5 Performance of the Urban Networks

The purpose of this chapter is to present the review of the existing and future performance of the transport network within the four urban networks of Aberdeen, Dundee, Edinburgh and Glasgow. As outlined in Chapter 2, the STPR will consider the performance of strategic transport links within the urban networks, insofar as they provide:

- Connections between National Strategic Transport Corridors;
- Connections between Corridors and Areas of Economic Activity and Areas of Community Regeneration Priority;
- Connections between Corridors and International Gateways (including airports and sea ports); and
- Connections within Urban Networks.

5.1 Aberdeen

5.1.1 Setting the Context

Aberdeen is Scotland's third largest city and plays a central role in contributing to the economy of the northeast. Figure 5.1.1 shows the key areas of economic activity and the principal components of the transport network that supports the city region.

The city has a population of approximately 177,000[118], whilst Aberdeenshire has a population of approximately 236,000[119]. Aberdeen City accounts for 40 per cent of the population in the Nestrans area119. Aberdeen port and airport provide connections to Shetland and Orkney (which can also be accessed by ferry from Scrabster (in Corridor 1). Kirkwall (port and airport) and Stromness (port) are hubs of activity for strategic passenger movements to the mainland and local lifeline services within Orkney. Orkney has a population of 19,000 people and supports 9,000 jobs, while Shetland has a population of 21,000 people and supports 11,200 jobs[120].

The population of the Aberdeen City Council area is forecast to decrease by two per cent between 2005 and 2022[121], while the number of households in Aberdeen is expected to increase by one per cent between 2005 and 2022[122]. The population of Aberdeenshire is forecast to increase, suggesting a trend of population dispersal from the city centre to the surrounding areas. Continued dispersal of population into Aberdeenshire with a relative lack of public transport will likely result in increased levels of commuting into Aberdeen city by car and other modes.

[118] General Register Office for Scotland Mid-2004 population estimates for town/city populations: http://www.gro-scotland.gov.uk/files1/stats/04mid-year-estimates-localities-table3.xls
[119] General Register Office for Scotland Mid-2006 population estimates for administrative areas: http://www.gro-scotland.gov.uk/files1/stats/06mype-cahb-t2-revised.xls
[120] Transport Scotland SERIS Database
[121] TELMoS
[122] TELMoS

The city's economy is primarily based on the oil and gas industry, which is reflected in employment levels that are consistently above the national average. The success of the oil and gas industry over the past thirty years has raised living standards. This has resulted in rising land and property values with house prices in Aberdeen being high compared to the national average[123]. This continuing rise may be a contributing factor to dispersal of population.

Jobs in the oil and gas sector are forecast to decline over the next ten years, although the energy sector is expected to continue as one of the key industries in the north east in the long term. Any decline is forecast to be offset by increases in the service and construction sector. Overall, employment levels are projected to increase from 137,900 to 144,400 between 2005 and 2022. Table 5.1.1 summarises the relevant socio-economic indicators.

Table 5.1.1: Summary of Socio-Economic Characteristics

Indicator	Aberdeen	Region Nestrans	Scotland	UK
Population (2005) [124]	177,000	413,000[125]	5,078,000	60,000,000
Population (2022)[126]	173,500	408,900	5,118,000	62,400,000
Population Change (2005 – 2022)[126]	-2%	-1%	+1%	+4%
Employment (2005)[126]	137,900	217,900	2,330,900	27.9m
Employment (2022)[126]	144,400	228,200	2,427,800	29.3m
GVA per Head (2004)[127]	£21,600	£21,600[128]	£15,500	£16,200
Cars/Capita (2005)[129]	0.46	0.49	0.39	0.42
Households with Car[130]	66%	74%	67%	75%

[123] Aberdeen City Council Local Plan, 2004
[124] General Register Office for Scotland Mid-2004 population estimates for town/city populations: http://www.gro-scotland.gov.uk/files1/stats/04mid-year-estimates-localities-table3.xls
[125] General Register Office for Scotland Mid-2006 population estimates for administrative areas: http://www.gro-scotland.gov.uk/files1/stats/06mype-cahb-t2-revised.xls
[126] TELMoS
[127] Scottish Economic Statistics 2007
[128] GVA per head for Aberdeen City, Aberdeenshire and North East Moray
[129] STS No.25 (2006)
[130] Scotland's Census, 2001: www.scotland.gov.uk Table KS17

Inactivity rates are projected to decline in Aberdeen from 22,800 in 2005 to 11,700 in 2022. At present inactivity rates for the urban network are around 16 per cent in Aberdeenshire, which is below the national average[126]. Median gross weekly earnings in Aberdeen are £445, approximately 92 per cent of the national average for Scotland of £412[131].

Economic inactivity in Orkney and Shetland is also lower than the Scottish average, at 14 and 12 per cent, respectively[131]. Income levels for Orkney are around £424 per week and approximately £446 per week in Shetland. This equates to 103 per cent of the national average in Orkney and 108 per cent of the national average in Shetland[132].

5.1.2 Land Use Patterns

Within Aberdeen, three areas of economic activity have been identified as being particularly relevant in terms of the STPR. These are:

- City centre;
- Dyce (including Aberdeen Airport); and
- South East Aberdeen (Altens).

Figure 5.1.2 highlights the areas of change in population and employment in future years.

[131] Scottish Economic Statistics 2006, table 4.20
[132] Scottish Economic Statistics 2006, table 4.3, 4.20

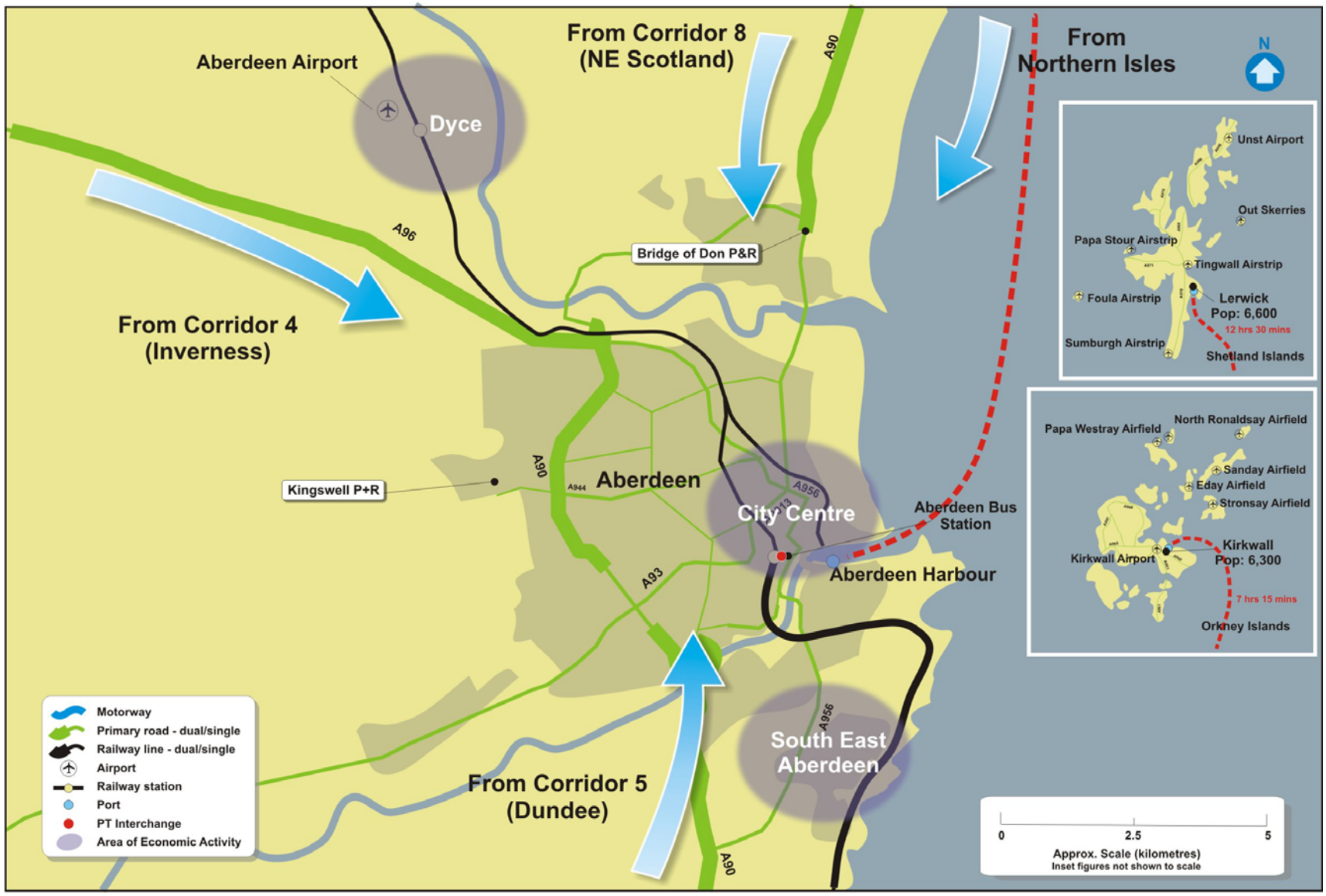

Figure 5.1.1: Setting the Context - Aberdeen Urban Network

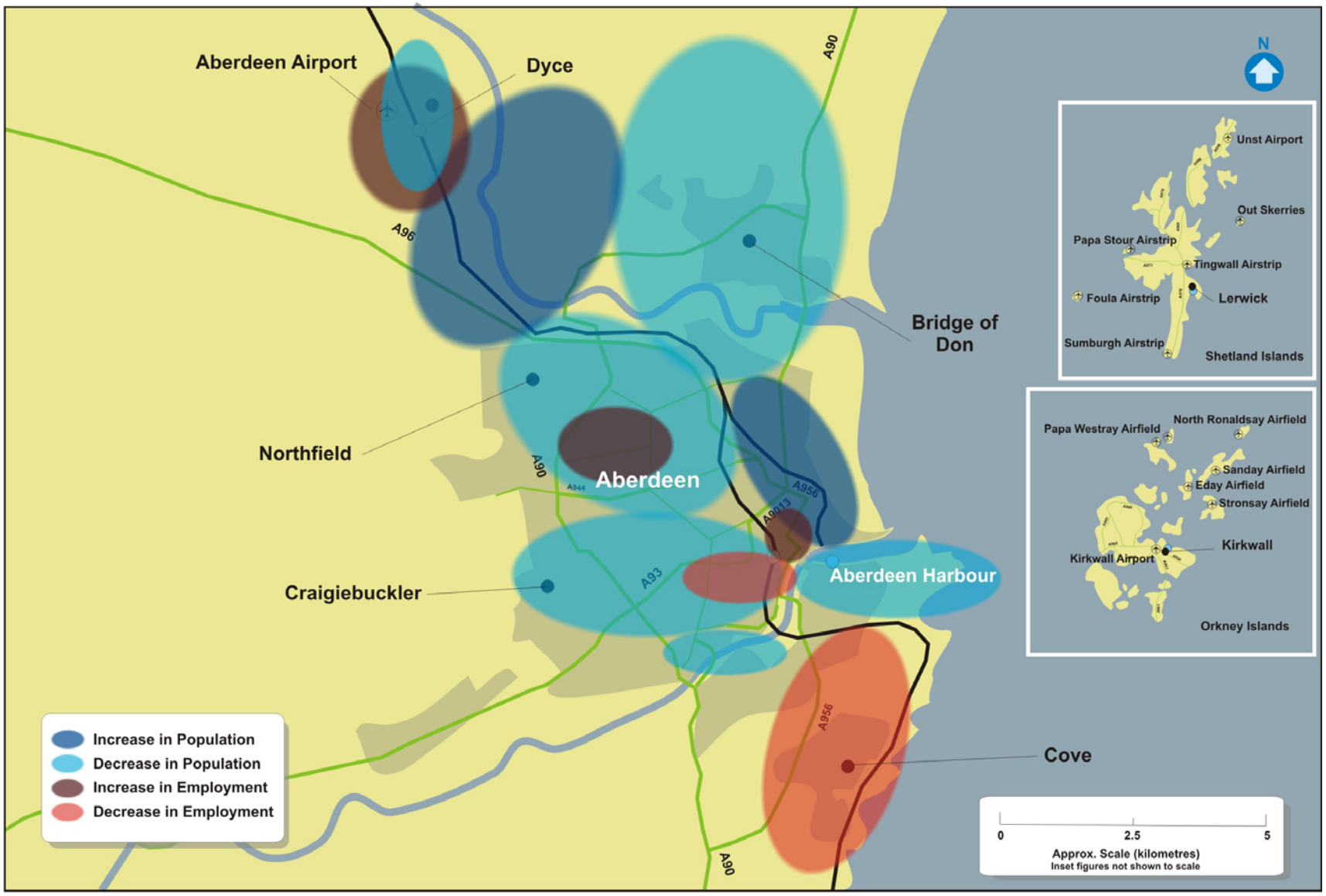

Figure 5.1.2: Change in Employment and Population, 2005 & 2022 - Aberdeen Urban Network

5.1.3 Transport Network and Operations

Infrastructure and Services

Aberdeen is a key point connecting three National Strategic Corridors: northwest to Inverness (Corridor 4), south to Dundee (Corridor 5) and north to North East Scotland (Corridor 8). These corridors are linked by the A90, which forms an orbital route to the west of the city centre. In addition, two main radial routes, the A944 and A93 provide further links to the west. Aberdeen also provides key lifeline services to Orkney and Shetland from Aberdeen port and Aberdeen airport (Dyce).

Of the main routes into Aberdeen, the A90 (north and south) and the A96 are dual carriageway, although some sections of the orbital A90 (Anderson Drive) are single carriageway. The A956 (south) is dual carriageway whilst the sections connecting the city centre to the A90 to the north are a mixture of dual and single carriageway. Radial routes to the city centre include the A944 which is partly dual but predominantly single carriageway and the A93, B9119 and B9077, which are all single carriageway.

The A90 crosses the River Dee as it enters Aberdeen from the south. The A90 is dual carriageway on approach to the Bridge of Dee but the bridge itself is single carriageway and this leads to congestion at the at-grade roundabouts on either side of the bridge and a reduction in vehicle speeds.

Two main rail routes radiate from the city; the Aberdeen to Dundee rail line, with onward connections to Perth, Glasgow and Edinburgh is a double track line with the exception of a single track section at Montrose and the Aberdeen to Inverness via Dyce line, which is single track with passing loops. First ScotRail operate the passenger services on these routes, with National Express East Coast and Arriva Cross-Country operating additional long distance services to London.

The key railway stations are Aberdeen station (located in the city centre) and Dyce (located to the north of Aberdeen and close to Aberdeen Airport). Aberdeen railway station currently caters for some 1.9 million passengers per annum (2005) and is the fifth busiest station in Scotland[133].

The road approaches to Aberdeen railway station suffer from congestion during the peak periods.

[133] Rail industry LENNON data (Station Usage 2004/2005)

Service patterns are generally:

- One train per hour between Aberdeen and Edinburgh;
- One train per hour between Aberdeen and Glasgow;
- One train every 2 hours between Aberdeen and Inverness;
- Three trains per day between Aberdeen and London;
- One overnight sleeper service per day between Aberdeen and London; and
- Various freight services.

As part of the Union Square development, the bus station and railway station forecourt will be remodelled providing better facilities and easier interchange between bus and rail[134].

In terms of recent improvements, Aberdeen railway station has benefited from significant investment under the First ScotRail franchise which is delivering a range of benefits including improved access, security and facilities; with the installation of two new lifts, CCTV cameras, ticket vending machines, gates and increased car parking[135].

First Aberdeen operates twenty two bus routes in the city, most of which are cross-city and operate along Union Street. The core network has daytime service frequencies of every 10 to 15 minutes, with Sunday services being half hourly. There are also two Park-&-Ride sites in Aberdeen at Kingswells and Bridge of Don and one in Ellon in Aberdeenshire, which are well used. Potential additional Park-&-Ride sites are currently being considered at Schoolhill (A90 south of Aberdeen), Kirkhill (A96 west of Aberdeen), Parkhill (A947 north of Aberdeen) and Banchory (A93 southwest of Aberdeen).

Stagecoach Bluebird operates rural and longer distance services in Aberdeen City and Aberdeenshire, with seven million passenger journeys being undertaken per year. Significant investment in bus services has been made along Corridor 4 between Aberdeen and Inverness.

Bus services within The Orkney and Shetland council areas provide connections with the ferry services.

Citylink, Megabus and National Express operate longer distance services to the other major Scottish cities and to England.

[134] Nestrans: http://www.nestrans.org.uk/projects/projects.asp
[135] Partnership working through First ScotRail, Network Rail and Hammerson along with Miller Construction

The following national bus operators provide services to, from, and within Aberdeen:

- First Aberdeen provides services within Aberdeen City; fare cards and unlimited weekly, one month and three month travel passes are available on First services operating in the city;
- Stagecoach provides services from Aberdeen bus station to Aberdeen Airport and to destinations within Aberdeenshire and Inverness. A range of travel passes are available for travel on these Stagecoach services;
- Scottish Citylink provide services from Aberdeen bus station to Edinburgh (via Dundee and Perth) and Glasgow (via Perth and Stirling);
- National Express provides services from Aberdeen bus station to destinations in Scotland, England and Wales; and
- Megabus provides services from Aberdeen bus station to destinations in Scotland, England and Wales.

Strategic long distance bus services all terminate in the city centre at Aberdeen bus station which is well integrated given its location adjacent to Aberdeen rail station, and there is a taxi rank located outside the entrance to the railway station catering for passengers using both stations. Dyce railway station provides a link to the airport, however it is not well integrated as the station is not immediately adjacent to the terminal building.

An integrated ticket is available for rail journeys into Aberdeen in the form of the *PLUSBUS* ticket. This ticket covers rail journeys and unlimited bus travel within the urban network.

Aberdeen Harbour is the support centre for the oil and gas industry for exporting oilfield equipment. The harbour is also the principal mainland port providing lifeline ferry services to The Orkney and Shetland Islands, including passenger, vehicle, livestock and freight. The port handles up to 140,000 passengers a year and 22,700 vehicles[136]. Access to the port is provided by road however the port has no car park, so passengers have to use a nearby national car park on Ship Row. Rail access is available although this is not currently used. In March 2006, a £3.5 million contract was awarded to provide more operational space at the port, and to improve rail access to it. The harbour annually handles around five million tonnes of cargo and this is not expected to change in the coming years[137]. In terms of freight movement in and around Aberdeen, it is also worth noting that the Bridge of Dee on the A90 is HGV restricted.

The harbour's central location in the city means access to the port can be restricted in the peaks as the surrounding road network is congested. The ferry terminal is located close to Aberdeen bus and railway stations.

[136] STS No. 25 (2006) Table 10.15
[137] STS No. 25 (2006) Table 10.3

The key sea port on Shetland is Lerwick, which has a throughput of some 315,000 passengers per year (900 per day)[138] and 622,000 tonnes of freight (1,700 tonnes per day)[139] and as such is a major trip generator. Sullom Voe has an annual throughput of over 20 million tonnes[513]; however, as this is oil transfer, it has no impact on the road network. Ports on Orkney (Kirkwall, Stromness and Scapa Flow) have a throughput of 280,000 passengers per year[512] and 14.5 million tonnes of freight[513], the vast majority of which is oil transfers in Scapa Flow and therefore has no impact on the road network.

There is a freight ferry service planned between Lerwick and Kristiansund (Mid Norway) commencing 2008.

Aberdeen Airport is North East Scotland's principal gateway and provides an essential service to Europe's oil and gas industry. This airport is the 14th busiest airport in the UK and is the fastest growing airport operated by BAA[140]. The airport handles a mixture of commercial and charter flights to destinations in the UK and Europe. Aberdeen Airport currently has a throughput of around 2.9 million passengers and 4,100 tonnes of freight per year[141]. Central forecasts project an increase in passengers to 3.3 million by 2015[142]. High forecasts project an increase to 3.6 million by 2015[141]. The airport is served by good road links from the nearby A96 dual carriageway.

The key airports in Shetland (Sumburgh, Tingwall and Scatsta[143]) have a total throughput of about 364,000 passengers per year. Approximately 65 per cent (some 239,000 passenger movements) are through Scatsta Airport, which is used primarily by the oil and gas industry, but also serves as a diversionary route. Kirkwall is the primary airport on Orkney with a throughput of 104,000 passengers per year[144]. In terms of air freight, airports on Shetland have a throughput of around 800 tonnes per year and Kirkwall Airport handles about 100 tonnes per year[145]. These levels of freight throughput do not generate significant number of HGV movements.

There will be a twice weekly air service from Sumburgh to Bergen in the summer of 2008.

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[138] STS No. 25 (2006) Table 10.15
[139] STS No. 25 (2006) Table 10.3
[140] BAA, Aberdeen Airport Master Plan, Dec 2006
[141] STS No. 25 (2006), Table 9.6, 9.13
[142] BAA, Aberdeen Airport Master Plan, Dec 2006
[143] Scatsta Airport is used primarily by the oil and gas industry but also serves as a diversionary route.
[144] STS No. 25 (2006) Table 9.6
[145] STS No. 25 (2006) Table 9.13

Asset Management

Condition of the trunk road network pavement in Aberdeen has been covered by the residual strength analysis of parts of Corridor 4 (Aberdeen to Inverness, section 7.4.2), Corridor 5 (Dundee to Aberdeen, Chapter 7.5.2) and Corridor 8 (Aberdeen to North East Scotland, Chapter 7.8.2).

Demand Management

The key routes within the City of Aberdeen are covered by an Urban Traffic & Management Control system. Aberdeen city has also invested in the development of a Real Time Passenger Information system on key public transport corridors. The system has information displays mounted on bus shelters across the city; displaying the estimated arrival time of bus services.

The council has also recently installed a new Parking Guidance and Information system covering the major car parking areas within the city. The system includes 16 Variable Message Signs installed at strategic locations across the city. This system aims to reduce traffic congestion by reducing the volume of circulating traffic searching for parking spaces.

The cost of parking in Aberdeen city centre is relatively high. This is part of Aberdeen City Council's policy of controlling parking to manage travel demand and to influence mode choice.

Off-street parking costs between £0.60 and £1.40 for up to two hours, between £1.80 and £2.10 for two to three hours and between £2.40 and £2.80 for three to four hours. It costs £3.10 to park for four to five hours and £4.00 to park for five to six hours. The maximum charge for off-street parking is £6.80 and this is for a period of six to ten hours[146]. In general, off street parking in Aberdeen is cheaper than in Edinburgh or Glasgow city centres for a similar time period. A direct comparison of prices is hard due to varying charging structures operated by car park operators.

On-street parking is limited to a maximum of one hour in the Inner Central Zone (a maximum cost of £1.80), two hours in the Outer Central Zone (a maximum cost of £3.00) and three hours in the Peripheral Zones (a maximum cost of £2.00). Both Edinburgh and Glasgow operate different on-street parking arrangements to Aberdeen. For example in Edinburgh city centre it cost £1.80 an hour[147] to park for anywhere between 30 minutes and a maximum of four hours. Parking prices and duration of stay vary depending on the proximity to the city centre.

There are several other major car parks with varying parking charges in Aberdeen city centre including the Trinity Centre and Loch Street / Harriet Street which caters for shoppers using the Bon Accord Centre.

[146] Aberdeen City Council: www.aberdeen.gov.uk
[147] Edinburgh City Council: www.edinburgh.gov.uk

Aberdeen City Council has bus priority measures on key routes in the form of bus lanes, bus gates (which give buses priority at key locations) and upgraded traffic signals which give priority to buses. There is a proposed Park-&-Ride site on the A90 to the south of Aberdeen which would provide bus connections into the city centre from Corridor 5 (Aberdeen to Dundee)[148].

There are currently three bus based Park-&-Ride sites, located on the A90 at Bridge of Don, the A944 at Kingswells and at Ellon, with services to the city centre.

Programmed Schemes

Programmed schemes, which are of relevance to STPR are shown in Figure 5.1.3 and include:

- The Aberdeen Western Peripheral Route;
- The construction of road-rail interchange facilities at Raiths Farm in the Dyce area; and
- Enhancement of the rail freight facilities at Waterloo Quay at the port.

[148] Aberdeen City Council www.aberdeen.gov.uk

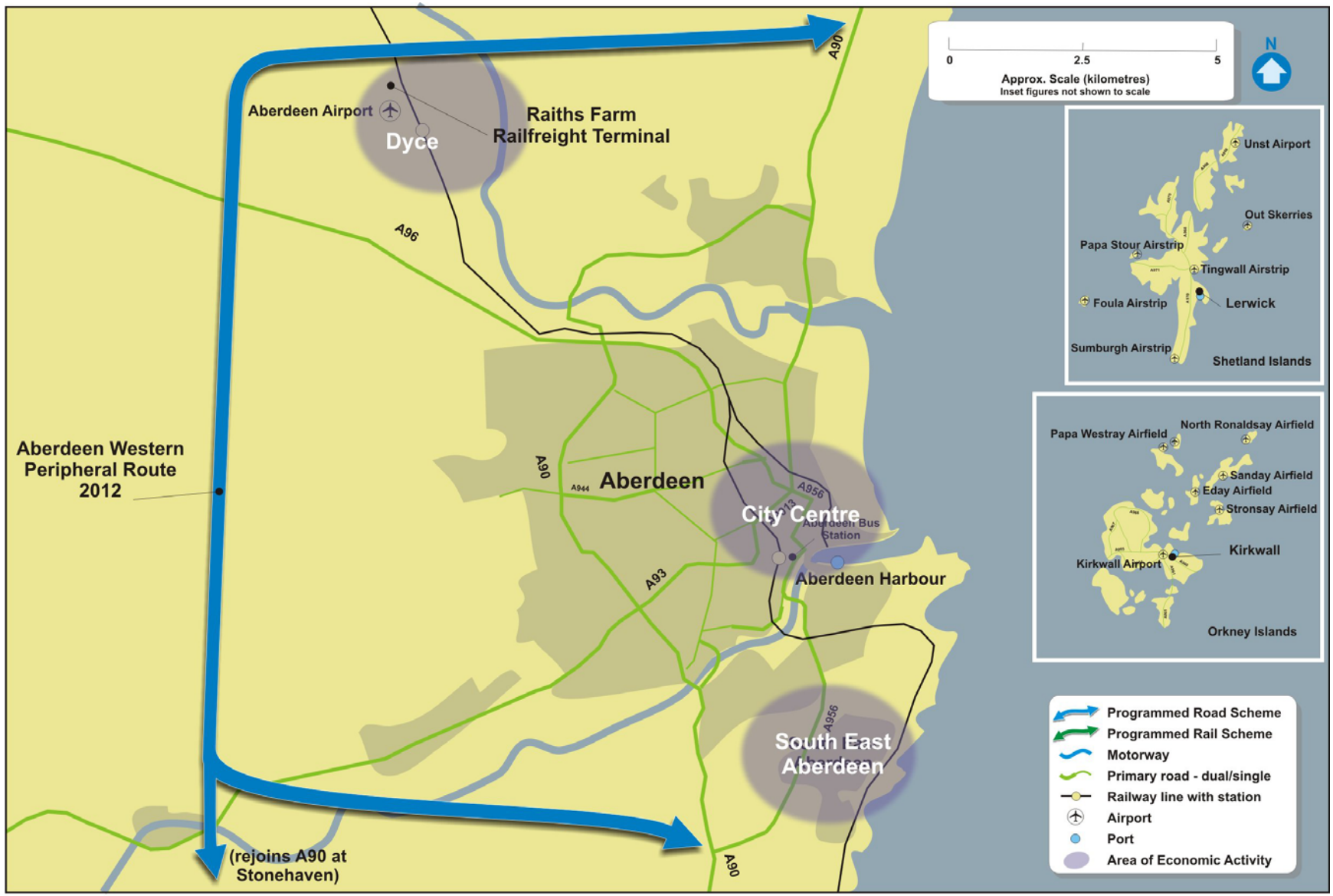

Figure 5.1.3: Programmed Future Transport Schemes, Aberdeen

5.1.4 Travel Patterns

Whilst the city has extensive links to the national network, Aberdeen lacks a suburban rail network. However, an extensive urban bus network caters for passenger movements within the city. Despite this, much of the city's transport network experiences congestion during the busiest periods, with particular pressure on the arterial routes in the north of the city and on the A90 through the west of the city. Increasing investment in bus priority measures including bus lanes within the city reduces the impact of the congestion on the bus network, helping to provide an attractive alternative to the car.

Aberdeen Urban Network experiences a total of 476,100 trips per day[149]. Figure 5.1.4 highlights the origins and destinations of the trips travelling to / from and through Aberdeen and the respective proportions travelling by public transport in 2022. A breakdown of these is provided in Table 5.1.2. Between 2005 and 2022 all trips within the Aberdeen Urban Network are expected to increase by 15 per cent to 549,200 per day. However, the proportion of those trips being made by public transport during this period only increases by less than one per cent, indicating an increase in private car trips. It should be noted however that as TMfS is a strategic model, it does not contain details of bus services at a local level. Coupled with this, the model does not accurately portray capacity issues on rail services. Thereby any forecasts will underestimate the level of public transport share within the urban network.

Figure 5.1.4 shows strategic traffic moving between Corridors 4 and 5 through the Aberdeen Urban Network. This strategic traffic will be catered for by the introduction of the Aberdeen Western Peripheral Route to the west of Aberdeen city centre.

TMfS indicates that use of Aberdeen railway station will increase by around a third between 2005 and 2022. Consequently, overcrowding may occur on some peak services on the section of network between Dyce and Stonehaven, affecting passengers travelling to / from Inverness and Dundee.

The largest public transport mode share is actually within the urban network area itself, which is not unexpected as the bus network density is highest in this area. The low public transport mode shares for movements between Inverness and Dundee, Inverness and Fraserburgh and Dundee and Fraserburgh via Aberdeen reflect the frequency / journey time of undertaking these trips by public transport.

[149] Based on a 12 hour flow

Table 5.1.2: Summary of Demand (12 hour) and Public Transport Mode Share[150]

Corridor Approach	2005		2022		Change	
	Total Trips	PT Share	Total Trips	PT Share	Total Trips	PT Share
Within Urban network	231,700	7%	270,000	7%	14%	+0.5%
Between Aberdeen and Corridor 8 (Fraserburgh)	31,600	4%	34,600	4%	9%	+0.2%
Between Aberdeen and Corridor 4 (Inverness)	83,500	5%	96,600	5%	14%	-0.1%
Between Aberdeen and Corridor 5 (Dundee)	93,400	6%	104,900	6%	11%	0%
Corridor 4 (Inverness) to Corridor 5 (Dundee)	27,000	1%	32,100	1%	16%	+0.2%
Corridor 4 (Inverness) to Corridor 8 (Fraserburgh)	5,200	1%	6,500	1%	20%	+0.3%
Corridor 5 (Dundee) to Corridor 8 (Fraserburgh)	3,700	2%	4,500	1%	19%	+0.3%
Total	476,100	6%	549,200	6%	15%	+0.3%

[150] TMfS:05

At present, over 30,000 of the through trips require to pass through Aberdeen city. The construction of the Aberdeen Western Peripheral Route will provide a more attractive route for these longer distance trips, and consequently, reducing congestion for other road users and freeing road space for the implementation of other transport improvement measures.

It is considered that freight traffic is a local issue in the vicinity of the port. However, once clear of this area the percentage of HGV traffic on key routes is typically around five to ten per cent[151]. These levels are average for urban / inter urban roads.

[151] TMfS:05

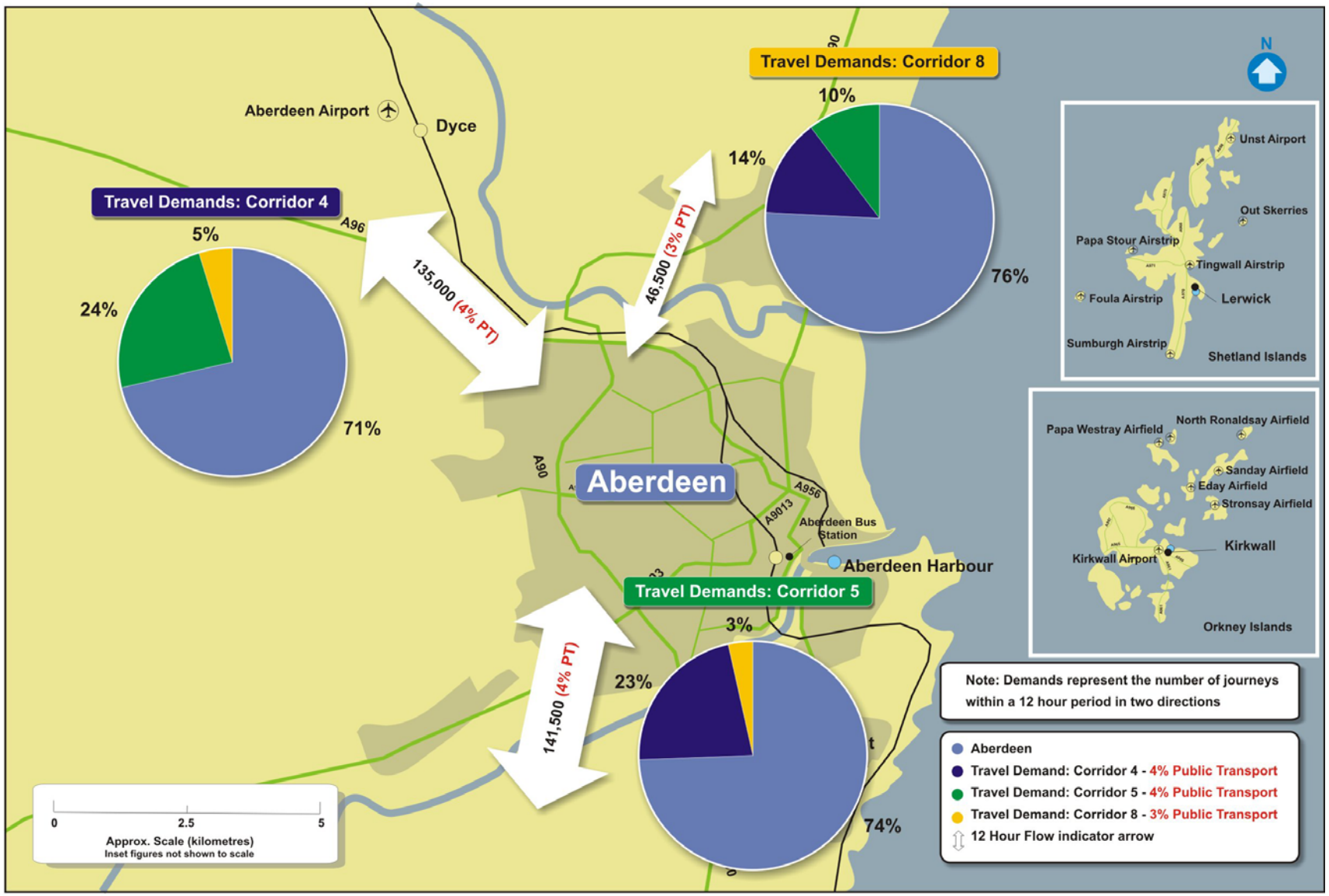

Figure 5.1.4: Travel Patterns to, through and around Aberdeen (2022)

Travel Patterns - Areas of Economic Activity

In recent years, much of the investment in public transport measures has been focussed on developing key radial routes into the city centre. However, Aberdeen City Council has recognised the need to provide additional public transport services to other areas of employment growth within the city, including South East Aberdeen (Altens) and Dyce. The council has recognised that this can best be achieved by a combination of improved bus services and the provision of demand responsive transport services[152].

Figure 5.1.5 summarises the travel patterns to the areas of economic activity.

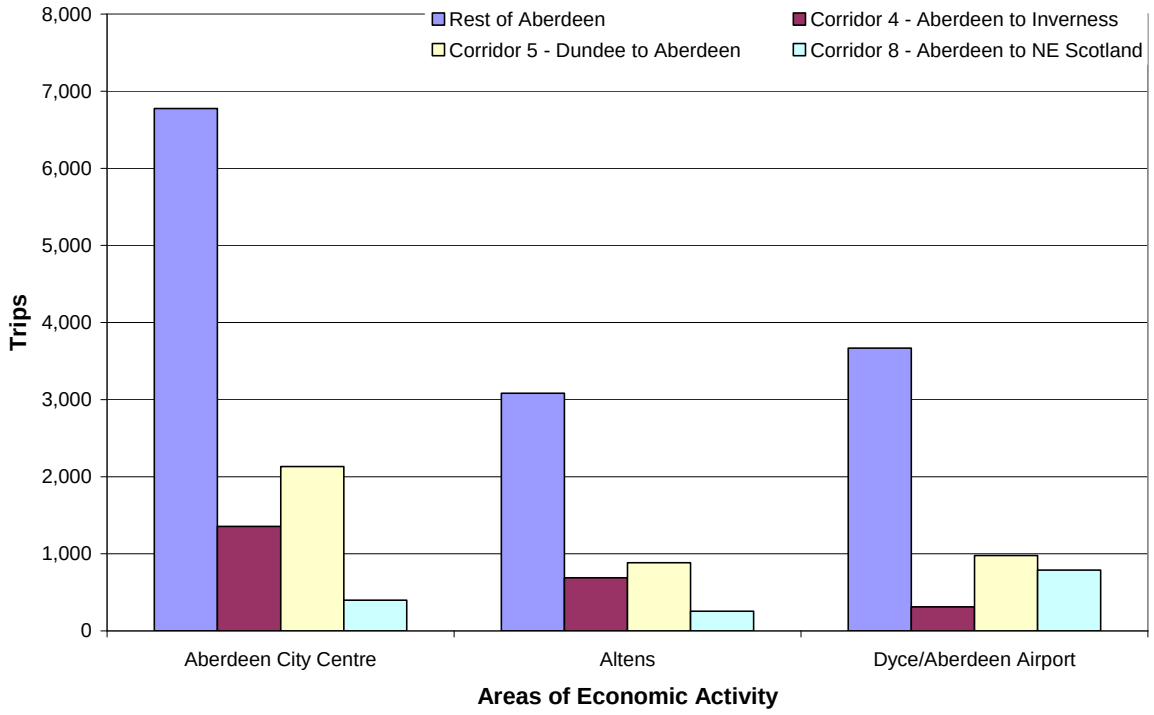

Figure 5.1.5: Travel Patterns to Centres of Economic Activity

Figure 5.1.5 shows the majority of trips to the three areas of economic activity originating elsewhere within Aberdeen. Of those trips from outside the city, almost 20 per cent of trips to the city centre originating in Corridor 5 (Aberdeen to Dundee). Public transport trips account for 20 per cent of the total trips into the city centre, however trips to the other two areas of economic activity, which are located outside of the centre in areas with limited public transport provision in comparison to the city centre, have public transport shares of only two per cent.

[152] Aberdeenshire Local Transport Strategy (2007)

Travel Patterns – International Gateways

Aberdeen Airport, located to the north of the city and adjacent to the railway, has experienced the fastest level of passenger growth of all Scottish airports in the last three years[153]. The majority of trips to/from the airport come from the Aberdeen area. Although the airport is served by rail, the railway station is located some distance from the terminal building. First Bus Service 27 runs to / from the city centre but this does not cater for a significant amount of the market travelling through the network. As such, public transport trips to the airport only account for two per cent of total trips[154] considerably lower than the trips to other regional airports within the UK that are generally about 10 per cent of total trips.

5.1.5 Performance Review

Network performance is considered within the context of the three KSOs:

- Improving journey times and connections;
- Reduce emissions; and
- Improving quality, accessibility and affordability.

Journey Times and Connections

The following paragraphs address the issues of:

- Does the network offer competitive journey times?
- Is the network operating efficiently and reliably? and
- What are the delays and when do they occur?

In reviewing the performance of Aberdeen's strategic transport network, it is relevant to consider the catchment area for trips, particularly those travelling to and from areas of employment. Figures 5.1.6a, 5.1.6b and 5.1.6c summarise the typical journey times by road and rail for trips to the city centre and other areas of economic activity[155]. Considering these journey times in the context of the city's labour market, it is estimated that approximately 260,000 people live within a one hour commute of the city centre. Using the same criteria for Edinburgh and Glasgow, there are 800,000 and 1,600,000 people living within a one hour commute of the respective city centres. The equivalent travel to work areas for Aberdeen to Dyce and Aberdeen to Altens are 290,000 and 280,000 respectively. These journey times are unlikely to change dramatically in the future without improvements to the transport network.

[153] Nestrans Regional Transport Strategy (Nestrans, 2007)
[154] Aberdeenshire Local Transport Strategy (2007)
[155] Journey times for bus/rail include a 20 minute walk/wait time

Without improvement in the transport network, it is forecast that due to the increased journey times projected in the future, based on the one hour travel time, the labour catchment will reduce slightly in the city centre and expand in the Dyce and especially the South East Aberdeen catchments as shown in Figure 5.1.6d. This could have a marginal impact on reducing the economic competitiveness of the city centre. Given that the Guild Street / Union Street area in the city centre is the nodal point in the city's public transport system, the expansion of the labour markets in Dyce and South East Aberdeen means it is likely that current public transport provision for these areas will be unable to support the projected growth of these labour catchments. Westhill in Aberdeenshire is also emerging as a growing industrial area and this may put pressure on the A944.

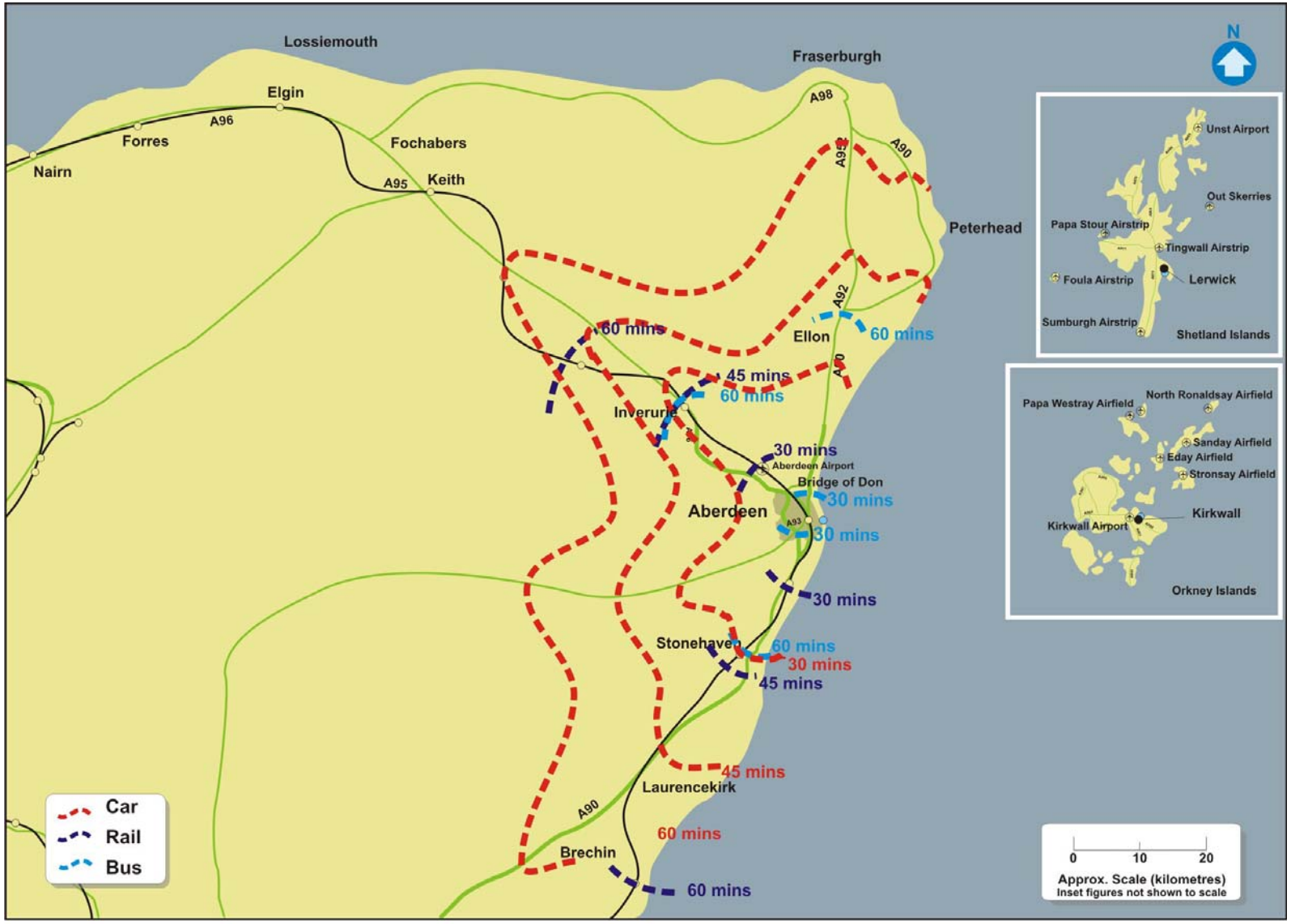

Figure 5.1.6a: Travel to Aberdeen City Centre (2005 AM peak)

Figure 5.1.6b: Travel to Dyce (2005 AM peak)

Figure 5.1.6c: Travel to South East Aberdeen (2005 AM peak)

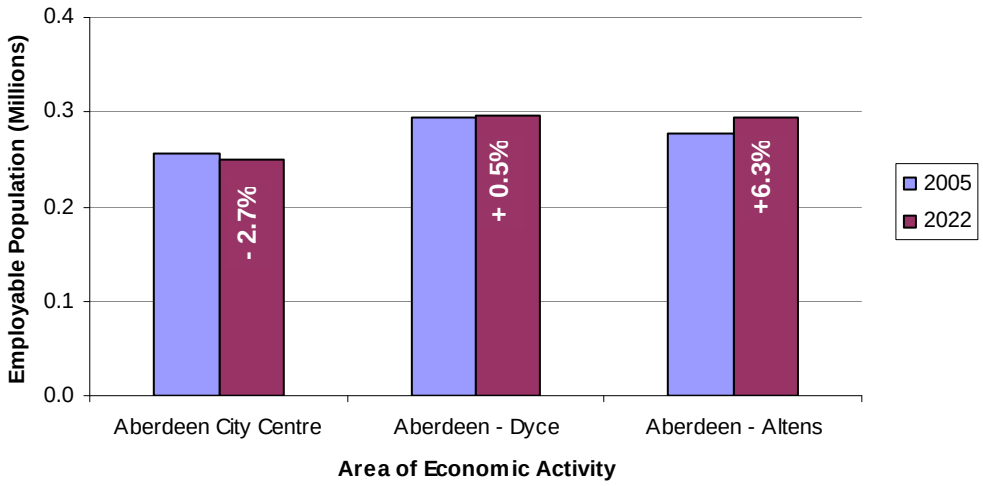

Figure 5.1.6d: Change in Labour Catchment for Areas of Economic Activity

Road congestion in the peak periods exists on the edges of Aberdeen and is forecast to increase unless improvements to the transport network are made, or unless new demand management measures are put in place. There are pinch points at key junctions such as those at Bridge of Dee, Haudagain Roundabout, Bridge of Don, Dyce and Wellington Road.

The orbital route within the city, Anderson Drive, and particularly the roundabouts at Bridge of Dee and Haudagain Roundabout experience slow speeds and queuing in the peaks. The congestion at these locations is expected to increase, with results being increased journey times for drivers as a result of additional congestion. The Haudagain Roundabout operates at or in excess of capacity during peak periods whilst further capacity constraints exist on the A90 approach from the north into Aberdeen.

There is currently congestion at peak periods on the road network surrounding the airport. At the Kirkhill Industrial Estate in Dyce traffic queues regularly extend back to the A96. This affects access to the airport for both passengers and staff.

Other problem areas include Great Southern Road where there are long queues at the King George VI bridge travelling south at peak periods, due to lack of capacity.

It can be expected that as journey times in the peak periods increase due to additional congestion, there is likely to be a certain amount of peak spreading, as regular drivers re-time the start of their journeys.

Figure 5.1.7 presents details of the average speed on the road network during the morning and evening peak periods as well as the inter-peak period. This graph considers key radial routes within the city, such as the A956, A96, A93, and A944, and therefore the average speeds detailed are a result of varying levels of congestion on these given routes. Within the city centre itself, the network is more congested and average speeds will be lower than indicated here

Average speeds in the morning and evening peaks are expected to increase by five kilometres per hour and four kilometres per hour respectively between 2005 and 2012 with the opening of the Aberdeen Western Peripheral Route and to fall back by three kilometres per hour in both peak periods to 2022 as traffic levels increase. Speeds during the inter-peak period in 2022 are forecast to be lower than those experienced in 2005 and 2012 indicating a worsening of traffic conditions outside the traditional peak period.

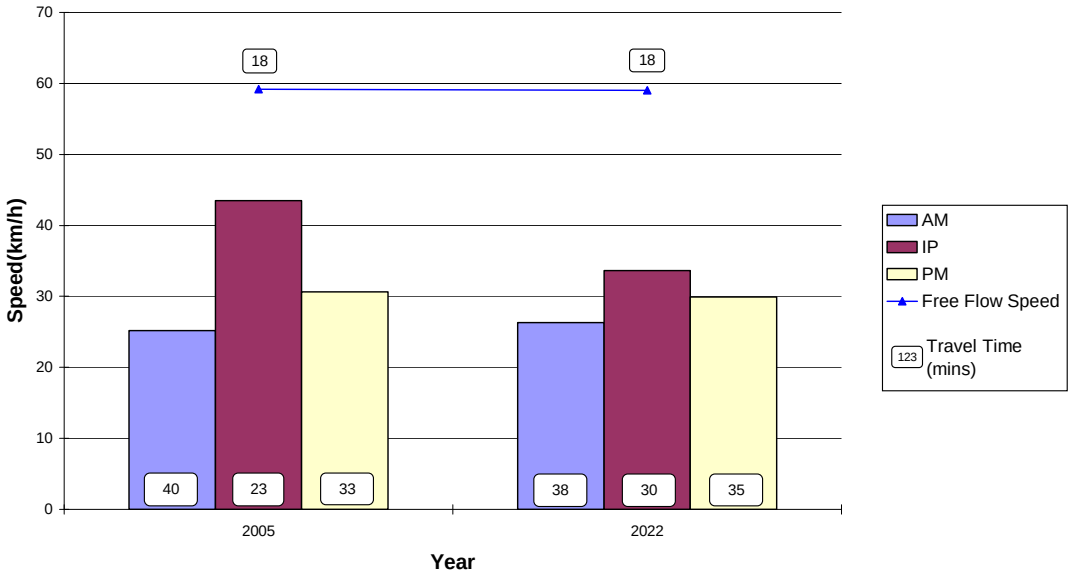

Figure 5.1.7: Average Urban Road Network Speed

The variability of travel speed throughout the day can be taken to be a proxy for journey time reliability on the road network. As Figure 5.1.7 shows, whilst there is considerable variability in speeds and therefore journey times at present, this is forecast to reduce during the next 15 years. This is largely as a consequence of increased congestion outside the peak periods.

The improvements in journey times exhibited by the transport modelling indicates that the opening of the Aberdeen Western Peripheral Route will provide relief in the form of additional capacity on the existing road network. One of the key parts of the Aberdeen Western Peripheral Route is that it forms part of a larger package of proposals, originally called the Modern Transport System. These measures now generally form part of the submitted Regional Transport Strategy and include investment in Park-&-Ride, rail, bus priority measures and commuter plans. It is an important part of delivery of the Aberdeen Western Peripheral Route that other transport related measures are implemented so that the benefits of the scheme are not eroded through additional car use that otherwise result. Some of the other measures in the Regional Transport Strategy may only be achievable in the long term following construction of the Aberdeen Western Peripheral Route and taking advantage of the released capacity on roads such as Anderson Drive.

Separate detailed traffic modelling and junction assessment undertaken for the Aberdeen Western Peripheral Route indicates that all junctions are forecast to operate satisfactorily beyond 2022.

Emissions (CO_2 only)

This section of the report addresses the issue:

- What are the levels of transport based emissions within the urban network?

CO_2 per person kilometre is forecast to rise from 136 tonnes / million person kilometres to 150 tonnes / million person kilometres between 2005 and 2022 in Aberdeen[156].

The road based transport network produced 156,500 tonnes of CO_2 in Aberdeen in 2005. This equates to approximately two per cent of the total road based transport related CO_2 emissions in Scotland.

By 2022, it is forecast that CO_2 emissions in Aberdeen will rise to around 196,000 tonnes, approximately two and a half per cent of Scotland's road based transport related CO_2 emissions in 2022.

The rail network produced 500 tonnes of CO_2 in Aberdeen in 2007. This equates to approximately one per cent of the total rail based CO_2 emissions in Scotland[157].

Therefore, it is estimated that the road and rail based transport network collectively produced 157,000 tonnes of CO_2 in Aberdeen in 2005. This equates to approximately two per cent of the total road and rail based transport related CO_2 emissions in Scotland.

Quality / Accessibility / Affordability

The following paragraphs address the issues of:

- Does public transport provision match origin/destination analysis?
- How competitive is public transport compared with the car?
- How integrated is the transport network?
- Do capacity issues impact on public transport service?
- How safe is the network?

Aberdeen generally has a good urban bus network providing connections between the population and employment centres. However the lack of a suburban rail network results in fewer alternatives for those wishing to travel by public transport.

[156] TMfS:05
[157] AEA (2001) Rail Emission Model Final Report, www.nationalrail.co.uk and www.networkrail.co.uk

Aberdeen is the headquarters of a major transport group, First, and there are partnership arrangements between the principal bus operators and councils. In Aberdeen, 98 per cent of the population lives within 400 metres of a regular bus service and around 20 million passenger journeys are made each year.

Considering the areas of economic activity:

- For Aberdeen city centre, public transport compares favourably against car. The city is well served by public transport from Aberdeen Port, Aberdeen Railway Station and Aberdeen Bus Station. As part of the Union Square development, the bus station and railway station forecourt will be remodelled providing better facilities and easier interchange between bus and rail[158].

- Dyce and Aberdeen Airport are served locally by bus services from Aberdeen. Dyce railway station provides a link to the airport, however it is not well integrated as the station is not immediately adjacent to the terminal building.

- For south east Aberdeen car use is more favourable than public transport. This area is served by both bus and rail. The Aberdeen Crossrail project proposes new stations and could lead to a half-hourly commuter service between Inverurie, Aberdeen and Stonehaven during the daytime[159].

The Aberdeen Western Peripheral Route will improve accessibility by both car and public transport in the future, but car travel will remain a more competitive option for most of the city. Around two per cent of the population are people without access to a car in the former Social Inclusion Partnership areas of Northfield and Hilton, with a greater dependency on public transport to meet their needs. Public transport accessibility in both areas is low, suggesting that transport-related social exclusion occurs.

As expected, within cities the proportion of severe accidents is lower than the national average, due to slower moving vehicles, resulting in less severe accidents. Initial analysis of severe accident clusters indicated a number of serious accident clusters at junctions along the A90 through Aberdeen. Annual average road accident casualties reported from 1994 - 1998 and 2001 - 2005 in Aberdeen have fallen by 23 per cent[160], whereas the national average drop is 16 per cent.

[158] Nestrans: http://www.nestrans.org.uk/projects/projects.asp
[159] Scottish Strategic Rail Study Final Report March 2003
[160] Road Accidents Scotland 2005, Table 37

Summary of Infrastructure and Operational Constraints

Figure 5.1.8 highlights the areas of physical and operational constraints on both the road and rail network.

In terms of the rail network, constraints are located on both routes serving the city. The Scotland Route Utilisation Strategy report notes that the Aberdeen to Inverness service pattern does not meet market needs and capacity is insufficient to meet demand. This is primarily owing to the single track and loop locations which fix timetable patterns and restrict development options. Along Corridor 5, Dundee to Aberdeen, there is a bottleneck near Montrose that limits the growth of freight and commuter services. On both routes, peak trains are heavily loaded and The Scottish Planning Assessment highlights a conflict between the mixture of services that consists of fast inter-urban, local, long distance and freight services[161]. The Scotland Route Utilisation Strategy also reports inconsistent stopping patterns on both of these routes[162]. These particular constraints are discussed more fully under the respective corridors.

Particular points of congestion on the road network are:

- Bridge of Dee Junction;
- A956 between A90 and city centre;
- B977 / A965 Junction;
- Great Southern Road / King George VI Bridge;
- Haudagain Roundabout; and
- Bridge of Don congestion.

[161] Scotland Planning Assessment Baseline Report, October 2005
[162] Scotland Route Utilisation Strategy, Network Rail March 2007

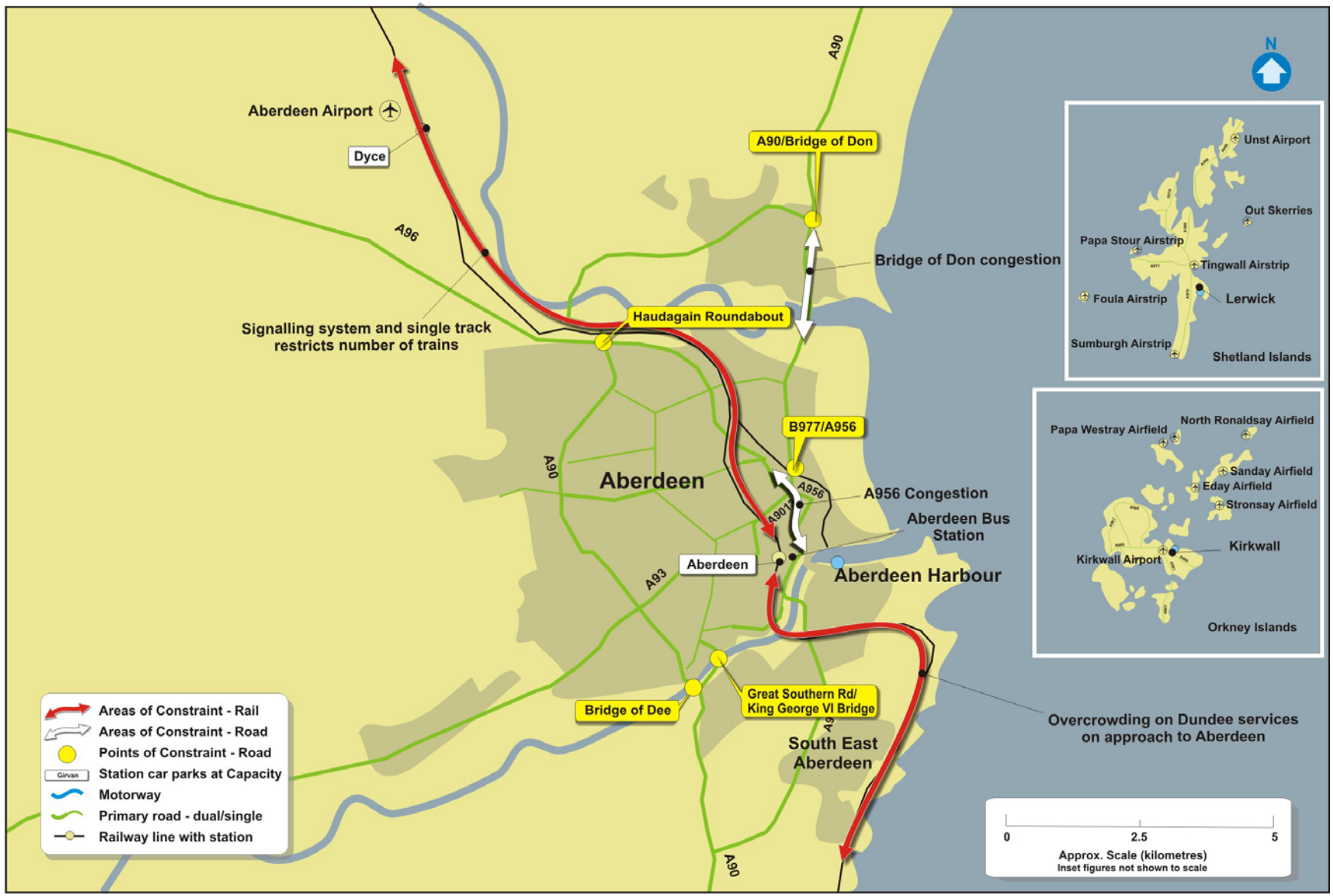

Figure 5.1.8: Areas of Constraint on the Network, Aberdeen

5.1.6 Summary and Conclusions

Overall, how well does the transport network perform?

The road network currently suffers from congestion during the peak periods. Areas experiencing congestion include the A90 at the Bridge of Dee, Anderson Drive and the Haudagain Roundabout that operates at or in excess of capacity during peak periods.

Constraints on the rail network are located on both main routes, between Aberdeen and Inverness and Dundee and Inverness. The Aberdeen to Inverness route operates with a capacity constraint due to the single track with passing loops and between Dundee and Aberdeen there is a bottle neck at Montrose, while there are issues related to maintaining suitable headways between Aberdeen and Stonehaven, and the lack of a turn back facility there too.

Aberdeen benefits from an adjacent bus / rail interchange with the Northlink passenger ferry terminal close-by (services to Orkney and Shetland). The redevelopment of the bus and rail stations as part of the Union Square proposals will enhance the level of integration.

Will the transport network meet future demand, particularly in areas of economic activity?

Of the routes into Aberdeen, journey times are forecast to improve in the period to 2017 as a result of the Aberdeen Western Peripheral Route but then increase by 2022 in the peak periods. This is due in part to the effect of removing through traffic from the urban network, however by 2022 without suitable demand management measures; traffic / congestion will fill the spare network capacity. This congestion in 2022 will result in longer journey times through the city; however travel time variability may reduce as a result. Routes expected to suffer the greatest increase in the morning peak periods following opening of the Aberdeen Western Peripheral Route are the A96 and the A90 from the north approaches.

TMfS indicates that use of Aberdeen railway station will increase by around a third between 2005 and 2022. Consequently, overcrowding may occur on some peak services on the section of network between Dyce and Stonehaven and given the capacity of the single track rail lines between Aberdeen to Inverness, and at Montrose, the opportunity to increase frequencies to meet future demand will be limited, resulting in the overcrowding on some of these services in the future.

What are the key drivers that will impact on performance in the future?

Growing employment centres outside of the historical core, the Dyce area, and the Altens area to the South East of Aberdeen, currently do not have competitive access by public transport and this may cause problems in the future as these areas of economic activity continue to expand.

The opening of the Aberdeen Western Peripheral Route will have a key part to play in shaping the future transport performance. It is an important part of delivery of the Aberdeen Western Peripheral Route that other transport related measures are implemented so that the benefits of the scheme are not eroded through additional car use which will otherwise result.

Freight movements by rail will be better facilitated by loading gauge enhancements between Mossend and Elgin and the construction of road-rail interchange facilities at Raiths Farm in the Dyce area.

What are the key problems associated with delivering the KSOs?

The predicted increase in road journey times due to increasing congestion is likely to be a problem in addressing improvements. Over the period to 2022, areas of congestion are forecast to intensify on the approaches to the urban area.

Peak road congestion at local points on the network is a significant constraint for accessibility into the city centre. This is also an issue for accessing the airport and port.

There is poor access by rail / bus to the peripheral economic areas. In addition, there is poor access by rail to the port.

The continued dispersal of population into Aberdeenshire will make providing effective access to public transport more difficult which will likely result in increased levels of commuting into Aberdeen by car, putting additional pressure on the road network.