male Of Assessed			
21 Dundee Rd / Strathmore St /	Arm	Strathmore Street Exit	Main St Exit 545 716	Isla Road Exit 8 88	Strathmore St Approach 463	Isla Road Approach 254	Main St Approach 1 406	7		
Crossroads	LGV		10	5 17		40	6 77			
	OGV1		210 24				3 26			
	OGV2		63 6	0 3	44					
	Single Decker Bus	1	193 16	5 44	121	3	9 24			
	Double Decker Bus Minibus		0 4	0		1	0	1		
	Coach			0		1	0	*		
	Total	34	172 879	6 118	574	306	3 545	3		
	96HDV	1-	4% 59	6 109	69	49	% 119	5		
	Speed (mph)		27	9 3		5	5	3		
Junction Junction Name	Speed (kmph)		44 1				8 1:	2		
22 Gowrie St / Bowerswell Rd /	Arm	Dundee Rd Exit	Gowrie St Exit 285	Bowerswil Rd Approach 3 56	Dundee Rd Approach 256	Gowrie St Approach 342	0			
Dundee Rd T Junction	LGV	6	i48 49	0 9	44	60	2			
	OGV1	9	252 27 77 10	3 3:	27:	3 22	1			
	OGV2		77 10	2 1	103	6				
	Single Decker Bus		49 12			4	9			
	Double Decker Bus Minibus		0	0			8			
	Minious		0	0	,	•	0			
	Total	46	384	3 71	349	435	1			
	%HDV		8% 139	6 89	149	8	*			
	Speed (mph)		14 1	0	21	2	0			
	Speed (kmph)		22 1		3					
	Arm	Edinburgh Rd Nthbnd Exit	Edinburgh Rd Sthbnd Exit	Glenearn Rd Exit	Edinburgh Rd Nthbnd Approach	Glenearn Rd Approach	Edinburgh Rd Sthbnd Approach			
23 Edinburgh Road / Glenearn R	Car LGV	32	248 277	9 204 3 37	430	242				
	OGV1		221 20	7 16	34	955 V				
	OGV2		105 4							
	Single Decker Bus		179 14				9 11			
	Double Decker Bus		0	0			0	0		
	Minibus		0	0	0		0	2		
	Coach		4 366	1 274	593	297	0	1		
	Total 96HDV		421 366 1% 115					2		
	Speed (mph)	-	17 2	8 127		0	4 107	2		
	Speed (kmph)		28 4		1		7 1	1		
Junction Junction Name	Arm	Tesco Exit	Tesco Approach	Breadalbane Terrace Approach	Edinburgh Rd Nthbnd Approach	Edinburgh Rd Sthbnd Approach	Breadalbane Terrace Exit	Edinburgh Rd Sthbnd Exit	Edinburgh Rd Nthbnd Exit	
24 Edinburgh Rd / Tesco /	Car	7	798 55	0 69	333	277		5 1918	4302	2
Breadalbane Terrace	LGV	1	126 13	0 12	69	48	3 71	357	879	9
	OGV1 OGV2		14 2 4 1		30	20		3 168 7 46		
	Single Decker Bus		7	1 2						
	Double Decker Bus		0	0		1	0	1 100	0	
	Minibus		0	0		1	0	0	0	2
	Coach		0	0		•	4 1	4	4	+
	Total		0 71 71	8 96	465					
	Total 96HDV		396 59	8 96 6 159	465					
	Total %HDV Speed (mph)		3% 5%	8 96 6 159 5 1	465	119	% 179 8	5 13% 3 5	13%	5
Junction Junction Name	Total 96HDV		396 59	8 96 6 159 5 1	465	119	% 179 8 2	5 13% 3 5		5
Junction Junction Name 25 Edinburgh Rd / Friarton Rd	Total 96HDV Speed (mph) Speed (kmph) Arm Car	Friarton Rd Exit	3% 55 18 1 29 2 Edinburgh Rd Sthbnd Exit	96 96 159 5 11 4 Edinburgh Rd Nthbnd Exit 6 423	465: 139 Edinburgh Rd Nthbnd Approach 4711	115 Friarton Rd Approach 66	6 179 8 2 2 Edinburgh Rd Sthbnd Approach 5 279	13% 3 5 8 8	13%	5
Junction Junction Name 25 Edinburgh Rd / Friarton Rd	Total 96HDV Speed (mph) Speed (kmph) Arm Car LGV	Friarton Rd Exit	3% 55 18 1 29 2 Edinburgh Rd Sthbnd Exit 189 284 221 51	96 96 6 159 5 1 4 23 6 423 8 8 81	465: 139 Edinburgh Rd Nthbnd Approach 4711 888	115 Friarton Rd Approach 66 12	6 179 8 1 2 Edinburgh Rd Sthbnd Approach 5 279 3 54	13% 5 8 8 8	13%	5
Junction Junction Nome 25 Edinburgh Rd / Friarton Rd	Total 96HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1	Friarton Rd Exit	3% 57 18 1 29 2 Edinburgh Rd Sthbod Exit 189 284 121 51 81 322	96 96 6 159 5 1 4 Edinburgh Rd Nthbnd Exit 6 423 8 61 9 377	465: 139 Edinburgh Rd Nthbnd Approach 4711 889	Friarton Rd Approach 66 22	8 179 9 1 2 Edinburgh Rd Sthbnd Approach 3 52 4 21	5 13% 8 5 8 8 9	13%	5
Junction Junction Name 25 Edinburgh Rd / Friarton Rd	Total 96HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1 OGV1 OGV2	Friarton Rd Exit	3% 59 18 1 29 Edinburgh Rd Sthbod Exit 20 20 20 20 21 51 31 32 25 7	a 96 6 159 5 <b>Control Control </b>	4455 139 Edinburgh Rd Nthbnd Approach 471 88 411 19	119 Friarton Rd Approach 66 12 21 6 6 4 4	8 179 8 2 2 2 8 2 8 2 8 2 8 4 9 3 9 54 4 211 6 5 8 5 9	5 13% 8 5 8 8 8	13%	5
Junction Junction Name 25 Edinburgh Rd / Friarton Rd	Total 96HDV Speed (mph) Arm Car LGV OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus	Friarton Rd Exit	3%         57           12         1           28         1           29         Edinburgh Rd Sthbnd Exit           209         284           21         51           31         32           25         7           63         21	a 96 6 159 5 <b>Control Control </b>	4655 139 139 Edinburgh Rd Nthbnd Approach 4711 88 141 19 19 27	Friarton Rd Approach 66 12 21 4 7	8 179 9 1 2 Edinburgh Rd Sthbnd Approach 3 52 4 21	5 13% 8 5 8 8 8	13%	5
Junction Junction Name 25 Edinburgh Rd / Friarton Rd	Total %HDV Speed (mph) Speed (kmph) Arm Car CGV OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	Friarton Rd Exit	3% 57 28 29 Edinburgh Rd Sthbnd Exit 299 284 211 51 31 32 25 7 33 221	a 96 6 159 5 1 Edinburgh Rd Nthbnd Exit 8 8 81 9 377 4 177 0 23	4655 139 139 Edinburgh Rd Nthbnd Approach 4711 88 141 19 19 27	Friarton Rd Approach 66 12 21 4 7	8 177 177 2 Edinburgh Rd Sthbnd Approach 3 54 4 211 6 55 4 177 4 177	5 13% 8 5 8 8 8	13%	5
Junction Junction Name 25 Edinburgh Rd / Friarton Rd	Total %HDV Speed (mph) Speed (mph) Arm Car Car CGV1 OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus Double Decker Bus Coach	Friarton Rd Exit 10 2	3%         55           18         11           29         2           Edinburgh Rd Sthbund Exit         284           18         11           19         21           21         52           25         72           0         0	a 966 b 159 5 1 c dinburgh Rd Nthbnd Exit 9 81 9	4455 133 Edinburgh Rd Nthbnd Approach 4711 89 141 191 27 27	Friarton Rd Approach 62 22 22 24 4 7	6 1779 6 177 6 177 7 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	s 1396 9 5 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	13%	5
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Junction Nume 25 Ednburgh Rd / Friarton Rd	Total           SkHOV           SkHOV           Speed (mph)           Speed (kmph)           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Coach           Total           Speed (mph)	Friarton Rd Exit	3%         5           16         12           20         20           21         20           221         51           25         77           26         21           0         0           0         10           17         390           19         15           10         22	0 996 6 1595 7 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	44055 139 Edinburgh Rd Mthbnd Approach 99 99 99 99 99 99 99 99 99 99 99 99 99	111 Friarton Rd Approach 62 21 21 7 7 7 30 30 30 30 30 30 30 30 30 30 30 30 30	6 177 6 Uniburgh Rd Stibind Approach 9 4 292 4 293 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	13%	5
Junction Junction Nome 26 Edinburgh Rd / Friarton Rd	Total           96HOV           Speed (mph)           Speed (kmph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           Speed (kmph)           Speed (kmph)           Speed (kmph)	Friorton Rd Exit 10 2 1 1 1	3%         5           16         11           29         20           Edinburgh Rd Sthöhd Exit         284           392         24           21         51           63         22           0         0           0         0           177         398           195         15           10         22	0         96           96         159           5         1           6         169           9         6           9         0           9         177           0         22           0         149           0         149           0         149           0         149           149         149           149         149           149         149           149         149           140         149           140         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149           141         149  <	4455 139 Edinburgh Rd Nthbnd Approach 471 141 141 141 141 141 141 141 141 141	Friarton Rd Approach 66 22 22 4 4 7 11 12 12 12 12 12 12 12 12 12 12 12 12	0         17           2         Edinburgh Rd Sthbud Approach         1           3         27         29           4         29         29           5         3         29           6         39         39           7         30         30           8         30         32           9         31         35	5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	13%	5
Junction Nome 25 Edinburgh Rd / Friston Rd	Total           Speed (imph)           Speed (imph)           Am           Cacv           Cacv           OGV1           Ocklass           Double Decker Bus           Double Decker Bus           Minibus           Speed (imph)           Speed (imph)           Speed (imph)           Speed (imph)           Speed (imph)           Car	Friarton Rd Exit	9%, 9%, 9%, 9%, 9%, 9%, 9%, 9%, 9%, 9%,	i         96           i         15           i         disburgh Rd Nthbud Exit	Edinburgh Rd Nthbnd Approach 971 971 971 971 971 971 971 972 973 974 974 974 974 974 974 974 974 974 974	Friarton Rd Approach 612 21 21 21 21 21 21 21 21 21 21 21 30 30 50 50 50 50 50 50 50 50 50 50 50 50 50	6   177 2   Cellburgh Rd Sthbud Approach 5   2   2   1 6   2   2   2   2   2   2   2   2   2	5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	13%	5
Junction Name 25 Edinburgh Rd / Priarton Rd Junction Name 26 Edinburgh Rd / Bhynd Rd	Total           %HOV           Speed (mph)           Speed (mph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           %HOV V           Speed (mph)           Speed (mph)           Car           Car           LGV	Friarton Rd Exit	3%         5           10         1           29         Edinburgh Rd Sthbnd Euk           29         21           20         25           21         55           22         7           63         22           0         0           77         3989           19%         15           10         1           2         1           2         1	Image: Constraint of the second sec	4955 139 Edinburgh Rd Nthbrid Approach 411 921 932 941 941 941 941 941 941 941 941	Frierton Rd Approach 66 12 12 14 12 12 12 12 12 12 12 12 12 12 12 12 12	•         179           2         1           2         1           2         1           3         2           4         25           4         21           0         1           0         177           0         177           0         177           0         172           0         172           0         172           0         172           0         172           0         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         123           1         124	5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	13%	5
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Junction Name 25 Edhburgh Rd / Fnarton Rd Junction Junction Name 26 Edhburgh Rd / Rhynd Rd	Total           Speed (mph)           Speed (mph)           Speed (mph)           Arm           LG           LG           Car           LG           Double Decker Bus           Double Decker Bus           Double Decker Bus           Speed (mph)           Speed (mph)           Speed (mph)           LG           LG           Coch           Coch           Coch           LG           LG           Coch	Friarton Rd Exit	198         19           10         11           20         Edinburgh Rd Sthbud Exht           21         25           22         25           23         22           24         27           25         27           26         22           0         24           10         10           11         Edinburgh Rd Sthbud Exht           12         Edinburgh Rd Sthbud Exht           21         4	Image: Constraint of the second sec	edinburgh Rd Nthbnd Approach 139 60 90 90 149 199 199 199 199 199 207 20 199 199 218 218 218 218 218 218 218 218 219 219 219 219 219 219 219 219 219 219	111 Friarton Rd Approach 66 12 12 12 12 12 12 12 12 12 12 12 12 12	•         179           2         12           2         12           2         13           2         14           2         12           4         22           5         17           6         17           7         17           8         17           9         17           10         177           10 <td>5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9</td> <td>13%</td> <td>5</td>	5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	13%	5
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Junction Name 25 Edinburgh Rd / Fnarton Rd Sunction Junction Name 26 Edinburgh Rd / Rhynd Rd	Total           Speed (mph)           Single Decker Bus           Minibus           Coach           Total           Speed (mph)           Speed (mph) </td <td>Friarton Rd Exit</td> <td>198         19           10         12           29         Edinburgh Rd Sthbuñ Eaki           21         51           22         15           23         22           24         77           25         27           26         22           0         15           10         15           11         12           12         10           14         15           15         12           16         12           17         398           19         15           21         40           24         79           0         19           0         19           0         19           0         312           0         312</td> <td>Image: Constraint of the second sec</td> <td>4955 139 Edinburgh Rd Nthbnd Approach 471 471 19 277 26 218 20 218 218 218 218 218 218 218 218 218 218</td> <td>Frierton Rd Approach 66 12 12 12 12 12 12 12 12 12 12 12 12 12</td> <td>•         179           2         1           2         1           2         1           3         27           4         22           6         21           7         1           8         1           9         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           10         1           11         1           <t< td=""><td>5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9</td><td>13%</td><td>5</td></t<></td>	Friarton Rd Exit	198         19           10         12           29         Edinburgh Rd Sthbuñ Eaki           21         51           22         15           23         22           24         77           25         27           26         22           0         15           10         15           11         12           12         10           14         15           15         12           16         12           17         398           19         15           21         40           24         79           0         19           0         19           0         19           0         312           0         312	Image: Constraint of the second sec	4955 139 Edinburgh Rd Nthbnd Approach 471 471 19 277 26 218 20 218 218 218 218 218 218 218 218 218 218	Frierton Rd Approach 66 12 12 12 12 12 12 12 12 12 12 12 12 12	•         179           2         1           2         1           2         1           3         27           4         22           6         21           7         1           8         1           9         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           10         1           11         1 <t< td=""><td>5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9</td><td>13%</td><td>5</td></t<>	5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	13%	5
Junction Nume 25 Ednburgh Rd / Friarton Rd Junction Nume 26 Ednburgh Rd / Physid Rd	Total           Speed (mph)           Speed (mph)           Speed (mph)           Cov           Cov           OCV1           OCV2           Double Decker Bus           Double Decker Bus           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           OV           Single Decker Bus           Double Decker Bus           Minbus           Total           Total           OV1           OV2           OV1           OV2 </td <td>Friarton Rd Exit</td> <td>3%         6           9         12           Edinburgh Rd Sthbud Exit         2           92         6           92         7           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         19           9         19           9         19           9         19           9         19           9         19           9         19           9         19           9         19</td> <td>i         99           i         15           clinburgh Rd Nthbod Exit         22           g         9           g         17           g         17           g         17           g         17           g         17           g         17           g         12           g         19           g         12           g         12           g         12           g         12           g         12           g         14           g         14</td> <td>46555 139 199 199 199 199 199 199 199 199 199</td> <td>111 Friarton Rd Approach 66 12 12 12 12 12 12 12 12 12 12</td> <td>0         17           2         Edinburgh Rd Bthbnd Approach         27           3         27           4         29           5         29           0         17           0         177           0         177           0         27           0         277           0         277           0         277           0         277           0         277           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           10         29           11         29           12         29           13         29           14         29           15         29</td> <td>5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9</td> <td>13%</td> <td>5</td>	Friarton Rd Exit	3%         6           9         12           Edinburgh Rd Sthbud Exit         2           92         6           92         7           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         19           9         19           9         19           9         19           9         19           9         19           9         19           9         19           9         19	i         99           i         15           clinburgh Rd Nthbod Exit         22           g         9           g         17           g         17           g         17           g         17           g         17           g         17           g         12           g         19           g         12           g         12           g         12           g         12           g         12           g         14           g         14	46555 139 199 199 199 199 199 199 199 199 199	111 Friarton Rd Approach 66 12 12 12 12 12 12 12 12 12 12	0         17           2         Edinburgh Rd Bthbnd Approach         27           3         27           4         29           5         29           0         17           0         177           0         177           0         27           0         277           0         277           0         277           0         277           0         277           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           0         29           10         29           11         29           12         29           13         29           14         29           15         29	5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	13%	5
Junction Name 25 Edinburgh Rd / Friarton Rd Junction Name 26 Edinburgh Rd / Rhynd Rd	Total           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Car           Could becker Bus           Minibus           Could becker Bus           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Car           Cavi           Covi           Double Decker Bus           Minibus           Covi           Single Decker Bus           Minbus           Covi           Single Decker Bus           Single Decker Bus           Single Decker Bus           Covi           Covi           Single Decke	Friarton Rd Exit	9%, 9%, 9%, 9%, 9%, 9%, 9%, 9%, 9%, 9%,	Image: Constraint of the second sec	4655 139 Edinburgh Rd Nthbnd Approach 471 471 471 471 471 471 471 471	111 Frierton Rd Approach 66 22 22 22 22 22 22 22 22 22 22 22 22	•         171           2         1           2         1           2         1           2         1           2         1           2         1           2         5           4         2           5         1           0         1           0         1           0         1           1         1	5 139% 3 55 8 8 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	13%	5
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Junction Nome 25 Edinburgh Rd / Friarton Rd Junction Name 26 Edinburgh Rd / Rhynd Rd Edinburgh Rd / Rhynd Rd	Total           Speed (mph)           Speed (mph)           Speed (mph)           An           An           Cov           OCV1           OCV2           Single Decker Bus           Single Decker Bus           Speed (mph)	Friarton Rd Exit	198         19           10         11           2         Edinburgh Rd Sthbud Exit           21         26           22         3           23         22           24         3           25         77           26         21           27         3           28         77           29         21           20         2           21         21           21         40           21         40           21         40           21         40           23         22           24         23           25         3	Image: Constraint of the second sec	edinburgh Rd Nthbnd Approach 139 67 87 87 87 87 87 87 87 87 87 8	111 Priarton Rd Approach  Fiarton Rd Approach  Edinburgh Rd Nthbnd Approach  Edinburgh Rd Nthbnd Approach  State S	Image: Second	5	13%	5
Junction Name 25 Edinburgh Rd / Friarton Rd Junction Name 26 Edinburgh Rd / Bhynd Rd 26 Edinburgh Rd / Bhynd Rd 3000000000000000000000000000000000000	Total           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Cav           OCV1           OCV2           Double Decker Bus           Double Decker Bus           Speed (mph)	Friarton Rd Exit	98         97           97         10           97         21           98         21           99         21           90         21           91         25           92         22           9         22           9         22           9         22           9         22           9         21           9         21           9         21           9         21           9         21           9         21           9         21           9         21           9         21           9         21           9         21           9         21           9         21           9         32           9         32           9         32           9         32           9         32           9         32           9         32           9         32           9         32           9         32 <t< td=""><td>i         99           i         15           i         11           i         12           i         14           i         14      <tr td=""></tr></td><td>4655 139 149 159 199 199 199 199 199 199 19</td><td>111 Friarton Rd Approach 66 12 12 12 12 12 12 12 12 12 12</td><td>Image: Second Second</td><td>5</td><td>13%</td><td>5</td></t<>	i         99           i         15           i         11           i         12           i         14           i         14 <tr td=""></tr>	4655 139 149 159 199 199 199 199 199 199 19	111 Friarton Rd Approach 66 12 12 12 12 12 12 12 12 12 12	Image: Second	5	13%	5
Junction Name 25 Edinburgh Rd / Friarton Rd Junction Name 26 Edinburgh Rd / Rhynd Rd 27 Edinburgh Rd / Rhynd Rd	Total           Speed (mph)	Friarton Rd Exit	198         19           10         11           20         Edinburgh Rd Sthbud Extl           20         21           20         25           21         25           25         27           26         22           0         21           0         22           0         21           10         21           110         21           12         24           13         24           14         79           15         21           16         21           17         190           18         21           19         21           10         21           10         21           10         21           10         21           10         21           10         21           10         21           10         21           10         21           10         21           10         21           10         21           10         21	Image: Constraint of the second sec	edinburgh Rd Nthbnd Approach 139 Edinburgh Rd Nthbnd Approach 149 149 149 149 149 149 149 149	Frierton Rd Approach         111           Frierton Rd Approach         66           12         2           2         2           4         4           7         7           111         7           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           112         30'           113         30'           114         30'           115         30'           116         30'           117         30'           118         30'           119         30'           110         30'	Important of slip to Broxden         171           Edinburgh Rd Sthbind Approach         275           Important of slip to Broxden         275		13%	5
Junction Name           25         Ednburgh Rd / Priarton Rd           Junction         Junction Name           26         Ednburgh Rd / Bhynd Rd           Junction         Junction Name           27         Ednburgh Road / M90 Motor	Total           Speed (mph)           Single Decker Bus           Minbus           Coach           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Coach           Coach           Coach           Coach           Coach           Speed (mph)           Coach	Friarton Rd Exit	99         99         91           10         11         12           Edinburgh Rd Sthbud Exit         29           21         26           22         77           23         21           0         22           0         22           11         15           12         20           13         21           14         21           15         21           16         21           17         398           18         21           19         0           19         0           19         0           19         0           10         15           21         40           21         40           22         9           23         9           24         21           25         9           26         9           27         28           28         9           29         9           20         9           21         21           22         9	Image: Constraint of the second sec	49655 139 Edinburgh Rd Nthbnd Approach 491 491 491 491 491 491 491 491	111           Frierton Rd Approach           66           12           21           22           4           7           111           12           22           131           132           14           15           16           17           18           19           111           111           12           111           12           131           131           132      <	Image: state of the s		13%	5
Junction Name 25 Edinburgh Rd / Friarton Rd Junction Name 26 Edinburgh Rd / Rhynd Rd Junction Name 27 Edinburgh Rd / Rhynd Rd	Total           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Social factors bus           Minibus           Coach           Total           Speed (mph)	Friarton Rd Exit	976         6           277         Edinburgh Rd Sthohd Exit           288         21           281         21           282         21           282         22           29         22           20         22           20         22           21         22           22         23           24         22           25         27           26         22           27         7           28         21           29         24           20         22           217         24           218         24           219         24           210         25           211         24           212         25           213         24           214         25           215         25           216         25           217         25           218         25           22         25           23         26           24         25           25         25	Image: Constraint of the second sec	49655 139 Edinburgh Rd Nthbnd Approach 491 491 491 491 491 491 491 491	111           Frierton Rd Approach           66           12           21           22           4           7           111           12           22           131           132           14           15           16           17           18           19           111           111           12           111           12           131           131           132      <	Image: state of the s		13%	5
Junction Name 25 Edinburgh Rd / Prarton Rd Junction Junction Name 26 Edinburgh Rd / Rhynd Rd 30 Edinburgh Rd / Rhynd Rd	Total           Speed (mph)           Single Decker Bus           Minibus           Coach           Total           Speed (mph)           Speed (mph) </td <td>Friarton Rd Exit</td> <td>99         99         91           10         11         12           Edinburgh Rd Sthbud Exit         29           21         26           22         77           23         21           0         22           0         22           11         15           12         20           13         21           14         21           15         21           16         21           17         398           18         21           19         0           19         0           19         0           19         0           10         15           21         40           21         40           22         9           23         9           24         21           25         9           26         9           27         28           28         9           29         9           20         9           21         21           22         9</td> <td>Image: Constraint of the second sec</td> <td>49655 139 Edinburgh Rd Nthbnd Approach 491 491 491 491 491 491 491 491</td> <td>111           Frierton Rd Approach           66           12           21           22           4           7           111           12           22           131           132           14           15           16           17           18           19           111           111           12           111           12           131           131           132      &lt;</td> <td>Image: state of the s</td> <td></td> <td>13%</td> <td>5</td>	Friarton Rd Exit	99         99         91           10         11         12           Edinburgh Rd Sthbud Exit         29           21         26           22         77           23         21           0         22           0         22           11         15           12         20           13         21           14         21           15         21           16         21           17         398           18         21           19         0           19         0           19         0           19         0           10         15           21         40           21         40           22         9           23         9           24         21           25         9           26         9           27         28           28         9           29         9           20         9           21         21           22         9	Image: Constraint of the second sec	49655 139 Edinburgh Rd Nthbnd Approach 491 491 491 491 491 491 491 491	111           Frierton Rd Approach           66           12           21           22           4           7           111           12           22           131           132           14           15           16           17           18           19           111           111           12           111           12           131           131           132      <	Image: state of the s		13%	5
Junction Name 25 Edinburgh Rd / Friarton Rd Junction Junction Name 26 Edinburgh Rd / Rhynd Rd 26 Edinburgh Rd / Rhynd Rd	Total           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Arr           Arr           OCV1           OCV2           Speed (mph)           Ocv1           Corr           Corr           Ocv2           Ocv4           Double Decker Bus           Double Decker Bus           Double Opecker Bus           Ocv1           Car           Speed (mph)           Speed mph           Speed mph           Speed mph           Speed mph           Speed mph           Speed mph <t< td=""><td>Friarton Rd Exit</td><td>976         6           277         Edinburgh Rd Sthohd Exit           288         21           281         21           282         21           282         22           29         22           20         22           20         22           21         22           22         23           24         22           25         27           26         22           27         7           28         21           29         24           20         22           217         24           218         24           219         24           210         25           211         24           212         25           213         24           214         25           215         25           216         25           217         25           218         25           22         25           23         26           24         25           25         25</td><td>Image: Constraint of the second sec</td><td>49655 139 Edinburgh Rd Nthbnd Approach 491 491 491 491 491 491 491 491</td><td>111           Frierton Rd Approach           66           12           21           22           4           7           111           12           21           22           4           4           4           111           12           12           131           132           132           133           134           135           136           137           138      <t< td=""><td>Image: state of the s</td><td></td><td>13%</td><td>5</td></t<></td></t<>	Friarton Rd Exit	976         6           277         Edinburgh Rd Sthohd Exit           288         21           281         21           282         21           282         22           29         22           20         22           20         22           21         22           22         23           24         22           25         27           26         22           27         7           28         21           29         24           20         22           217         24           218         24           219         24           210         25           211         24           212         25           213         24           214         25           215         25           216         25           217         25           218         25           22         25           23         26           24         25           25         25	Image: Constraint of the second sec	49655 139 Edinburgh Rd Nthbnd Approach 491 491 491 491 491 491 491 491	111           Frierton Rd Approach           66           12           21           22           4           7           111           12           21           22           4           4           4           111           12           12           131           132           132           133           134           135           136           137           138 <t< td=""><td>Image: state of the s</td><td></td><td>13%</td><td>5</td></t<>	Image: state of the s		13%	5
Junction Name 25 Edinburgh Rd / Prarton Rd Junction Junction Name 26 Edinburgh Rd / Rhynd Rd Junction Junction Name 27 Edinburgh Road / M90 Motor	Total           Speed (mph)           Single Decker Bus           Minibus           Coach           Total           Speed (mph)           Speed (mph) </td <td>Friarton Rd Exit</td> <td>976         6           277         Edinburgh Rd Sthohd Exit           288         21           281         21           282         21           282         22           29         22           20         22           20         22           21         22           22         23           24         22           25         27           26         22           27         7           28         21           29         24           20         22           217         24           218         24           219         24           210         25           211         24           212         25           213         24           214         25           215         25           216         25           217         25           218         25           22         25           23         26           24         25           25         25</td> <td>Image: Control of the second second</td> <td>4655 139 139 Edinburgh Rd Nthbnd Approach 471 471 471 471 471 471 471 471</td> <td>Frierton Rd Approach         11           Frierton Rd Approach         66           12         12           24         12           24         4           4         4           4         4           4         4           4         4           6         623           4         4</td> <td>Important of slip to Broxden         171           Edinburgh Rd Sthbind Approach         275           Important of slip to Broxden         <t< td=""><td><ul> <li>1.3%</li> <li>1.3%</li> <li>3</li> <li>3</li> <li>3</li> <li>3</li> <li>4</li> <li>4</li> <li>4</li> <li>4</li> <li>4</li> <li>4</li> <li>5</li> <li>4</li> <li>5</li> <li>5</li> <li>5</li> <li>6</li> <li>7</li> <li>7</li> <li>8</li> <li>8</li> <li>9</li> <li>9&lt;</li></ul></td><td>13%</td><td>5</td></t<></td>	Friarton Rd Exit	976         6           277         Edinburgh Rd Sthohd Exit           288         21           281         21           282         21           282         22           29         22           20         22           20         22           21         22           22         23           24         22           25         27           26         22           27         7           28         21           29         24           20         22           217         24           218         24           219         24           210         25           211         24           212         25           213         24           214         25           215         25           216         25           217         25           218         25           22         25           23         26           24         25           25         25	Image: Control of the second	4655 139 139 Edinburgh Rd Nthbnd Approach 471 471 471 471 471 471 471 471	Frierton Rd Approach         11           Frierton Rd Approach         66           12         12           24         12           24         4           4         4           4         4           4         4           4         4           6         623           4         4	Important of slip to Broxden         171           Edinburgh Rd Sthbind Approach         275           Important of slip to Broxden         275           Important of slip to Broxden <t< td=""><td><ul> <li>1.3%</li> <li>1.3%</li> <li>3</li> <li>3</li> <li>3</li> <li>3</li> <li>4</li> <li>4</li> <li>4</li> <li>4</li> <li>4</li> <li>4</li> <li>5</li> <li>4</li> <li>5</li> <li>5</li> <li>5</li> <li>6</li> <li>7</li> <li>7</li> <li>8</li> <li>8</li> <li>9</li> <li>9&lt;</li></ul></td><td>13%</td><td>5</td></t<>	<ul> <li>1.3%</li> <li>1.3%</li> <li>3</li> <li>3</li> <li>3</li> <li>3</li> <li>4</li> <li>4</li> <li>4</li> <li>4</li> <li>4</li> <li>4</li> <li>5</li> <li>4</li> <li>5</li> <li>5</li> <li>5</li> <li>6</li> <li>7</li> <li>7</li> <li>8</li> <li>8</li> <li>9</li> <li>9&lt;</li></ul>	13%	5
Junction Name 25 Edinburgh Rd / Priarton Rd Junction Junction Name 26 Edinburgh Rd / Rhynd Rd Junction Junction Name 27 Edinburgh Rd / Rhynd Rd	Total           Speed (mph)           Car           Could packet Bus           Double Decket Bus           Minibus           Coach           Total           Speed (mph)	Friarton Rd Exit	978         978           279         20           281         20           281         20           281         20           292         20           203         20           204         20           205         20           205         20           206         20           207         20           208         20           209         20           200         20           201         20           201         20           201         20           201         20           201         20           201         20           201         20           201         20           201         20           202         20           203         20           204         20           205         20           206         20           207         20           208         20           209         20           201         20           202         20	Image: Constraint of the second sec	4655 139 139 147 147 147 147 147 147 147 149 149 149 149 149 149 149 149 149 149	111  Friarton Rd Approach  Friarton Rd Approach  Edinburgh Rd Nthbnd Approach  Edinburgh Rd Nthbnd Approach  State	Image: second		13%	5
Junction Name 25 Edinburgh Rd / Friarton Rd Junction Junction Name 26 Edinburgh Rd / Frlynd Rd Junction Junction Name 27 Edinburgh Road / M00 Motor	Total           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Car           Car           Covid           Single Decker Bus           Minbus           Coach           Speed (mph)           Speed (mph)           Speed (mph)           Coach           Cock           Ocvid Decker Bus           Minibus           Cock           Cock           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Cock           Cock           Cock           Cock           Cock           Cock           Cock           Cock           OV           Speed (mph)           Speed (mph)           Speed (mph)           Car           OV           Over           Over           Over           Outble Decker Bus           Outble <td>Friarton Rd Exit</td> <td>9%         9%         9           29         Edinburgh Rd Sthbud Exit         2           21         26         26           22         3         2           23         27         3           24         3         2           3         3         2           4         3         3           5         10         2           6         10         2           7         398         3           10         15         2           6         10         2           7         399         3           10         15         2           6         10         15           10         11         10           11         20         10           12         4         3           13         15         10           14         20         3           20         3         2           21         20         3           22         23         2           24         32         3           25         40         3</td> <td>Image: Constraint of the second sec</td> <td>edinburgh Rd Nthbnd Approach 139 Edinburgh Rd Nthbnd Approach 149 149 149 149 149 149 149 149</td> <td>Frierton Rd Approach         66           Frierton Rd Approach         61           11         12           21         12           22         4           4         7           5         11           6         62           6         62           6         62           14         62           6         62           6         62           6         62           6         62           6         62           6         62           6         62           6         62           6         62           6         72           6         73           73         73           74         74           75         74           75         74           75         74           75         74           75         74           75         74           75         74           75         74           75         74           75         74           <td< td=""><td>•        </td><td></td><td>13%</td><td>5</td></td<></td>	Friarton Rd Exit	9%         9%         9           29         Edinburgh Rd Sthbud Exit         2           21         26         26           22         3         2           23         27         3           24         3         2           3         3         2           4         3         3           5         10         2           6         10         2           7         398         3           10         15         2           6         10         2           7         399         3           10         15         2           6         10         15           10         11         10           11         20         10           12         4         3           13         15         10           14         20         3           20         3         2           21         20         3           22         23         2           24         32         3           25         40         3	Image: Constraint of the second sec	edinburgh Rd Nthbnd Approach 139 Edinburgh Rd Nthbnd Approach 149 149 149 149 149 149 149 149	Frierton Rd Approach         66           Frierton Rd Approach         61           11         12           21         12           22         4           4         7           5         11           6         62           6         62           6         62           14         62           6         62           6         62           6         62           6         62           6         62           6         62           6         62           6         62           6         62           6         72           6         73           73         73           74         74           75         74           75         74           75         74           75         74           75         74           75         74           75         74           75         74           75         74           75         74 <td< td=""><td>•        </td><td></td><td>13%</td><td>5</td></td<>	•		13%	5

### Unrestricted AEA/ED48360001/Draft

### Table A1.1e – 2018 with CCTMR AADT for Perth City Centre

2005 Base Average Peak - City			Р	c	P	E	E	c		
unctior Junction Name	Arm	A	В		D	E		G	н	
Inctior Junction Name	Arm	Caledonian Rd Nthbnd Exit	York Place Exit	Caledonian Rd Sthbnd Exit	Glasgow Road Exit	York Place Approach	Caledonian Rd Nthbnd Approach	Caledonian Rd Sthbnd Approa	Glasgow Rd Approach	
28 Glasgow Road / Caledonian		3474								
York Place Crossroads	LGV	45:	. 49	39	471	. 39-	4 36:	1 519	543	
	OGV1	132	16	59 12	5 167	17	2 91			
	OGV2	130				12			132	
	Single Decker Bus	73								
	Double Decker Bus	· · · · · · · · · · · · · · · · · · ·		n ,						
		1							, U	
	Minibus				4	+ :			2 0	
	Coach	2		7						
	Total	4261	488					3 4886		
	%HDV	89	12	96 109	5 12%	149	6 109	5 10%	10%	
	Speed (mph)	13		15 1	7 19		a .	2	11	
	Speed (kmph)	27		1 2			7		18	
action Junction Name	Arm	York Place Estbnd Approach	New Row Nthbnd Exit	York Place Estond Exit	New Row Sthbnd Exit	York Place Wstbnd Exit	New Row Nthbnd Approach	York Place Wstbnd Approach		
29 York Place / New Row	Car	4530		06 S00						
	LGV	546				44				
	OGV1	154		51 20	9 33	15	8 5'	7 169	70	
	OGV2	99		26 11	9 24	8	6 21	92	2 44	
	Single Decker Bus	22		37 24						
	Double Decker Bus			0 24						
	Minibus				3 13		2 (			
	Coach			0	7 0					
	Total	5564	211	14 617	3 1186	445	1 1670	5 5194	1855	
	%HDV	10%		96 109						
	Speed (mph)	31					e	5 21		
	Speed (kmph)	49		17 1				33	9	
ctior Junction Name	Arm	South St Estbnd Exit	Scott St Sthbnd Exit	Scott St Nthbnd Exit	Scott St Sthbnd Approach	Scott St Nthbnd Approach	South St Estbnd Approach			
30 South St / Scott St	Car	5863	240	24 213	3 1958	213:	2 657			
	LGV	682								
	OGV1	213								
	OGV2	10:		52 5						
	Single Decker Bus	141		30 15						
	Double Decker Bus	(	1	0	o c	1	0 (	)		
	Minibus	2		2 1	1 3	1	1	2		
	Coach			1				-		
	cuach									
	Total	7009								
	%HDV	89	16	% 139	6 12%	119	6 109	5		
	Speed (mph)	19		12 2	3 6		4 1:	1		
	Speed (kmph)	31		30			7 18			
nctiorJunction Name	Arm	County Place Wstbnd Exit	Sth Methven St Exit	King St Approach	Sth Methven St Approach	County Place Estbnd Approach	South St Exit	·		
ne dor punction Name	ann									
31 County Place / Sth Methy		4205	140			. 500				
King St	LGV	493								
	OGV1	169	6	52 27	3 130	20	9 323	3		
	OGV2	92		31 13	79	11	9 19	1		
	Single Decker Bus	211		18 18						
	Double Decker Bus			0		1				
	Minibus	15		0	4 13	1	0 (	3		
	Coach	(	1	0	o c		7	7		
	Total	5194	173	34 666	4 3381	617	8 806			
	%HDV	12%								
	Speed (mph)	21		17 1		1				
	Speed (kmph)	33		1	9 5	2				
nctior Junction Name	Arm	South St Approach	Tay St Nthbnd Exit	Queens Bridge Exit	Tay St Sthbnd Exit	Tay St Sthbnd Approach	Tay St Nthbnd Approach	Queens Bridge Approach		
32 South St / Tay St	Car	716:		13 737	7097	210			)	
	LGV	855								
		284								
	OGV1 OGV2	147				2	5 111			
				11						
	Single Decker Bus	187		13						
	Double Decker Bus		1	0	) (	1	0 0	0 0	)	
	Minibus			4						
	Coach			0						
	Total	8646			3					
					6 896	49	6 99	5 9%	>	
	%HDV	99								
	%HDV			24 1			3	7 10	)	
	%HDV Speed (mph)	99		24 1	7 14		3	7 10		
tion Name	%HDV Speed (mph) Speed (kmph)	99		24 1	7 14	:	3 1	2 10	i .	
tion Junction Name	%HDV Speed (mph) Speed (kmph) Arm	99 12 Atholl St Wstbnd Approach	Atholl St Estbrid Exit	24 1 38 2 Kinnoull St Exit	7 14 7 23 Atholl St Wstbnd Exit	Barossa St Exit	3 5 Atholl St Estbrd approach	7 10 2 16 Kinnoull St Approach	Barossa St Approach	
ctior Junction Name 33 Atholl St / Kinnoull St	%HDV Speed (mph) Speed (kmph) Arm Car	9% 12 Atholi St Wstbnd Approach 4433	Atholl St Estbnd Exit 32:	24 1 18 2 Kinnoull St Exit 16 215	7 14 7 23 Atholl St Wstbnd Exit 5 5075	Barossa St Exit 37/	3 5 Atholl St Estbnd approach 6 431	7 10 2 1é Kinnoull St Approach 4 1745	Barossa St Approach 352	
ctior Junction Name 33 Atholi St / Kinnoull St	96HDV Speed (mph) Speed (kmph) Arm Car LGV	9% 11 Atholl St Wstbnd Approach 4433	Atholl St Estbnd Exit	24 1 88 2 Kinnoull St Exit 74 27	7 14 7 23 Atholl St Wstbnd Exit 5 5075 9 671	Barossa St Exit 37	3 5 11 Atholl St Estbrd approach 6 431 3 550	7 10 2 16 Kinnoull St Approach 1745 165	Barossa St Approach 352 33	
iction Junction Name 33 Atholii St / Kinnouli St	96HDV Speed (mph) Speed (kmph) Arm Car LGV	9% 11 Atholl St Wstbnd Approach 4433	Atholl St Estbnd Exit	24 1 18 2 Kinnoull St Exit 16 215	7 14 7 23 Atholl St Wstbnd Exit 5 5075 9 671	Barossa St Exit 37	3 5 11 Atholl St Estbrd approach 6 431 3 550	7 10 2 16 Kinnoull St Approach 1745 165	Barossa St Approach 352 33	
nctior Junction Name 33 Atholl St / Kinnoull St	%HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1	9% 12 Atholl St Wstbnd Approach 4433 653 77	Atholl St Estbod Exit	24 1 18 2 Kinnoull St Exit 16 215 24 27 80 2	7 14 23 Atholl St Wstbnd Exit 5 5 675 5 136	Barossa St Exit 37/ 7/ 1	3 Atholi St Estbnd approach 6 4314 3 551	7 10 2 16 Kinnoull St Approach 4 1745 0 166 7 96	Barossa St Approach 352 333 0 0	
nctiorJunction Name 33 Atholl St / Kinnoull St	%HDV           Speed (mph)           Speed (kmph)           Arm           Car           LGV           OGV1           OGV2	9% 11 Atholl St Wstond Approach 4433 653 7, 5	Atholl St Estbrid Exit 32: 31: 41: 32: 32: 32: 32: 32: 32: 32: 32: 32: 32	24 1 Kinnoull St Exit 16 215 14 27 10 2 13 4	7 14 7 23 Atholl St Wstbnd Exit 5 575 6 673 5 136 6 925	Barossa St Exit 37 7. 1	3 5 Atholl St Estbnd approach 6 431 3 55 1 7 6	7 10 2 16 4 1745 3 166 3 166 5 5 5	Barossa St Approach 352 33 0 0 9 9	
ctior Junction Name 33 Atholl St / Kinnoull St	%HDV Speed (mph) Arm Car LGV OGV1 OGV2 Single Decker Bus	9% 11 Atholl St Wstbnd Approach 4431 652 77 52 10	Atholl St Estbnd Exit	24 1 Kinnoull St Exit 16 215 16 215 16 225 17 44 227 10 2 13 4 19 13	7 11 Atholl St Wstbnd Exit 5 5075 9 6775 5 136 6 923 1 56	Barossa St Exit 377 7. 1	3 12 12 12 12 12 12 12 12 12 12 12 12 12	7 11 Kinnoull St Approach 4 1748 5 166 7 68 5 55 8 9 95	Barossa St Approach 352 33 0 9 9 13	
nctior Junction Name 33 Atholi St / Kinnoull St	96HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus	9% Atholl St Wstbnd Approach 4433 653 77 55 100	Atholl St Estbrid Exit	24 1 Kinnoull St Exit 4 215 4 27 50 225 4 27 50 22 3 4 59 13 0	7 11 3 Atholl St Wstbnd Exit 5 075 6 12 6 12 6 12 7 12	Barossa St Exit 37. 7. 1	3 Atholl St Estbnd approach 6 431 3 551 1 5 7 6 7 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0	7 10 10 11 12 14 1745 167 166 1745 167 168 1745 169 199 199 10 10 10 10 10 10 10 10 10 10	Barossa St Approach 352 33 0 0 9 13 0	
ictior Junction Name 33 Atholl St / Kinnoull St	9×HOV Speed (mph) Speed (kmph) Arm Car Car Car CGV1 OGV2 Single Decker Bus Double Decker Bus Double Decker Bus	9% 11 Atholl St Wstbnd Approach 4431 652 77 52 10	Atholl St Estbrid Exit	24 1 Kinnoull St Exit 16 215 16 215 16 225 17 44 227 10 2 13 4 19 13	7 11 3 Atholl St Wstbnd Exit 5 075 6 12 6 12 6 12 7 12	Barossa St Exit 377 7. 1	3 Atholl St Estbnd approach 6 431 3 551 1 5 7 6 7 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0	7 10 10 11 12 14 1745 167 166 1745 167 168 1745 169 199 199 10 10 10 10 10 10 10 10 10 10	Barossa St Approach 352 33 0 0 9 13 0	
ictior Junction Name 33 Atholi St / Kinnoull St	9×HOV Speed (mph) Speed (kmph) Arm Car Car Car CGV1 OGV2 Single Decker Bus Double Decker Bus Double Decker Bus	9% Atholl St Wstbnd Approach 4433 653 77 55 100	Atholl St Estbrid Exit 32: 33	24 1 Kinnoull St Exit 4 215 4 27 50 225 4 27 50 22 3 4 59 13 0	7 11 3 Atholl St Wstbnd Exit 5 075 6 12 6 12 6 12 7 12	Barossa St Exit 377 7 1	3 Atholl St Estbnd approach 6 431 3 551 1 5 7 6 7 1 3 0 0 0 0 0 0 0 0 0 0 0 0 0	7 11 Kinnoull St Approach 4 1745 5 55 9 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Barossa St Approach 352 33 30 9 9 5 13 0 0 0 0 0	
ictior Junction Name 33 Atholi St / Kinnoull St	94HDV Speed (mph) Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach	999 11 Atholl St Wstbnd Approach 4433 655 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Atholl St Estbnd Exit 322 3	24 1 Kinnoull St Exit 16 215 14 27 15 20 2 19 4 19 4 19 4 19 0 10 0 0	7 11 x tholl St Wstbnd Exit 5077 5 108 6 108 6 20 1 168 6 20 1 168 6 20 2 20 2 20 2 20 2 20 2 30 2	Barossa St Exit 37 7 1	3 5 6 11 6 14 6 1 6 1 7 1 7 7 1 1 7 1 1 1 1 1 1 1 1 1	7 111  Kinnoull St Approach 124 0 1744 0 166 7 86 6 55 0 55 0 50 0 0 0 0 0 0 0 0	Barossa St Approach 352 30 5 5 5 5 13 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
ctiorJunction Name 33 Atholi St / Kinnouli St	94HOV Speed (mph) Speed (kmph) Arm Car LGV OGV2 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total	98 Atholl St Wstbnd Approach 443 652 10 10 10 10 10 10 10 10 10 10 10 10 10	Atholl St Estland Exit 32: 33 37	24 1 1 Kinnoul St Exit 24 225 24 27 20 27 20 27 21 27 20 27 20 20 27 20 27	7 112 A tholl St Wstbnd Exit 9 6775 1375 14 9 19 19 19 19 19 19 19 19 19 19 19 19 19 19 19 19 1	Barossa St Exit 37 7 1 1 4 4 7 4 7	3 Athol St Estbnd approach Athol St Estbnd approach 3 3 431 5 5 7 7 6 7 1 9 0 0 0 0 0 0 0 5 2 2 5 2 2 5 2 5 2 5 2 5	7 110 Kinnoull St Approach 4 1745 5 1555 9 9 999 0 0 0 0 0 0 0 0 0 0 0 0	Barossa St Approach 5 352 5 0 5 0 5 0 9 5 13 0 0 0 0 0 0 407	
ctiorJunction Name 33 Atholi St / Kinnoull St	%HDV Speed (kmph) Arm Car LGV OGV1 OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total %HDV	999 11 Atholl St Wstbnd Approach 4433 655 100 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Atholl St Estbod Exit 32 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	24         1           Kinnoull St Exit         2           2         2           2         2           2         2           2         3           4         2           2         3           3         1           0         1           0         0           0         2           0         2           0         2           0         2           0         2           0         2           0         2           0         2           0         2           0         2           0         2           0         2           0         2           0         2           0         2           0         3           0         3           0         3           0         3           0         3           0         3           0         3           0         3           0         3           0	7 112 Atholf St Wathond Exit 5 5075 5 112 5 112	Barossa St Exit 37 7 1 1 47 59	3 Atholi St Estbnd approach 4 431 3 5 7 7 6 0 0 0 3 6 5 7 6 6 5 7 6 6 5 7 6 6 5 7 6 6 5 7 6 6 6 5 7 6 6 5 7 6 6 5 7 6 6 5 7 6 6 7 7 6 6 7 7 6 6 7 7 6 6 7 7 6 6 7 7 6 6 7 7 6 6 7 7 6 6 7 7 6 6 7 7 7 6 6 7 7 7 6 6 7 7 7 7 8 7 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 8 7 7 8 8 7 7 8 8 7 7 8 8 8 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8	7 110 Kinnoull St Approach 7 164 5 5 55 9 0 0 0 0 5 2145 5 139 7 0 5 139 7 0 5 139 7 0 5 139 7 0 7 0 7 0 7 0 7 0 7 0 7 0 7 0 7 0 7 0	Barossa St Approach 5 352 5 0 5 0 5 0 9 5 13 0 0 0 0 0 0 407	
ction Junction Name 33 Atholi St / Kinnoull St	94HOV Speed (mph) Speed (kmph) Arm Car LGV OGV2 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total	98 Atholl St Wstbnd Approach 443 652 10 10 10 10 10 10 10 10 10 10 10 10 10	Atholl St Estend Exit 32: 33 37 4	24 1 1 Kinnoul St Exit 24 225 24 27 20 27 20 27 21 27 20 27 20 20 27 20 27	7 111 Atholi St Wathod Exit 5 007 5 007	Barossa St Exit 37 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 Atholi St Estind approach I1 Atholi St Estind approach I I I I I I I I I I I I I I I I I I I	7 110 110 110 110 110 110 110 110	Barossa St Approach 5 352 5 0 5 0 5 0 9 5 13 0 0 0 0 0 0 407	

unction Junction Name	Arm	Atholl St Approach	Atholl St Exit	N Methven St Exit	Caledonian Rd Exit	Melville St Exit	N Methven St Approach	Melville St Approach	Caledonian Rd Approach	
	Car			1305 266						в
	LGV		671	546 34					2 840	3
	OGV1		139	57 11	4 246	6 3				7
	OGV2		92	66 8						
	Single Decker Bus			136 9						
	Double Decker Bus		0		0 (		0 0			2
	Minibus		0		0 13		0 11		0 0	
	Coach				0 0	0	0 0		0 0	2
			5140 5			1 137			9 8188	
	Total									
	%HDV		6%	5% 99						6
	Speed (mph)		3	20 2						5
	Speed (kmph)		5	33 34		8 3.	5 6	6 6	ō 8	В
ctior Junction Name	Arm	Atholl St Wstbnd	Atholl St Estbnd Exit	Atholl St Wstbnd Exit	Atholl St Estbnd Approach					
35 Atholl St / Stormont St	Car	5	5075 4	314 508	2 4305	5				
	LGV		671	550 67	1 546	6				
	OGV1		136	57 13	9 5	7				
	OGV2		92	66 93	2 66	6				
	Single Decker Bus		154	139 15						
	Double Decker Bus		0		0					
	Minibus		0			0				
			2							
	Coach		0			0				
	Total			5126 614						
	%HDV		6%	5% 69						
	Speed (mph)		9		3 20					
	Speed (kmph)		15	23	5 33					
ctiorJunction Name	Arm	Atholl St Estbnd Exit	Atholl St Wstbnd Exit	Rose Terrace Exit	Atholl St Estbnd Approach	Atholl St Wstbnd Approach	Rose Terrace Approach			
	Car		3670 4	125				+		
	LGY			653 15						
	OGV1		44	77 20						
	OGV2		42	53 11						
				103 4						
	Single Decker Bus Double Decker Bus		70							
			0				0 0			
	Minibus		0			0 .	4 0			
	Coach		0		0 (		0 0			
	Total			5328 149						
	96HDV		4%	4% 59	6 49	6 59	6 4%	÷		
	Speed (mph)		26	5 1	0 29	9 1	5 6	6		
	Speed (kmph)		42	8 1	6 47	7 2	4 9	4		
nctior Junction Name	Arm	Caledonian Road Exit	Atholl St Approach	Atholl Street to Barrack Street			k Barrack Street Approach to Caledoniar		Atholl St Exit	D+C
	Car			609 405	7 3104			4 4523		
Caledonian Road	LGY			803 44	9 438	8 43			4 840	
	OGV1			246 223						
				165 15						
	OGV2			205 17						
	Single Decker Bus									-
	Double Decker Bus		0		0 (		0 0			J
	Minibus		13	13 1			0 11			3
	Coach		0		0 3		2 0			3
	Total			3041 506	7 4162	2 416:	2 3397	7 5559		2
	96HDV		496	8% 119	6 159					
	Speed (mph)							6 8%	6 796	
	m 10 10		21	9 21		6 159 3 3			6 796	
				9 21	8	3 3	3 3	6 8%	6 796	
ction Junction Name	Speed (kmph) Arm	Bridge Lane Approach	34	9 21 14 4	8 5	3 3: 5 5:	3 3 4	6 896 3 4 4 6	6 796	
	Arm	Bridge Lane Approach	34 Perth Bridge Exit	9 21 14 Tay St Exit	8 S Charlotte St Exit	3 3 5 Tay St Approach	3 3 3 4 Charlotte St Approach	6 8% 3 4 4 6 Perth Bridge Approach	6 796 4 5 6 8	
38 Charlotte St / Tay St /	Arm Car	1	34 Perth Bridge Exit 1342 2	9 21 14 4: Tay St Exit 2702 234	18 3 5 S Charlotte St Exit 7 5570	3 3 5 5 Tay St Approach 0 139-	3 3 3 4 Charlotte St Approach 5 3678	6 896 3 4 4 6 Perth Bridge Approach 8 4204	6 796 4 5 6 8	
	Arm Car LGV	1	34 Perth Bridge Exit 1342 2 145	9 21 14 4: Tay St Exit 702 234 293 26	8 3 5 4 Charlotte St Exit 7 8 8 803	3 3: 5 5: Tay St Approach 0: 3 139.	3 3 3 Charlotte St Approach 5 3678 4 431	6 896 3 4 4 6 Perth Bridge Approach 8 4204 1 614	6 796 4 5 5 8 4 4	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1	1	34 Perth Bridge Exit 1342 2 145 24	9 21 14 4 Tay St Exit 2702 234 293 260 24 22	88 3 5 Charlotte St Exit 77 8 800 4 900	3 33 5 Tay St Approach 0 139 3 17 9 55	3 3 4 Charlotte St Approach 5 3678 4 431 9 44	6 896 3 4 4 Perth Bridge Approach 8 4204 1 614 4 20	6 796 4 5 6 8 4 4 4 0	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2	1	34 Perth Bridge Exit 1342 2 145 24 11	9 22 14 4 49 Tay St Exit 202 234 293 264 24 22 18 22	88 3 5 Charlotte St Exit 77 5577 88 800 4 99 6 6 66	3 33 5 Tay St Approach 0 139 3 177 9 55 8 44	3 3 3 3 3 3 4 Charlotte St Approach 5 3678 4 431 9 444 42 42	6 8% 3 4 Perth Bridge Approach 8 4204 1 614 4 200 2 15	6 796 4 5 6 8 4 4 4 0 5	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2 Single Decker Bus	1	34 Perth Bridge Exit 1342 2 145 24 11 68	9 21 14 Tay St Exit 700 239 293 266 24 22 18 22 103 26	88 577 577 577 5777 5777 5777 5777 5777	3 33 Tay St Approach 0 1399 3 177 9 58 8 4 1 1	3 3 4 Charlotte St Approach 5 3678 4 433 9 44 4 433 9 444 5 700	6 8% 3 4 Perth Bridge Approach 8 4204 1 614 4 20 2 15 0 119	6 796 4 5 6 8 4 4 4 5 9	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus	1	34 Perth Bridge Exit 1342 2 145 24 11	9 22 14 Tay St Exit 7002 293 264 24 293 265 18 22 10 22 10 10 22 10 22 10 22 10 22 10 22 10 22 10 22 10 22 10 22	8 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 Tay St Approach 139 3 17 9 5 8 4 1 1 0 1	3 3 4 Charlotte St Approach 5 3678 4 4 411 9 44 4 42 5 70 0 0 0	6 8% 3 4 4 Perth Bridge Approach 1 614 4 20 2 15 0 119 0 0	6 796 4 5 6 8 4 4 4 5 9	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	1	34 Perth Bridge Exit 1342 2 145 24 11 68 0 2	9 22 1 702 Start 293 284 293 284 294 293 24 29 18 29 19 29 10 20	18 57 57 57 57 57 57 57 57 57 57 57 57 57	3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	3 3 3 3 4 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4	6 88% 3 44 Perth Bridge Approach 8 4204 2 614 4 200 2 15 0 119 0 0 4	6 766 4 57 6 8 4 4 5 5 9 0 4	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach	1	34 Perth Bridge Exit 1342 2 24 11 68 0 2 2 0	9 22 14 25 Exit 702 234 293 260 24 23 10 22 10 22 0 2 0 2	8         3           Charlotte St Exit         9           7         \$\$77           8         80           4         90           6         66           9         144           0         0	3 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	3 3 3 4 Charlotte St Approach 5 3678 4 4 431 9 44 4 42 5 70 0 0 0 0 0 0	6 8% 8 44 Perth Bridge Approach 8 4204 4 201 2 15 0 119 0 0 0 4 0 4 0 4 0 4 0 4 0 4 0 4	6 7% 6 8 4 5 6 8 4 4 4 0 5 9 9 0 0 4 0 0	
38 Charlotte St / Tay St / West Bridge St / Bridge Land	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total	1	34 Perth Bridge Exit 1342 24 11 69 0 2 2 0 593 3	9 22 702 25 Exit 702 234 24 24 13 22 10	19 55 6690	a 3 Fay St Approach 139 3 177 9 187 8 4 4 4 4 4 6 186	3   charlotte St Approach 4   charlotte St Approach 4   4   4   4   4   4   4   4   4   4 	6 096 3 44 Perth Bridge Approach 8 4204 4 200 2 115 0 119 0 0 0 44 0 4976 6 4976	6 736 4 53 6 8 4 4 5 5 9 0 4 6	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV	1	34 Perth Bridge Exit 1342 2 24 11 68 0 2 2 0	9 22 14 54 54 54 54 54 54 54 54 54 54 54 54 54	8         3           Charlotte St Exit         5           7         5557           8         807           9         607           6         66           0         14           0         14           0         60           0         60           0         60           0         50           0         50           0         50           0         50           0         50           0         50	3 3 3 Tay St Approach 5 9 4 5 9 19 199 9 19 9 4 0 11 0 1 0 10 6 106 6 79	3 3 3 3 Charlotte St Approach 4 4 433 9 4444 6 444 6 7 0 0 0 0 0 0 7 4266 6 476 6 476	6 0% 9% 9 0% 9 0% 9 0% 9 0% 10 0% 11 10 0% 11 10 0% 11 10 0% 10 0%	6 776 4 5 6 8 4 4 9 9 0 4 4 0 5 9 0 4 4 0 5 5 5 6 6 6 6 6 6	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total %HDV Speed (mph)	1	34 Perth Bridge Exit 1342 24 11 69 0 2 2 0 593 3	9 22 14 51 641 234 19 51 641 234 19 20 234 19 20 234 19 20 234 19 20 234 10 20 24 20 24 20 24 20 25 20	iii)         3           Charlotte St Exit         557           Charlotte St Exit         600           4         000           90         040           00         04           00         04           00         04           00         05           00         64           01         65           02         64           03         64	a) 33 55 7 ay St Approach 0199 3 3 177 9 57 8 4 1 1 0 1 4 1 0 1 6 1168 6 1168 6 77 7	3 Charlotte St Approach 4 Charlotte St Approach 4 4 4 4 4 4 4 5 70 0 0 0 0 0 7 4 4 4 4 4 4 4 4 4 4 4 4 4	6 9% 9% 9 Perh Bridge Approach 8 0 4204 4 0 4204 1 6214 0 115 0 119 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4	6 736 6 8 4 5 6 8 4 9 0	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total 96HDV	1	34 Perth Bridge Exit 1342 24 11 69 0 2 2 0 593 3	9 22 14 54 54 54 54 54 54 54 54 54 54 54 54 54	iii)         3           Charlotte St Exit         557           Charlotte St Exit         600           4         000           90         040           00         04           00         04           00         04           00         05           00         64           01         65           02         64           03         64	a) 33 55 7 ay St Approach 0199 3 3 177 9 57 8 4 1 1 0 1 4 1 0 1 6 1168 6 1168 6 77 7	3 3 3 3 Charlotte St Approach 4 4 433 9 4444 6 444 6 7 0 0 0 0 0 0 7 4266 6 476 6 476	6 000 4 4 9 Perth Bridge Approach 6 4204 6 4204 6 4204 6 4204 6 4204 6 4204 0 419 0 40 0 40 0 4976 7 313 1 222	6 736 6 8 4 5 6 8 4 9 0	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total %HDV Speed (mph)	1	34 Parth Bridge Exit 145 24 115 0 2 2 0 0 2 3 3	9 22 199 St.Bit 199 St.Bit 202 24 24 29 20 20 20 20 20 20 20 20 20 20	iii         3           Charlotte St Exit         5777           iiii         600           iiiii         600           iiiiii         600           iiiiiii         600           iiiiiiiiii         600           iiiiiiiiiii         600           iiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	3 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	3 3 3 Charlotte St Approach 4 5 4 3875 9 4 3875 9 4 42 0 0 70 0 0 0 0 0 0 0 0 7 4266 4 4 48 4 48 4 48 4 48 4 48 4 48 4 48	6 000 4 4 9 Perth Bridge Approach 6 4204 6 4204 6 4204 6 4204 6 4204 6 4204 0 419 0 40 0 40 0 4976 7 313 1 222	6 776 4 5 6 8 4 4 9 9 0 4 4 0 5 9 0 4 4 0 5 5 9 0 4 5 5 2 2	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total Speed (kmph) Speed (kmph) Arm	1 East Bridge St Exit	34 Perth Bridge Exit 1342 2 145 10 60 0 59 11% 159 11% 11% 2 2 3 West Bridge St Exit	9 22 14 55 Exit 14 25 Exit 7020 294 2930 294 2930 294 1030 294 200 295 1030 295 1042 295 1045 1	a 5 Charlotte St Exit Charlotte St Exit Charlotte St Exit Charlotte St Exit Charlotte St Exit Charlotte St Approach St St Approach	3 3 3 Tay St Approach 0 19 9 3 17 6 5 1 17 6 4 1 1 1 1 6 6 1 19 6 6 1 19 6 10 6 10 7 7 9 7 9 7 9 7 9 7 9 1 1 19 1 11	3 3 3 3 3 3 3 3 4 3 3 4 4 5 5 4 Approach 4 4 5 5 4 Approach 4 4 4 5 5 7 7 7 0 0 7 7 0 0 7 7 0 0 7 7 4 266 7 7 0 0 7 7 4 266 7 7 1 4 266 7 7 1 4 266 7 7 1 4 266 7 1 1 1 4 4 4 5 1 1 1 1 1 1 1 1 1 1 1 1 1	6 876 976 976 976 976 976 976 976 976 976 976	7764           4         5           6         8           4         0           5         8           4         9           0         9      0         9           0         9           0         9           0         9           0         9           0         9           0         9           0         9           0         9	6 5 3 
39 Charlotte St / Tay St / West Bridge St / Bridge Lan West Bridge St / Bridge Lan	Arm           Car           Car           OGV1           OGV2           Single Decker Bus           Minibus           Coach           Total           Speed (mph)           Speed (mph)           Arm           Car	1 East Bridge St Exit	34 Perth Bridge Exit 2342 24 24 24 24 24 24 29 2 2 2 2 2 2 2 2	9 29 1 ay St Evit 203 204 24 203 204 24 203 204 24 203 204 24 204 20 20 2 20 2 20 2 20 2 20 2 30 2 30	a) 3 Charlotte St Exit 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 Charlotte St Appreach 4 4 4 5 7 7 7 7 7 7 7 7 7 7 7 7 7	6 0%% 4 4 4 4 4 4 6 5 5 5 5 5 5 5 5 5 5 5 5 5	6 7766 4 5 6 8 4 4 5 9 0 0 4 4 0 0 0 0 0 0 0 0 0 0 0 0 0	6 5 8 
38 Charlotte St / Tay St / West Bridge St / Bridge Land User St / Bridge Land toor Junction Name 39 Main St / Gowrie St / West Bridge St	Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total %HDV Speed (mph) Speed (mph) Arm Car LGV	1 East Bridge St Exit	34 Perth Bridge Exit 342 44 69 0 0 5599 5599 2 2 3 West Bridge St Exit 410 68 69 69 69 69 69 69 69 69 69 69 69 69 69	9 22 14 35 Edit 7020 234 Edit 293 264 293 264 293 264 293 264 295 295 294 295 294 295 294 295 294 295 294 204 495 294	a	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 4 3 3 4 4 3 3 4 4 4 3 1 4 4 3 1 4 4 4 3 1 4 4 4 4	6 0% 8 0% 9 with Bridge Approach 6 1 041 4 000 2 15 0 119 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6 776 4 5 6 8 4 4 4 4 4 0 0 0 0 0 0 0 0 0 0 0 0 0	6 5 3 
38 Charlotte St / Tay St / West Bridge St / Bridge Land Stor Auroction Name 39 Main St / Gowie St / West Bridge St	Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus           Minibus           Coach           Total           Systed (mph)           Speed (mph)           Arm           LGV           OGV1	1 East Bridge St Exit	34 Perth Bridge Exit 2342 24 24 24 24 20 22 20 22 20 22 20 22 20 22 20 20 20	9 22 7 25 Edit 24 7 25 Edit 24 7 26 7 26 7 26 7 26 7 26 7 26 7 27 7	8         3           Charlotte St Ent         557           Charlotte St Ent         657           4         000           4         000           9         144           0         66           0         62           0         66           0         66           0         60           0         60           0         600           0         600           0         600           0         600           0         400           0         450           0         450           0         3110	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 Charlotte St Approach 4 Charlotte St Approach 4 4 4 4 4 4 4 4 4 4 4 4 4	6 0% 8 Perth Bridge Approach 1 6474 8749 1 6474 400 0 15 0 01 0 0 0 40 0 40	6 776 4 55 6 8 8 4 4 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	6 5 3 4 1 4
38 Charlotte St / Tay St / West Bridge St / Bridge Lan West Bridge St / Bridge Lan Stor Junction Name 39 Main St / Gowie St / West Bridge St	Arm           Car           LGV           0GV1           0GV2           Single Decker Bus           Minibus           Coach           Total           Speed (mph)           Speed (mph)           Car           Car           Car           Car           OGV1           OGV1	1 East Bridge St Exit	34 Perth Bridge Exit 2342 245 25 20 0 0 20 20 20 20 20 20 20 20 20 20 20	9 29 179 20 Edit 179 20 Edit 293 204 24 293 204 293 204 204 204 20 20 20 20 20 20 20 20 20 20	a Charlotte St Exit Charlotte St Exit 30 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 4 3 3 3 3 5 5 5 5 5 5 5 5 5	6 0%% 4 9erth Bridge Approach 4 9erth Bridge Approach 4 1 1 1 2 2 2 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6 776 6 8 6 8 7 8 6 9 8 4 4 4 5 5 5 6 6 6 6 6 6 6 6 6 6 6 6 6	6 5 3 4 4 1 9
38 Charlotte St / Tay St / West Bridge St / Bridge Lan bridge St / Bridge Lan toor Junction Name 39 Main St / Gowrie St / West Bridge St	Arm           Car           CGV1           OGV1           OGV1           Single Decker Bus           Minibus           Cosch           Total           Speed (cmph)           Speed (mph)           Car           LGV           OGV1           OGV3           Signed Decker Bus           GoV1           OGV1           OGV1           OGV2	1 East Bridge St Exit	34 Perth Bridge Exit 346 347 347 347 347 347 347 347 347 347 347	9 22 14 52 Edit 702 22 Edit 703 22 Edit 994 294 199 20 294 199 20 103 294 103 294 104 295 105 295 105 295 106 295 107 295 108 295 109 295 10	8         3           Charlotte St Exit         557           Charlotte St Exit         657           4         00           4         00           9         144           0         144           0         65           5         568           6         568           6         668           0         456           6         100	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	6 0% 6 0% 1 0%	6 776/6 4 55 5 8 4 4 4 5 0 5 0 6 5 0 6 6 6 6 7 7 8 7 8 8 8 8 8 8 8 8 9 8 9 8 9 8 9 8	6 5 5 5 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
38 Charlotte St. / Tay St. / West Bridge St. / Bridge Lam bor Junction Name 39 Main St. Gowre St. / West Bridge St	Arm           Car           Car           LGV           OGV1           OGV2           Single Decker Bus           Minibus           Coach           Total           Speed (mph)           Arm           Car           LGV           OGV1           OGV2           Single Decker Bus           Double Decker Bus	1 East Bridge St Exit	34 Perth Bridge Exit 2442 245 26 26 20 20 20 20 20 20 20 20 20 20	9 23 9 25 Edit 10 25 Edit 10 20 20 24 20 24 20 29 20 20 20	a)	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	6 0% 8 Perth Bridge Approach 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0	6 7764 4 75 6 8 4 4 4 0 5 5 0 0 4 0 5 5 5 6 6 6 6 5 2 4 0 5 5 5 6 6 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8	6 5 5 5 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9
38 Charlotte St / Tay St / West Bridge St / Bridge Lam 29 Jancilion Name 39 Man St / Gowne St / West Bridge St	Arm           Car           CGr           LGV           OGV1           OGV2           Single Decker Bus           MinBus           Coach           Total           Speed (roph)           Arm           Car           LGV           OGV1           Car           Car           CoV1           OGV1           OGV2           Single Decker Bus           Double Decker Bus	1 East Bridge St Exit	34 Perth Bridge Exit 346 347 347 347 347 347 347 347 347 347 347	9 22 14 52 641 234 702 26 244 293 26 24 293 26 24 293 26 24 294 294 109 294 204 294 204 295 109 295 204 295 204 295 205 295	8 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	6 0%% 9 mth Bridge Approach 9 1 040 1 040 1 040 2 15 2 15 0 119 0 0 0 0 0 0 0 0 0 0 0 0 0 2 0 2	6 7764 4 75 6 8 4 4 4 0 5 5 0 0 4 0 5 5 5 6 6 6 6 5 2 4 0 5 5 5 6 6 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8	6 5 5 5 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9
38 Charlotte St / Tay St / West Bridge St / Bridge Lam color Ametion Name 39 Man St / Gowne St / West Bridge St	Arm Car (LGV OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 Speed (mph) Arm Car LGV LGV Car LGV Speed (mph) Speed (mph	1 East Bridge St Exit	34 54 54 54 54 54 54 5 5 5 5 5 5 5 5 5 5	9 23 7 25 Edit 7 29 5 Edit 7 203 29 24 29 24 29 24 29 24 29 24 29 24 29 24 29 24 29 25 20 26 29 27 29 28 29 29 29 29 29 29 29 29 29 20	0         3           Charlott St Ent         587           Charlott St Ent         687           4         60           9         144           0         62           0         62           0         62           0         52           6         668           0         52           6         632           0         455           0         452           0         131           0         101           2         0           0         0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 5 3 5 3 5 5 5 5	6 0% 8 mm b migg Approach 1 emb Bridge Approach 2 4004 1 4001 0 115 0 110 0 400 0 4000 0 400 0 4000 0 4000 0 400 0 400 0 400 0	6 7764 4 75 6 8 4 4 4 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	
38 Charlotte St / Tay St / West Bridge St / Bridge Lan (bio) west Bridge St / Bridge Lan (bio) west Bridge St / West Bridge St	Arm           Car           Car           LGV           OGV1           OGV2           Single Decker Bus           Minbus           Coach           Total           Speed (mph)           Speed (mph)           Single Decker Bus           OGV1           OGV1           OGV1           OGV1           OGV1           OGV1           OGV1           OGV2           OGV4           OGV4           OGV5           OGV6           OGV6           OGV1           OGV2           OGV3           OGV4           OGV4           OGV5           OGV6           OGV7           OGV6     <	1 East Bridge St Eart	34 Perth Bridge Exit 144 244 241 241 241 241 241 241 241 241	9 22 14 52 641 234 702 26 244 293 26 24 293 26 24 293 26 24 294 294 109 294 204 294 204 295 109 295 204 295 204 295 205 295	0         3           Charlott St Ent         587           Charlott St Ent         687           4         60           9         144           0         62           0         62           0         62           0         52           6         668           0         52           6         632           0         455           0         452           0         131           0         101           2         0           0         0	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 5 3 5 3 5 5 5 5	6 0% 8 mm bridge Approach 1 0mm bridge Approach 2 0% 1 0	6 7764 4 75 6 8 4 4 4 0 0 0 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0	
38 Charlotte St / Tay St / West Bridge St / Bridge Lam compared to the state of the state of the state sp Man St / Cowne St / West Bridge St	Arm Car (LGV OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 OGV1 Speed (mph) Arm Car LGV LGV Car LGV Speed (mph) Speed (mph	1 East Bridge St Eart	34 54 54 54 54 54 54 5 5 5 5 5 5 5 5 5 5	9 23 7 25 Edit 7 29 5 Edit 7 203 29 24 29 24 29 24 29 24 29 24 29 24 29 24 29 24 29 25 20 26 29 27 29 28 29 29 29 29 29 29 29 29 29 20	a)	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	6 0%% 9wrth Shidge Approach 4204 14 200 2 15 0 119 0 0 6 9977 6 9977 7 West Bridge St Approach 9 995 6 997 6 997 6 997 6 997 6 997 6 997 6 999 6 997 6 9	6 776 6 786 6 8 7 8 6 9 8 9 9 9 9 9 9 0 0 0 0 0 0 0 0 0 0	6 5 3 3 4 4 1 9 9 3 0 0 0 0 0 7
38 Charlotte St / Tay St / West Bridge St / Bridge Lam color Ametion Name 39 Man St / Gowne St / West Bridge St	Arm           Car           Car           LGV           OGV1           OGV2           Single Decker Bus           Minbus           Coach           Total           Speed (mph)           Speed (mph)           Single Decker Bus           OGV1           OGV1           OGV1           OGV1           OGV1           OGV1           OGV1           OGV2           OGV4           OGV4           OGV5           OGV6           OGV6           OGV1           OGV2           OGV3           OGV4           OGV4           OGV5           OGV6           OGV7           OGV6     <	1 East Bridge St Eart	34 Perth Bridge Exit 144 244 241 241 241 241 241 241 241 241	9 29 1 ay St Eult 29 20 24 29 20 24 29 20 20 20 20 20 20 20 20 20 20	a)         3           Charlotte St Ent         557           Charlotte St Ent         657           4         000           4         000           9         144           0         66           0         62           0         66           0         66           0         660           0         660           0         660           0         650           0         1310           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100           0         100	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	6 0%% 6 mmth Bridge Approach 1 0404 1 0404 2 015 2 140 2 140 2 140 2 140 3 1404 3 1405 3 1405 4 1405 4 1405 5 14	6 776,6 4 78,5 5 8 4 4 4 5 9 6 6 6 6 7 6 7 8 7 7 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 8 8 7 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8	6 5 5 4 4 4 4 1 3 3 3 3 3 3 3 3 3 3 3 5 5 5 5 5 5 5 5

Junction .	Average Peak - Major Roa	id Links (adjusted by									
		Am	Α	В	с	D	E	F	G	н	I
Junction		Arm	Dunkeld Rd Approach	A9 North Approach	A9 Western Bypass Approach	Dunkeld Rd Exit	A9 Western Bypass Exit	Industrial Estate Exit	A9 North Exit		-
1	Inversiment Roundabout	Car	1008	1803	9 1605	5 1338	11498	309			
		LGV	124						1960		
					202	6 28	149	72	1960		
		0GV1	36	1 120	2 138			2	1351		
		OGV2	30	1 75		0 22	1 663	10	1 574		
		Single Decker Bus	27	0 92	1 80			17	2 805		
		Double Decker Bus		0	0	0	0	1	0		
		Minibus		0	0	0	0	1	0		
		Coach			0	0	0	1			
		Total	1226	1 2331	4 2082	2 1580	5 15603	410	2 20885		
		%HDV	89		6 139	6 59		15	14%		
		Speed (mph)	1		4	4 21		4	3 33		
		Speed (mpn)			8	7 4					
Junction		Speed (kmph)	1 Bute Drive Exit	Dunkeld Rd South Exit	9 Dunkeld Rd North Exit			c c	9 54		
Junction						Dunkeld Road South Approach	Dunkeld Rd North Approach	Bute Drive Appreach			
2	Dunkeld Road / Bute Drive	Car	430								
		LGV	47	6 148	1 138	3 135	5 141:	57	1		
		OGV1	7	7 19	3 391	6 400	3 18	3 7	4		
	40	OGV2	6	0 19	3 35	4 311	2 193	10	2		
		Single Decker Bus	3						T		
		Double Decker Bus		2	2	0	201				
		Minibus		8	0			1			
				0	0	U I		1			
		Coach		0		4 (	+ 1	1	,		
		Total	495		5 1400	0 1387		543			
		96HDV	49					4	6		
		Speed (mph)	2				2	3	3		
		Speed (kmph)	3		0 4	5 21	1				
lunction		Arm	Dunkeld Rd South Approach	Gowans Terrace Exit	Dunkeld Rd North Approach	Gowans Terrace Approach	Dunkeld Rd South Exit	Dunkeld Rd North Exit			
	Dunkeld Rd / Gowans Terrac	Car	1166	6 436	5 1027	6 435	3 1000	7 1141	7		
3											
		LGV	140	0 50	8 136	5 54	140	133	1		
		OGV1	38	9 4	2 19	3 10		40 40	3		
		OGV2	27								
		Single Decker Bus	27	0 4	0 18	2 4:	2 175	26	3		
		Double Decker Bus		n	0	n (	1	1	1		
		Minibus		0	0	0					
		Coach		4	0						
					0	0	1105	1072			
		Total	1400					1373	1		
		%HDV	79								
		Speed (mph)	1	1 2	4	4 1	5 15	5 1	5		
		Speed (kmph)	1	7 3	9	7 2	4 23	3 2	5		
Junction		Arm	Ballantine Place Approach	Crieff Rd Approach	Dunkeld Rd North Approach	Dunkeld Rd South Exit	Dunkeld Rd South Approach	Ballantine Place Exit	Crieff Rd Exit	Dunkeld Rd North Exit	
		Car	47	3 710	5 1189		9 1154		3 7550		
		LGV	5						7 994		
			3	3 91	+ 1021						
		OGV1	1	8 27	7 27	0 41	3 55	3	305	399 277	
		OGV2	3	2 25					326		
		Single Decker Bus	1	8 23	5 18	6 34	7 461	5	256	301	
		Double Decker Bus		0	0	0	) I	1	0 0	0	
		Minibus		0 1					18		
						0 18	3 18			0	
				0	0	0 19	3 10	1	2 10	0 4	
		Coach		0	0	0	,	1	0	4	
		Total	59	2 879	0 9 1414	0 (	9 1442	i 7 c	0 9447	4 14053	
		Total 96HDV	59	2 879	0 9 1414 6 59	0 () 0 1439 6 89	2	4 7 d	0 9447 6 0%	4 14053	
		Total 96HDV Speed (mph)	59	0	0 9 1414 6 59 7 1:	0 () 0 1439 6 89 3 1:	2	4 7 d 6 004	0 0 9447 6 9% 5 11	4 14053 7% 8	
		Total %HDV Speed (mph) Speed (kmph)	119	0 2 879 6 91 4	0 1414 6 59 7 11 1 2 2	0 () 0 1439 6 89 3 11 11	0 9 1442 6 119 1 8 1	4 7 0 9 3 4	0 0 9447 6 9% 5 11	4 14053	
	Junction Name	Total 96HDV Speed (mph) Speed (kmph) Arm	119 Dunkeld Road South Exit	0 879 6 97 4 6 8 Catherines Road Exit	0 1414 6 59 7 11 1 Dunkeld Rd North Exit	0 1439 6 89 3 1 1 St Catherines Road Entry	0 1442 0 11442 0 119 1 1 0 Unikeld Rd South Entry	i c c c c c c c c c c c c c c c c c c c	0 0 9447 6 0945 5 11 4 18	4 14053 7% 8	
		Total 96HDV Speed (mph) Speed (kmph) Arm	119	0 879 6 97 4 6 8 Catherines Road Exit	0 1414 6 59 7 11 1 Dunkeld Rd North Exit	0 1439 6 89 3 1 1 St Catherines Road Entry	0 1442 0 11442 0 119 1 1 0 Unikeld Rd South Entry	i c c i i i i i i i i i i i i i i i i i	0 0 9447 6 0945 5 11 4 18	4 14053 7% 8	
5	Junction Name Dunkeld Rd / St Catherines R Barrack Street	Total 96HDV Speed (mph) Speed (kmph) Arm Car LGV	119 Dunkeld Road South Exit 1187 157	2 879 6 979 6 1 1 8t Catherines Road Exit 6 170 9 200	0 9 1414 6 59 7 1.1 1 2 Dunkeld Rd North Exit 2 1170 0 1411	0 14399 6 89 3 11 5 K Catherines Road Entry 5 2266	2 1442 5 1442 6 119 1 9 1 0 0 unkeld Rd South Entry 5 1134 9 140	1 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 9447 6 996 5 11 4 18	4 14053 7% 8	
5	Junction Name Dunkeld Rd / St Catherines R Barrack Street	Total 96HDV Speed (mph) Speed (kmph) Arm Car LGV	119 Dunkeld Road South Exit 1187 157	2 879 6 979 6 1 1 8t Catherines Road Exit 6 170 9 200	0 9 1414 6 59 7 1.1 1 2 Dunkeld Rd North Exit 2 1170 0 1411	0 14399 6 89 3 11 5 K Catherines Road Entry 5 2266	2 1442 5 1442 6 119 1 9 1 0 0 unkeld Rd South Entry 5 1134 9 140	1 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 9447 5 0% 5 11 4 18 8	4 14053 7% 8	
5	Junction Name Durkeld Rd / St Catherines F Barrack Street	Total 96HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1	119 Dunkeld Road South Exit 1187 157 36	0 977 5 977 6 97 6 St Catherines Road Exit 9 20 9 20 8 16	0 9 1414 6 59 7 1 11 1 2 Dunkeld Rd North Exit 2 1170 6 11170 5 611	0	2 4 2 14427 5 119 6 119 8 119 8 119 10 1000keld Rd South Entry 11344 5 11344 5 700	i 7 00 6 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2 0 0 2 9447 5 0% 5 11 6 18 8	4 14053 7% 8	
5	Junction Name Durkald Rd / St Catherines P Barrack Street	Total SeHUV Speed (kmph) Speed (kmph) Arm Car LGV OGV1 OGV2	119 Dunkeld Road South Exit 1187 157 36 25	0 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	0 1 1 9 1414 6 5 15 17 11 1 1 10 10 10 10 10 10 10 10 10 10 10	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	o Dunkeld Rd North Entry 100 100 100 100 100 100 100 100 100 10	0 0 9447 5 0% 5 11 4 18 8	4 14053 7% 8	
5	Junction Name Durkeld Rd / St Catherines R Barrack Street	Total 96HDV Speed (kmph) Arm Car LGV OGV1 OGV2 Single Dacker Bus	119 Dunkeld Road South Exit 1187 157 25 25 34	0	0 1 1 9 1414 6 5 15 17 11 1 1 10 10 10 10 10 10 10 10 10 10 10	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 4 2 14427 5 119 6 119 8 119 8 119 10 1000keld Rd South Entry 11344 5 11344 5 700	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 0 944 2 944 5 0% 5 11 1 18 3	4 14053 7% 8	
5	Junction Name Durkald Rd / St Catherines P Barrack Street	Total Speed (mph) Speed (mph) Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus	119 Dunkeld Road South Exit 1187 157 36 25 34	0	0 1 1 9 1414 6 5 5 1 2 1 0unkeld Rd North Exit 2 1170 6 1141 5 6 1141 5 6 49 5 48	0 0 1499 0 1499 6 249 1 25 Cotherines Road Entry 5 266 2 3 269 3 200 0 440 0 29 0 0 0 0	0	6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	2 0 944 2 944 5 0% 5 11 1 18 3	4 14053 7% 8	
5	Junction Name Dunkaid Ad / St Catherines P Barrack Street	Total 96HDV Speed (mph) Speed (kmph) Arm Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	119 Dunkeld Road South Exit 1187 157 25 25 34	0	0 1 1 9 1414 6 5 15 17 11 1 1 10 10 10 10 10 10 10 10 10 10 10	0 0 1499 0 1499 6 249 1 25 Cotherines Road Entry 5 266 2 3 269 3 200 0 440 0 29 0 0 0 0	0	6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	2 0 944 2 944 5 0% 5 11 1 18 3	4 14053 7% 8	
5	Junction Name Dunkaid Ad / St Catherines P Barrack Street	Total SkHDV Speed (mph) Speed (kmph) Amm Car LGV OGV1 OGV1 OGV2 Single Dacker Bus Double Decker Bus Minibus Coach	119 Dunkeld Road Bouth Exit 1187 36 25 34 14 14 15 15 15 16 14 14 11 11 11 11 11 11 11 11 11 11 11	0	0	0 0 0 14990 0 14990 0 2000 11 1 0 Catherines Road Entry 0 2000 0 2000 0 2000 0 4 0 4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 947 6 998 1 18 1 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 14053 7% 8	
5	Junction Name Dunkaid Ad / St Catherines P Barrack Street	Total Speed (mph) Speed (mph) Speed (mph) Arm Car LGV OGV1 OGV2 Single Dacker Bus Minibus Coach Total	119 Dunkeld Road South Exit 1187 157 36 25 34	0	0 1 1 0 1444 0 1444 0 1444 0 1444 1 1179 0 1444 0 1444	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 947 6 998 1 18 1 9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 14053 7% 8	
5	Junction Name Dunkaid Ad / St Catherines P Barrack Street	Total SkHDV Speed (mph) Speed (kmph) Amm Car LGV OGV1 OGV1 OGV2 Single Dacker Bus Double Decker Bus Minibus Coach	119 Dunkeld Road Bouth Exit 1187 36 25 34 14 14 15 15 15 16 14 14 11 11 11 11 11 11 11 11 11 11 11	0	0 1 1 0 1444 0 1444 0 1444 0 1444 1 1179 0 1444 0 1444	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	Conception of the second secon	0 0 9444 94445 0% 5 111 1 18 0 0 7 7 7 7	4 14053 7% 8	
5	Junction Nome Durkeid Bd / St Catherines P Barrack Street	Total Speed (mph) Speed (mph) Arm Lov Car Cov Soly Cov Single Ocker Bus Double Decker Bus Mixibus Coach Total SHOV	119 Dunkeld Road South Exit 119 159 25 25 34 1 1 1444 1444	0	0 1 1 9 1414 6 29 1414 7 11 1 9 makeld Rd North Exit 9 119 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 9444 5 0% 5 110 9 1 0 9 9 9 9 9 9 9	4 14053 7% 8	
5	Junction Name Durkeid Bd / St Catherines P Barrack Street	Total Speed (mph) Speed (mph) Arm Car LGV OGV1 OGV2 Single Dacker Bus Double Decker Bus Minibus Coach Total Stead Speed (mph)	111 Dunkeld Road South Exit 1110 15 15 15 14 14 14 14 14 14 14 14 14 14 14 14 14	0	0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	Dunkeld Rd North Entry	0 0 9447 9447 1 00k 1 10 1 10 1 10 1 10 1 10 1 10 1 1	4 14053 7% 8	
5	Junction Neme Durkeid Rd / St Catherines F Barrack Street	Total Speed (mph) Speed (mph) Arm Car LGV GGV3 GGV2 Single OGV2 Souble Decker Bus Miribus Coach Total Speed (mph) Speed (mph)	119 Dunkeld Road South Exit 1187 55 55 55 34 34 11466 1466 77 7 7 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	Conception of the second secon	0 0 9447 9447 1 00k 1 10 1 10 1 10 1 10 1 10 1 10 1 1	4 14053 7% 8	
S	Junction Nome Durkais Bd / St Cathernes F Barrack Street Junction Name	Total           Speed (mph)           Spead (kmph)           Arm           Car           LGV           OGV2           Singla Dacker Bus           Double Decker Bus           Minibus           Coach           Total           Spead (kmph)           Spead (kmph)	153 Dunkeld Road South Exit 1187 157 157 157 157 157 118 1144 144 144 144 144 144 144 144 14	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 14990 9 14990 9 240 240 240 9 220 9 220 9 220 9 20 9 20 9 20 9 20	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Crieff Rd Westbound Exit	0 0 9447 9447 10 916 110 10 10 10 10 10 10 10 10 10 10 10 10	4 14053 7% 8	
5 Junction 6	Junction Nome Darkali Bd / St Cathornes f Barrack Street Junction Name Ad / Cneff Rd Raundabout	Total Speed (mph) Speed (mph) Arm Car LGV OGV2 OGV2 OGV2 Single Dacker Bus Minibus Minibus Single Dacker Bus Minibus Single Oacker Bus Single Oacker B	111 Dunkeld Road Bouth Exit 1112 1113 1113 1113 1113 1113 1114 1144 114	0	0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	Curieff Rd Westbound Exit	0 0 9444	4 14053 7% 8	
5 Junction 6	Junction Name Darkal Rd / St Cathornes F Barrack Street	Total           94HDV           Speed (mph)           Speed (mph)           Arm           Car           LGV           OGV2           Singla Dacker Bus           Double Decker Bus           Minitus           Coach           Total           Spead (mph)           Spead (mph)           Spead (mph)           Car           LGV	Dunkeld Road South Exit 1187 157 258 259 269 269 269 269 269 279 270 200 200 200 200 200 200 200 200 200	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0		Dunkeld Rd North Entry Dunkeld Rd North Entry 1980 1990 1990 1990 Crieff Rd Wextbound Exit 91 1990	0 0 0 9447 5 0% 6 110 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 14053 7% 8	
5 Junction 6	Junction Name Darkais Bd / St Catherines F Barrack Street Junction Name Ad / Coeff Rd Raundabout Dobbies Roundabout	Total           %HOV           Speed (mph)           Speed (mph)           Arm           Car           LEV           OGV1           OGV2           Single Dacker Bus           Brobb Occlerr Bus           Minisus           Chail           Speed (mph)           Speed (mph)           Arm           Car           Car           Car           Speed (mph)           Arm           Car	153 Dunkeld Road South Exit 1107 156 255 34 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	0	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Crieff Ad Westbound Exit	0 0 9447 0 9447 1 0% 1 18 1 18 1 19 1 19 1 19 1 19 1 19 1 19	4 14053 7% 8	
5 Junction 6	Junction Name Darkais Bd / St Catherines F Barrack Street Junction Name Ad / Coeff Rd Raundabout Dobbies Roundabout	Total           %HOV           Speed (mph)           Speed (mph)           Arm           Car           LEV           OGV1           OGV2           Single Dacker Bus           Brobb Occlerr Bus           Minisus           Chail           Speed (mph)           Speed (mph)           Arm           Car           Car           Car           Speed (mph)           Arm           Car	153 Dunkeld Road South Exit 1107 156 255 34 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	0	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Crieff Ad Westbound Exit	0 0 9447 0 9447 1 0% 1 18 1 18 1 19 1 19 1 19 1 19 1 19 1 19	4 14053 7% 8	
5 Junction 6	Junction Name Durival Bd / St Catherines f Barrack Street Junction Name Ag / Crieff Rd Roundabout Dobles Roundabout	Total %HOV Speed (mph) Speed (mph) Arm Car Car Car Car Car Car Car Car	Dunkeld Road South Exit Dunkeld Road South Exit 1187 157 157 157 157 168 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1487 1497 147	0	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Crieff Rd Westbound Exdt	0 0 9444 0 9444 5 0% 6 118 0 18 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 14053 7% 8	
5 Junction 6	Junction Name Durkaid Rd / St Cathornes F Barrack Street Junction Name A9 / Creff Rd Roundabout Dobbes Roundabout	Total           Speed (mph)           Speed (mph)           Arm           CoV           Social Complex           Double Decker Bus           Double Decker Bus           Speed (mph)           Speed Rep (mph)	153 Dunkeld Road South Exit 1107 156 255 34 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	0	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	Crieff Rd Westbound Exit	0 0 9447 9447 1 096 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 1	4 14053 7% 8	
5 Junction 6	Junction Nome Durkeld Rd / St Cathornes F Barack Street Junction Name Ag / Creff Rd Roundabout Dobbes Roundabout	Total           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Car           Costh           Total           Speed (mph)           Arm           Car           Lov           Cort	Dunkeld Road South Exit Dunkeld Road South Exit 1187 157 157 157 157 168 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1487 1497 147	0	0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Crieff Rd Westbound Exit	0 0 9444 0464 046 10 10 10 10 10 10 10 10 10 10 10 10 10	4 14053 7% 8	
5 Junction 6	Junction Name Darkal Rd / St Cathornes F Barrack Street Junction Name AS / Cneff Rd Raundabout Dobbies Roundabout	Total           9400V           Speed (mph)           Speed (mph)           Arm           CoV           OGV1           OGV2           Single Decker Bus           Minbus           Carch           Speed (mph)           Speed (mph)           Arm           Car           CaV1           OGV1           Speed (mph)           Arm           OGV1           OGV2           Single Decker Bus           Minbus	Dunkeld Road South Exit Dunkeld Road South Exit 1187 157 157 157 157 168 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1484 1487 1497 147	0	0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Crieff Rd Westbound Exit	0 0 9444 0464 046 10 10 10 10 10 10 10 10 10 10 10 10 10	4 14053 7% 8	
5 Junction 6	Junction Name Darked Bd / St Cathernes F Barrack Street Junction Name Ag / Creff Bd Foundabout Dobbes Roundabout	Total           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Car           Car           Cory 2           Winkow           Crash           Speed (mph)           Cory           Cory           Cor           Cor	133 Dunkeld Road South Exit 1107 157 157 157 157 157 157 14 14 14 14 14 14 14 14 14 14 14 14 14	0	0 0 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Crieff Rd Westbound Exit	0 0 9444 9444 10 9444 10 10 10 10 10 10 10 10 10 10 10 10 10 10 1	4 14053 7% 8	
5 Junction 6	Junction Name Darked Bd / St Cathernes F Barrack Street Junction Name Ag / Creff Bd Foundabout Dobbes Roundabout	Total           WHOV           Speed (mph)           Speed (mph)           String           Speed (mph)           Car           LoV           Songle Dackier Bus           Minbus           Crach           Total           Speed (mph)           Arm           Car           Speed (mph)           Arm           Car           OdV2           Sould Decker Bus           Double Decker Bus           Car           OdV2           Careh           Caseh           Total	111 Dunkeld Road South Exit 1187 13 13 13 14 14 14 14 14 14 14 14 14 14 14 14 14	Image: Control of the state of the	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Crieff Rd Westbound Ex8 Crieff	0 0 9444 0 9444 5 006 1 10 0 0 0 0 0 0 0 0 0 0 0 0 0	4 14053 7% 8	
5 Junction 6	Junction Name Darked Bd / St Cathernes F Barrack Street Junction Name Ag / Creff Bd Foundabout Dobbes Roundabout	Total           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Speed (mph)           Car           Car           Cory 2           Winkow           Crash           Speed (mph)           Cory           Cory           Cor           Cor	155 Dunkeld Road South Exit 1107 157 157 157 157 157 157 14 14 14 14 14 14 14 14 14 14 14 14 14	Image: Control of the state of the	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Crieff Rd Westbound Exit Orieff Rd Westbound E	0 0 9444 0 9444 5 006 1 10 0 0 0 0 0 0 0 0 0 0 0 0 0	4 14053 7% 8	
5 Junction 6	Junction Name Durkaid Rd / St Cathornes F Barrack Street Junction Name A9 / Crieff Rd Roundabout Dobbes Roundabout	Total           WHOV           Speed (mph)           Speed (mph)           String           Speed (mph)           Car           LoV           Songle Dackier Bus           Minbus           Crach           Total           Speed (mph)           Arm           Car           Speed (mph)           Arm           Car           OdV2           Sould Decker Bus           Double Decker Bus           Car           OdV2           Careh           Caseh           Total	111 Dunkeld Road South Exit 1187 13 13 13 14 14 14 14 14 14 14 14 14 14 14 14 14	Image: Control of the state of the	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Crieff Rd Westbound Exit Orieff Rd Westbound E	0 0 9447 9447 1 096 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 1	4 14053 7% 8	

### Table A1.1f – 2018 with CCTMR AADT for Perth other major roads

Terrent in m	Junction Name	Arm	Crieff Rd Eastbound Entry	Crieff Rd Eastbound Exit	Newhouse Rd Approach	A9 On / Off slip approach	Crieff Rd westbound Approach	Newhouse Rd Exit	Crieff Rd Westbound Exit	A9 On / Off Slip Exit	
	A9 / Crieff Rd Roundebout		Grian Na Cawaaana Chery				C 65				
	Newhouse Rd Roundabout		111					25 91			
		OGV1	28					86 28			
		06V2	35	7 46				82 24		G 0	
		Single Decker Bus	39	2 34	7 24	9		18 27	0 39		
		Double Decker Bus						0	0	00	
		Minibus	2	1	8	4	0	18	4 2	1 0	
		Coach		8 995				68 B62	1 1912	0	
		Total 96HDV	1122					*B 80:			
		Speed (mph)	101	0 141 1	n	0 U1	o	4 10	1	E 076	
		Spaad (kmph)		9		7		6		4 0	
Junction	Junction Nerne	Arm	Fairfield Avenue Approach	Grieff Rd Westbound Approach	Crieff Rd Eastbound Entry	Feus Rd Approach	Feirfield Avenue Ealt	Grieff Rd Easthound Exit	Crieff Rd Westbound Exit	Feus Rd Ealt	
8	Crieff Rd / Faus Rd Roundab		96	6 1056	5 740	3 691					
		LGV	14	0 135		9 73	9 1	12 97	0 103		
		OGV1	16	: 59			e :	40 27	9 44		
		OGV2	1			1 31		91 24			
		Single Decker Bus	10	97	8 25	29		74 22	36	8 912	
		Dauble Decker Bus Minibus			0 0						
		Goech		n .	n -			n .	n .		
		Total	143	0 0 1951	4 927	2 798	0 14	28 972	7 1057	4 10476	
		%HDV	235		5 103				5 13		
		Speed (mph)				£		18	7		1
		Speed (kmph)			9	9		30 2	79 2	5 31	
Junction	Junction Name	Arm	M90 Edinburgh Approach	M90 Edinburgh Exit	A9 Stirling Exit	A9 Inverness Exit	Glasgow Road Exit	A9 Western Bypass Approach	A9 Stirling Approach		Glasgow Rd - M90 8
9	Brouden Roundabout	Ger	2111								
			282								479
		OGV1	130	9 192				54 175	116	9 203	179
		0GV2	60					21 96 17 115			
		Single Decker Bus	89	6 117	6 102	2 41	2	17 11	<u>si</u> tit	2 144	109
		Double Decker Bus Minibus						0			
		Coach		0	0	2	0	4		4 7	ŏ
		Total	2076	e 2152		1 1.587	6 112	217	3 1638	6290	4417
		95HDV	109				6 7	196 19	% 15 <sup>5</sup>	8%	8%
		Speed (mph)	1	1 3	2 4	7 5		40		4 3	34
		Spaad (kmph)	1	8	1 7	5 0		65 1		6 E	<u></u>
		Ann	Clasgow Rd Eastbound Exit	Glesgow Rd Westbound Approach	Necessity Bree Approach	Glesgow Rd Westbound Exit	Clasgow Rd Eastbound Approach	Necessity Brae Exit			
	Glasgow Pd / Necessity Bras										
			650			3 750		966			
	Roundebout	LGV	81	2 82				55 55			
		LGV OGV1	81	2 62 0 22	4 3	1 85 5 23	1 9	55 55 96 7	7		
		LGV OGV1 OGV2	81 14	2 82 0 22 9 12	4 3	5 80 5 23 2 15	1 9	55 55	7		
	Roundebout	LGV OGV1 OGV2 Single Decker Bus	81	2 82 0 22 9 12	4 3 3	1 80 5 23 2 15	1 9	55 55 96 7	7		
	Roundebout	LGV OGV1 OGV2	81 14	2 82 0 22 9 12	4 3 3	5 80 5 23 2 15	1 9	55 55 96 7	7		
	Roundebout	USV OGV1 OGV2 Single Decker Bus Double Decker Bus	81 14 11 22	2 87 2 87 9 12 4 27 0 27 0 27 0 4 4	4 3 3 4 7 2 1 7 7 7	5 80 5 22 8 15 4 28 0 0	1 9 6 1 1 2 7 2 7 7	66 65 65 65 65 65 65 65 65 65 65 65 65 6	11 77 79 12 0 0 0		
	Roundebout	USV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	81 14	2 88 0 22 9 12 4 27 0 27 0 4 4 27 0 27 0 27 0 27 0 27 0 27 0 27 0 27 0	4 3 3 9 7 2 1 7 7 7 0 439	8 80 5 22 2 15 4 28 0 20 0 20 2 20 0 20 2 20 2 20 2 20 2	1 9 6 1 7 2 7 7 7 7 4 87	66 65 65 65 65 65 65 65 65 65 65 65 65 6	11 77 79 12 0 0 0		
	Roundebout	LGV CGV1 CGV2 9Inde Decker Bus Double Decker Bus Minibus Coech Total 96HDV	10 14 11 11 22 785 785 785 785	2 692 692 9 22 9 2 9	4 3 3 9 7 2 1 7 7 7 0 439	e 860 5 223 2 155 4 229 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2	1 9 6 1 1 1 7 2 0 7 7 7 1 8 7 7 1 8 7 7 1 8 7 7	66 65 65 65 65 65 65 65 65 65 65 65 65 6	11 77 29 20 0 0 0 0		
	Roundebout	LGV CGV1 CGV2 Single Decker Bus Minipus Coech Total 96HDV Speed (mph)	81 14 11 22 789 789	2 692 692 9 22 9 2 9	4 3 3 9 7 2 1 7 7 7 0 439	8 80 5 22 2 15 4 28 0 20 0 20 2 20 0 20 2 20 2 20 2 20 2	1 9 6 1 1 1 7 2 0 7 7 7 1 8 7 7 1 8 7 7 1 8 7 7	65 65 65 65 65 65 65 65 65 65 65 65 65 6	11 77 29 20 0 0 0 0		
	Roundatiout	LSV OGV1 OGV2 Single Dacker Bus Dauble Dacker Bus Minbus Gaech Tatal SHOV Speed (httph) Speed (httph)	10 14 12 22 70 70 70 70 70 70 70 70 70 70 70 70 70	2 02 2 02 4 22 4 27 6 02 6 02 6 02 6 09 7 0 6 09 7 0 7 0 7 0 7 0 7 0 7 0 7 0 7 0	4 33 7 4 7 7 2 4 7 7 7 2 0 4 7 2 7 2 0 4 9 2 6 2 6 2 6 2 7	e 860 5 223 2 155 4 229 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2	1         9           0         2           1         1           0         2           0         7           4         87           6         7           8         7	88	11 77 99 02 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
Junction	Roundahout	LGV CGV1 OGV2 9hote Dacker Bus Double Dacker Bus Mirkous Gaech Total 94-DV 9peed (kmph) Speed (kmph) Arm	10 14 14 70 70 70 70 70 70 70 70 70 70 70 70 70	2 0900 2 22 20 2 22 20 2 20	4 33 3 4 4 7 4 7 5 7 5 7 6 8 6 27 8 7 7 7 7 7 8 7 8 7 8 7 8 7 8 7 8 7 8	e 000 5 22 2 15 4 28 0 0 0 0 5 000 5 0000 5 0000 5 000 5 0000 5 0000 5 000 5 000 5 0000 5 0000 5 0	1 99 9 1 2 7 2 7 7 7 7 4 8 7 5 7 5 7 7 7 7 7 7 7 7 7 7 8 7 7 7 7	55 00000000000000000000000000000000000	11 7 7 99 22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Nurray Crescuri Approach	
Junction 11	Roundabout	LGV CGV1 OGV2 9hote Dacker Bus Double Dacker Bus Mirkous Gaech Total 94-DV 9peed (kmph) Speed (kmph) Arm	11 14 15 12 12 12 12 12 12 13 13 14 14 14 15 15 15 15	2 0222 3 222 4 227 4 227 4 227 4 227 4 227 4 27 4 7 4 7 4 7 4 7 4 7 4 7 4 7 4	4 3 3 4 7 4 7 5 7 7 0 4 8 6 1 2 6 1 7 6 6 1 1 8 8 1 1 8 8 1 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1 9 1	e 000 5 22 6 23 7 32 7 4 7 3 7 4 7 3 7 4 7 4 7 510 7 5	1 99 9 1 9 1 1 9 7	es 555 555 557 557 557 557 557 557 557 557	11 7 7 99 22 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 2509	
Junction 11	Roundshout	LGV CGV1 OGV2 9hote Dacker Bus Double Dacker Bus Mirkous Gaech Total 94-DV 9peed (kmph) Speed (kmph) Arm	11 14 13 12 70 70 70 70 70 70 70 70 70 70 70 70 70	2 9 92 2 2 22 4 22 5 12 6 22 6 22 6 29 7 20 7	4 3 3 4 7 4 7 5 7 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7	e 000 2 12 2 2 2 0 2 0 2 0 2 0 2 0 2 0 2	1 99 2 3 4 3 4 7 4 4 7 5 7 6 7 6 7 7 6 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 8 7 7 7 8 7 7 7 8 8 7 7 7 8 8 7 7 7 8 8 7 7 7 8 8 7 7 7 8 8 7 7 8 8 7 7 8 8 8 8 8 8 8 8 8 8 8 8 8	8         38           8         2           8         2           8         2           9         2           9         2           10         2           11         4           12         4           13         2           14         2           14         2           14         2	11 7 9 9 0 0 0 0 0 0 0 0 0 0 0 7 7 7 7 9 7 9	0 2009 7 940	
Junction 11	Roundshout	LGV GGV1 GGV2 Binde Decker Bus Mritinus Gosth Total Systev Speed (Jmph) Arm Car LGV GGV1 LGV GGV1 LGV GGV1 LGV GGV1 LGV GGV1 Car Car Car Car Car Car Car Car	11 14 15 12 12 12 12 12 13 15 15 15 15 15	2 0 000 2 0 0000 2 0 000 2	4 3 9 4 7 5 7 6 8 6 8 6 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7	e 000 2 12 2 2 2 0 2 0 2 0 2 0 2 0 2 0 2	1 99 2 31 7 4 7 5 7 5 7 5 8 6 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7	cc         50           cc         60	11 7 9 9 0 0 0 0 0 0 0 0 0 0 0 7 7 7 7 9 7 9	0 2509	
Junction 11	Roundshout	LGV OGV2 Sincle Deckor Bus Oaubis Deckor Bus Miriaus Goesh Total Steed (httph) Speed (httph) Arm Got LGV	11 14 12 22 783 77 77 77 7 7 7 7 7 7 7 7 7 7 7 7 7	2	4	e	1 99 2 3 4 3 4 5 7 4 7 4 7 5 5 6 7 6 7 7 7 6 7 7 7 6 7 7 7 7 7	cc         50           cc         60	11 7 90 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 2008 7 940 8 105	
Junction 11	Roundshout	LGV OGV2 Single Deckor Bus Outlie Deckor Bus Miriaus Cosch Total SHOY Speed (httph) Speed (httph) Arm Cort LGV OGV1 OGV2	III III III III III III III III	2	4	e	1 99 2 3 4 3 4 5 7 4 7 4 7 5 5 6 7 6 7 7 7 6 7 7 7 6 7 7 7 7 7	8	11 7 90 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 2509 7 940 8 105 2 56	
Junction 11	Routlebox Junction Kerne Georger Rd / Marry Place / Marry Debort	LGV OGV1 OGV2 Pincja Deckar Rus Double Secket Rus Mridus Coach Total Secket (mph) Steed (mph) Steed (mph) Steed (mph) Ann CoV OGV1 OGV1 OGV1 OGV2 Single Decker Rus Doublo Decker Rus Minitus	III III III III III III III III	2	4	e	1 99 2 3 4 3 4 5 7 4 7 4 7 5 5 6 7 6 7 7 7 6 7 7 7 6 7 7 7 7 7	8	11 7 90 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 2509 7 940 8 105 2 56	
Junction 11	Roundabout Jurnation Norma Derrot Der / Harry Place / Annoy Destant	LOV     COV1     COV4	Classeaw Rd Easthourd Appraish	2 0 000 2 0 0000 2 0 000 2	4 33 7 34 4 7 34 4 7 4 7 4 7 5 7 5 7 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7	s	1 99 9 197 7 99 8 99 9 99 9 99 9 99 9 99 9 99 9	0         58         38           0         38         38           0         38         38           1         38         38           2         38         38           30         38         38           31         38         38           32         38         38           33         38         38           34         38         38           35         38         38           36         38         38           37         38         38           38         38         38           39         38         38           30         38         38           30         38         38           30         38         38           30         38         38           31         38         38           32         38         38           33         38         38           34         38         38           35         38         38           36         38         38	11 22 23 24 25 25 25 25 25 25 25 25 25 25 25 25 25	0 2009 7 3400 8 105 2 56 1 99 0 0 0 0 0 0	
Junction 11	Routlebox Junction Nerres Discuss Nei / Marroy Place / Marroy Dressen	USV OGV1 OGV2 OGV2 Sinda Carker Bus Binda Carker Bus Minipus Capach Minipus Secol (mph) Stend (mph)	III III III III III III III III	2   1997 2   2997 2   2007 2   2007 2	4	s	1	88         38           98         32           94         32           9         32           9         32           10         32           11         4           12         4           13         32           14         32           15         32           16         32           17         32           18         32           19         32           10         32           10         32           11         32           12         32           13         32           14         32           15         32           16         32           17         32           18         32           19         32           10         32	11 7 7 9 9 9 12 13 14 14 15 15 15 15 15 15 15 15 15 15	0         2000           7         940           940         105           2         56           1         99           0         0           0         0           1         0           0         0           1         2	
Junction 11	Routebox Ionation Xerne George Rd / Marky Flace / Marky Decourt	LAW ORV1 ORV2 SINgle Carekor Bus SINgle Carekor Bus Mingleue Care Signed Careho Signed Careho Signed Careho LGW Care LGW Care Care Care Care Care Care Care Care	Gangan Kd Easthound Angrasch	2	4	s	1	eg	11 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 2000 7 2940 8 300 8 300 8 300 8 300 8 300 8 300 8 300 9 30	
Junction 11	Roundahout Junation Norma Clasgon M/ / Murroy Paces / Murroy Dresont	Law Ody 1 Ody 2 David Exercise Rus Single Decise Rus Ministra Content Ministra Ministra Ministra Second (men) Second (men)	Classeaw Rd Easthourd Appraish	2	4	Image: state	1	6	11 22 23 24 25 25 25 25 25 25 25 25 25 25	0         2000           7         940           8         105           9         56           1         99           0         0           0         0           1         0           1         3206           1         3205           1         95           1         97	
herection 3.1	Routlebox Jondion Nome Gasgara Bd / Marray Pace / Marray Descart	UAV OGV1 OGV2 DGV2 DGV2 DGubb Decker Bus Mreau Const Second (mph) Second (mph) Second (mph) Arron OGV2	6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2	4	Image: state	1 9 9 9 3 2 7 3 2 7 4 9 4 7 9 4 7 9 4 8 9 4 8 9 4 8 9 4 8 9 4 8 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8	8	11 22 23 24 25 25 25 25 25 25 25 25 25 25	0         2000           7         940           8         305           2         55           2         56           1         99           0         0           7         3800           8         816	
Junction 31	Routeboot	Low Original Device Rus Sincle Device Rus Sincle Device Rus Double Device Rus Coach Total WebV Second (meh) Second (meh) Second (meh) Second (meh) Second Device Rus Double Device Rus Double Device Rus Total Total Total Second (meh) Second Total Total New New New New New New New New New New New	Clover Breet Approach	2	4	s	2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	6         5           6         3           7         4           8         3           8         4           9         4           10         4           11         4           12         4           13         Clesser % dwsthound Apprase %           14         4           15         4           16         4           17         4           18         4           19         4           10         4           10         4           11         4           12         4           13         4           14         4           15         4           16         4           17         4           18         4           19         4           10         4           11         4           12         4           13         4           14         4           15         4           16         4           17         4	11 2 3 3 3 4 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0         20000           7         5400           8         3050           1         69           0         0           0         0           1         2050           8         2050           1         7           10         2050           11         7           12         10           13         10           14         11           14         11           15         11           16         11           17         10           16         10           16         10	
Junction 31	Routlebox Jondion Nome Gasgara Bd / Marray Pace / Marray Descart	Low Original Device Rus Sincle Device Rus Sincle Device Rus Double Device Rus Coach Total WebV Second (meh) Second (meh) Second (meh) Second (meh) Second Device Rus Double Device Rus Double Device Rus Total Total Total Second (meh) Second Total Total New New New New New New New New New New New	Gaver Breet Approxim	2 0 000 2 0 0000 2 0 000 2	4	s	1         9           2         1           7         1           7         1           8         1           9         1           9         1           9         1           9         1           9         1           9         1           1         1           2         1           1         1           1         1           1         1           1         1           1         1           1         1           1         1           1         1           1         1           2         1           3         1           4         1           5         1           6         1           6         1           6         1           6         1           6         1           6         1	6	1	0 2000 0 205 0	
Junction 31	Routeboot	LOV OVY12 OV	Clover Breet Approach	2	4	Cleargers Rend Factback Circle     Cleargers R	2	65	11 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 000000000000000000000000000000000000	
Junction 3.1 Junction	Routeboot	Lay Oraya Oraya Bridd Decker Mus Oraya Mirageu Mirageu Mirageu Mirageu Nation Statu	Gavgav Rd Eastbound Apprach Gavgav Rd Eastbound Apprach 10 11 12 13 14 15 15 15 15 15 15 15 15 15 15	2	4	c	2	6	11 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0	
Junction 31	Routeboot	Lov Order Order Decke Denker Hus Duckle Denker Hus Duckle Denker Hus Stand Mirjeus Stand (mph) Stand (mph) Stand (mph) Stand (mph) Arry Order Signer Onder Hus Diskuble Hus Diskuble Hus Diskuble Car Diskuble Car Car Car Car Car	Gavgav Rd Eastbound Apprach Gavgav Rd Eastbound Apprach 10 11 12 13 14 15 15 15 15 15 15 15 15 15 15	2	4	c	2	6	11 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0	
Junction 2.1 Junction	Routlebox Innution Nerres Gargos Bd / Plans, Place / Muroy Decort Decetion Nerres Classon Bd / Plags Bt BM	Law Law Correct Control of Control of Control Control Decision Hous Control Co	Gavgav Rd Eastbound Apprach Gavgav Rd Eastbound Apprach 10 11 12 13 14 15 15 15 15 15 15 15 15 15 15	2	4	c	2	68	1) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2)	Image: Second	
Junction 2.1 Junction	Routlebox Junction Name Geograp Rd / Marky Flace / Marky Decourt Decision Name Calactor Bd / Phys Rd Rd.	LOV OGV12 OGV21 OGV21 OGV21 OGV21 OGV21 OGV21 OGV21 OGV21 OGV21 OGV21 OGV21 OGV2 OGV2 OGV2 OGV2 OGV2 OGV2 OGV2 OGV2	Gavgav Rd Eastbound Apprach Gavgav Rd Eastbound Apprach 10 11 12 13 14 15 15 15 15 15 15 15 15 15 15	2	4	c	2	68	11 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Image: Second	
Junction 2.1 Junction	Routlebox Junction Name Geograp Rd / Marky Flace / Marky Decourt Decision Name Calactor Bd / Phys Rd Rd.	Lay Oracle Decker Rus Oracle Decker Rus Oracle Decker Rus Oracle Decker Rus Oracle Decker Rus Oracle Decker Rus Start V Start V Start V Start V Start V Start V Start V Start V Start V Start Rus Oracle Decker Rus	Graver Breet Approach	2	4	Image: second	2	6	1	0	
Junction 31	Roundations Investion Nerrie Georgen Rd / Marrier, Place / Marrier, Decount Neuron Nerrie Cascore Rd / Place Rd Ref.	Lov Oracle Control Control Fuel Oracle Decision Russ Oracle Decision Russ Margings Researd, Credit Researd, Credit Researd, Credit Researd, Credit Researd, Credit Display Decision Russ Oracle Decision Russ Oracle Decision Russ Oracle Decision Russ Researd, Credit Researd, Credit Resear	Garver Breet Approach	2	4	Image: second	1         9           2         1           2         1           2         2           2         2           2         2           3         3           4         1           5         5           6         3           7         3           8         5           9         5           10         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1           14         1           15         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           10         1           11         1           12         1           13         1           14         1      15 <td< td=""><td>es interval and a second secon</td><td>1                                      </td><td>I        </td><td></td></td<>	es interval and a second secon	1	I	
Junction 2.1 Junction	Routeboot	Lov Order Order Decke Decker Rus Decker Rus Decker Rus Coucher Mirjaus Tata Steed (meh) Steed (meh) St	Graver Breet Approach	2	4	Image: second	1         9           2         1           2         1           2         1           2         1           3         1           4         5           5         1           6         1           7         1           8         1           9         1           10         1           10         1           10         1           10         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1	6	1	0	
Junction 31	Roundahout Jurnation Norma (Sangata Bd / Plana, Place / Murray Descont Duration Norma Calagoe Bd / Place Bd RM	Lov Oracle Control Control Fuel Oracle Decision Russ Oracle Decision Russ Margings Researd, Credit Researd, Credit Researd, Credit Researd, Credit Researd, Credit Display Decision Russ Oracle Decision Russ Oracle Decision Russ Oracle Decision Russ Researd, Credit Researd, Credit Resear	Garver Breet Approach	2	4	c	1         9           2         1           2         1           2         1           2         1           3         1           4         5           5         1           6         1           7         1           8         1           9         1           10         1           10         1           10         1           10         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           10         1           11         1           12         1           13         1           14         1           15         1	es interval and a second secon	1	I	

In the law of			1	1	1				
Junction Junction Name	Arm	Caledonian Rd Sthbnd Approach	Caladanian Rd Northbound Exit	Alaxandra St Exit	Caladanian Rd 8thand Exit	Caledonian Rd Nthond Approach	Alexandra St Approach		
13 Caledonian Rd / Alexandre	3 GB1	38			31 319	9 d11		74	
	OGV1		64 10		70 41 36 12			25	
	06/2				16 Lz 12 19		1	28	
	Single Decker Bus		61 0 19 17		18 9	5 14			
	Double Decker Bus	A		0	0	2 A 1	1	0	
	Minibus		n	0	n			n	
	Coach		4 3	a	0	4 D		0	
	Total	97	50 460	- FI 73	36 394	8 291		5	
	96HDV		96 8				1 0 1 0	96	
	Speed (mph)		20	7	20 P.	1		15	
	Saaad (kmph)		40 0	7	10 0			24	
Junction Junction Neme	Arm	Leonard St Nthlond Approach	Leonard St Sthond Approach	St Andrew St Approach	Leonard St Nthbnd Exit	Leonard St Sthbnd Exit	St Andrew St Fait		
14 St Andrew St / Leonard S	t Car	da	12 266	7 282		2 520		51	
	1.159			2 37	11 20		4	7	
	OGV1	1		8 11	19 7	27		31	
	0642		96 10	19 12		2 21			
	Single Decker Bus		61 20		14 8	6 24	1	57 37	
	Double Decker Bus		n		0			n	
	Minisus		0		0	9	1	0	
	Cosch		n	5	-			21	
	Total		95	1 352	25 221	665	99	9	
	SHDV		96 18	107 107	96 87	6 120		%	
	Speed (mph)	,	34 3	8	14 2	7 2		14	
	Speed (Amph)		56		72 4	3 3		73	
Junction Junction Name	Arm	Bt Leonards Bank Approach	Kings PI Estand Exit	8t Leanards Bank Exit	Kings Place Wstbnd Exit	Kings PI Wstbnd Approach	Kings PI Estbrid Approach		
15 Kings Place / Bt Leonards	BeGet	E1	49 025	375	12 450	4 4 445	40	16	
		6	30 75	36 45				27	
			55 27	3 10	17			73	
	06/2		21 25	2			2	17	
	Single Decker Bus		10 22	9 10	16 17	5 20		77	
	Double Decker Bus			0			1	0	
	Minibus		4 5	1	9		1	21	
	Coach			4	1	1	3	4	
	Totel	51			+9 800	• • 630	1 61	46	
	96HDV		10				13		
	Speed (mph)		12 5	5 3	24 2		1	18	
	Spaad (kmph)		19	8 8 9	18 9	4 L		24	
Junction Junction Name	Ann	Marshall Place Estbod Approach	Princes Street Exit	Marshall Place Estbrid Ealt	Edinburgh Road Ealt	Marshall Place Wsthind Exit	Marshall Place Wstbod Approach	Edinburgh Rd Approach	
16 Marshall Place / Edinburgh		File stell Flede Esteric Approach		278	23 770	672	Preistell Prece wscond Approach	20 7711	
	L EN								
	06V1		87 40		18 21			50 514 17 320	
	OGYZ			15 16	10	9 10		140	
	Single Decker Bus		52 12		10 10 10 10 10 10 10 10 10 10 10 10 10 1	10	1 4	240 256	
	Double Decker Bus		n .		n		1	n n	
	Minibus		0	0	0	0	3		
	Gosch		a	0				4 4	
	Total	34	44 916	1 376	14 010	8 705	1 75	10 <b>9</b> 352	
	%HDV							% 8%	
	Speed (mph)	1:	20 27	173 0	12 1	1		70 0.70	
	Speed (kmph)		0 / / / / / / / / / / / / / / / / / / /	n	10 0	•		7 <b>4</b>	
Junction Junction Name		South Street Approach	Tay St Northbound Exit	Queens Bridge Exit	Tay St Southbound Exit	Tay St Southbound Appproach	Tay St Northbound Approach	Queens Bridge Approach	
		112	10 Y 25 15211121221121201	5 1172	19 1129	1 224	Tray as rearranaeana Agantaitan	2020 7020	
Junction Junction Name	Arm	13							
17 Tay St / South St Crossro						96	4	19 1826	
17 Tay Bt / South St Crossre			52 37	5	16 140	D 36	4	1026	
17 Tay St / South St Crossro	LCV OGV1	4	52 33 53 15	8 40	36 140 18 57	9 6	1 1	79 <b>4</b> 66	
17 Tay St / South St Crosss	BE GBT LGV 0GV1 0GV2	4	62 1.8 35 6	7 40 7 18	16 140 18 57 36 27	8 <u>6</u> 7 3		79 455 40 214	
17 Tay Bt / South St Crossru	et Cer LGV OGV1 OGV2 Single Deckor Bus	4	52 13 35 6	8 40	16 140 18 57 16 27	8 <u>6</u> 7 3		79 <b>4</b> 66	
17 Fay Bt / South St Grossn	ec Ger LCV OGV1 OGV2 Single Decker Bus Double Decker fus	4 2 2	52 14 55 6 58 14 0	7 40 7 18	16 140 18 57 36 27	8 <u>6</u> 7 3		79 455 40 214	
17 Tay Bt / South St Crossre	e Cer LCV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus	4	52 15 55 6 98 14 0	70 40 77 18 70 23 0 7	16 140 16 57 16 227 11 229 0 9	8 5 7 3 4 4 0		99 465 0 214 35 207 0 0 0	
10 Tay Bt / South St Croser	er Cer LCV OGV1 OGV2 Single Deckor Bus Double Deckor Bus Minibus Coach	9 2 2	82 18 35 6 98 19 14	70 40 77 18 70 23 0 7	16 140 16 57 16 227 11 229 0 9	8 5 7 3 4 4 4 0 0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9 465 9 214 55 207 0 0 0 0 14 0 0 14 0 0 14 0 14 0 14 0 0 0 0 0 0 0 0 0 0 0 0 0	
17 Tay Dt / South St Chosen	er Ger LCV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total	4 2 2 2	22 11 25 6 26 12 20 12 21 20 12 20 12	90 90 90 90 90 90 90 90 90 90 90 90 90 9	16 440 18 87 19 87 19 87 10 87 10 87 10 87 11 10 10 10 11 10 10 10 1	8 5 7 3 4 4 6 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	1 1 1 2 7 3 7 1 7 7 7 7 7 7 7	9         465           0         224           0         201           0         0           0         0           0         0           0         54           0         54           0         54           0         54	
10 Tay Bt / South St Croser	et Get LCV OGV2 Single Decker Bus Double Decker Bus Double Decker Bus Coach Total SHDV	4 2 2 2	82 18 35 6 98 19 14	90 90 90 90 90 90 90 90 90 90 90 90 90 9	16 440 18 57 16 277 11 229 10 29 14 4 11 100 10 100 11 100 10 100 11 100 10	8 5 7 3 4 4 6 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	1 1 1 2 7 3 7 1 7 7 7 7 7 7 7	9 465 9 214 55 207 0 0 0 0 14 0 0 14 0 0 14 0 14 0 14 0 0 0 0 0 0 0 0 0 0 0 0 0	
1) Tay Bt / South St Crosert	al Car LEV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Total Speed (mph)	4 2 2 2	22 11 25 6 26 12 20 12 21 20 12 20 12	90 90 90 90 90 90 90 90 90 90 90 90 90 9	16 440 18 87 19 87 19 87 10 87 10 87 10 87 11 10 10 10 11 10 10 10 1	8 5 7 3 4 4 6 7 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	1 1 1 2 7 3 7 1 7 7 7 7 7 7 7	9         465           0         224           0         201           0         0           0         0           0         0           0         54           0         54           0         54           0         54	
17 Tay Pt / Seath St Crossr	ar Car LEV OGV1 OGV2 Single Decker Bus Double Dacker Bus Minibus Coach Tatel SHOV Speed (mph) Speed (mph)	4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	22 11 23 4 24 12 24 12 25 6 24 12 24 12 24 2 2 2 2 2 2 2 2 2 2 2 2 2	8         46           7         11           0         22           7         12           0         23           0         138           0         138           0         138           0         138           0         138           0         138           0         138           0         138           0         138           0         138           0         138           0         138           0         138	16         440           18         40           19         27           10         29           11         29           12         1           13         1           14         1           15         1           16         1           17         1           17         2	0 6 6 7 7 9 4 4 9 0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9         465           0         224           0         201           0         0           0         0           0         0           0         54           0         54           0         54           0         54	
17 Tay Pt / South St Crown	al Car LEV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Tatal 944DV Speed (mph) Speed (mph) Array	4 2 2 2 1 37	22 11 25 6 26 12 20 12 21 20 12 20 12	8         46           7         12           0         22           7         2           0         22           0         2395           6         2396           0         2396           1         32           1         32           1         32           1         32           1         32           1         32           1         32           1         32           1         32           1         32           1         32           1         32           1         33           1         34           1         34           1         34	ie 140 55 37 66 37 77 38 79 37 70 37 70 70 37 70 37 70 70 37 70 37 70 70 37 70 70 37 70 70 70 37 70 70 70 70 70 70 70 70 70 70 70 70 70	0 5 7 3 8 4 4 9 9 5 9 5 9 7 9 8 9 7 9 9 9 7 9 9 9 10 10 10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	19         465           50         224           55         207           0         0           10         10           10         10	
17 Tay Pt / Seath St Crossr	ar Car LEV OGV1 OGV2 Single Decker Bus Double Dacker Bus Minibus Coach Tatel SHOV Speed (mph) Speed (mph)	a 2 3 1.27 1.27 1.27 1.27 1.27 1.27 1.27 2.27 2	12	8         44           7         11           0         21           7         12           0         22           0         138           0         138           0         139           6         06           14         1           15         24           16         210           179         St Northbound Exit	is 140 is 157 is 277 is 2777 is 27777 is 27777 is 27777 is 27777 is 2777777 is 2777777777777777777777777777777777777	0 6 6 7 3 3 4 4 4 0 4 0 4 4 204 4 4 6 4 204 4 4 7 ay St Northbourd Approach 7 ay St Northbourd Approach	1 1 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	19         465           100         224           25         227           0         0           0         0           0         1           0         5           0         1           0         5           0         5           0         1           0         5           0         5           0         5           0         5           0         5           0         5           0         5	
17 Tay Pt / South St Crown	ind Car LGV OGV1 OGV2 Single Decher Bus Double Decher Bus Minibus Cauch Tatel Steed (mph) Speed (mph) Based (mph) Car LGV LGV LGV	a 2 3 1.27 1.27 1.27 1.27 1.27 1.27 1.27 2.27 2	121         121           125         6           121         121           121         121           121         121           121         121           121         121           121         121           121         121           121         121           121         121           121         121	8         49           7         41           7         22           7         23           8         215           9         212           9         212           9         212           9         212	is         1440           is         177           is         172           is         182           is         182           is         182           is         192           is         192           is         192           is         192           is         192           is         192	0 5 7 3 8 4 4 9 9 5 9 5 9 7 9 8 9 7 9 9 9 7 9 9 9 10 10 10 10 10 10 10 10 10 10 10 10 10	1 1 3 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	19         465           100         224           25         227           0         0           0         0           0         1           0         5           0         1           0         5           0         5           0         1           0         5           0         5           0         5           0         5           0         5           0         5           0         5	
17 Tay Pt / South St Crown	al Car LEV OGV1 OGV2 Single Decker Bus Double Decker Bus Minibus Coach Tatal 944DV Speed (mph) Speed (mph) Array	a 2 3 1.27 1.27 1.27 1.27 1.27 1.27 1.27 2.27 2	12	8         49           7         41           7         22           7         23           8         215           9         212           9         212           9         212           9         212	is 140 is 157 is 277 is 2777 is 27777 is 27777 is 27777 is 27777 is 277777 is 2777777777777777777777777777777777777	0 6 6 7 3 3 4 4 4 0 4 0 4 4 204 4 4 6 4 204 4 4 7 ay St Northbourd Approach 7 ay St Northbourd Approach	Tay R: Seathbeand Appreach	19         465           100         224           25         227           0         0           0         0           0         1           0         5           0         1           0         5           0         5           0         1           0         5           0         5           0         5           0         5           0         5           0         5           0         5	
17 Tay Pt / South St Crown	ind Car LGV OGV1 OGV2 Single Decker Bus Double Decker Bus Double Decker Bus Cases Tatel Statel Statel Saeed (mph) Based (mph) Based (mph) Car LGV Car Car Car Car Car Car Car Car Car Car	a 2 3 1.27 1.27 1.27 1.27 1.27 1.27 1.27 2.27 2	2	0	is         1440           is         177           is         172           is         182           is         182           is         182           is         192           is         192           is         192           is         192           is         192           is         192	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 37 77 8 7 8 7 8 7 8 7 9 7 9 7 9 7 9 7 7 9 7 9	9         465           26         224           80         201           0         0           0         1           7         5750           20         10           1         10           1         10           1         10           1         10           20         10           21         10           22         10           23         10           24         20	
17 Tay Pt / South St Crown	ind Car LGV OGV1 OGV2 Single Decker Bus Disple Decker Bus Minibus Caseb State State State Saead (mph) Seead (mph) Arm Disple Decker Bus Car OGV1 OGV2 Disple Decker Bus	a 2 3 1.27 1.27 1.27 1.27 1.27 1.27 1.27 2.27 2	2	0	is         1440           is         177           is         172           is         182           is         182           is         182           is         192           is         192           is         192           is         192           is         192           is         192	0 0 0 7 3 3 8 4 4 9 4 9 3 1 4 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5	2 37 77 8 7 8 7 8 7 8 7 9 7 9 7 9 7 9 7 7 9 7 9	19         465           124         124           25         224           26         21           27         50           28         0           29         14           29         14           20         10           21         14           22         14           23         14           24         14           25         14           26         14           27         31           29         14           20         14	
17 Tay Pt / South St Crown	ed Cet LGV OGV1 OGV2 Single Decker Bus Ongele Decker Bus Minibus Cancel Tatel Minibus Cancel Tatel Secus (mph) Secus (mph) Secus (mph) Cet Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Tatel Cancel Cancel Tatel Cancel Tatel Cancel	a 2 3 1.27 1.27 1.27 1.27 1.27 1.27 1.27 2.27 2	2	0	is         1440           is         177           is         172           is         182           is         182           is         182           is         192           is         192           is         192           is         192           is         192           is         192	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 37 77 8 7 8 7 8 7 8 7 9 7 9 7 9 7 9 7 7 9 7 9	9         465           26         224           80         201           0         0           0         1           7         5750           20         10           1         10           1         10           1         10           1         10           20         10           21         10           22         10           23         10           24         20	
17 Tay Pt / South St Crown	ed Cet LEV OEV1 OEV1 OFV2 Single Decker Bus Masses Tatel Seed (mph) Seed (mph) Seed (mph) Seed (mph) Cer Cer Seed (mph) Seed (mph) See	a 2 3 1.27 1.27 1.27 1.27 1.27 1.27 1.27 2.27 2	2	0	is         1440           is         177           is         172           is         182           is         182           is         182           is         192           is         192           is         192           is         192           is         192           is         192	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 37 77 8 7 8 7 8 7 8 7 9 7 9 7 9 7 9 7 7 9 7 9	9         465           26         224           80         201           0         0           0         1           7         5750           20         10           1         10           1         10           1         10           1         10           20         10           21         10           22         10           23         10           24         20	
17 Tay Pt / South St Crown	LDP CDP COV2	a 2 3 3 3 3 3 7 7 9 9 1 9 2 3 3 3 2 2 3 3 3 2 3 3 3 3 3 3 3 3 3	12	8	is 440 is 440 is 472 is 272 is 272	0         6         6           2         3         4           4         3         4           5         3         4           6         4         4           7         3         4           9         3         9         9           9         9         9         Northbound Approximation 2           10         1         1         1           10         1         1         1           10         1         1         1           10         1         1         1           10         1         1         1	Tey R Southbound Approach	19         465           124         4           15         124           16         11           17         578           18         08           19         14           19         14           19         14           10         14           17         578           10         16           11         16           12         16           12         16           13         16           14         16           15         16           16         16           17         18           18         16           19         16           10         16           10         16           10         16           10         16	
17 Tay Pt / South St Crown	LDV CDV COV12	4 2 2 127 107 SI Bauchtenund Falt 3 2 3	Image: Street Lat.         Image: Street Lat.           Image: Street Lat. <td>0        </td> <td>is        </td> <td>0 6 6 0 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7</td> <td>Tay R Seuthheand Approach</td> <td>9         465           26         224           80         281           9         0           0         1           7         5758           80         14           9         14           9         16           9         16           9         18           9         18           90         18           90         19           90         1           91         10           92         10           93         10           94         10</td> <td></td>	0	is	0 6 6 0 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Tay R Seuthheand Approach	9         465           26         224           80         281           9         0           0         1           7         5758           80         14           9         14           9         16           9         16           9         18           9         18           90         18           90         19           90         1           91         10           92         10           93         10           94         10	
17 Tay Pt / South St Crown	LEV LEV OV12 OV	a 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3	ال ا	0	6         140           6         172           7         2           9         2           9         2           1         1           1         1           1         1           1         1           2         1           2         1           2         1           2         1           2         1           2         1           2         1           2         1           2         1           2         1           3         1           4         1           5         1	0         6         5           2         3         4           4         3         4           5         3         3           6         3         3           7         3         3           8         3         3           9         3         3           10         3         3           2         3         3           3         3         3           4         6         6           2         3         3           7         3         3           8         3         3           9         3         3           9         3         3           9         3         3	Tay R Seuthheand Approach	19         465           124         4           15         124           16         11           17         578           18         08           19         14           19         14           19         14           10         14           17         578           10         16           11         16           12         16           12         16           13         16           14         16           15         16           16         16           17         18           18         16           19         16           10         16           10         16           10         16           10         16	
17 Tay Pt / South St Crown	Lev Lev Single Decker Ine Single Decker Ine Decker Societ Fue Oracle Control Decker Ine Control Beend (oracle) Beend (oracle) Control Beend (oracle) Control Decker Ine Oracle Decker Ine Mitting Control Decker Ine Decker Ine Mitting Control Decker Ine Mitting Control Decker Ine Mitting Control Decker Ine Mitting Control Decker Ine Mitting Control Decker Ine Mitting Control Decker Ine Decker In	a 2 2 127 3 109 SU Bouchbourni Exit 3 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Image: Second	0	is	0         6         5           2         3         4           4         3         4           5         3         3           6         3         3           7         3         3           8         3         3           9         3         3           10         3         3           2         3         3           3         3         3           4         6         6           2         3         3           7         3         3           8         3         3           9         3         3           9         3         3           9         3         3	Tey Rt Southbound Approach 34 4 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	9         465           26         224           8         287           9         0           0         1           0         1           10         14           10         14           10         14           11         14           12         18           12         18           12         18           12         18           12         18           12         10           12         10           13         10           14         10           15         10           16         10           17         10           18         10           19         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10	
12 Fay IA / South 34 Conver Acation Deatlies Series 19 Tay Invest / Higt Street	Low	a 2 2 2 3 1 ay SI Bauchbaund Lak 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2	8	6         440           6         472           7         722           8         722           9         723           10         723           11         723           12         723           13         733           14         734           15         744           16         743           16         744           17         744           18         744           19         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744           10         744	0         6           2         3           3         4           4         2           5         2           6         2           7         5           7         5           8         2           9         2           9         2           9         2           9         2           9         2           9         2           9         2           9         3           9         3           9         3           9         3           9         3           9         3           9         3           9         3	2 3 77 77 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	9         465           90         214           80         201           9         0           0         1           7         5750           9         10           9         14           9         10           9         10           9         10           9         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10           10         10	
12 for D / South 31 Conver	LDP LDP ODF/1 ODF/1 ODF/1 ODF/1 ODF/1 Datable Nacione Bus Objects Datable Nacione Bus Objects Datable Nacione Bus Objects ODF/1 Based Orgen() Article Ministree ODF/1 Datable Decker Bus Ministree ODF/1 Datable Decker Bus Ministree ODF/1 Datable Decker Bus Ministree ODF/1 Datable Decker Bus Ministree M	4 4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	2	8	is         140           is         172           is         172           is         182	0         6         6           2         3         4           4         3         4           5         3         4           6         3         4           7         3         4           9         10         2         2           10         3         5         5           2         3         4         3           2         3         4         3           2         3         4         3           2         3         4         3           2         3         3         3           3         4         3         3           4         3         4         3           5         3         3         3           6         3         3         3           7         3         3         3           8         3         3         3           9         3         3         3           9         3         3         3           9         3         3         3           9         3         3	Tay Bt Southbound Approach 44 40 0 0 0 0 0 0 0 0 0 0 0 0 0	9         445           50         224           50         227           50         0           0         0           0         0           0         10           0         10           0         54           7         750           6         00           10         10 </td <td></td>	
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Marson         Marson<	Junction Junction Name	Am	Dundee Rd Tetal from Netorway	Walnut Grave From Perth	M90 Edinburgh Offsilp	M90 Edinburgh Onsilp	Walnut Grove to Perth	A90 Dundeo Onsilp	A00 Dundee Offsilp	Dundee Rd Total To Motorway
Normal         Normal<	20 Dundee Rd / MSO / ASI 0 Motorway Junction L	LOV	711 D	11 86 19 6				9 051 6 <u>61</u>	0 629 2 70	10034
Normal Problem         Normal		DGV1 DGV2	21	17	4 5	3 4		4 24	2 21	301
No.         No. <td>0</td> <td>Double Decker Bus</td> <td>21</td> <td>0</td> <td>7 1</td> <td>8 3</td> <td>0</td> <td>1 13</td> <td>3 18</td> <td>175</td>	0	Double Decker Bus	21	0	7 1	8 3	0	1 13	3 18	175
No. 10         No. 10<	1	Minibus		4	0				1	0
Matrix	-	Tatel			231	7 2251	8 68	0 776	8 161	
M PACTOR         PACTOR        PACTOR        PACTOR        PACTOR        PACTOR        PACTOR        PACTOR        PACTOR <td>1</td> <td>Speed (mph)</td> <td></td> <td>17 2</td> <td>70 TO</td> <td>0 3 9 4</td> <td>5</td> <td></td> <td>8 3</td> <td>53</td>	1	Speed (mph)		17 2	70 TO	0 3 9 4	5		8 3	53
Martine	Junction Junction Name	Anni	Strathmore Street Exit	Main St Ealt	Isle Roed Exit	Strathmore St Approach	Isla Road Approach	Main St Approach	4	Bb
No. 1         <	21 Dundee Rd / Strathmora St. ( Crosstoads	Lav Lav	574		211	8 764 0 105	1 33 0 38			
Normal Problem         Normal					17 6	7 14	4	4 20	7	
Not         Not <td>6</td> <td>Bingla Dacker Bus</td> <td>1</td> <td>17</td> <td>75 7</td> <td>4 12</td> <td>9</td> <td>24</td> <td>0</td> <td></td>	6	Bingla Dacker Bus	1	17	75 7	4 12	9	24	0	
Matrix         Matri		Winibus		4	0		0		4	
Math         Math <th< td=""><td></td><td>Total</td><td>663</td><td></td><td></td><td>1 900</td><td>0 6 384</td><td></td><td>4</td><td></td></th<>		Total	663			1 900	0 6 384		4	
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Name 71 000	5	Steed (knob)	Dundee Rd Evit	Gouvie St Ewit	Bowerson Rd Aneroach	5 Dundao Rd Aneroach	7 Cowrie St Aonreach	8	8	
Image: second	22 Gowie St / Bowerswel Rd / G	Cer		10 796	114	1 746	700			
No.         No. <td></td> <td></td> <td>3</td> <td>12 20</td> <td></td> <td>5 Z.</td> <td></td> <td>8</td> <td></td> <td></td>			3	12 20		5 Z.		8		
Norm         Norm <t< td=""><td>5</td><td>Single Decker Bus</td><td>1</td><td></td><td>nt 31 3</td><td></td><td></td><td>4</td><td></td><td></td></t<>	5	Single Decker Bus	1		nt 31 3			4		
No.         No. <td></td> <td>Couble Decker Bus</td> <td></td> <td>0</td> <td>0</td> <td>0</td> <td>4</td> <td>0</td> <td></td> <td></td>		Couble Decker Bus		0	0	0	4	0		
Norm         Norm <th< td=""><td></td><td>Coach</td><td></td><td>- </td><td>0 137</td><td>9 875</td><td>0</td><td></td><td></td><td></td></th<>		Coach		- 	0 137	9 875	0			
Image         Image <t< td=""><td></td><td>IGHDV</td><td>6</td><td>10 (10) 10 (10)</td><td>76 76</td><td>6</td><td>5 6 6</td><td></td><td></td><td></td></t<>		IGHDV	6	10 (10) 10 (10)	76 76	6	5 6 6			
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No.         No. <td></td> <td>JGVZ</td> <td></td> <td></td> <td>99 24</td> <td></td> <td></td> <td>8 11</td> <td>9</td> <td></td>		JGVZ			99 24			8 11	9	
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Noise         Solid Matrix										
N         Norm         No	Junction Junction Name	Arm	Tesco Exit	Tesca Approach	Breadalbane Terrace Approach	Edinburgh Rd Nthbnd Approach	Edinburgh Rd Sthbrid Approach	Breadalbane Terrace Exit	Edinburgh Rd Sthbnd Exit	Edinburgh Rd Nthbrid Exit
Norm         Norm <th< td=""><td>24 Edinburgh Rd / Tesco / G Breadalbane Terrace L</td><td>Arm Cer LCV</td><td>331</td><td>13 290 78 30</td><td>57 129</td><td>2 694</td><td>1 921 7 11</td><td>6 74 6 12</td><td>9 115</td><td>9615</td></th<>	24 Edinburgh Rd / Tesco / G Breadalbane Terrace L	Arm Cer LCV	331	13 290 78 30	57 129	2 694	1 921 7 11	6 74 6 12	9 115	9615
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Image of the set of	24 Editburgh R4 / Tesco / 0 Broadalbane Terrace 0 0	Arm Get DGV1 DGV2 Single Decker Bus Double Decker Bus Minibus	331	23 28 28 28 28 28 28 28 28 28 28 28 28 28	77 128 78 24 76 14 74 5 75 5 76 7 76 76 76 76 76 76 76 76 76 76 76 76 76 76 76 76 76 7	2 009 2 02 7 37 6 4 7 37 7 37 7 37 7 37 7 37 7 37 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	1         98           7         11           5         42           6         11           2         31           0         31           0         4	16         74           16         12           10         C           10         C           11         4	9 555 5 89 3 38 9 14	9518 1162 578 350
Indem     Define     Define     Define (Define)     Define (Define) <thdefine (define)<="" th="">     Define (Define)     <t< td=""><td>24 Editburgh Rol / Tesco / C BraadaBane Terrace 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td><td>Arm Get GV DGV1 DGV2 Single Decker Bus Double Decker Bus Minibus Coach Totel</td><td>333 3 2 2 2 2 3 2 3 2 3 2 3 2 3</td><td>33         238           281         232           42         35           12         5           13         12           14         12           15         1           16         1           17         1           18         2           19         2</td><td>77         129           125         24           26         14           25         5           26         6           27         14           28         5           20         0           0         0           0         140</td><td>() () () () () () () () () () () () () (</td><td>1 98 7 117 5 44 8 11 2 31 0 31 0 4 4 5 113</td><td>6         74           6         127           0         6           0         6           0         6           0         6           0         7           0         7           0         7           0         7           0         7           0         7           0         7           0         7</td><td>96 (1955) 97 (1975) 97 (1975)</td><td>9018 1160 570 300 440 0 0 4 12150</td></t<></thdefine>	24 Editburgh Rol / Tesco / C BraadaBane Terrace 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Arm Get GV DGV1 DGV2 Single Decker Bus Double Decker Bus Minibus Coach Totel	333 3 2 2 2 2 3 2 3 2 3 2 3 2 3	33         238           281         232           42         35           12         5           13         12           14         12           15         1           16         1           17         1           18         2           19         2	77         129           125         24           26         14           25         5           26         6           27         14           28         5           20         0           0         0           0         140	() () () () () () () () () () () () () (	1 98 7 117 5 44 8 11 2 31 0 31 0 4 4 5 113	6         74           6         127           0         6           0         6           0         6           0         6           0         7           0         7           0         7           0         7           0         7           0         7           0         7           0         7	96 (1955) 97 (1975) 97 (1975)	9018 1160 570 300 440 0 0 4 12150
No.         No. <td>24 Etholungh Rd / Terco / Broadultaine Terrace</td> <td>Arm Cet LOV DGV2 DGV2 Double Dacker Bus Minibus Coach Tatal BHEV BHEV Speed (mph)</td> <td>223 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3</td> <td>33         238           281         232           42         35           12         5           12         5           13         1           14         1           15         1           16         1           17         1           18         2           19         244</td> <td>77         129           125         24           26         14           25         5           26         6           27         14           28         5           20         0           0         0           0         140</td> <td>2 009 2 0 00 7 37 6 4 4 7 37 1 37 1</td> <td>1] 982 77 111 5 44 8 41 20 31 0 7 4 4 5 1123 6 0</td> <td>6 774 6 242 0 0 0 6 4 1 4 1 4 1 4 1 4 9 10 1 10 1</td> <td>9 6 9 855 6 892 3 38 0 14 0 25 0 26 0 1 0 1 1 0 1 1 0 1 1 0 1 1 1 0 1 1 1 1</td> <td>90.15 1142 570 440 0 </td>	24 Etholungh Rd / Terco / Broadultaine Terrace	Arm Cet LOV DGV2 DGV2 Double Dacker Bus Minibus Coach Tatal BHEV BHEV Speed (mph)	223 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	33         238           281         232           42         35           12         5           12         5           13         1           14         1           15         1           16         1           17         1           18         2           19         244	77         129           125         24           26         14           25         5           26         6           27         14           28         5           20         0           0         0           0         140	2 009 2 0 00 7 37 6 4 4 7 37 1	1] 982 77 111 5 44 8 41 20 31 0 7 4 4 5 1123 6 0	6 774 6 242 0 0 0 6 4 1 4 1 4 1 4 1 4 9 10 1	9 6 9 855 6 892 3 38 0 14 0 25 0 26 0 1 0 1 1 0 1 1 0 1 1 0 1 1 1 0 1 1 1 1	90.15 1142 570 440 0 
Image         Image <th< td=""><td>24 Edricuph Rd / Terco / C Brackbarne Terrors</td><td>Arm Cet LDV DGV1 SGV2 Single Decker Bus Single Decker Bus Minibus Caseh Total BHEV Speed (mph) Speed (mph) Speed (mph)</td><td>233 5 1 288 9 37 37 37 37 37 37 37 37 37 37 37 37 37</td><td>3]         28           8]         32           9]         32           9]         42           9]         34           9]         35           9]         35           9]         35           9]         35           9]         35           9]         35           9]         35           9]         14           9]         36           10]         36           10]         36</td><td>17         129           12         24           2         24           24         14           24         1           20         0           0         0           0         10           0         10           0         130           20         130           20         130           20         30</td><td>2 699 2 697 7 7 7 8 7 8 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8</td><td>1] 92 77 111 5 44 4 12 6 14 6 112 6 112 6 112 6 112 6 112 7 6 112 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7</td><td>6 77 6 22 8 4 9 4 9 4 9 10 9 1</td><td>96 95 95 95 95 95 95 95 95 95 95 95 95 95</td><td>90.15 1142 570 440 0 </td></th<>	24 Edricuph Rd / Terco / C Brackbarne Terrors	Arm Cet LDV DGV1 SGV2 Single Decker Bus Single Decker Bus Minibus Caseh Total BHEV Speed (mph) Speed (mph) Speed (mph)	233 5 1 288 9 37 37 37 37 37 37 37 37 37 37 37 37 37	3]         28           8]         32           9]         32           9]         42           9]         34           9]         35           9]         35           9]         35           9]         35           9]         35           9]         35           9]         35           9]         14           9]         36           10]         36           10]         36	17         129           12         24           2         24           24         14           24         1           20         0           0         0           0         10           0         10           0         130           20         130           20         130           20         30	2 699 2 697 7 7 7 8 7 8 8 9 8 9 8 9 8 9 8 9 8 9 8 9 8	1] 92 77 111 5 44 4 12 6 14 6 112 6 112 6 112 6 112 6 112 7 6 112 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	6 77 6 22 8 4 9 4 9 4 9 10 9 1	96 95 95 95 95 95 95 95 95 95 95 95 95 95	90.15 1142 570 440 0 
Image         Image <td< td=""><td>24 Editoryh Rd / Tesco / 1 Bracilieges Territe Bracilieges Territe</td><td>Arm Cet LDV DQV1 DQV2 DQV2 DQV2 DQV2 DQV2 DQV2 DQV1 DQV2 DQV2 DQV1 DQV2 DQV1 DQV1 DQV1 DQV1 DQV1 DQV1 DQV2 DQV1 DQV2 DQV1 DQV2 DQV2 DQV2 DQV1 DQV2 DQV2 DQV1 DQV2 DQV2 DQV2 DQV1 DQV2 DQV1 DQV2 DQV1 DQV2 DQV1 DQV2 DQV1 DQV2</td><td>233 3 3 4 28 3 3 27 27 5 27 4 5 27 4 5 27 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td><td>2 2 2000 2 2 2 2 2 2000 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2</td><td>17         19           16         14           16         16           17         18           18         18           19         18           10         18           10         18           10         19           10         19           10         19           10         19           10         19           10         19</td><td>2 6000 2 6000 2 7000 2 700</td><td>1 992 1 11 1 11 1 12 1 12</td><td>6 777 8 787 9 787 9</td><td>9 9 95 95 6 199 9 2 300 0 144 0 29 0 10 0 10 0</td><td>90.15 1142 570 440 0 </td></td<>	24 Editoryh Rd / Tesco / 1 Bracilieges Territe	Arm Cet LDV DQV1 DQV2 DQV2 DQV2 DQV2 DQV2 DQV2 DQV1 DQV2 DQV2 DQV1 DQV2 DQV1 DQV1 DQV1 DQV1 DQV1 DQV1 DQV2 DQV1 DQV2 DQV1 DQV2 DQV2 DQV2 DQV1 DQV2 DQV2 DQV1 DQV2 DQV2 DQV2 DQV1 DQV2 DQV1 DQV2 DQV1 DQV2 DQV1 DQV2 DQV1 DQV2	233 3 3 4 28 3 3 27 27 5 27 4 5 27 4 5 27 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2000 2 2 2 2 2 2000 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	17         19           16         14           16         16           17         18           18         18           19         18           10         18           10         18           10         19           10         19           10         19           10         19           10         19           10         19	2 6000 2 6000 2 7000 2 700	1 992 1 11 1 11 1 12 1 12	6 777 8 787 9	9 9 95 95 6 199 9 2 300 0 144 0 29 0 10 0	90.15 1142 570 440 0 
Image         Image <th< td=""><td>24 Edricuph Rd / Tesco / Brackleges Terrice Junction Annelion Nerre 26 Edricupt Rd / Priston Rd</td><td>Arr Ext Ext Ext Ext Ext Ext Ext Ext</td><td>233 3 3 9 9 9 9 17 17 17 17 17 17 17 17 17 17 17 17 17</td><td>3</td><td>2         129           4         14           4         14           4         16           5         5           6         18           8         18           9         19           9         19           9         19           9         19           9         19           9         19           10         19           10         19           10         11           10         11           11         19           12         11           13         11</td><td>2 000000000000000000000000000000000000</td><td>1 992 1 11 2 11 2 12 4 12 4 1 5 12 5 12 6 12 7 freton 86 Approx1 7 freton 86 Approx1 2 13 6 21 1 12 1 12 1</td><td>2</td><td>9 9 99 99 99 99 99 99 99 99 99 99 99 99</td><td>90.15 1142 570 440 0 </td></th<>	24 Edricuph Rd / Tesco / Brackleges Terrice Junction Annelion Nerre 26 Edricupt Rd / Priston Rd	Arr Ext Ext Ext Ext Ext Ext Ext Ext	233 3 3 9 9 9 9 17 17 17 17 17 17 17 17 17 17 17 17 17	3	2         129           4         14           4         14           4         16           5         5           6         18           8         18           9         19           9         19           9         19           9         19           9         19           9         19           10         19           10         19           10         11           10         11           11         19           12         11           13         11	2 000000000000000000000000000000000000	1 992 1 11 2 11 2 12 4 12 4 1 5 12 5 12 6 12 7 freton 86 Approx1 7 freton 86 Approx1 2 13 6 21 1 12 1	2	9 9 99 99 99 99 99 99 99 99 99 99 99 99	90.15 1142 570 440 0 
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Instant Number         Specified	24 Editoryh Bd / Teccr/ 1 Braciliene Fornes Braciliene Fornes Dentition Rentien Nerre 23 Editoryh Bd / Frietre Bd 24 Editoryh Bd / Frietre Bd 25 Editoryh Bd / Frietre Bd	Arm Arm Arm Arm Service Decker Run Strolge Decker Run Strolge Decker Run Texts	233 3 3 28 3 29 3 27 5 Frierton Rd Sub 1 2 3 3 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1	3	Image: Section of the sectio	Image: Section of the sectio	3	6	9 9 99 99 99 99 99 99 99 99 99 99 99 99	90.15 1142 570 440 0 
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OV/L         OV/L <th< td=""><td>24 Editoryh B/ (1900/ ) Baadingen Fornes Baadingen Fornes Baating Bartien Sens 75 Editoryh B/ / Part Bd Bantion Bantien Sens 76 Editoryh B/ / Part Bd</td><td>Area Area 2010 2017</td><td>233 33 34 34 35 35 35 37 37 37 37 37 37 37 37 37 37 37 37 37</td><td>Image: state of the s</td><td>1         129           2         1           3         3           4         3           5         3           6         1           7         1           8         3           9         1           9         3           10         3           11         3           12         3           13         3           14         3           15         3           16         3           17         3           18         3           19         3           19         3           10         3           11         3           12         3           13         3           14         3           15         3           16         3           17         3           18         3           19         3           19         3           10         3           11         3           12         3           1</td><td>Image: Section of the sectio</td><td>3        </td><td>6        </td><td>9 9 99 99 99 99 99 99 99 99 99 99 99 99</td><td>90.15 1142 570 440 0 </td></th<>	24 Editoryh B/ (1900/ ) Baadingen Fornes Baadingen Fornes Baating Bartien Sens 75 Editoryh B/ / Part Bd Bantion Bantien Sens 76 Editoryh B/ / Part Bd	Area Area 2010 2017	233 33 34 34 35 35 35 37 37 37 37 37 37 37 37 37 37 37 37 37	Image: state of the s	1         129           2         1           3         3           4         3           5         3           6         1           7         1           8         3           9         1           9         3           10         3           11         3           12         3           13         3           14         3           15         3           16         3           17         3           18         3           19         3           19         3           10         3           11         3           12         3           13         3           14         3           15         3           16         3           17         3           18         3           19         3           19         3           10         3           11         3           12         3           1	Image: Section of the sectio	3	6	9 9 99 99 99 99 99 99 99 99 99 99 99 99	90.15 1142 570 440 0 
Image: Section (1)         10	24 Edricuph Bd / Tesco/ 1 Bracilian terms bracilian terms 25 Edricuph Bd / Pharton Bd 26 Edricuph Bd / Pharton Bd	Area Area Bridge Desire Bus Bridge Desire Bus Bridge Desire Bus Bridge Desire Bus Bridge Desire Bus Area Bridge Desire Bus Bridge Desire	23 33 34 37 37 37 37 37 37 37 37 37 37	Image: Section of the sectio	1         1           1         1           2         1           3         1           4         1           5         1           6         1           7         1           8         1           9         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           10         1           11         1           12         1           13         1      14	Image: Section of the sectio	3         1         1           2         1         2           8         1         2           9         1         2           9         1         2           10         1         2           11         2         2           12         2         2           14         1         2           15         2         2           16         1         2           17         10         2           18         2         2           19         1         2           10         1         2           10         1         2           10         1         2           10         1         2           10         1         2           10         1         2           10         1         2           10         1         1           10         1         1           10         1         1           10         1         1           10         1         1           10         1 <td>Image: Second second</td> <td>9 0 055 0 100 0 2 14 0 2 14 0 2 14 0 0 14 0 0 10 0 0 10 0 0 0 0 0 0 0 0 0</td> <td>90.15 1142 570 440 0 </td>	Image: Second	9 0 055 0 100 0 2 14 0 2 14 0 2 14 0 0 14 0 0 10 0 0 10 0 0 0 0 0 0 0 0 0	90.15 1142 570 440 0 
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Consh         0         4         4         0         0         0           Total         1084         604         6772         1100         14743         10007           Total         10868         604         6772         1100         14743         10007           Total         1098         1208         1208         1208         1000         14743           Spect/men         68         60         60         61         61         61	24 Edricuph Bd / Tesco/ 1 Bracilian Reference 28 Edrication Network 28 Edrication Network 29 Edrication Network 29 Edrication Network 29 Edrication Network 29 Edrication Network 29 Edrication Network 20 Edrication Networ	Area Area Area Area Area Second Second Second Second Second Second Area	233 33 34 34 35 35 35 35 35 35 35 35 35 35 35 35 35	Image: Section of the sectio	1         1           1         1           2         1           3         1           4         1           5         1           6         1           7         1           8         1           9         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15<	Image: Section of the sectio	3         10           3         11           4         11           6         11           7         11           8         11           9         11           10         11           11         12           12         11           14         12           15         12           16         12           17         12           18         12           19         12           10         12           10         12           11         12           12         12           13         12           14         12           15         12           16         12           17         14           18         14           19         14           10         14           11         14           12         14           14         14	6	239 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	90.15 1142 570 440 0 
WebV         10%         11%         12%         13%         10%         10%           Speed (mp)         6il         6	24 Editoryh Bd / Tesco/ 1 Bracilien Peres Bracilien Menes 26 Editoryh Bd / Pfurton Bd 26 Editoryh Bd / Pfurton Bd	Area Area Manual Ma	233 33 34 34 35 35 35 35 35 35 35 35 35 35 35 35 35	Image: Section of the sectio	1         1           1         1           2         1           3         1           4         1           5         1           6         1           7         1           8         1           9         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15         1           16         1           17         1           18         1           19         1           10         1           11         1           12         1           13         1           14         1           15<	Image: Section of the sectio	3         10           3         11           4         11           6         11           7         11           8         11           9         11           10         11           11         12           12         11           14         12           15         12           16         12           17         12           18         12           19         12           10         12           10         12           11         12           12         12           13         12           14         12           15         12           16         12           17         14           18         14           19         14           10         14           11         14           12         14           14         14	6	239 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	90.15 1142 570 440 0 
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### Table A1.2 - Traffic Growth Factors used to predict traffic flows in future years

Year		Growth
From	То	Central
2005	2006	1.000
2005	2007	1.009
2005	2008	1.019
2005	2009	1.032
2005	2010	1.043
2005	2011	1.053
2005	2012	1.064
2005	2013	1.076
2005	2014	1.088
2005	2015	1.099
2005	2016	1.110
2005	2017	1.124
2005	2018	1.138

# Appendix 2

# **Monitoring Data**

### Contents

Diffusion Tube Monitoring Data

Site Name	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05
42 Scott St, Perth, PH1 5PH	47	43	44	37	39	37	37	36	40	51	49	58
42 Scott St, Perth, PH1 5PH	45	48	49	38	40	36	41	30	40	49	49	54
42 Scott St, Perth, PH1 5PH	45	43	50	47	38	35	43	29	38	50	49	55
17 Speygate, Perth, PH2 8PJ	34	30	35	23	15	16	21	20	25	31	34	43
15 Murray Cres, Perth, PH2 0HU	23	23	24	16	15	13	13	14	20	25	26	38
15 Murray Cres, Perth, PH2 0HU	27	23	25	15	14	16	15	14	19	26	25	40
8 Stormont St, Perth, PH1 5NW	32	26	26	19	17	16	15	17	27	27	29	33
8 Stormont St, Perth, PH1 5NW	31	23	25	17	18	19	14	20	24	28	28	32
41 Mull Place, Perth, PH1 3DP	21	16	18	9	9	9	8	8	13	17	19	28
257 Rannoch Rd/Newhouse Road Roundabout, Perth, PH1 2DW	19	21	22	19	14	12	16	13	17	25	25	32
86/88 South Street Perth PH2 8PD	42	40	45	38	36	34	30	34	39	51	47	51
86/88 South Street Perth PH2 8PD	41	43	44	38	36	34	38	36	40	45	47	х
9 Main St, Bridgend, Perth, PH2 7HD	33	40	43	41	38	37	42	30	35	42	42	48
9 Main St, Bridgend, Perth, PH2 7HD	37	45	45	49	40	35	40	29	37	45	36	46
9 Main St, Bridgend, Perth, PH2 7HD	39	44	47	42	39	38	41	29	40	46	42	44
St Ninian's School ,Dunkeld Rd, Perth, PH1 5RF	36	38	37	24	29	25	26	24	38	45	38	46
2 Crieff Road Perth PH1 5RT	32	28	33	24	27	22	27	20	30	35	38	42
28 York Place Perth PH2 8EH	47	45	49	44	39	35	38	32	45	59	51	53
37 York Place Perth PH2 8EH	40	42	50	37	30	х	38	26	36	46	42	49
104 South St, Perth, PH2 8PA	41	40	43	41	37	36	41	38	43	45	48	54
104 South St, Perth, PH2 8PA	48	40	47	42	39	39	38	34	44	42	47	56
104 South St, Perth, PH2 8PA	49	43	45	34	37	37	40	35	41	46	45	56
45-47 South St, Perth, PH2 8PD	39	42	40	32	27	21	33	25	29	38	38	46
135 South St, Perth, PH2 8PA	46	48	47	39	38	32	37	29	39	45	47	53
216 South Street Perth PH2 8NY	42	41	44	35	34	26	31	31	38	46	47	53
10 County Place, Perth, PH2 8EE	44	47	43	49	49	46	46	44	54	56	53	60
10 County Place, Perth, PH2 8EE	51	44	46	59	46	49	46	42	53	45	52	62
17 Princes St, Perth, PH2 8NG	37	36	39	25	28	26	31	31	33	35	40	Х
51 Glasgow Rd, Perth, PH2 0PE	38	34	38	30	30	27	28	22	31	36	44	47
Riggs Rd, Perth, PH1 1PR	35	31	36	28	27	26	21	22	31	38	41	44
93-109 Main St Bridgend, PH2 7HE	31	32	35	33	30	28	32	22	28	40	32	35
39 Main St, Bridgend, PH2 7HD	42	47	50	48	43	41	46	31	46	52	44	46
39 Main St, Bridgend, PH2 7HD	45	48	55	53	40	41	45	27	44	52	49	51
18 Main St, Bridgend, PH2 7HB	48	46	46	42	39	39	43	38	48	46	45	56
18 Main St, Bridgend, PH2 7HB	49	49	51	37	43	39	47	44	46	45	48	56
76 Atholl St, Perth, PH1 5NL	39	58	57	55	42	45	54	33	43	57	54	63
76 Atholl St, Perth, PH1 5NL	53	56	57	57	44	42	44	34	46	61	58	64
26-28 Atholl St, Perth, PH1 6NP	48	57	53	41	45	40	46	39	47	48	53	63
17 Atholl St, Perth, PH1 5NH	52	51	54	50	48	51	49	48	55	56	58	59
17 Atholl St, Perth, PH1 5NH	51	53	51	46	51	56	56	44	55	54	54	48
17 Atholl St, Perth, PH1 5NH	56	53	54	37	51	52	52	46	55	54	54	61
22 Barrack St, Perth, PH1 5RD	45	47	44	38	34	33	35	31	40	51	52	55
22 Barrack St, Perth, PH1 5RD	47	48	50	41	37	37	35	29	39	56	56	55
Ballantine Place, Perth PH1 5RR	29	29	31	х	21	18	20	х	20	35	33	40

### Table A2.1 - Diffusion tube locations and raw monitoring results in Perth in 2005

Site Name	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05	Nov-05	Dec-05
204 A Crieff Rd, Perth, PH1 2PE	25	32	30	30	25	27	26	21	26	36	34	42
5 East Huntingtower, Perth, PH1 3JJ	22	11	25	23	18	24	19	18	22	36	9	33
30 Edinburgh Rd, Perth, PH2 8BX	х	29	31	24	18	20	22	16	25	36	29	40
2 West Bridge St, Bridgend, Perth, PH2 7HA	38	36	36	29	26	27	29	24	30	36	41	37
Real Time Monitor adjacent to 176 High St, Perth PH1 5EW	36	40	34	25	26	24	26	23	29	34	37	42
Real Time Monitor adjacent to 176 High St, Perth PH1 5EW	36	39	35	27	28	22	24	21	30	33	35	41
Real Time Monitor adjacent to 176 High St, Perth PH1 5EW	37	41	38	25	27	24	20	23	26	34	40	44
Atholl St, Perth real time monitor	58	51	50	51	53	53	56	48	56	59	56	51
Atholl St, Perth real time monitor	57	50	49	55	49	53	52	50	58	59	55	56
Atholl St, Perth real time monitor	50	52	50	51	49	46	51	50	61	58	60	52
Opp Wood'n Garden, Glencarse, PH2 7LX	21	22	25	27	19	23	22	19	27	34	22	33
Linden Garden Centre, Glencarse, PH2 7LX	22	36	22	28	22	22	26	18	27	35	26	34
7 West High st, Crieff	39	х	31	39	38	34	36	31	х	42	37	44
39, High St, Crieff	34	33	38	37	35	29	34	32	31	42	36	39
The Highland Trading Company, 62, High St, Crieff	32	35	31	32	28	23	32	25	22	36	35	38
9 East High St, Crieff	31	х	39	36	33	33	34	32	34	42	41	44
9 East High St, Crieff	34	х	38	36	35	31	36	30	34	45	39	44
12 Dunkeld Street, Aberfeldy	25	28	27	22	23	22	25	20	28	27	28	32
Highland Gift Shop, Bridgend, Aberfeldy	20	20	22	19	21	17	18	17	21	23	20	23
Highland Gift Shop, Bridgend, Aberfeldy	20	20	23	20	17	16	15	15	21	23	19	23

Notes : 1. All concentrations are  $\mu g m^{-3}$  expressed as NO<sub>2</sub>.

These data have not been bias adjusted

### Table A2.2 – Perth 1 Automatic Monitoring Data (High Street)

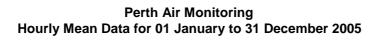
PERTH 01 January to 31 December 2005 These data are provisional from 01/07/2005 and may be subject to further quality control

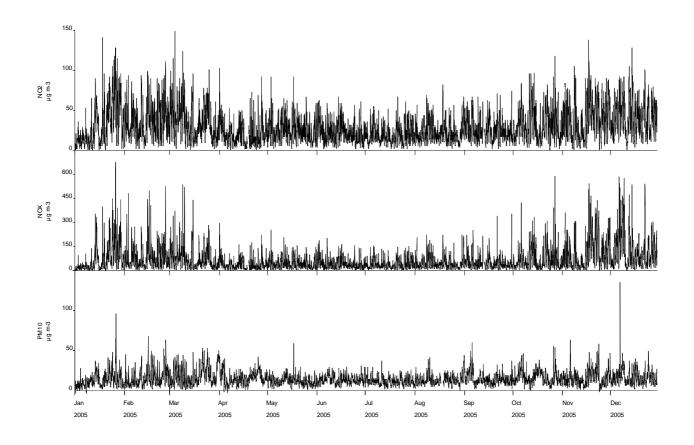
POLLUTANT	NO <sub>2</sub>	NO <sub>X</sub>	PM <sub>10</sub> +
Number Very High	0	-	0
Number High	0	-	0
Number Moderate	0	-	0
Number Low	8689	-	8715
Maximum 15-minute mean	397 µg m <sup>-3</sup>	1024 µg m <sup>-3</sup>	225 µg m <sup>-3</sup>
Maximum hourly mean	149 µg m <sup>-3</sup>	678 µg m <sup>-3</sup>	135 µg m <sup>-3</sup>
Maximum running 8-hour mean	105 µg m <sup>-3</sup>	444 µg m <sup>-3</sup>	59 µg m <sup>-3</sup>
Maximum running 24-hour mean	$77 \mu g  m^{-3}$	$282 \mu g  m^{-3}$	41 µg m <sup>-3</sup>
Maximum daily mean	$70 \mu g m^{-3}$	263 µg m <sup>-3</sup>	40 µg m <sup>-3</sup>
Average	28 µg m <sup>-3</sup>	63 µg m <sup>-3</sup>	14 µg m <sup>-3</sup>
Data capture	99.2 %	99.2 %	99.2 %

+  $PM_{10}$  instrument is a TEOM All mass units are at 20'C and 1013mb NO<sub>X</sub> mass units are NO<sub>X</sub> as NO<sub>2</sub>

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 $\mu$ g m <sup>-3</sup>	0	-
Nitrogen Dioxide	Hourly mean > 200 $\mu$ g m <sup>-3</sup>	0	0
PM <sub>10</sub> (Gravimetric)	Daily mean > 50 μg m <sup>-3</sup>	1	1
PM <sub>10</sub> (Gravimetric)	Annual mean > 40 μg m <sup>-3</sup>	0	-
PM <sub>10</sub> (Gravimetric)	Annual mean > 18 µg m⁻³	1	-

### Produced by netcen on behalf of Perth and Kinross Council





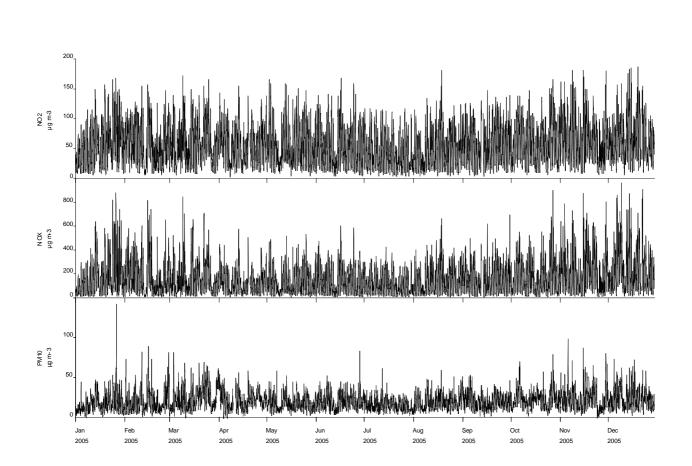
### Table A2.3 - Perth 2 Automatic Monitoring Data (Atholl Street)

PERTH 2 01 January to 31 December 2005 These data are provisional from 01/07/2005 and may be subject to further quality control

POLLUTANT	NO <sub>2</sub>	NO <sub>x</sub>	PM <sub>10</sub> +
Number Very High	0	-	0
Number High	0	-	0
Number Moderate	0	-	0
Number Low	8681	-	8634
Maximum 15-minute mean	308 µg m <sup>-3</sup>	1217 µg m <sup>-3</sup>	205 µg m <sup>-3</sup>
Maximum hourly mean	187 µg m⁻³	963 µg m⁻³	142 µg m <sup>-3</sup>
Maximum running 8-hour mean	157 µg m <sup>-3</sup>	677 µg m⁻³	71 µg m <sup>-3</sup>
Maximum running 24-hour mean	99 µg m <sup>-3</sup>	427 µg m <sup>-3</sup>	47 µg m <sup>-3</sup>
Maximum daily mean	95 µg m <sup>-3</sup>	394 µg m <sup>-3</sup>	46 µg m⁻³
Average	54 µg m <sup>-3</sup>	153 µg m <sup>-3</sup>	19 µg m⁻³
Data capture	99.1 %	99.1 %	98.1 %

+  $PM_{10}$  instrument is a TEOM All mass units are at 20'C and 1013mb  $NO_X$  mass units are  $NO_X$  as  $NO_2$ 

Pollutant	Air Quality Regulations (2000) and Air Quality (Scotland) Amendment Regulations 2002	Exceedences	Days
Nitrogen Dioxide	Annual mean > 40 $\mu$ g m <sup>-3</sup>	1	-
Nitrogen Dioxide	Hourly mean > 200 $\mu$ g m <sup>-3</sup>	0	0
PM <sub>10</sub> (Gravimetric)	Daily mean > 50 µg m⁻³	4	4
PM <sub>10</sub> (Gravimetric)	Annual mean > 40 μg m <sup>-3</sup>	0	-
PM <sub>10</sub> (Gravimetric)	Annual mean > 18 μg m <sup>-3</sup>	1	-



Produced by netcen on behalf of Perth and Kinross Council

Perth 2 Air Monitoring Hourly Mean Data for 01 January to 31 December 2005

# **Appendix 3**

# Model validation Nitrogen dioxide roadside concentrations

Contents

Introduction Model application Results Discussion

## INTRODUCTION

The dispersion model ADMS-3 was used to predict nitrogen dioxide concentrations at roadside locations. ADMS-3 is a PC-based model that includes an up-to-date representation of the atmospheric processes that contribute to pollutant dispersion.

The model was used to predict

- the local contribution to pollutant concentrations from roads; and
- The contribution from urban background sources.

The contribution from urban background sources was calculated from the ADMS-3 output using the NETCEN Local Area Dispersion System (LADS) model. The LADS model provides efficient algorithms for applying the results of the dispersion model over large areas.

The model was verified by comparison with monitoring data obtained at a number of roadside, kerbside or near-road monitoring sites in London.

- London Marylebone
- Camden Roadside
- Haringey Roadside
- London Bloomsbury
- London North Kensington
- London A3 Roadside

London Marylebone site is located in a purpose built cabin on Marylebone Road opposite Madame Tussauds. The sampling point is located at a height of 3 m, around 1 m from the kerbside. Traffic flows of over 80,000 vehicles per day pass the site on six lanes. The road is frequently congested. The surrounding area forms a street canyon and comprises of education buildings, tourist attractions, shops and housing

Camden Roadside site (TQ267843) is located in a purpose built cabin on the north side of the Swiss Cottage Junction. The site is at the southern end of a broad street canyon. Sampling points are approximately 1 m from the kerbside of Finchley Road at a height of 3 m. Traffic flows of 37,000 vehicles per day pass the site and the road is often congested. Pedestrian traffic is also high. The surrounding area mainly consists of shops and offices.

London North Kensington site (TQ240817) is located within the grounds of Sion Manning School. The sampling point is located on a cabin, in the school grounds next to St Charles Square, at a height of 3 m. The surrounding area is mainly residential.

London A3 monitoring station (TQ193653) is within a self-contained, air-conditioned housing immediately adjacent to the A3 Kingston Bypass (6 lane carriageway). Traffic flow along the bypass is approximately 112,000 vehicles per day and is generally fast and free flowing with little congestion. The manifold inlet is approximately 2.5 m from the kerbside at a height of approximately 3 m. The surrounding area is generally open and comprises residential dwellings and light industrial and commercial properties.

London Bloomsbury monitoring station (TQ302820) is within a self-contained, air-conditioned housing located at within the southeast corner of central London gardens. The gardens are generally laid to grass with many mature trees. All four sides of the gardens are surrounded by a busy (35,000 vehicles per day), 2/4 lane one-way road system which is subject to frequent congestion. The nearest road lies at a distance of approximately 35 metres from the station. The manifold inlet is approximately 3 metres high. The area in the vicinity of the manifold is open, but there are mature trees within about 5 metres.

London Haringey site (TQ339906) is located in a purpose built cabin within the grounds of the Council Offices. The sampling point is at a height of 3 m located 5 m from High Road Tottenham (A1010) with traffic flows of around 20,000 vehicles per day. The road is frequently congested. The surrounding area consists of shops, offices and housing.

# MODEL APPLICATION

### Study area

Two study areas were defined- a local study area and an urban background study area. The local study area was defined for each of the monitoring sites extending 200 m in each direction (NSEW) from the monitoring site. Roads in the study area were identified. Each road in the study area was then treated as a quadrilateral volume source with depth 3 m, with spatial co-ordinates derived from OS maps. The urban background study area extended over an 80 km x 80 km area covering the London area. The background study area was divided into 1 km x 1 km squares-each 1 km square was then treated as a square volume source with depth 10 m.

### Traffic flows in the local study area

Traffic flows, by vehicle category, on each of the roads within the local study area for 1996 were obtained from the DETR traffic flow database. The traffic flows were scaled to 1998 by factors shown in Table A3.1 obtained by linear interpolation from Transport Statistics GB, 1997.

Table A3.1	Traffic growth 1998:1996
------------	--------------------------

Vehicle Type	Growth factor
Cars	1.05
Light goods vehicles	1.05
Heavy goods vehicles	1.04
Buses	1.00
Motorcycles	1.00

Traffic flows follow a diurnal variation. Table A3.2 shows the assumed diurnal variation in traffic flows.

**Table A3.2**Assumed diurnal traffic variation

Hour	Normalised traffic flow
0	0.20
1	0.11
2	0.10
3	0.07
2 3 4 5 6	0.08
5	0.18
6	0.49
7	1.33
8	1.97
9	1.50
10	1.33
11	1.46
12	1.47
13	1.51
14	1.62
15	1.74
16	1.94
17	1.91
18	1.53
19	1.12
20	0.88
21	0.68
22	0.46
23	0.33

### Vehicle speeds in the local study area

Vehicle speeds were estimated on the basis of TSGB, 1997 data for central area, inner area and outer area average traffic speeds in London, 1968-1995 and for non-urban and urban roads for 1996. Table A3.3 shows the traffic speeds applied to each of the sites. The low speeds in Central London reflect the generally high levels of congestion in the area.

Site	Road class	Vehicle speed, kph
London Marylebone	Central London	17.5
Camden Roadside	Central London	17.5
London Bloomsbury	Central London	17.5
London A3 Roadside	Non-urban dual carriageway	88
London Haringey	Outer London	32
London North Kensington	Background site	Not applicable

### Table A3.3 Traffic speeds used in the modelling

### Vehicle emissions in the local study area

Vehicle emissions of oxides of nitrogen were estimated using the Highways Agency Design Manual for Roads and Bridges, 1999 (DMRB). DMRB provides a series of nomograms that allow the effect on emission rates of the proportion of heavy goods vehicles and the average vehicle speed to be taken into account. The estimated emissions are based on average speeds and take account of the variations in emissions that follow from normal patterns of acceleration and deceleration. DMRB provides estimates of the emissions of particulate material from vehicle exhausts.

### Emissions in the urban background study area

Emission estimates for each 1 km square in the urban background study area were obtained from two emission inventories. The London inventory for 1995/6 (LRC, 1997) was used for most of the urban background study area: the National Atmospheric Emission Inventory 1996 was used for areas within the urban background study area not covered by the London inventory.

The emission estimates for each square for 1996 were scaled to 1998 using factors taken from DMRB.

### Meteorological data

Meteorological data for Heathrow Airport 1998 was used to represent meteorological conditions. The data set included wind speed and direction and cloud cover for each hour of the year. It was assumed that a surface roughness of 0.5 m was representative of the suburban area surrounding Heathrow Airport.

The meteorological conditions over London are affected by heat emissions from buildings and vehicles. This "urban heat island" effect reduces the frequency and severity of the stable atmospheric conditions that often lead to high pollutant concentrations. In order to take this into account the Monin-Obukhov length (a parameter used to characterise atmospheric stability in the model) has been assigned a lower limit as shown in Table A3.4.

Site	Limit, m	Note
London Marylebone	100	Large conurbation
Camden Roadside	100	Large conurbation
London Bloomsbury	100	Large conurbation
London A3 Roadside	30	Mixed urban/industrial
London Haringey	30	Mixed urban/industrial
London North Kensington	100	Large conurbation
Small towns <50,000	10	
Urban background area	100	
Rural	1	

### Table A3.4: Monin-Obukhov limits applied

### Surface roughness

The surface roughness is used in dispersion modelling to represent the roughness of the ground. Table A3.5 shows the surface roughness values applied.

### Table A3.5Surface roughness

Site	Surface roughness, m	Note
London Marylebone	2	Street canyon
Camden Roadside	1	City
London Bloomsbury	1	City
London A3 Roadside	0.5	Suburban
London Haringey	1	City
London North Kensington	1	Suburban
Urban background area	1	

### Model output

The local model was used to estimate:

- Annual average road contribution of oxides of nitrogen;
- Road contribution to oxides of nitrogen concentrations for each hour of the year.

The urban background model was used to estimate:

- The contribution from urban background sources to annual average oxides of nitrogen concentrations;
- The contribution from roads considered in the local model to urban background concentrations;
- The contribution from urban background sources to oxides of nitrogen concentrations for each hour of the year.

### **Background concentrations**

A rural background concentration of 20  $\mu g~m^{\text{-3}}$  was added to the urban background oxides of nitrogen concentration.

### Calculation of annual average nitrogen dioxide concentrations

Nitrogen dioxide is formed as the result of the oxidation of nitrogen oxides in air, primarily by ozone. The relationship between oxides of nitrogen concentrations and nitrogen dioxide concentrations is complex; an empirical approach has been adopted.

The contribution from locally modelled roads to urban background oxides of nitrogen concentrations was first subtracted from the calculated urban background concentration. The annual average urban background nitrogen dioxide concentration was then calculated from the corrected annual average urban background oxides of nitrogen concentration using the following empirical relationship based on monitoring data from AUN sites:

For NO<sub>x</sub>>23.6  $\mu$ g m<sup>-3</sup>

 $NO_2 = 0.348.NO_r + 11.48 \ \mu g \ m^{-3}$ 

For NO<sub>x</sub><23.6  $\mu$ g m<sup>-3</sup>

 $NO_2 = 0.833.NO_x \ \mu g \ m^{-3}$ 

The contribution of road sources to nitrogen dioxide concentrations was then calculated using the following empirical relationship (Stedman):

 $NO_2 = 0.162.NO_x$ 

The contributions from road and background sources to annual average nitrogen dioxide concentrations were then summed.

The calculated value was then corrected so that there was agreement between modelled and measured concentrations at a reference site (London North Kensington (LNK)):

NO<sub>2</sub>(corrected, site)= NO<sub>2</sub>(modelled, site)+ NO<sub>2</sub>(measured, LNK)- NO<sub>2</sub>(modelled, LNK)

### Calculation of 99.8<sup>th</sup> percentile hourly average concentrations

A simple approach has been used to estimate 99.8<sup>th</sup> percentile values. The approach relies on an empirical relationship between 99.8th percentile of hourly mean nitrogen dioxide and annual mean concentrations at kerbside/roadside sites, 1990-1998:

 $NO_2(99.8^{th} \text{ percentile})=3.0 NO_2(annual mean)$ 

99.8 th percentile values were calculated on the basis of the modelled annual mean.

The calculated value was then corrected so that there was agreement between modelled and measured concentrations at a reference site (London North Kensington (LNK)):

NO<sub>2</sub>(corrected, site)= NO<sub>2</sub>(modelled, site)+ NO<sub>2</sub>(measured, LNK)- NO<sub>2</sub>(modelled, LNK)

## RESULTS

Modelled results are shown in Table A3.6. Fig. A3.1 shows modelled annual average nitrogen dioxide concentrations plotted against the measured values. Similarly Fig. A3.2 shows modelled 99.8th percentile average nitrogen dioxide concentrations plotted against measured values.

Table A3.6	Comparison of modelled and measured concentrations
------------	--

Site	Nitrogen dioxide concentration, ppb			
	Annual average		99.8 <sup>th</sup> percentile hourly	
	Modelled	Measured	Modelled	Measured
London A3	32	30	94	73
North Kensington	24	24	70	70
Bloomsbury	28	34	83	78
Camden	32	33	95	89
London Marylebone	45	48	134	121
Haringey	22	28	65	77

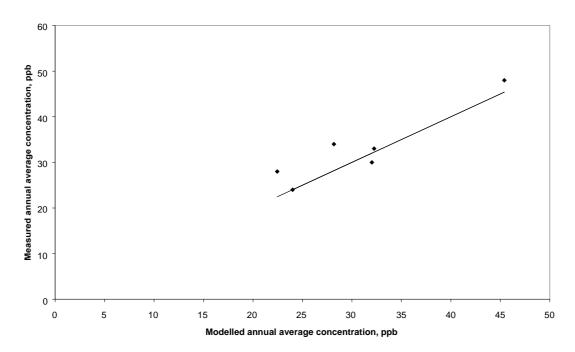
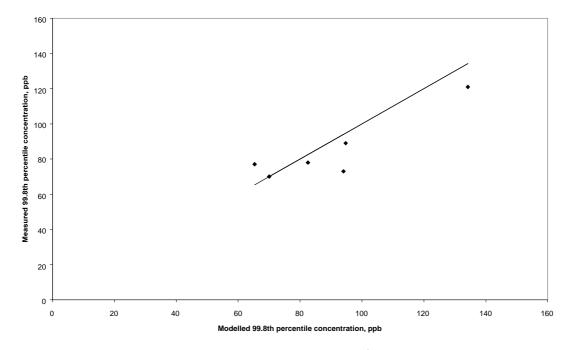


Fig. A3.1 Comparison of modelled and measured annual average nitrogen dioxide concentrations



**Fig. A3.2** Comparison of modelled and measured 99.8<sup>th</sup> percentile hourly average nitrogen dioxide concentrations

## DISCUSSION

### Model errors

The error in the modelled annual average at each site was calculated as a percentage of the modelled value. The standard deviation of the errors was then calculated: it was 12% with five degrees of freedom.

The error in the 99.8th percentile concentration at each site was calculated as a percentage of the modelled value. The standard deviation of the errors was then calculated: it was also 12% with five degrees of freedom.

### Year to year variation in background concentrations

Nitrogen dioxide concentrations at monitoring sites show some year to year variations. Reductions in emissions in the United Kingdom are responsible for some of the variation, but atmospheric influences and local effects also contribute to the variation.

In order to quantify the year to year variation monitoring data from AUN stations with more than 75% data in the each of the years 1996-1998 was analysed using the following procedure.

First, the expected concentrations in 1997 and 1996 were calculated from the 1998 data.

$$c_e = \frac{d_{1998}}{d_v} c_{1998}$$

where  $c_{1996}$  is the concentration in 1998;

 $d_{1998}$ ,  $d_y$  are correction factors to estimate nitrogen dioxide concentrations in future years (1996=1, 1997=0.95, 1998=0.91) from DETR guidance;

The difference between the measured value and the expected value was then determined for each site and normalised by dividing by the expected value. The standard deviation of normalised differences was determined for each site. A best estimate of the standard deviation from all sites was then calculated. The standard deviation of the annual mean was 0.097 with 2 degrees of freedom. The standard deviation of the 99.8th percentile hourly concentration was 0.21 with 2 degrees of freedom.

### Short periods of monitoring data

Additional errors can be introduced where monitoring at the reference site (used to calibrate the modelling results against) takes place over periods less than a complete year, typically of three or six months.

In this case, a whole year of data was available at the monitoring site (1999 in Glasgow Centre), and so no correction was necessary for short periods of monitoring.

### **Confidence limits**

Upper confidence limits for annual mean and 99.8<sup>th</sup> percentile concentrations were estimated statistically from the standard deviation of the model error and the year to year standard deviation:

$$u = c + \sqrt{(t_m s_m)^2 \cdot (1 + \frac{1}{k})} + (t_y s_y)^2 + \sum (t_p s_p)^2 / k$$

### where:

 $s_m,\,s_y,\,s_p\,$  are the model error standard deviation , the year to year standard deviation and the standard error introduced using part year data;

c is the concentration calculated for the modelled year;

 $t_m$ ,  $t_y$ ,  $t_p$  are the values of Student's t distribution for the appropriate number of degrees of freedom at the desired confidence level;

k is the number of reference sites used in the estimation of the modelled concentration.

In many cases, the concentration estimate is based on a single reference site (k=1). However, improved estimates can be obtained where more than one reference site is used.

Table A3.7 shows confidence levels for predictions as a percentage of modelled values

Confidence level	Annual mean	99.8 <sup>th</sup> percentile
80 %	+19%	+27%
90%	+31%	+47%
95%	+44%	+70%

 Table A3.7
 Upper confidence levels (k=1) for modelled concentrations for future years

In practical terms,

- There is less than 1:5 chance (i.e.100-80=20%) that the 40 μg m<sup>-3</sup> objective will be exceeded if the modelled annual average concentration in 2005 is less than 34 μg m<sup>-3</sup> (i.e. 40/1.19);
- There is less than 1:20 (i.e. 100-5=5%) chance that the objective will be exceeded if the modelled roadside concentration is less than 28  $\mu$ g m<sup>-3</sup> (i.e. 40/1.44).
- Similarly, there is less than 1:5 chance that the 200 µg m<sup>-3</sup> 99.8<sup>th</sup> percentile concentration will be exceeded if the modelled concentration for 2005 is less than 157 µg m<sup>-3</sup>;
- There is less than 1:20 chance that the objective will be exceeded if the modelled concentration in 2005 is less than 117  $\mu$ g m<sup>-3</sup>.

In the figures shown in the report, the intervals of confidence limits for the 'probable' and 'likely' annual average and hourly objective concentrations have been set equal to those for 'possible' and 'unlikely', respectively. In reality, the intervals of concentration increase as the probability of exceeding the annual and hourly objective increases from 'unlikely' to 'likely'. The advantage to setting symmetrical concentration intervals is that the concentration contours on the maps become simpler to interpret. This is a mildly conservative approach to assessing the likelihood of exceedances of the  $NO_2$  objectives since a greater geographical area will be included using the smaller confidence intervals.

A simple linear relationship can be used to predict the  $99.8^{th}$  percentile concentration of NO<sub>2</sub> from the annual concentration: the  $99.8^{th}$  percentile is three times the annual mean at kerbside/roadside locations. Therefore, plots of the modelled annual mean NO<sub>2</sub> concentrations can be used to show exceedances of both the annual and hourly NO<sub>2</sub> objectives. However, the magnitude of the concentrations used to judge exceedances of the hourly objective need to be adjusted so they may be used directly with the plots of annual concentration. This has been performed by simply dividing the concentrations of the confidence limits by three.

The following table shows the difference between assigning symmetrical confidence intervals and assigning intervals based directly on the statistics.

 Table A3.8a
 Confidence levels for modelled concentrations for future years based on symmetrical concentration intervals and concentration intervals derived purely from the statistics

Description	Chance of exceeding objective	Confidence limits for the modelled annual average concentrations ( $\mu$ g m <sup>-3</sup> )			
		Annual average objective (symmetrical intervals)	Symmetrical intervals	Annual average objective (intervals based on statistics)	Interval
Very unlikely	Less than 5%	< 28		< 28	
Unlikely	5 to 20%	28 to 34	6.0	28 to 34	6.0
Possible	20 to 50%	34 to 40	6.3	34 to 40	6.3
Probable	50 to 80%	40 to 46	6.3	40 to 47	7.5
Likely	80 to 95%	46 to 52	6.0	47 to 58	10.3
Very likely	More than 95%	> 52		> 58	

### Unrestricted

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 Table A3.8b
 Confidence levels for modelled concentrations for future years based on symmetrical concentration intervals and concentration intervals derived purely from the statistics

Description	Chance of exceeding objective	Confidence limits for the modelled annual average concentrations ( $\mu g \ m^{-3}$ )			
		Hourly average objective (symmetrical intervals)	Symmetrical intervals	Hourly average objective (intervals based on statistics)	Interval
Very unlikely	Less than 5%	< 39		< 39	
Unlikely	5 to 20%	39 to 52	13.2	39 to 52	13.2
Possible	20 to 50%	52 to 67	14.3	52 to 67	14.3
Probable	50 to 80%	67 to 81	14.3	67 to 85	18.1
Likely	80 to 95%	81 to 94	13.2	85 to 113	28.7
Very likely	More than 95%	> 94		> 113	

# Appendix 4

# Model validation $PM_{10}$

	Calculation of the calibration curve for the modelled PM <sub>10</sub> concentrations
Figure A4.1	Scatter plot to show the relationship between the measured (estimated) and modelled primary emissions at the Edward Benefer monitoring station
Figure A4.2	Calibration curve to derive the bias in the modelled $PM_{10}$

concentrations

## INTRODUCTION

The dispersion model ADMS-3 was used to predict  $PM_{10}$  concentrations at roadside locations. ADMS-3 is a PC-based model that includes an up-to-date representation of the atmospheric processes that contribute to pollutant dispersion.

The model was verified by comparison with monitoring data obtained at a number of roadside, kerbside or near-road monitoring sites in London. The monitoring sites considered were:

- London Marylebone
- Camden Roadside
- Haringey Roadside
- London Bloomsbury
- London North Kensington
- London A3 Roadside

London Marylebone site is located in a purpose built cabin on Marylebone Road opposite Mme Tussauds. The sampling point is located at a height of 3m, around 1m from the kerbside. Traffic flows of over 80,000 vehicles per day pass the site on six lanes. The road is frequently congested. The surrounding area forms a street canyon and comprises of education buildings, tourist attractions, shops and housing

Camden Roadside site (TQ267843) is located in a purpose built cabin on the north side of the Swiss Cottage Junction. The site is at the southern end of a broad street canyon. Sampling points are approximately 1 m from the kerbside of Finchley Road at a height of 3m. Traffic flows of 37,000 vehicles per day pass the site and the road is often congested. Pedestrian traffic is also high. The surrounding area mainly consists of shops and offices.

London North Kensington site (TQ240817) is located within the grounds of Sion Manning School. The sampling point is located on a cabin, in the school grounds next to St Charles Square, at a height of 3m. The surrounding area is mainly residential.

London A3 monitoring station (TQ193653) is within a self-contained, air-conditioned housing immediately adjacent to the A3 Kingston Bypass (6 lane carriageway). Traffic flow along the bypass is approximately 112,000 vehicles per day and is generally fast and free flowing with little congestion. The manifold inlet is approximately 2.5 m from the kerbside at a height of approximately 3m. The surrounding area is generally open and comprises residential dwellings and light industrial and commercial properties.

London Bloomsbury monitoring station (TQ302820) is within a self-contained, air-conditioned housing located at within the southeast corner of central London gardens. The gardens are generally laid to grass with many mature trees. All four sides of the gardens are surrounded by a busy (35,000 vehicles per day), 2/4 lane one-way road system which is subject to frequent congestion. The nearest road lies at a distance of approximately 35 metres from the station. The manifold inlet is approximately 3 metres high. The area in the vicinity of the manifold is open, but there are mature trees within about 5 metres.

London Haringey site (TQ339906) is located in a purpose built cabin within the grounds of the Council Offices. The sampling point is at a height of 3 m located 5m from High Road Tottenham (A1010) with traffic flows of around 20,000 vehicles per day. The road is frequently congested. The surrounding area consists of shops, offices and housing.

#### Model application

#### Study area

A study area was defined for each of the monitoring sites extending 200 m in each direction (NSEW) from the monitoring site. Roads in the study area were identified. Each road in the study area was then treated as a quadrilateral volume source with depth 3m, with spatial coordinates derived from OS maps.

#### Traffic flows

Traffic flows, by vehicle category, on each of the roads within the study area for 1996 were obtained from the DETR traffic flow database. The traffic flows were scaled to 1998 by factors shown in Table A4.1 obtained by linear interpolation from Transport Statistics GB, 1997.

#### **Table A4.1:** Traffic growth 1998:1996

	Growth factor
Cars	1.05
Light goods vehicles	1.05
Heavy goods vehicles	1.04
Buses	1.00
Motorcycles	1.00

Traffic flows follow a diurnal variation. Table A4.2 shows the assumed diurnal variation in traffic flows.

Table A4.2: Assumed diurnal traffic variation

Hour	Normalised
	traffic flow
0	0.20
1	0.11
2	0.10
3	0.07
4	0.08
5	0.18
6	0.49
7	1.33
8	1.97
9	1.50
10	1.33
11	1.46
12	1.47
13	1.51
14	1.62
15	1.74
16	1.94
17	1.91
18	1.53
19	1.12
20	0.88
21	0.68
22	0.46
23	0.33

#### Vehicle speeds

Vehicle speeds were estimated on the basis of TSGB, 1997 data for central area, inner area and outer area average traffic speeds in London, 1968-1995 and for non-urban and urban roads for 1996. Table A4.3 shows the traffic speeds applied to each of the sites. The low speeds in Central London reflect the generally high levels of congestion in the area.

Table A4.3. Traine speeds used in the modelling					
Site	Road class	Vehicle speed, kph			
London Marylebone	Central London	17.5			
Camden Roadside	Central London	17.5			
London Bloomsbury	Central London	17.5			
London A3 Roadside	Non-urban dual carriageway	88			
London Haringey	Outer London	32			
London North Kensington	Background site	Not applicable			

 Table A4.3: Traffic speeds used in the modelling

#### Vehicle emissions

Vehicle emissions were estimated using the Highways Agency Design Manual for Roads and Bridges, 1999 (DMRB). DMRB provides a series of nomograms that allow the effect on emission rates of the proportion of heavy goods vehicles and the average vehicle speed to be taken into account. The estimated emissions are based on average speeds and take account of the variations in emissions that follow from normal patterns of acceleration and deceleration. DMRB provides estimates of the emissions of particulate material from vehicle exhausts. Nearly all the exhaust material is in the sub 10  $\mu$ m range and so it was assumed that all the particulate material released in the exhaust was PM<sub>10</sub>.

 $PM_{10}$  is also released as the result of resuspension of roadside dusts from tyre wear, brake pad wear etc.. The rate of emission is uncertain: it has been suggested that resuspended dusts may be emitted at rates approaching those from vehicle exhausts. The rate of resuspension is expected to depend to some extent on wind speed, with relatively little resuspension occurring at low wind speeds. For this assessment it has been assumed that resuspended dusts are emitted at a rate of half the exhaust emissions when calculating annual average  $PM_{10}$  concentrations but resuspension has been ignored when calculating  $PM_{10}$  concentrations for the meteorological conditions (generally low wind speeds) corresponding to the 90<sup>th</sup> percentile 24 hour average.

#### Meteorological data

Meteorological data for Heathrow Airport 1998 was used to represent meteorological conditions. The data set included wind speed and direction and cloud cover for each hour of the year. It was assumed that a surface roughness of 0.5 m was representative of the suburban area surrounding Heathrow Airport.

The meteorological conditions over London are affected by heat emissions from buildings and vehicles. This "urban heat island" effect reduces the frequency and severity of the stable atmospheric conditions that often lead to high pollutant concentrations. In order to take this into account the Monin-Obukhov length (a parameter used to characterise atmospheric stability in the model) has been assigned a lower limit as shown in Table A4.4.

Site	Limit, m	Note
London Marylebone	100	Large conurbation
Camden Roadside	100	Large conurbation
London Bloomsbury	100	Large conurbation
London A3 Roadside	30	Mixed urban/industrial
London Haringey	30	Mixed urban/industrial
London North Kensington	100	Large conurbation
Small towns <50,000	10	
Rural	1	

#### Table A4.4: Monin-Obukhov limits applied

#### Surface roughness

The surface roughness is used in dispersion modelling to represent the roughness of the ground. Table A4.5 shows the surface roughness values applied.

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#### Table A4.5: Surface roughness

Site	Surface roughness, m	Note
London Marylebone	2	Street canyon
Camden Roadside	1	City
London Bloomsbury	1	City
London A3 Roadside	0.5	Suburban
London Haringey	1	City
London North Kensington	1	Suburban

#### Model output

The model was used to estimate:

- Annual average road contribution ;
- 90 th percentile 24 hour average road contribution;
- road contribution for each hour of the year.

#### Background concentrations

The London North Kensington site was used to provide an estimate of the background concentration of  $PM_{10}$ . The background concentration was then estimated at other sites on the basis of DETR background maps (http://www.aeat.co.uk/netcen/airqual/) for 1996. The background maps were corrected to 1998 by multiplying the concentrations by 0.82 (0.9 for 1997), based on the comparison of monitoring data at 17 monitoring sites with greater than 75% data capture in both years. Thus, background annual average concentrations at other sites were estimated using:

C<sub>av</sub>(site, 1998)=C<sub>av</sub>(LNK,measured,1998)+0.82\*(C<sub>av</sub>(site,map,1996)-C<sub>av</sub>(LNK,map,1996))

The 90<sup>th</sup> percentile 24 hour average concentration at other sites were estimated using:

C<sub>90</sub>(site, 1998)=C<sub>av</sub>(LNK,measured,1998)\*1.68+0.82\*1.68\*(C<sub>av</sub>(site,map,1996)-C<sub>av</sub>(LNK,map,1996))

The background concentrations for each hour used in the calculation of 90<sup>th</sup> %ile concentrations at other sites were estimated using:

C (site, 1998)=C (LNK,measured,1998)+0.82\*1.68\*(C<sub>av</sub>(site,map,1996)-C<sub>av</sub>(LNK,map,1996))

The factor 1.68 in the above equations is taken from an analysis of the relationship between the  $90^{th}$  percentile 24 hour average PM<sub>10</sub> and the annual average PM<sub>10</sub> concentration at UK Automatic Network sites 1992-1997.

The background concentrations and the DETR background map were based on TEOM measurements. In order to convert to gravimetric measurements the values were multiplied by a factor 1.3, following Pollutant Specific Guidance.

#### Adding background concentrations

The modelled road contribution to PM<sub>10</sub> were added to the background concentrations in a number of ways. For total annual average gravimetric concentrations:

 $C_{av}$ (total, site, 1998)=  $C_{av}$ (background, site, 1998)\*1.3+  $C_{av}$ (roads, site, 1998)-  $C_{av}$ (roads, LNK, 1998)

90<sup>th</sup> percentile 24 hour average concentrations were estimated (Method 1):

C<sub>90</sub>(total, site, 1998)= C<sub>90</sub>(background, site, 1998)\*1.3+ C<sub>90</sub>(roads, site, 1998)- C<sub>90</sub>(roads, LNK, 1998)

The 90<sup>th</sup> %ile 24 hour average concentration was also estimated more formally by first calculating for each hour (Method 2):

C (total, site, 1998)= C (background, site, 1998)\*1.3+ C (roads, site, 1998)- C (roads, LNK, 1998)

then calculating the average concentration for each day and then determining the 36<sup>th</sup> highest daily average concentration.

#### Results

Modelled results are shown in Table A4.6. Fig.A4.1 shows modelled annual average  $PM_{10}$  concentrations plotted against the measured values. Similarly Fig. A4.2 shows modelled 90 th percentile 24 hour average  $PM_{10}$  concentrations plotted against measured values (Method 1).

The two methods of calculating the 90<sup>th</sup> percentile concentration are compared in Fig. A4.3. It shows the value calculated by adding the 90<sup>th</sup> percentile road contribution to the 90<sup>th</sup> percentile background concentrated compared with the value calculated more formally by taking the 90<sup>th</sup> percentile of daily average background plus road concentrations.

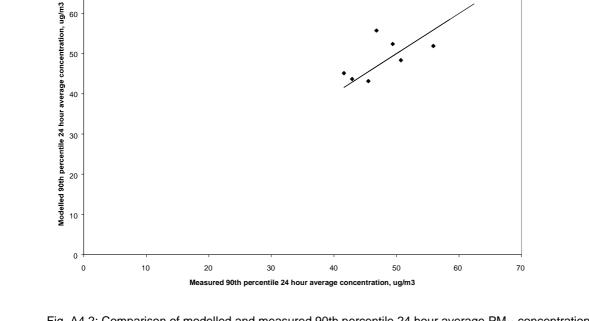
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#### Table A4.6: Model results summary

		Measu	ured		Backgrou	Ind, TEOM	Model	led road	Modelled,	gravimetric	
								ibution, imetric			
	Mean (TEOM)	Mean, gravimetric	90%ile TEOM	90 % gravimetric	DETR19 96 map	Corrected to model	Mean	90th%ile	Mean	90th%ile (1)	90th%ile (2)
1998 Haringey	22	28.6	35	45.5	27	year 18.36	2.28	3.08	26.15	43.18	41.34
London Marylebone	32	20.0 41.6	35 45	45.5 58.5	29	20	2.20 17.60	21.55	43.60	43.16 65.23	61.33
,											
Camden	25	32.5	36	46.8	29	20	9.39	12.08	35.39	55.76	53.23
Bloomsbury	23	29.9	32	41.6	29	20	1.20	1.46	27.20	45.14	43.87
London A3	24	31.2	39	50.7	25	16.72	8.76	11.85	30.50	48.37	47.28
North Kensington	20	26	33	42.9	29	20	0.00	0.00	26.00	43.68	42.80
1997 Camden	32	41.6	48	62.4	29	24	10.43	13.42	41.63	65.84	
Haringey	26	33.8	43	55.9	27	22.2	2.53	3.42	31.39	51.91	
North Kensington	24	31.2	38	49.4	29	24	0.00	0.00	31.20	52.42	

(1) 90<sup>th</sup> percentile 24 hour average value calculated by adding background and road 90<sup>th</sup> percentiles

(2) 90<sup>th</sup> percentile 24 hour average value calculated by adding daily mean background and road concentrations and then calculating the 90 th percentile value



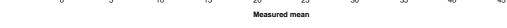


Fig. A4.1:Comparison of modelled and measured annual mean  $PM_{10}$  concentrations,  $\mu g/m^3$  gravimetric

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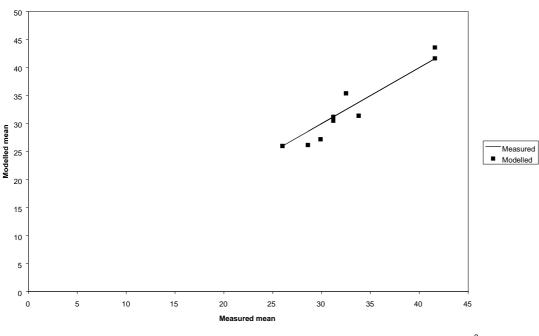


Fig. A4.2: Comparison of modelled and measured 90th percentile 24 hour average  $PM_{10}$  concentrations (Method 1),  $\mu g/m^3$  gravimetric.

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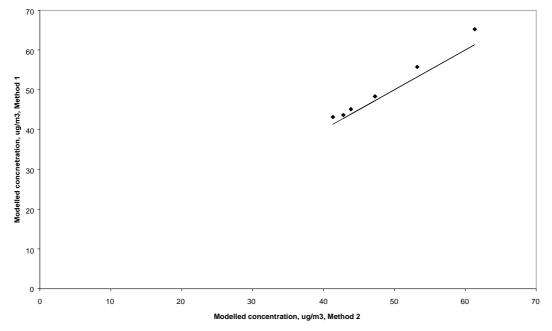


Fig. A4.3: Comparison of 90<sup>th</sup> percentile calculation methods, gravimetric units

#### Discussion Model errors

The difference between the modelled and measured values were calculated. The standard deviation of the difference was then determined.

The estimated standard error was 2.0  $\mu$ g m<sup>-3</sup> and 4.3  $\mu$ g m<sup>-3</sup> (gravimetric) for the annual mean and 90<sup>th</sup> percentile concentrations respectively with 5 degrees of freedom.

#### Year to year variation in background concentrations

 $PM_{10}$  concentrations at background sites show wide year to year variations. The year 1996 showed exceptionally high  $PM_{10}$  concentrations while 1998 showed relatively low concentrations. Reductions in emissions in the United Kingdom are responsible for some of the variation, but atmospheric influences have a significant effect.

Measurements of  $PM_{10}$  concentrations in Epping Forest District were carried out for a limited period (August 1 – November 5) during 1999. Monitoring data from other measurement sites in the London area was therefore assessed to determine whether measurements made over this period were representative of concentrations in 1996.

In order to quantify the year to year variation monitoring data from monitoring stations in the London area with more than 75% data in the each of the years 1996-1998 was analysed using the following procedure.

First, the expected annual average concentrations in 1999 were calculated from the 199x data.

$$c_e = (c_{av,199x} - 1.3.c_m b_{199x} - 10.5) \cdot \frac{a_{199x}}{a_{1999}} + 1.3 \times b_{1999} \times c_m + 10.5$$

where c<sub>av,199x</sub> is the average concentration (gravimetric) in 199x;

the factor 1.3 is used to convert TEOM measurements to gravimetric;

 $c_m$  is the annual average secondary concentration (TEOM) from DETR map for 1996;  $a_{1999x}$  are correction factors to estimate primary combustion PM<sub>10</sub> concentration in 2004 from DETR guidance;

 $b_{year}$  is a correction factor to estimate secondary  $PM_{10}$  in future years from 1996 mapped data; the factor 10.5 represents the contribution of coarse dusts to annual average concentrations (gravimetric).

The expected concentrations are plotted against the average concentration over the measurement period in Fig. A4.4. The difference between the measured average concentration for the period August 1 –November 5 1999 and the expected value was then determined for each site. The average difference and the standard deviation of the differences was determined.

The average difference in annual average (the bias) was  $-0.06 \ \mu g \ m^{-3}$  with standard deviation 1.95  $\ \mu g \ m^{-3}$  with 26 degrees of freedom (both in TEOM units).

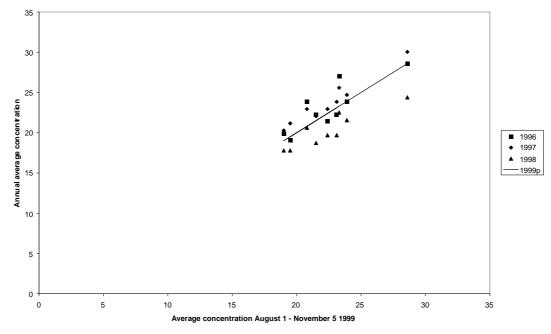


Fig. A4.4: Comparison of average concentrations ( $\mu$ g m<sup>-3</sup> TEOM) during August 1-November 5 1999 with annual average concentrations

#### **Confidence limits**

Upper confidence limits for predicted 90<sup>th</sup> percentile 24 hour average concentrations were estimated from the standard deviation of the model error and the year to year standard deviation:

$$u = c + 1.68b + \sqrt{2.(t_m s_m)^2 + (1.68t_y s_y)^2}$$

where s<sub>m</sub>, s<sub>y</sub> are the model error standard deviation and the standard deviation in the yearly bias, b; c is the concentration calculated for the modelled year;

b is the bias between average annual concentrations and the concentrations for the measurement period at the reference site;

 $t_m$ ,  $t_y$  are the values of Student's t distribution for the appropriate number of degrees of freedom at the desired confidence level;

the factor 2 allows for uncertainty in the estimates of concentrations at the reference site; the factor 1.68 applies to 90<sup>th</sup> percentile concentrations only.

Table A4.7 shows confidence levels for predictions of concentrations in future years based on the use as reference of data from the Epping Forest District monitoring site.

 Table A4.7: Confidence levels for prediction of concentrations in future years based on Epping Forest monitoring data

g aata		
One sided confidence level	Upper confidence limits, µg m <sup>-3</sup> gravimetric	
	Mean	90 <sup>th</sup> percentile 24 hour
		average
80%	+3.3	+6.5
90%	+5.2	+10.4
95%	+7.0	+14

In practical terms, there is less than 1:5 chance that the 50 ug/m3 objective will be exceeded in 2004 if the modelled 90<sup>th</sup> percentile 24 hour average concentration is less than 43.5 ug/m3: there is less than 1:20 chance that the objective will be exceeded if the modelled roadside concentration is less than 36 ug/m3.

#### Alternative method of calculation

Figure A2.3 shows that the simple method of adding 90<sup>th</sup> percentile backgrounds and road contributions provides a good estimate of the value calculated as the 90<sup>th</sup> percentile of daily average background plus road concentrations.

## **Appendix 5**

## The UK Air Quality Strategy

Contents

The need for an Air Quality Strategy Overview of the principles and main elements of the National Air Quality Strategy Air Quality Reviews Locations that the review and assessment must concentrate on

#### The Need for an Air Quality Strategy

The Government published its proposals for review of the National Air Quality Strategy in early 1999 (DETR, 1999). These proposals included revised objectives for many of the regulated pollutants. A key factor in the proposals to revise the objectives was the agreement in June 1998 at the European Union Environment Council of a Common Position on Air Quality Daughter Directives (AQDD).

Following consultation on the Review of the National Air Quality Strategy, the Government prepared the Air Quality Strategy for England, Scotland, Wales and Northern Ireland for consultation in August 1999. It was published in January 2000 (DETR, 2000).

The Environment Act (1995) provides the legal framework for requiring LA's to review air quality and for implementation of an AQMA. The main constituents of this Act are summarised in the table below.

Part IV Air Quality	Commentary
Section 80	Obliges the Secretary of State (SoS) to publish a National Air Quality Strategy as soon as possible.
Section 81	Obliges the Environment Agency to take account of the strategy.
Section 82	Requires local authorities, any unitary or Borough, to review air quality and to assess whether the air quality standards and objectives are being achieved. Areas where standards fall short must be identified.
Section 83	Requires a local authority, for any area where air quality standards are not being met, to issue an order designating it an air quality management area (AQMA).
Section 84	Imposes duties on a local authority with respect to AQMAs. The local authority must carry out further assessments and draw up an action plan specifying the measures to be carried out and the timescale to bring air quality in the area back within limits.
Section 85	Gives reserve powers to cause assessments to be made in any area and to give instructions to a local authority to take specified actions. Authorities have a duty to comply with these instructions.
Section 86	Provides for the role of County Councils to make recommendations to a district on the carrying out of an air quality assessment and the preparation of an action plan.
Section 87	Provides the SoS with wide ranging powers to make regulations concerning air quality. These include standards and objectives, the conferring of powers and duties, the prohibition and restriction of certain activities or vehicles, the obtaining of information, the levying of fines and penalties, the hearing of appeals and other criteria. The regulations must be approved by affirmative resolution of both Houses of Parliament.
Section 88	Provides powers to make guidance which local authorities must have regard to.

A4.1 Major elements of the Environment Act 1995

#### Overview of the principles and main elements of the National Air Quality Strategy

The main elements of the AQS can be summarised as follows:

- The use of a health effects based approach using national air quality standards and objectives.
- The use of policies by which the objectives can be achieved and which include the input of important factors such as industry, transportation bodies and local authorities.
- The predetermination of timescales with target dates of 2003, 2004, 2005, 2008 and 2010 for the achievement of objectives and a commitment to review the Strategy every three years.

It is intended that the AQS will provide a framework for the improvement of air quality that is both clear and workable. In order to achieve this, the Strategy is based on several principles which include:

- the provision of a statement of the Government's general aims regarding air quality;
- clear and measurable targets;
- a balance between local and national action and
- a transparent and flexible framework.

Co-operation and participation by different economic and governmental sectors is also encouraged within the context of existing and potential future international policy commitments.

#### **National Air Quality Standards**

At the centre of the AQS is the use of national air quality standards to enable air quality to be measured and assessed. These also provide the means by which objectives and timescales for the achievement of objectives can be set. Most of the proposed standards have been based on the available information concerning the health effects resulting from different ambient concentrations of selected pollutants and are the consensus view of medical experts on the Expert Panel on Air Quality Standards (EPAQS). These standards and associated specific objectives to be achieved between 2003 and 2010 are shown in Table A4.2. The table shows the standards in ppb and  $\mu g m^{-3}$  with the number of exceedances that are permitted (where applicable) and the equivalent percentile.

Specific objectives relate either to achieving the full standard or, where use has been made of a short averaging period, objectives are sometimes expressed in terms of percentile compliance. The use of percentiles means that a limited number of exceedances of the air quality standard over a particular timescale, usually a year, are permitted. This is to account for unusual meteorological conditions or particular events such as November 5th. For example, if an objective is to be complied with at the 99.9th percentile, then 99.9% of measurements at each location must be at or below the level specified.

#### Objectives included in the Air Quality Regulations 2000 and (Amendment) Table A4.2 Regulations 2002 for the purpose of Local Air Quality Management

Air Quality Objectives			
Pollutant	Concentration	Measured as	Date to be achieved by
Benzene All authorities	16.25 μg m-3	running annual mean	31.12.2003
Authorities in England and Wales only	5.00 μg m-3	annual mean	31.12.2010
Authorities in Scotland and Northern Ireland only <sup>a</sup>	3.25 μg m-3	running annual mean	31.12.2010
1,3-Butadiene	2.25 μg m-3	running annual mean	31.12.2003
<b>Carbon monoxide</b> Authorities in England, Wales and Northern Ireland only <sup>a</sup>	10.0 mg m-3	maximum daily running 8- hour mean	31.12.2003
Authorities in Scotland only	10.0 mg m-3	running 8-hour mean	31.12.2003
Lead	0.5 μg m-3 0.25 μg m-3	annual mean annual mean	31.12.2004 31.12.2008
Nitrogen dioxide <sup>b</sup>	200 μg m-3 not to be exceeded more than 18 times a year 40 μg m-3	1 hour mean	31.12.2005
		annual mean	31.12.2005
<b>Particles (PM<sub>10</sub>)</b> (gravimetric) <sup>°</sup> All authorities	50 μg m-3 not to be exceeded more than 35 times a year 40 μg m-3	24 hour mean	31.12.2004
	10 10 10 10	annual mean	31.12.2004
Authorities in Scotland only <sup>d</sup>	50 μg m-3 not to be exceeded more than 7 times a year 18 μg m-3	24 hour mean	31.12.2010
	. o µg o	annual mean	31.12.2010
Sulphur dioxide	350 μg m-3 not to be exceeded more than 24 times a year	1 hour mean	31.12.2004
	125 μg m-3 not to be exceeded more than 3 times a year 266 μg m-3 not to be exceeded more than 35 times a year	24 hour mean	31.12.2004
		15 minute mean	31.12.2005

a. Air Quality (Northern Ireland) Regulations (2003) b. The objectives for nitrogen dioxide are provisional. c. Measured using the European gravimetric transfer sampler or equivalent. d. These 2010 Air Quality Objectives for PM<sub>10</sub> apply in Scotland only, as set out in the Air Quality (Scotland) Amendment Regulations 2002.

#### Relationship between the UK National Air Quality Standards and EU air quality Limit Values As a member state of the EU, the UK must comply with EU Directives.

There are three EU ambient air quality directives that the UK has transposed in to UK law. These are:

- 96/62/EC Council Directive of 27 September 1996 on ambient air quality assessment and management (the Ambient Air Framework Directive).
- **1999/30/EC** Council Directive of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide, oxides of nitrogen, PM<sub>10</sub> and lead in ambient air (the First Daughter Directive).
- **2000/69/EC** Directive of the European Parliament and the Council of 16 Nov 2000 relating to limit values for benzene and carbon monoxide in ambient air (the Second Daughter Directive).

The first and second daughter directives contain air quality Limit Values for the pollutants that are listed in the directives. The United Kingdom (i.e. Great Britain and Northern Ireland) must comply with these Limit Values. The UK air quality strategy should allow the UK to comply with the EU Air Quality Daughter Directives, but the UK air quality strategy also includes some stricter national objectives for some pollutants, for example, the 15-minute sulphur dioxide objective.

The Government is ultimately responsible for achieving the EU limit values. However, it is important that Local Air Quality Management is used as a tool to ensure that the necessary action is taken at local level to work towards achieving the EU limit values by the dates specified in those EU Directives.

#### Additional particle objectives (not included in Regulations<sup>4</sup>)

For particulates (as PM<sub>10</sub>) additional objectives apply. It should be noted that only the objectives for Scotland have been included in Regulations.

- For all parts of the UK, except London and Scotland, a 24 hour mean of 50 μg/m<sup>3</sup> not to be exceeded more than 7 times a year and an annual mean of 20 μg/m<sup>3</sup>, both to be achieved by the end of 2010;
- For London, a 24 hour mean of 50 μg/m<sup>3</sup> not to be exceeded more than 10 times a year and an annual mean of 23 μg/m<sup>3</sup>, both to be achieved by the end of 2010;
- For Scotland, a 24 hour mean of 50 μg/m<sup>3</sup> not to be exceeded more than 7 times a year and an annual mean of 18 μg/m<sup>3</sup>, both to be achieved by the end of 2010.

#### Policies in place to allow the objectives for the pollutants in AQS to be achieved

The policy framework to allow these objectives to be achieved is one that takes a local air quality management approach. This is superimposed upon existing national and international regulations in order to effectively tackle local air quality issues as well as issues relating to wider spatial scales. National and EC policies that already exist provide a good basis for progress towards the air quality objectives set for 2003 to 2008. For example, the Environmental Protection Act 1990 allows for the monitoring and control of emissions from industrial processes and various EC Directives have ensured that road transport emission and fuel standards are in place. These policies are being developed to include more stringent controls. Developments in the UK include the announcement by the Environment Agency/SEPA in January 2000 of controls on emissions of SO<sub>2</sub> from coal and oil fired power stations. This system of controls intended that by the end of 2005 coal and oil fired power stations would have met the air quality standards set out in the AQS.

Local air quality management provides a strategic role for local authorities in response to particular air quality problems experienced at a local level. This builds upon current air quality control responsibilities and places an emphasis on bringing together issues relating to transport, waste, energy and planning in an integrated way. This integrated approach involves a number of different aspects. It includes the development of an appropriate local framework that allows air quality issues to be considered alongside other issues relating to polluting activity. It should also enable co-operation with and participation by the general public in addition to other transport, industrial and governmental authorities.

<sup>&</sup>lt;sup>4</sup> The exception is the Scottish Executive which has incorporated the PM10 objectives in their Regulations.

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An important part of the Strategy is the requirement for local authorities to carry out air quality reviews and assessments of their area against which current and future compliance with air quality standards can be measured. Over the longer term, these will also enable the effects of policies to be studied and therefore help in the development of future policy. The Government has prepared guidance to help local authorities to use the most appropriate tools and methods for conducting a review and assessment of air quality in their District. This is part of a package of guidance being prepared to assist with the practicalities of implementing the AQS. Other guidance covers air quality and land use planning, air quality and traffic management and the development of local air quality action plans and strategies.

#### Timescales to achieve the objectives

In most local authorities in the UK, objectives will be met for most of the pollutants within the timescale of the objectives shown in Table A4.2. It is important to note that the objectives for  $NO_2$  remain provisional. The Government has recognised the problems associated with achieving the standard for ozone and this will not therefore be a statutory requirement. Ozone is a secondary pollutant and transboundary in nature and it is recognised that local authorities themselves can exert little influence on concentrations when they are the result of regional primary emission patterns.

#### **Air Quality Reviews**

A range of Technical Guidance has been issued to enable air quality to be monitored, modelled, reviewed and assessed in an appropriate and consistent fashion. This includes LAQM.TG(03), on 'Local Air Quality Management: Technical Guidance, February 2003 and subsequent update issued in January 2006. This review and assessment has considered the procedures set out in the guidance.

The primary objective of undertaking a review of air quality is to identify any areas that are unlikely to meet national air quality objectives and ensure that air quality is considered in local authority decision making processes. The complexity and detail required in a review depends on the risk of failing to achieve air quality objectives and it has been proposed in the second round that reviews should be carried out in two stages. Every authority is expected to undertake at least a first stage Updating and screening Assessment (USA) of air quality in their authority area. Where the USA has identified a risk that an air quality objective will be exceeded at a location with relevant public exposure, the authority will be required to undertake a detailed assessment. The Stages are briefly described in the following table, Table A4.3.

Level of assessment	Objective	Approach
Updating and screening assessment (USA)	To identify those matters that have changed since the last review and assessment, which might lead to a risk of the air quality objective being exceeded.	Use a check list to identify significant changes that require further consideration. Where such changes are identified, apply simple screening tools to decide whether there is sufficient risk of an exceedance of an objective to justify a detailed assessment
Detailed assessment	To provide an accurate assessment of the likelihood of an air quality objective being exceeded at locations with relevant exposure. This should be sufficiently detailed to allow the designation or amendment or any necessary AQMAs.	Use quality-assured monitoring and validated modelling methods to determine current and future pollutant concentrations in areas where there is a significant risk of exceeding an air quality objective.

#### Table A4.3The phased approach to review and assessment.

Table A4.4

#### Locations that the review and assessment must concentrate on

For the purpose of review and assessment, the authority should focus their work on locations where members of the public are likely to be exposed over the averaging period of the objective. Table A4.4 summarises the locations where the objectives should and should not apply.

Typical locations where the objectives should and should not apply

Averaging Period	Pollutants	Objectives <i>should</i> apply at	Objectives should <i>not</i> generally apply at …
Annual mean	<ul> <li>1,3 Butadiene</li> <li>Benzene</li> <li>Lead</li> <li>Nitrogen dioxide</li> <li>PM<sub>10</sub></li> </ul>	<ul> <li>All background locations where members of the public might be regularly exposed.</li> </ul>	<ul> <li>Building facades of offices or other places of work where members of the public do not have regular access.</li> </ul>
		Building facades of residential properties, schools, hospitals, libraries etc.	<ul> <li>Gardens of residential properties.</li> </ul>
			<ul> <li>Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term</li> </ul>
24 hour mean and 8-hour mean	<ul> <li>Carbon monoxide</li> <li>PM<sub>10</sub></li> <li>Sulphur dioxide</li> </ul>	<ul> <li>All locations where the annual mean objective would apply.</li> </ul>	<ul> <li>Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term.</li> </ul>
		<ul> <li>Gardens of residential properties.</li> </ul>	

Averaging Period	Pollutants	Objectives should apply at	Objectives should generally not apply at …
1 hour mean	<ul><li>Nitrogen dioxide</li><li>Sulphur dioxide</li></ul>	<ul> <li>All locations where the annual mean and 24 and 8-hour mean objectives apply.</li> </ul>	<ul> <li>Kerbside sites where the public would not be expected to have regular access.</li> </ul>
		<ul> <li>Kerbside sites (e.g. pavements of busy shopping streets).</li> </ul>	
		• Those parts of car parks and railway stations etc. which are not fully enclosed.	
		<ul> <li>Any outdoor locations to which the public might reasonably be expected to have access.</li> </ul>	
15 minute mean	Sulphur dioxide	All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer.	

d not apply
(

It is unnecessary to consider exceedances of the objectives at any location where public exposure over the relevant averaging period would be unrealistic, and the locations should represent non-occupational exposure.

### **Key Points**

- The Environment Act 1995 has required the development of a National Air Quality Strategy for the control of air quality.
- A central element in the Strategy is the use of air quality standards and associated objectives based on human health effects that have been included in the Air Quality Regulations.
- The Strategy uses a local air quality management approach in addition to existing national and international legislation. It promotes an integrated approach to air quality control by the various factors and agencies involved.
- Air quality objectives, with the exception of ozone, are to be achieved by specified dates up to the end of 2010.
- A number of air quality reviews are required in order to assess compliance with air quality objectives. The number of reviews necessary depends on the likelihood of achieving the objectives.