5.2 Dundee

5.2.1 Setting the Context

Dundee is the fourth largest city in Scotland, with a population of around 142,000[163]. It lies within the TACTRAN RTP area. The city's economy is based on a variety of sectors, including manufacturing, retail, public administration, health and social work, and education. As shown in Table 5.2.1, around 30 per cent of the total population in the TACTRAN RTP area lives in Dundee. The city's population is expected to increase in the future and as a proportion of the TACTRAN RTP area, but at a lower rate than forecast increase in population for the UK.

Table 5.2.1: Summary of Socio-Economic Characteristics

Indicator Year	Dundee	TACTRAN	Scotland	UK
Population (2005)[163]	142,000	478,000[164]	5,078,000	60,000,000
Population (2022)[165]	143,400	463.700	5,118,000	62,400,000
Population Change (2005 – 2022)[165]	+1%	-0.3%	+1%	+4%
Employment (2005)[165]	65,800	201,300	2,330,900	27,900,000
Employment (2022)[165]	64,200	203,000	2,427,800	29,300,000
GVA per head (2004)[166]	£14,800[167]	£14,500	£15,500	£16,200
Cars/Capita (2005)[168]	0.32	0.43	0.39	0.42
Households with Car (2005)[169]	54%	68%	67%	75%

The city is adjusting to a long term decline in traditional industry and in recent years the city's economy has grown, reflected in a four per cent increase in employment levels from 2003 to 2007[170]. In the longer term employment in Dundee is expected to fall slightly by three per cent between 2005 and 2022, while across the region employment is expected to increase about eight per cent. The proportion of Dundee households with a car (54 per

[163] 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
[164] 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
[165] TELMoS
[166] Scottish Economic Statistics 2007
[167] GVA per head for Angus and Dundee
[168] STS No. 25 (2006)
[169] Scotland's Census 2001 www.scrol.gov.uk TableKS17
[170] Dundee City Council – Dundee Economic Profile August 2007

cent) is significantly lower than the same figure for both the region and Scotland. Inactivity rates are projected to decline in Dundee from 43,700 in 2005 to 39,800 in 2022[171]. However, average earnings in the city area are among the lowest in Scotland, with median weekly earnings approximately £375, around 9 per cent lower than the national average (£412)[172].

Figure 5.2.1 shows the location of the two key areas of economic activity (city centre and Dundee West) and principal components of the transport network that support the city region. Figure 5.2.2 highlights the main areas for expected change in population and employment in future years.

[171] TELMoS
[172] Scottish Economic Statistics 2006, table 4.20

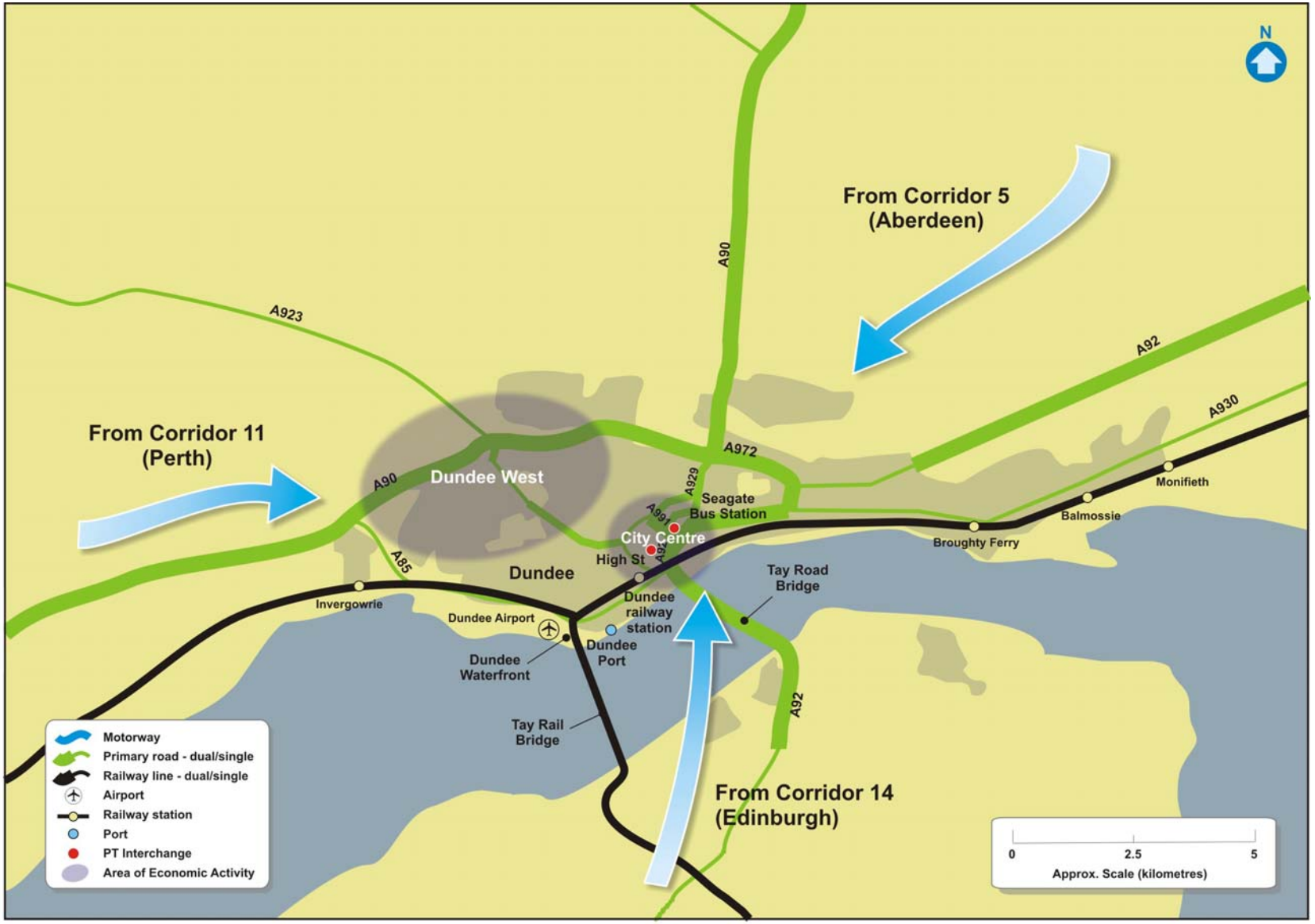

Figure 5.2.1: Setting the Context, Dundee Urban Network

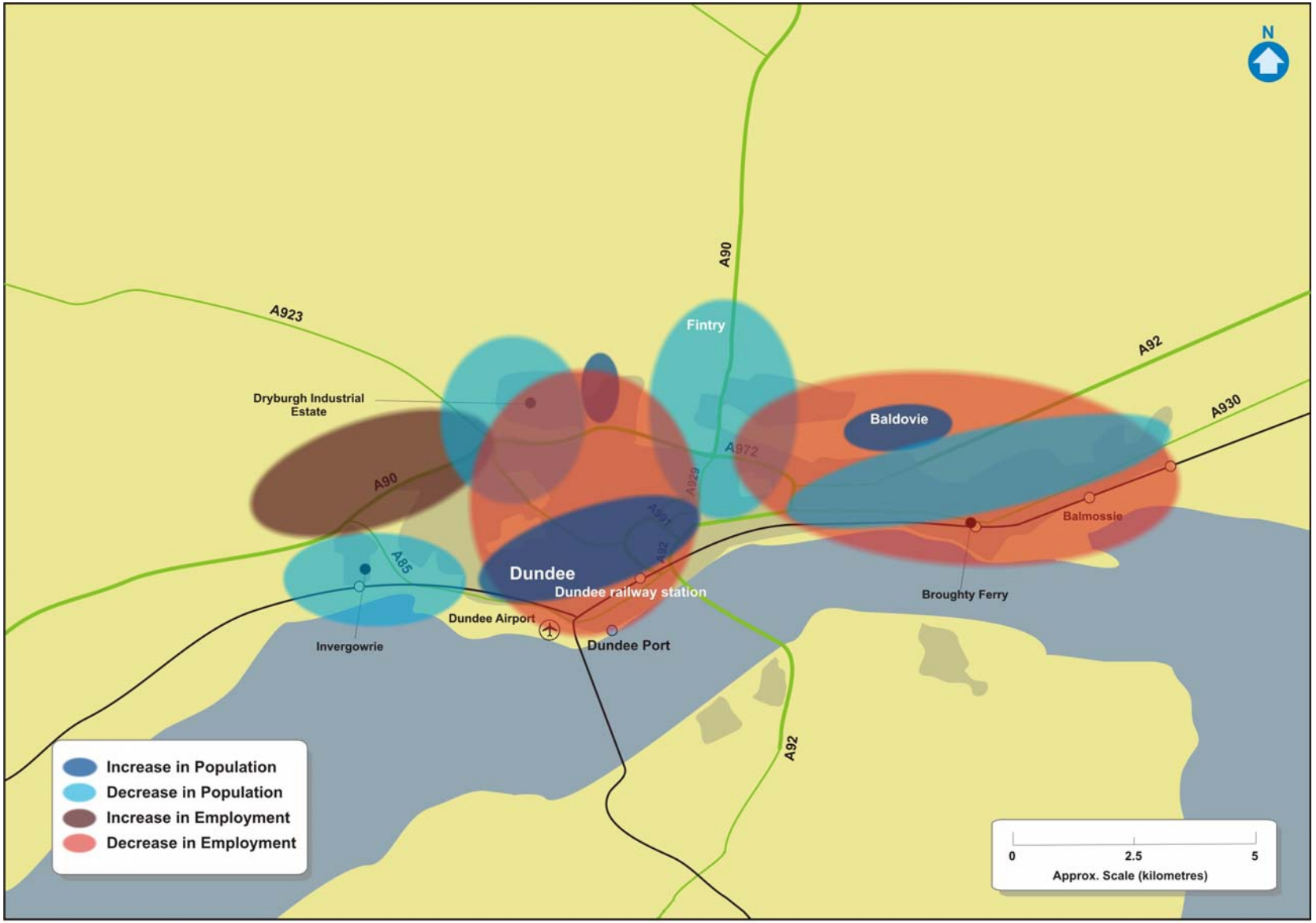

Figure 5.2.2: Change in Population and Employment - 2005 & 2022, Dundee

5.2.2 Land Use Patterns

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

- City centre (historical, business and retail centre); and
- Dundee West (established retail and business area, with expanding high technology parks).

In recent years the city has started to expand, accommodating demand for new residential and economic development. As shown in Figure 5.2.2[173], future increases in population are now forecast in central and northeast areas of the city with reductions expected in the east and west. The planned Dundee Waterfront[174] regeneration project will deliver a significant location for population growth in the central area. While employment is expected to fall in the city centre, Dundee West is highlighted as a centre for employment growth. These trends suggest that travel will intensify to and within the city.

5.2.3 Transport Network and Operations

Infrastructure and Services

Three main road connections provide vehicle access to and from Dundee. The A90 runs between Dundee and Perth, and beyond to the central belt and is a dual carriageway. At Dundee, the A90 continues through the northern periphery of the city at the Kingsway and then turns inland to Forfar and Aberdeen. It links to the A92 coastal route to Arbroath and Montrose. The Tay Road Bridge provides access via the A92 to / from the south of the city into Fife.

Dundee railway station lies on the south-western edge of the city centre and provides access to direct rail services via the East Coast Main Line to Aberdeen in the northeast; to Glasgow, Edinburgh and Perth in the Central Belt; and to Newcastle, York, Birmingham, London and other destinations in England. The Tay Rail Bridge links Dundee by rail to the south. There are suburban railway stations to the east at Broughty Ferry, Balmossie and Monifieth, however few services call at these stations. The nearest stop to the south is at Leuchars (approximately 12 kilometres) and there is only one to the west between Dundee and Perth at Invergowrie. Rail speeds between Dundee and Edinburgh are inhibited by a difficult combination of gradients and sharp curvature, with a consequential impact on journey times.

Dundee railway station currently caters for some 1.4 million passengers per annum (2005) and is the eighth busiest station in Scotland[175].

[173] TMfS:05
[174] www.dundeewaterfront.com
[175] Rail industry LENNON data (Station Usage 2004/2005)

Service patterns are generally:

- Two trains per hour between Dundee and Aberdeen (through services from Glasgow and Edinburgh);
- One train per hour between Dundee and Glasgow;
- One train per hour between Dundee and Edinburgh;
- One train per day between Dundee and Birmingham;
- Three trains per day between Dundee and London; and
- Various freight services.

The city is covered by a comprehensive local bus network operated by Travel Dundee. Suburban bus services out with Dundee are provided generally by Strathtay Buses in Angus and Perthshire, and by Stagecoach Fife in Fife. Most services operate on a radial basis for the city centre. National bus services are provided by Scottish Citylink and Megabus. Service patterns are generally:

- Three buses per hour between Dundee and Aberdeen;
- Two buses per hour between Dundee and Glasgow; and
- Two buses per hour between Dundee and Edinburgh.

Dundee is on the hourly Citylink service between Aberdeen, Perth and Glasgow. Megabus operates to Edinburgh and Glasgow. Megabus and National Express run road services into England. Stagecoach Fife operates an hourly service to Edinburgh via Glenrothes.

Rural, regional and long distance buses serve the modern Seagate Bus Station, at the eastern end of the city centre. Urban services pass close to the bus station but the main urban interchange is in the High Street. The A92 between Dundee and Arbroath has also been upgraded from single to dual carriageway standard.

Dundee railway station is separated from the city centre and the bus station by the ring road. The railway and bus stations are located some distance from each other resulting in poor integration.

The *PLUSBUS* integrated ticket has recently been extended to cover the Dundee area. This ticket can be used for journeys on both rail services and bus services operated by Travel Dundee and Stagecoach.

Dundee airport provides air services to London (City), Birmingham and Belfast airports. It lies further west of the city centre than the railway station. The short runway length places severe constraints on the size of aircraft that can land in Dundee.

Dundee Port lies on the southern boundary of the city centre on the River Tay, adjacent to the Dundee Waterfront regeneration area. Dundee Port handles over 1.1 million tonnes of freight which is transported on the surrounding road network[176]. The port provides freight (mainly forestry and oil-based products), oil and gas offshore support services, and cruise liner services.

Asset Management

In 2007, nine per cent of the trunk road network pavement[177] in Dundee is judged to require structural strengthening as it has no theoretical residual strength. This compares with a national level of four per cent[178]. Under Transport Scotland's planned maintenance schedule, the net figure for the city is expected to fall to six per cent by 2012.

Further details on asset management, including bus and rail, are provided in Chapter 4.

Demand Management

In recent years Dundee City Council has developed and implemented a strategy for encouraging the use of public transport in the city. This strategy, entitled 'Bringing Confidence to Public Transport' consists of improvements to infrastructure to provide priority for buses and real-time information displays. A Quality Bus Partnership between Travel Dundee (the main bus operator) and Dundee City Council has also delivered quality enhancements to the network. This was part of a comprehensive city centre regeneration strategy that included reconfiguration of city centre roads, junctions and car parking.

Dundee 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. This information is also available online[179].

Within Dundee City Council there are strategically located car parks around the Inner Ring Road which provide around 5,000 parking spaces for shoppers, tourists and business people, all within easy walking distance of the city centre "Pedestrian Zone" shops. There are approximately 530 on-street parking spaces[180].

Off – street parking costs between £0.65 and £0.90 for a stay of 1 hour, £1.30 and £1.80 for two hours, £2.20 and £2.70 for two to three hours and the maximum cost for a stay of between six to twelve hours is £6.00 and £7.00. In general, off – street parking in Dundee is cheaper than in Edinburgh or Glasgow city centres for a similar time period.

[176] STS No. 25 (2006), Table 10.6
[177] Transport Scotland SERIS Database
[178] STS No. 25 (2006) Table 5.5
[179] http://www.dundeetravelinfo.com/default.asp
[180] http://www.dundeecity.gov.uk/visitorparking/main.htm

On – street parking is limited to one hour in the city centre (a maximum cost of £1.50) and four hours outside the city centre (a maximum cost of £2.50). Both Edinburgh and Glasgow operate different on – street parking arrangements to Dundee. For example in Edinburgh city centre it costs £1.80 an hour to park for anywhere between 30 minutes and four hours. Parking prices and duration of stay vary depending on the proximity to the city centre.

There are currently no Park-&-Ride facilities within Dundee.

Programmed Schemes

The following is the only programmed infrastructure change:

- Removal of tolls on the Tay Road Bridge.

5.2.4 Travel Patterns

Figure 5.2.4 highlights the forecast origins and destinations of the trips travelling to, from and through Dundee. It should be noted that the current version of TMfS does not contain detailed modelling of local bus services in Dundee and therefore the level of public transport demand is underestimated. The enhanced version of the model (available in November 2007) will address this issue. Travel is concentrated generally along an east-west axis through or around the city. Large proportions of these east-west travel demands are destined for, or originate from, Dundee itself (55 per cent to / from the west, 45 per cent to / from the east), of which only about five per cent[181] are undertaken by public transport, reflecting the rail network in the city. A sizeable minority (about 40 per cent) of trips are travelling through Dundee between north east Scotland and the central belt, via Perth on the A90 / M90. Such traffic would generally not enter the city centre and remain on the A90 Kingsway in the northern part of the city.

A greater proportion (eight per cent) of trips from Fife is undertaken by public transport reflecting the availability and route of inter-city rail services between Dundee and Edinburgh. Around two-thirds of this travel demand is destined for, or originates from, Dundee. A majority of the remainder passes through Dundee between the northeast and the Central Belt or beyond. Table 5.2.2 summarises the change in travel demand for trips travelling to, from and within Dundee.

[181] TMfS:05

Table 5.2.2: Summary of Demand (12 hour) and Public Transport Share[182]

Corridor Approach	2005		2022		Change	
	Total Trips	PT Share	Total Trips	PT Share	Total Trips	PT Share
Within Urban Network	107,100	4%	124,000	3%	+16%	-1%
Between Dundee and Corridor 5 (Aberdeen)	28,300	5%	31,600	4%	+12%	-0.7%
Between Dundee and Corridor 11 (Perth)	32,000	7%	40,500	6%	+26%	-1.5%
Between Dundee and Corridor 14 (Edinburgh)	23,700	11%	30,800	9%	+30%	-2.3%
Corridor 5 to Corridor 11 (Perth)	24,400	6%	28,600	6%	+17%	-0.3%
Corridor 5 to Corridor 14 (Edinburgh)	8,700	10%	10,800	9%	+24%	-1.5%
Corridor 11 (Perth) to Corridor 14 (Edinburgh)	3,300	1%	4,500	1%	+38%	-0.2%
Total	227,600	6%	270,900	5%	+19%	-0.9%

The percentage of HGV traffic on the A90 Kingsway in Dundee of 3.8 per cent. AADT levels on the A90 Kingsway are between 35,000 and 42,000, which is approaching the theoretical capacity of this standard of carriageway[183].

[182] TMfS:05
[183] SRTDb

Travel Patterns – To Areas of Economic Activity

Figure 5.2.3 summarises the travel patterns to the two key areas of economic activity.

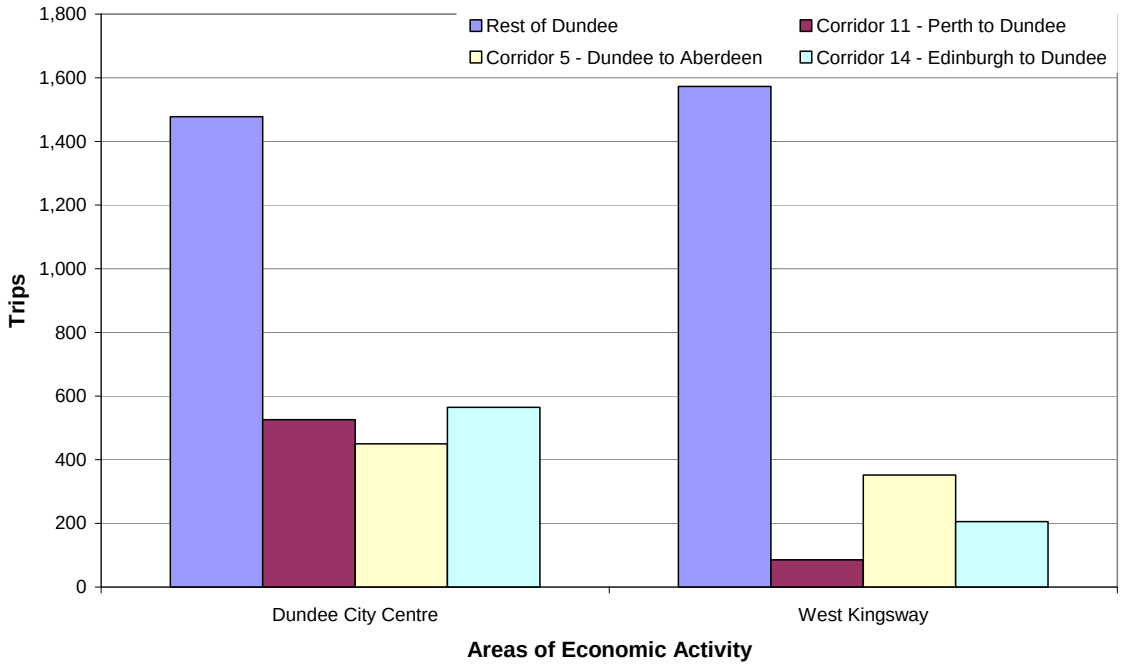

Figure 5.2.3: Travel Patterns to Centres of Economic Activity, AM Peak Period

The majority of trips to the city centre and Dundee West are forecast to travel from other areas of the city. There is a much lower and fairly uniform proportion of travel between the three linked corridors and the city centre. Trip demand to Dundee West from the east (Carnoustie, Arbroath and Aberdeen) and the south (Fife), results in a number of cross city movements.

Travel catchments for both the city centre and Dundee West are more localised than that of the city as a whole, which draws a greater proportion of travel to / from the north east and Central Belt.

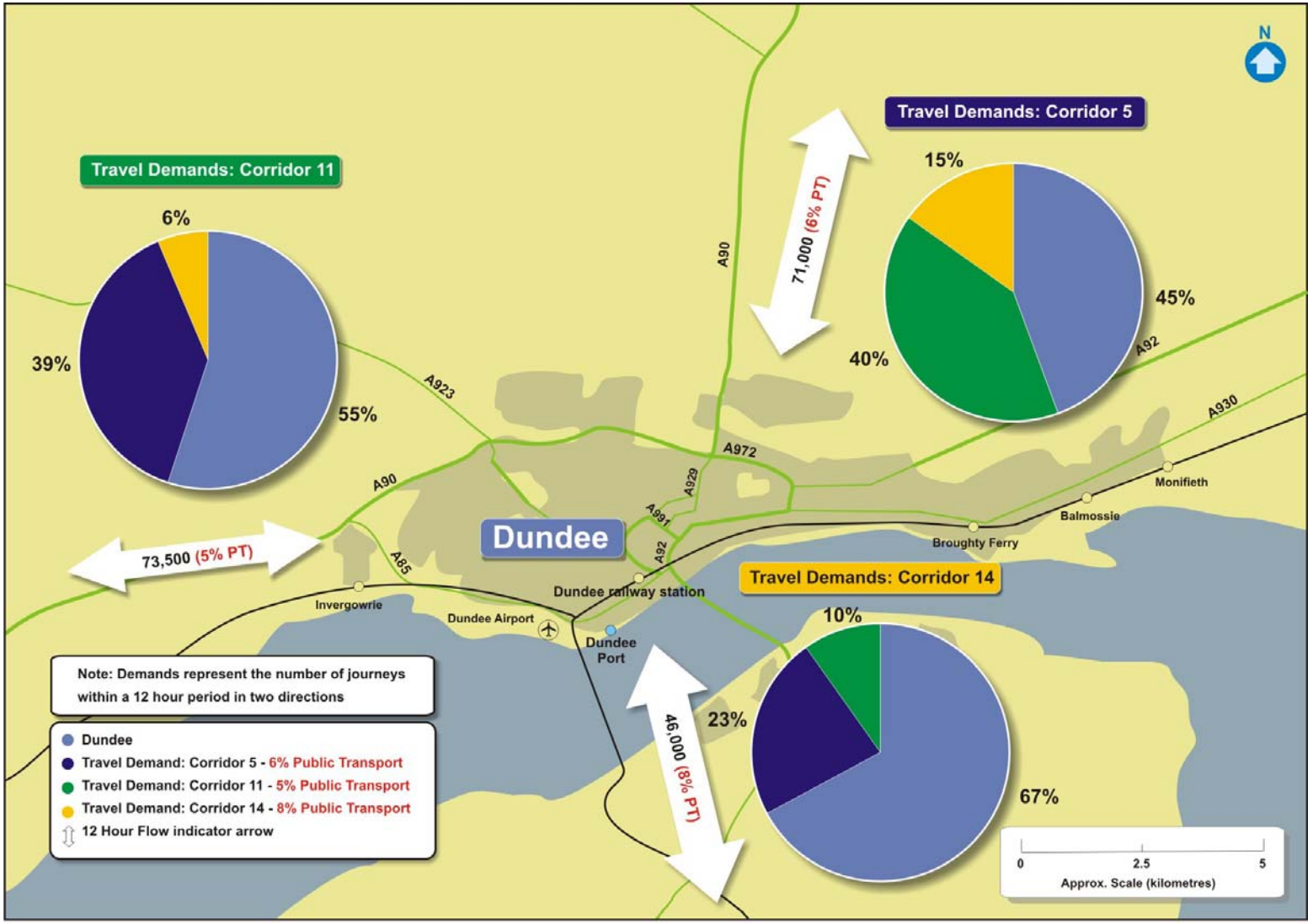

Figure 5.2.4: Travel Patterns to, through and around Dundee (2022)

5.2.5 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?
- What are the delays and when do they occur?

Figure 5.2.5a shows how the labour market catchment[184] is forecast to change for Dundee city centre and Dundee West in the future, based on forecast travel horizons presented in Figures 5.2.5b and 5.2.5c[185]. The available labour market for both is forecast to fall in future years, reflecting increased costs of travel to and through an area where no major transport investments beyond 2012 are currently programmed.

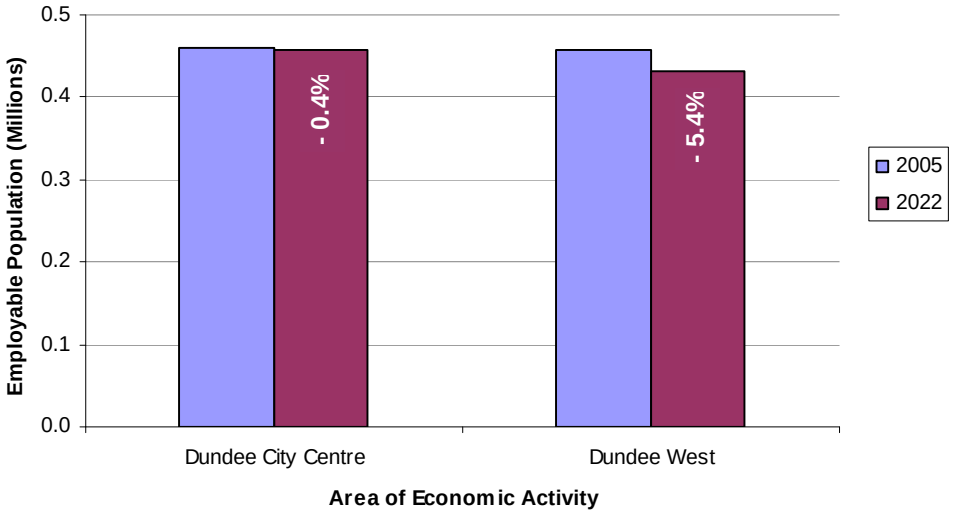

Figure 5.2.5a: Change in Labour Catchment for Areas of Economic Activity

[184] TMfS:05
[185] Journey times for bus/rail include a 20 minute walk/wait time

Figure 5.2.5b: Travel to Dundee City Centre (2005 AM peak)

Figure 5.2.5c: Travel to Dundee West (2005 AM peak)

Figure 5.2.6 presents details of the average speed on the road network for all peak periods throughout the day, comparing against free-flow speeds and giving an indication of road congestion within Dundee. This graph considers key radial routes within the city, such as the A85, A923 and A92, 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.

This shows little existing congestion or reliability problems across all periods of a typical weekday and relatively little change expected in the future. In part, this reflects recent road infrastructure investment around the city centre. It also reflects that the major areas of road constraint are on the city boundary (in particular along the A90 Kingsway) rather than the city centre, as shown in Figure 5.2.7. These congested points of entry contribute to managing city-bound traffic demand. Expansion of the city beyond the A90 has increased local traffic access demands across the A90, often in conflict with east-west, long-distance movements.

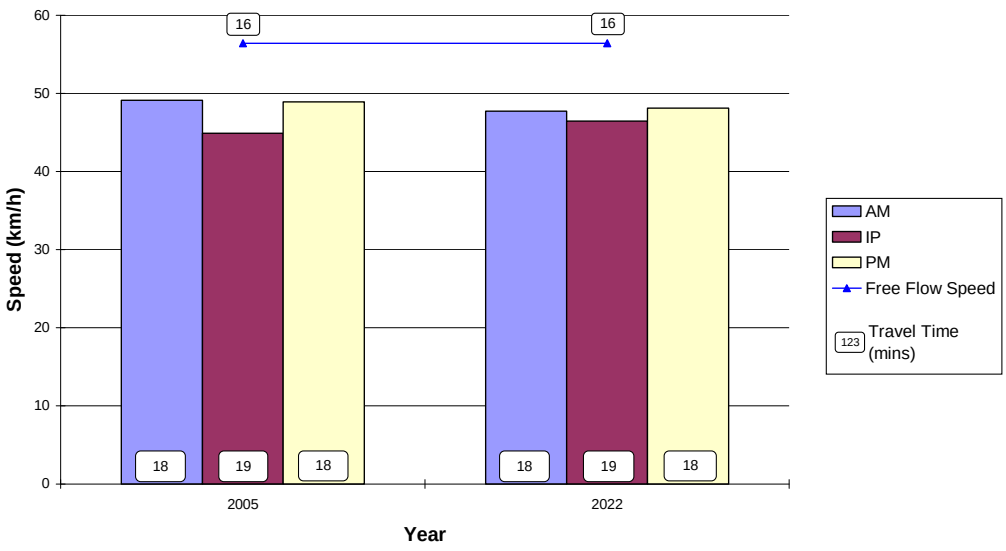

Figure 5.2.6: Average Urban Road Network Speed

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 emissions per person kilometre are forecast to rise from 122 tonnes / million person kilometres to 136 tonnes / million person kilometres between 2005 and 2022. This is a result of CO_2 emissions rising at a slightly greater rate than person kilometres between 2005 and 2022[186].

The road based transport network produced 91,500 tonnes of CO_2 in Dundee in 2005. This equates to approximately one per cent of the total road based transport related CO_2 emissions in Scotland.

By 2022, it is forecast that CO_2 emissions in Dundee will rise to around 109,500 tonnes, approximately one per cent of Scotland's road based transport related CO_2 emissions in 2022

The rail network produced 1,000 tonnes of CO_2 in Dundee in 2007. This equates to approximately one per cent of the total rail based CO_2 emissions in Scotland[187].

Therefore, it is estimated that the road and rail based transport network produced 92,500 tonnes of CO_2 in Dundee in 2005. This equates to approximately one 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?

Figure 5.2.7 shows current limitations on passenger rail services to and through the city. Very low service frequencies at suburban railway stations are a constraint on local catchments for the city centre. Restrictive signalling on the Tay Rail Bridge also extends journey times between the city centre, Fife, and the central belt via Fife. The short section of single line near Montrose limits capacity and can also lead to poor performance and inconsistent headways. For Dundee West and the airport, public transport access is limited to bus services serving the local area. The potential for any extended catchment is constrained by the absence of a conveniently located railway station.

Considering the areas of economic activity:

[186] TMfS;05
[187] AEA (2001) Rail Emission Model Final Report; www.nationalrail.co.uk; and www.networkrail.co.uk

- Dundee's railway station is cut off from the city centre by the city centre ring road, and the railway station is not well integrated with the city bus network. Waterfront regeneration plans are expected to address this issue; the City Council has approved a redevelopment planning brief for the station.

- Dundee West public transport access is limited to bus services serving the local area and therefore car is the main form of transport to this area. The potential for any extended catchment is constrained by the absence of a conveniently located railway station.

The Scottish Planning Assessment also shows difficulty in accommodating the mix of inter-urban, long distance and freight services on the routes into and through Dundee.

Recent years have seen positive moves towards providing high quality services within Dundee, with the City Council and the major bus operators working in partnership. As a result of this, the urban bus network generally caters well for the demand within the city.

TMfS does not include local bus services in Dundee so public transport accessibility is underestimated. City centre areas provide the highest levels of public transport accessibility where rail and long distance bus services are available. Car accessibility is considerably higher[188] and this is forecast to continue with no major schemes planned and no significant changes in journey costs or opportunities forecast. There are some concentrations of social excluded people with a greater dependency on public transport for access to key services in the former Social Inclusion Partnership areas of Menzieshill, Douglas and Angus and Downfield West. However, while public transport accessibility in these areas is not always good, it is not as low as former Social Inclusion Partnership areas in other corridors when the availability of local bus services is taken into account.

Surveys show that safety and security fears discourage individuals from using public transport, particularly in the evening. Of significance within Dundee is the perception by males in that they felt 'unsafe' when travelling on the railway (13 per cent compared to eight per cent nationally).

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 safety issues on the A90 Kingsway near the West Gourdie Industrial Estate and also on the A92 at East Dock Street. Annual average road accident casualties reported from 1994 - 1998 and 2001 - 2005 in Dundee have fallen by 19 per cent[189]. This is higher than the national average of 16 per cent.

[188] Even after accounting for local bus services
[189] Road Accidents Scotland 2005, Table 37

Summary of Infrastructure and Operational Constraints

Figure 5.2.7 highlights the areas of congestion on both the road and rail network.

In terms of the rail network, the constraints are focussed on the Tay Rail Bridge which has restricted signalling. Other constraints on the rail network concern the low service frequency of services to the suburban stations to the east and west of the city.

Points of congestion on the road network are the Swallow Hotel Roundabout and a number of junction locations along the A90 Kingsway, where there is conflict between long distance and local traffic.

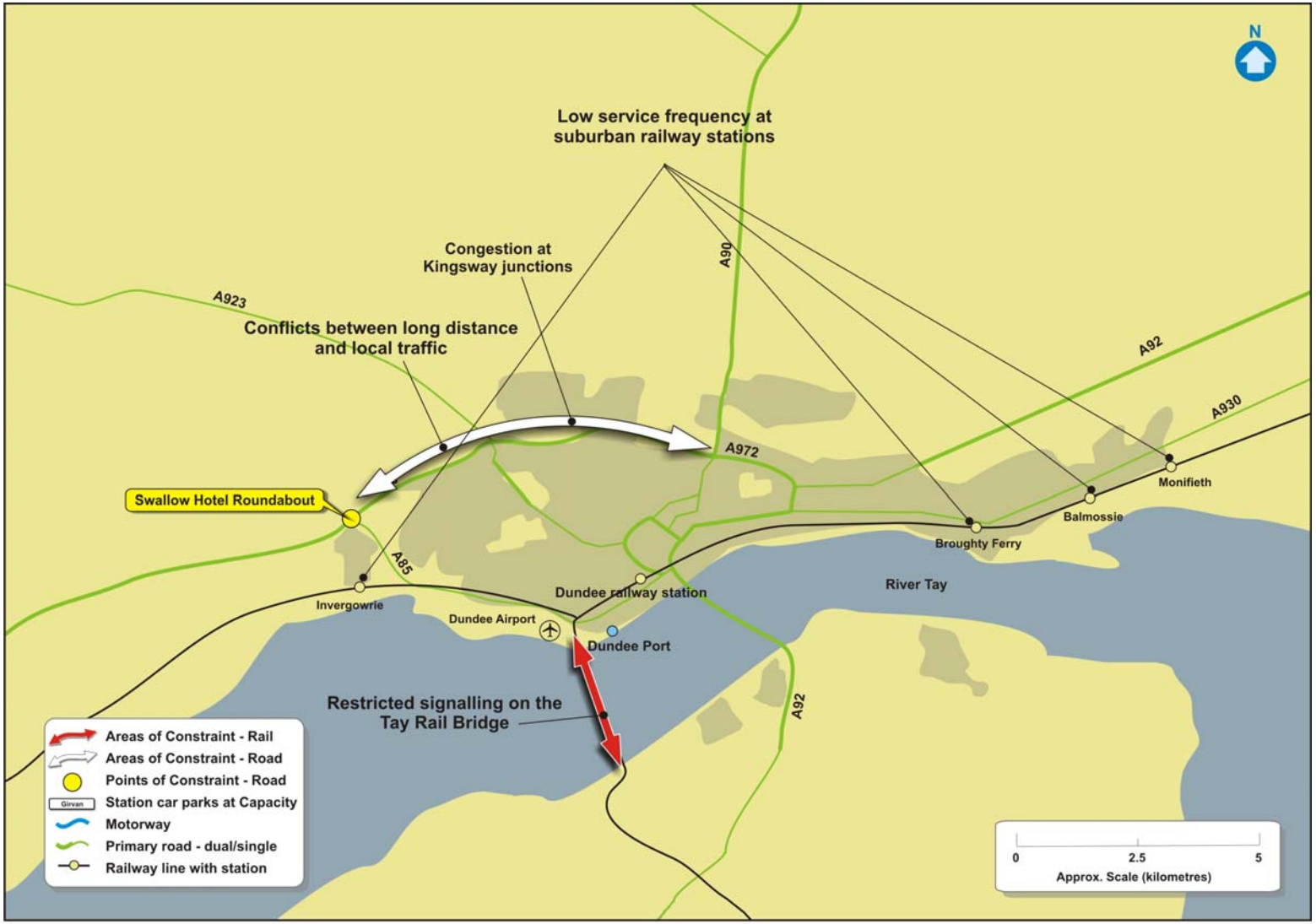

Figure 5.2.7: Areas of Constraint on the Network, Dundee

5.2.6 Summary and Conclusions

Overall, how well does the transport network perform?

The road network in and around Dundee operates well during most of the day. Some congestion is experienced at peak hours at the entry points on the periphery of the city. The constraints posed by this congestion and the recent re-alignments to city centre roads prevent city centre congestion levels rising to significant levels. Recent improvements to junctions on the A90 between Perth and Dundee have improved the safety of this route. The upgrading of the A92 to dual carriageway between Dundee and Arbroath has improved the accessibility of local communities served by this route into the city.

The rail network operates well throughout the day. Hourly services to the main cities in Scotland from Aberdeen are complemented by national services throughout the UK.

Suburban rail services along the Tay estuary to Arbroath operate at very low frequencies. The low line speed between Dundee and Edinburgh acts as a constraint on commuting between the two cities.

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

The road, rail and air networks are forecast to continue to offer a relatively good level of service without the need for substantial infrastructure investment.

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

The continued growth of cross-A90 traffic within Dundee will lead to a slight deterioration in long-distance journey times for vehicles using the A90 to cross Dundee. Economic growth outside the city centre and housing development to the north and east of Dundee will present challenges for matching public transport provision.

What are the key problems associated with delivering the KSOs?

Over the period to 2022, areas of congestion are forecast to intensify on the approaches to the urban area.

There is poor access by rail and bus to the peripheral economic areas and waterfront regeneration areas.

The provision of adequate public transport services as an attractive alternative to private car use is likely to be the main difficulty in delivering KSOs for Dundee. The increasing number of commuter destinations within Dundee but outside the centre (e.g. Dundee West), and the relatively low levels of road congestion could lead to modal shift away from public transport for commuters.

5.3 Edinburgh

5.3.1 Setting the Context

Edinburgh is Scotland's capital city and plays a vital role in contributing to the economic well-being of the country. The city has a population of approximately 436,000[190], and the SEStran area[191], which largely correlates with the functioning of the Edinburgh labour market, has a population of approximately 1.5 million[192].

The city's economy, which has been growing steadily in recent years, is dominated by the service sector with a strongly performing financial services sector and a significant number of public service employees. This growth has resulted in rising land and property prices and demand for further development in and around the city. Average house prices more than doubled between 1998 and 2006[193]. One of the consequences of this is the increase in the number of those working in Edinburgh but residing outside the city, increasing the levels of demand on radial routes into the city. Putting this into context, Edinburgh accounts for 45 per cent of the total employment in the SEStran area but only 30 per cent of the population.

Figure 5.3.1 highlights the areas of particular relevance within Edinburgh. This shows the three key areas of economic activity within the city and the principal components of the transport network that support the city region.

[190] 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
[191] SEStran includes City of Edinburgh Council, Clackmannanshire, East Lothian, Falkirk Council, Fife, Midlothian, Scottish Borders and West Lothian
[192] 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
[193] Edinburgh City Council Capital Review www.capitalreview,co.uk