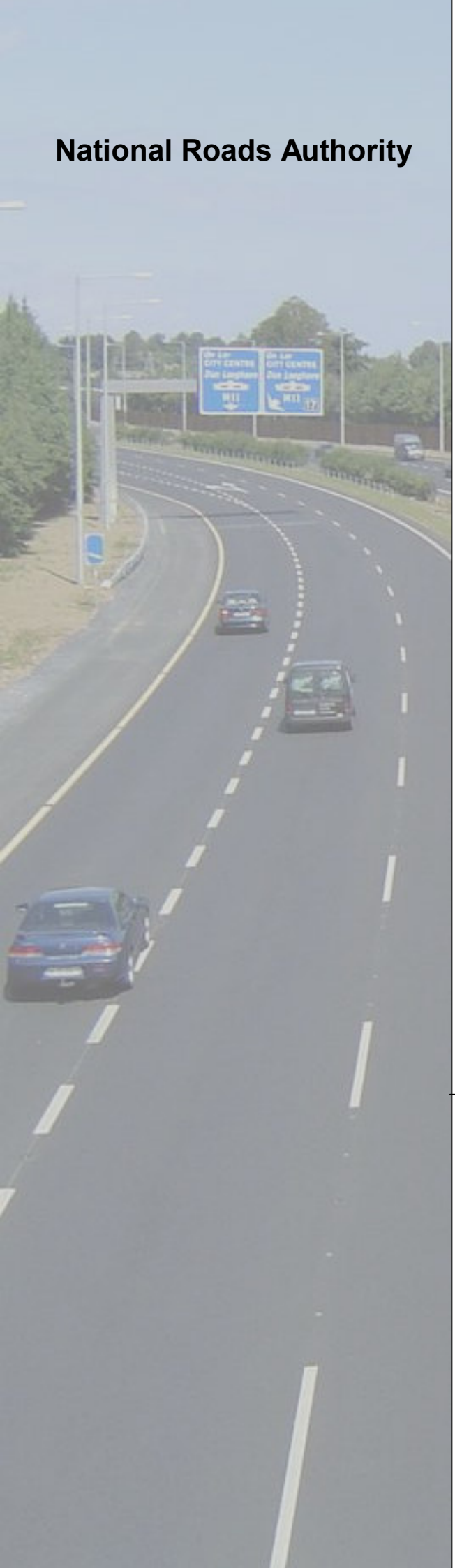


National Roads Authority

Project: **Leinster Orbital Route Feasibility Study**

Final Report

Roughan & O'Donovan – FaberMaunsell Alliance
Arena House
Arena Road
Sandyford
Dublin 18

Roughan & O'Donovan
FABER MAUNSELL

Goodbody
ECONOMIC CONSULTANTS

tiros
resources limited
Planning, Sustainable Development and Landscape Consultants

Leinster Orbital Route Feasibility Study

Final Report

Table of Contents

Page

Executive Summary v

1.0 Introduction 1
1.1 Overview 1
1.2 Format of the Study 2

2.0 Context of the Study Area 5
2.1 Context of the Study Area 5
2.2 Existing Development Patterns 5
2.2.1 Employment and Industry 5
2.3 Car Ownership and Travel Patterns 7
2.3.1 Trends in Car Ownership 7
2.3.2 Car Ownership Forecasts 8
2.3.3 Population and Settlement 10
2.4 Existing Traffic Patterns 12
2.4.1 Overview 12
2.4.2 M50 Dublin Ring Road 13
2.4.3 National Primary Roads 13
2.4.4 National Secondary Roads 13
2.4.5 Regional and Local Roads 14
2.5 Key Policies and Future Infrastructure 15
2.5.1 Overview 15

3.0 Review of Planning Policy 17
3.1 Overview 17
3.2 Transport 21 17
3.3 National Spatial Strategy 2002 - 2020 18
3.4 Dublin Transportation Office – "Platform for Change" 19
3.5 Regional Planning Guidelines Greater Dublin Area 2004-2016 20
3.6 Local Authority Development Plans 22
3.6.1 Town Bypasses 22
3.6.2 Development of Regional Connections 23
3.6.3 Additional Local Routes to Relieve M50 23

4.0 Population and Employment Projections 24
4.1 Introduction 24

4.2 Data issues 24
4.3 The National Population 24
4.4 Study Area Population Projections 25
4.5 Regional Population Settlement Patterns 26
4.6 Projection of Regional Population Settlement Patterns 27
4.7 Population Projections for Major Towns in the Study Area 27
4.7.1 Indicative Population Growth Rates 27
4.7.2 Refinement of Population Growth Rates in Major Towns 28
4.8 Employment Projections for Major Towns in the Study Area 30
4.9 Summary and Conclusions 32

5.0 Traffic Forecasting 33
5.1 Introduction 33
5.2 Traffic Model Development 33
5.2.1 Boundary of the Traffic Model 33
5.2.2 Base Year Model Development (2006) 35
5.2.3 Traffic Data Collection 35
5.2.4 Development of Trip Matrices 35
5.2.5 Model Calibration and Validation 36
5.2.6 Development of Future Year Matrices (2025) 37
5.3 Assessment of Future Year Traffic Flows (Without Leinster Orbital) 38
5.3.1 The M50 Dublin Ring 38
5.3.2 National Primary Roads 38
5.3.3 National Secondary Roads 39
5.3.4 Regional and Local Roads 39
5.4 Conclusions 41

6.0 Constraints Study 43
6.1 Overview 43
6.2 Other Relevant Local Road Proposals 43
6.2.1 Fingal County Council Road Network Proposals 43
6.2.2 South Dublin County Council Road Network Proposals 44
6.3 Identification of Route Corridor 45
6.3.1 Drogheda to Navan 45
6.3.2 Navan to Enfield 46
6.3.3 Enfield to Naas 46
6.4 Junction Strategy 47

7.0 Scheme Traffic Forecasting and Evaluation 48
7.1 Overview 48
7.2 Traffic Forecasting 48
7.2.1 Anticipated Scheme Flows (2025) 48
7.2.2 Connectivity between Regional Towns 50
7.3 Scheme Assessment 51
7.3.1 Integration 53
7.3.2 Economy 56

7.3.3 Environmental Impacts 58
7.3.4 Road Safety 59
7.3.5 Accessibility and Social Inclusion 60
7.3.6 Conclusions of Scheme Assessment 60

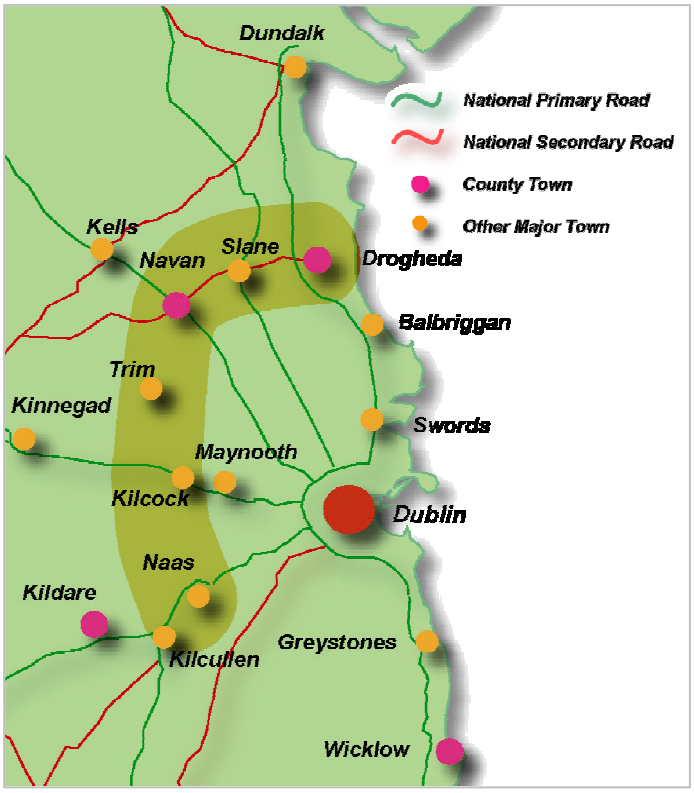
8.0 Further Considerations 62
8.1 The Role of Public Transport 62
8.2 Scheme Funding 62
8.2.1 Introduction 62
8.2.2 Public Private Partnerships with Tolling 63
8.2.3 Public Private Partnerships without Tolling 63
8.2.4 Development Contributions 63
8.3 Land Use Effects of New Road Infrastructure 64

Executive Summary

Introduction

Following initial examination by the National Roads Authority, the Roughan & O'Donovan Faber Maunsell Alliance, in association with Goodbody Economic Consultants and Tiros Resources have been asked to undertake a Feasibility Study for a Leinster Orbital Route.

The objective of this commission is to prepare a report on the feasibility of a new road link connecting the towns of Navan, Drogheda and Nass/Newbridge/Kilcullen, whilst serving Navan/Kells/Trim and Kilcock/Maynooth/Leixlip/Celbridge. The route should also provide linkages to the N2 and N3 to serve the Ashbourne/Dunboyne primary development cluster. An approximate graphical representation of this corridor is outlined opposite.



The Feasibility Study has been based on a thorough review of planning policy, the development of a detailed traffic model, an examination of constraints along the corridor, and the identification and testing of an appropriate route.

The Context of the Study Area

The study area for the Leinster Orbital Route is broadly contiguous with the Dublin, Midlands, Mid-East and South-East Regions. Preliminary results of the 2006 Census of Population indicate that the population of the Greater Dublin Area (GDA) is almost 1.7m. This represents a population growth of 8.2 per cent in the GDA since the last Census in 2002. The region now accounts for 39 per cent of the national population.

The number of people employed in the Greater Dublin Area has risen to 820,000, an increase of 9 per cent since 2003. This compares to an increase of just 5.1 per cent over the preceding three-year period between 2000 and 2003, suggesting an increasing rate of growth in employment in the region.

Vehicle ownership has experienced very strong growth in the Study area in the last fifteen years. In 1990, there were just over 436,000 cars in the Study area, but this had more than doubled to 924,000 by 2005. This rate of growth in car numbers exceeded that for the country as a whole. The national forecasts envisage a further growth in car numbers of 36 per cent by 2026.

National Car Number Forecasts, 2006-2026

Year	Car Numbers
2006	1,661,655
2011	1,876,168
2016	2,028,235
2021	2,160,704
2026	2,262,455

Source: NRA. Future Traffic Forecasts, 2002-2040

The Greater Dublin Area and the surrounding Leinster counties have been a key driver of population growth in the country. In 1971, Leinster's share of the national population accounted for less than half of the total population of the State. Since then the share of national population in the Leinster area has increased, and currently stands at over 54%.

Existing traffic patterns in the study area are heavily influenced by current population and employment patterns throughout the Greater Dublin Area. While the provincial towns have seen residential populations grow considerably over the last few years this has not yet been reflected in an increase in available employment in those areas. Consequently, this urban sprawl has resulted in a pattern of commuting from towns as far from Dublin as Virginia, Co. Cavan, and Mullingar, Co. Westmeath, leading to tidal traffic patterns on all radial routes into Dublin City. Congestion on routes into Dublin has also been exacerbated by a high demand for orbital connections around the city. Of particular note are the local roads connecting the N1, N3, N4 and N7. These roads are being used as 'rat runs' by traffic affected by congestion on the radial routes and the M50, leading to significant road safety concerns, and notable impact on the communities through which they pass.

Review of Planning Policy

The concept of a Leinster Orbital Route is promoted by both the Regional Planning Guidelines and by the DTO Strategy Document '*Platform for Change'*. Both documents suggest the need for an additional Orbital Route which provides connections between the major towns throughout the Leinster Region, and which is located some distance from the Dublin Area. The concept of improving connectivity and stimulating a higher level of economic interaction between these towns is supported by the National Spatial Strategy.

Population and Employment Projections

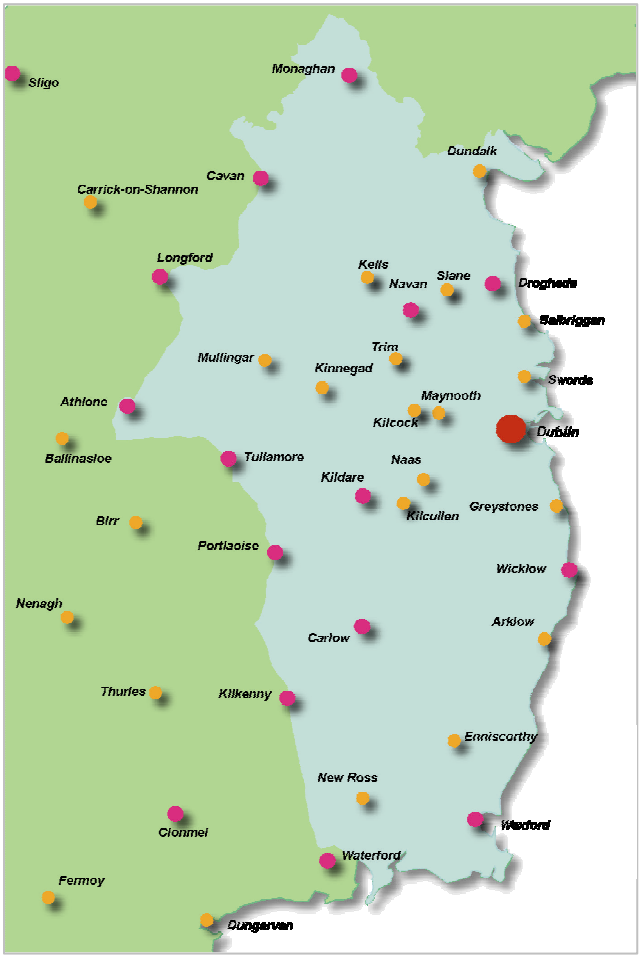
Population predictions have been undertaken for major towns throughout the Leinster Region. In preparing such forecasts, it is recognised that they need to be compatible with official predictions made by planning authorities and, in particular, the Central Statistics Office. It is further recognised that reliance on locally based predictions of populations may give rise to a situation where the sum of predictions so made may exceed the aggregate regional predictions made by the CSO. The methodology employed by the study took account of these issues by not only obtaining the views of each local authority on population growth and other issues, but also by providing a broad regional context against which the local predictions could be validated.

A preliminary census estimate of the national population for 2006 indicates that there are 4.23m persons in the country, compared with 3.92m in 2002. The national population is rising at a rate in excess of 2 per cent per annum. The most significant factor influencing population growth is net immigration, which amounted to an average of 46,000 per annum in this period. The National population is projected by CSO to reach 5.26m by 2025. The most optimistic projection considered by the CSO is for 5.35m by that year. The 2020 Vision report produced in 2006 by NCB Stockbrokers provides a slightly more optimistic estimate of 5.522m by 2025.

Having reviewed the job levels in the major towns in the study area, it was established that there were a number of contributory factors influencing the number of jobs in each town. These factors included town size; county town status; distance from Dublin and population growth experienced over the period 1996 – 2002. Projections of future job levels in each town were made, having recourse to the projected population levels in each town and the above factors. It is predicted that the number of jobs in the major urban centres will grow by 3.1 per cent annually on average, to reach 0.7 million in 2025.

The Traffic Model

The Leinster Orbital Route Feasibility Study is supported by a comprehensive traffic forecasting exercise, based opn the above population and employment projections, to determine traffic flows on the proposed corridor, its impact on other roads, and the travel time benefits than can be expected to accrue.



The Traffic Model is based on the Dublin Transportation Office Traffic Model for the Greater Dublin Area. The Leinster Model is an evolution of the DTO model, which includes both a broader geographical area, and more detailed definition of the existing and future road network outside Dublin City.

The traffic model forecasts considerable increases in traffic flow on the main roads through the Study Area, with significant traffic flows developing on the various Regional Roads connecting the N1, N3, N4 and N7 corridors.

Constraints Study

Urban areas along the proposed Leinster Orbital Route Corridor are concentrated at major towns such as Drogheda, Navan and Trim. Any orbital route through this area needs to skirt the edge of the lands zoned for urban expansion in accordance with the Regional Planning Guidelines for the Greater Dublin Area, as well as navigating through the ribbon development that lines the roads radiating from each town. The many towns and villages in the rural stretches of this region also need to be avoided.

There are few significant topographical constraints in most of the study area. The main feature is the Dublin / Wicklow mountain range, which extends at elevations of up to 1,000m for a distance of 45km south of the capital, thus effectively blocking the provision of a high quality road linking most of east Wicklow to the Midlands. At a smaller scale there is an upland area extending from Ballyboughil in north County Dublin to Bellewstown in East Meath with elevations of up to 150m, which forms a modest barrier between the N2 corridor and the coastal plain. Another example is the ridge at up to 200m elevation at Lyon's Hill east of Newcastle and north of the N7 corridor in southwest County Dublin. Otherwise the study area is relatively flat with only localised hills that might influence route planning for a major road.

Major heritage constraints exist at the Boyne Valley complex and the Tara Hill areas in County Meath. Various Special Areas of Conservation (SAC) and Natural Heritage Areas are scattered across the region, with a cluster of SAC's in the midland bogs of northwest Kildare and east Offaly. In general the route corridor has avoided or skirted these areas.

Traffic Forecasting

The 2025 Traffic Model has been used to assess the impact of the Leinster Orbital Route in capturing traffic from existing roads. The scheme will attract a significant demand, with forecast two-way traffic flows during the AM peak of over 4,000 PCU's per hour, equating to an AADT of over 50,000 vehicles/day. The most heavily trafficked section of the Route is between the M4 and M7, with traffic volumes reducing gradually to less than 20,000 AADT between the M1 and N2.

Significant reductions in journey time would be expected between the key towns. End to end journey times for a typical journey between Navan and Naas will reduce by some 50%, with Trim to Naas reducing by a similar level. Enfield to Naas reduces by some 65%, reflecting the current difficulties that exist with connectivity between these two corridors for the Do-Minimum scenario.

Scheme Evaluation

The Leinster Orbital Route will strengthen the links between the development centres and firms locating in them will have access to larger labour markets and a larger range of business services and sub-suppliers. It should thus encourage the growth of firms in the Development Centres of the Dublin Hinterland. This will make jobs available for residents of these towns. The ensuing improved settlement patterns will contribute to sustainable development**.**

Because it is situated at approximately 30 km from the Metropolitan Area throughout its length, the Route carries limited risk of contributing to urban sprawl. It thus supports the consolidation of the Metropolitan area. In addition, it offers opportunities to North-South

traffic for better linkages with radial routes emanating from Dublin, in particular with the M3, M4 and M7/N7. This thereby facilitates linkage of, say, Dundalk with the Gateways of Limerick, Galway, Waterford, Cork and the Midlands, without having to access the M50. The Route is thus highly compatible with the National Spatial Strategy as it provides a relatively direct linking of the Dundalk, Midlands and Galway Gateways, as well as improved linkage between the Dundalk, Limerick, Cork and Waterford Gateways.

The Leinster Orbital Route offers substantial integration prospects as it ties into the M7/N7 close to the M9 junction and thus offers integration benefits to traffic to/from the south east.

Based on a consideration of environmental constraints, the Route has been designed to avoid major negative environmental impacts. Nevertheless, careful planning of the Route and appropriate mitigation measures will be required to ensure that environmental impacts are avoided. However, it is clear that there are no major environmental concerns that would rule out this route alignment at this stage in the analysis.

The Route, to a large extent, attracts traffic from National Secondary and Regional Roads. As such, the road safety benefits are expected to be a significant proportion of the overall scheme benefits. The scheme will also have a positive but small impact on social inclusion, in that it serves the Rapid areas of Navan and Drogheda. The Outturn Feasibility Cost Estimate for the scheme is in the range €1.4 to €2.2 billion inclusive of VAT, assuming an opening year of 2016. Based on a mid-point cost estimate, this equates to a Present Value of Costs of some €768m (excluding VAT) in 2006 prices.

The scheme provides benefits in excess of costs of some €535m in Net Present Value terms, thereby providing a robust economic rate of return. The Benefit Cost Ratio for the project is expected to be approximately 2.0. It is noted that this figure does not capture the broader regional economic and social benefits described in the above paragraphs, but it does include an allowance for the road safety benefits that will accrue as a result of the scheme.

Further Considerations

All the local authorities that may be affected by the Leinster Orbital Route have adopted a Section 48 Development Contribution Scheme. None of these schemes, however, include provisions to contribute to the cost of the Leinster Orbital Route.

Section 49 of the Planning and Development Act, 2000, allows Planning Authorities to adopt Supplementary Development Contribution Schemes, the purpose of which is to provide funding for specified 'public infrastructure projects or services'. Given the nature of the Leinster Orbital Route and its purpose, coupled with the need to manage development adjacent to the junctions in accordance with NRA Policy Documentation, it is unlikely that either of the above schemes of contribution funding will have any significant applicability to the project.

Preliminary analysis has been undertaken to assess whether the project would be suitable for development as a Public Private Partnership (PPP) scheme incorporating tolling. The initial findings from that work indicate that the project would have the potential to be developed as a viable toll scheme. Further analysis of such potential would, however, be necessary at a later stage in the development of the Leinster Orbital Project.

1.0 Introduction

1.1 Overview

Following initial examination by the National Roads Authority, the Roughan & O'Donovan Faber Maunsell Alliance, in association with Goodbody Economic Consultants and Tiros Resources have been asked to undertake a Feasibility Study for a Leinster Orbital Route.

The objective of this commission is to prepare a report on the feasibility of a new road link connecting the towns of Navan, Drogheda and Naas/Newbridge/Kilcullen, whilst serving Navan/Kells/Trim and Kilcock/Maynooth/Leixlip/Celbridge. The route should also provide linkages to the N2 and N3 to serve the Ashbourne/Dunboyne primary development cluster. An approximate graphical representation of this corridor is outlined below in Figure 1-1.

It is acknowledged that there are considerable difficulties with identifying an appropriate route for the Leinster Orbital Route to extend into Wicklow. The National Roads Authority will separately consider the examination of a possible route further south to link the N11 with the N9 corridor, thereby providing onward access to the Leinster Orbital Route.

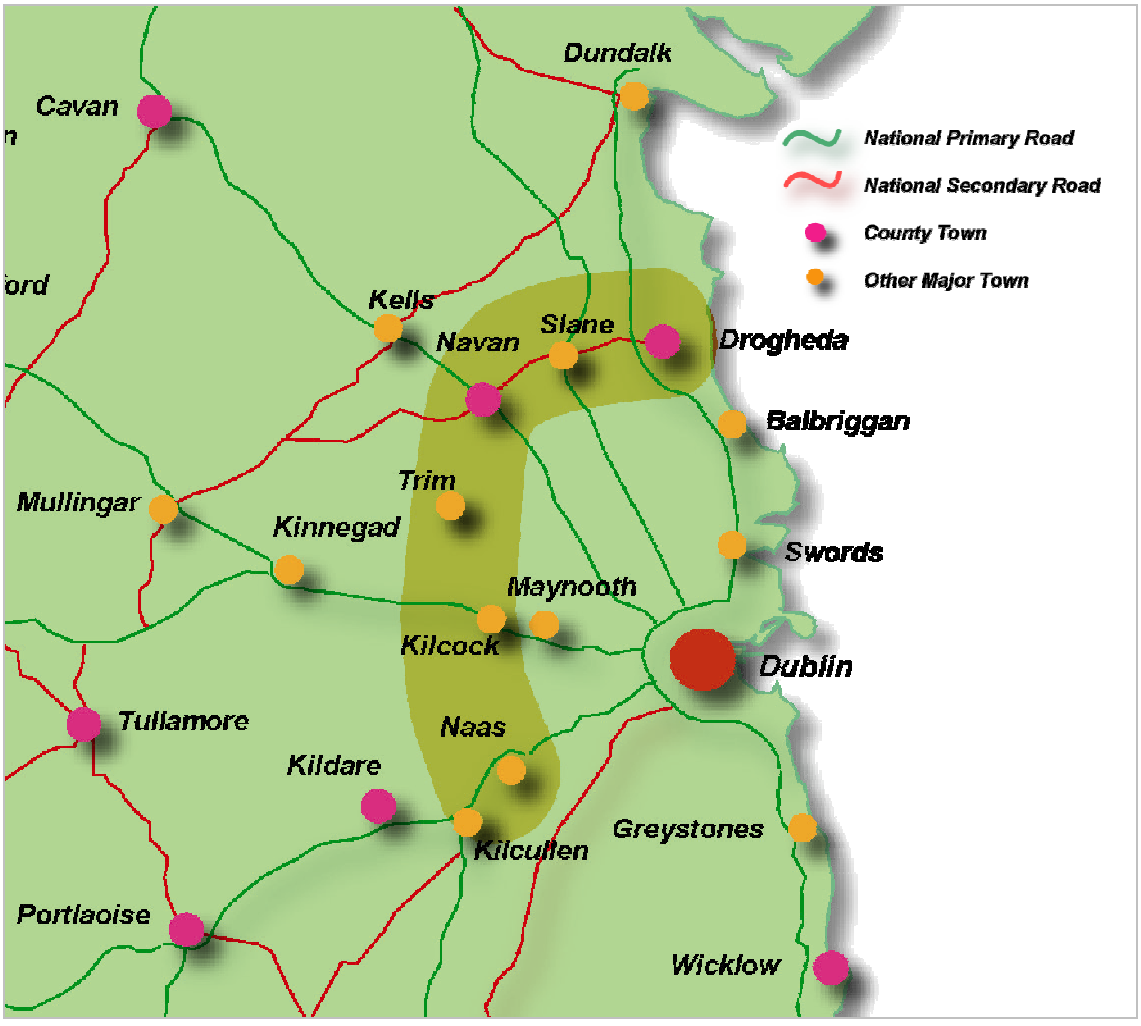


Figure 1-1: The Leinster Orbital Route Corridor

In responding to this brief, there was a recognition that the study would need to examine traffic, planning and economic issues in a sufficient level of detail to establish the feasibility for the route, and to understand the impact that it would have on growth patterns throughout the Greater Dublin Area. As such, the following approach was developed:

- Define and summarise the various planning policies which have driven the requirement for a Leinster Orbital Route. This would be achieved through a review of Local and National Policies and Objectives, and through consultation with the various Local Authorities throughout the Region;

- Undertake a review of existing population and employment patterns throughout the Study Area, and develop future population and employment forecasts for 2025. The forecasts should be disaggregated by the various settlements, and should be based on thorough consultation with relevant Local Authorities. They should also, however, reflect expected aggregate population and employment growth in the Region throughout the period to 2025;

- Develop a Strategic Traffic Model for 2025, utilising the above population and employment projections. The Traffic Model requires the collection of appropriate traffic survey information, and should take account of future road and public transport improvements proposed under *Transport 21*;

- Identify constraints along the corridor identified in the Study Brief, and develop an alignment option which recognises such constraints;

- Use the traffic model to forecast future traffic flows on the Leinster Orbital Route, and its impact on other road links throughout the Leinster Region; and

- Assess and evaluate the proposed Route with reference to economic benefits, compliance with planning policy and stated objectives, and hence to determine feasibility or otherwise for the project;

This Report outlines the findings of the Feasibility Study and proposes a Preferred Corridor to be taken forward to Route Selection Stage.

1.2 Format of the Study

The format for the Leinster Orbital Feasibility Study follows a clear process of scheme identification and evaluation. It is based on a thorough understanding of planning needs and supported by a comprehensive traffic forecasting exercise. A simplified flowchart outlining the structure of this Feasibility Study is outlined below.

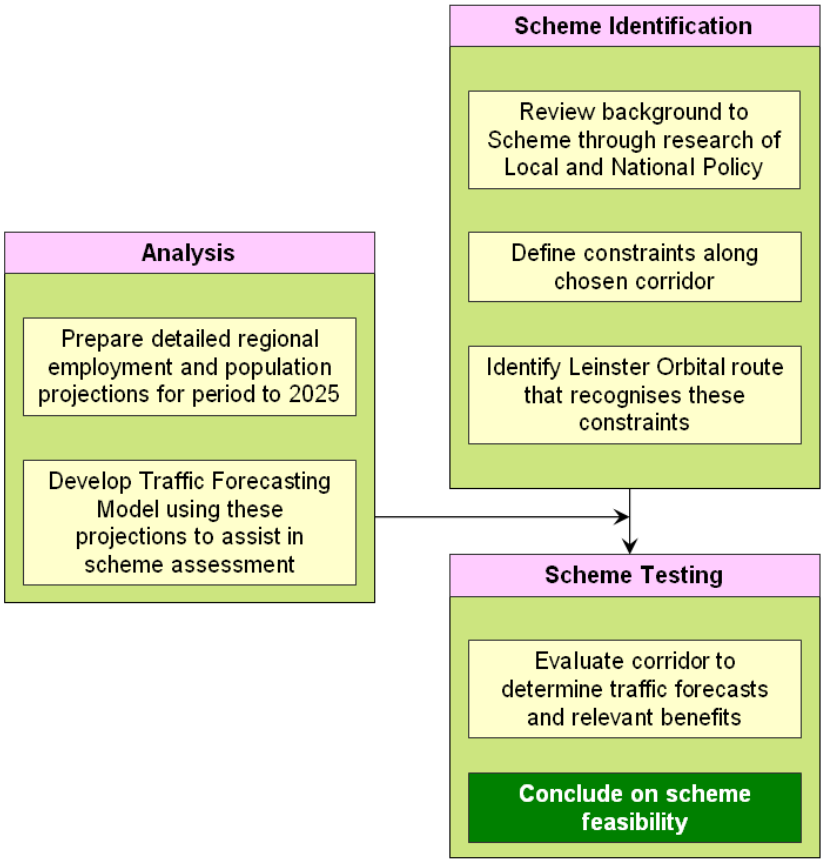


Figure 1-2: Methodology for the Leinster Orbital Feasibility Study

The extent of the Feasibility Study comprises a boundary roughly defined by the province of Leinster. Defining a Study Area of this size ensures that all influences of future economic growth throughout the Region can be accounted for, and the wider benefits of a Leinster Orbital Route can be fully assessed. An approximation of the Study Area Boundary is shaded as blue in Figure 1-3 below.

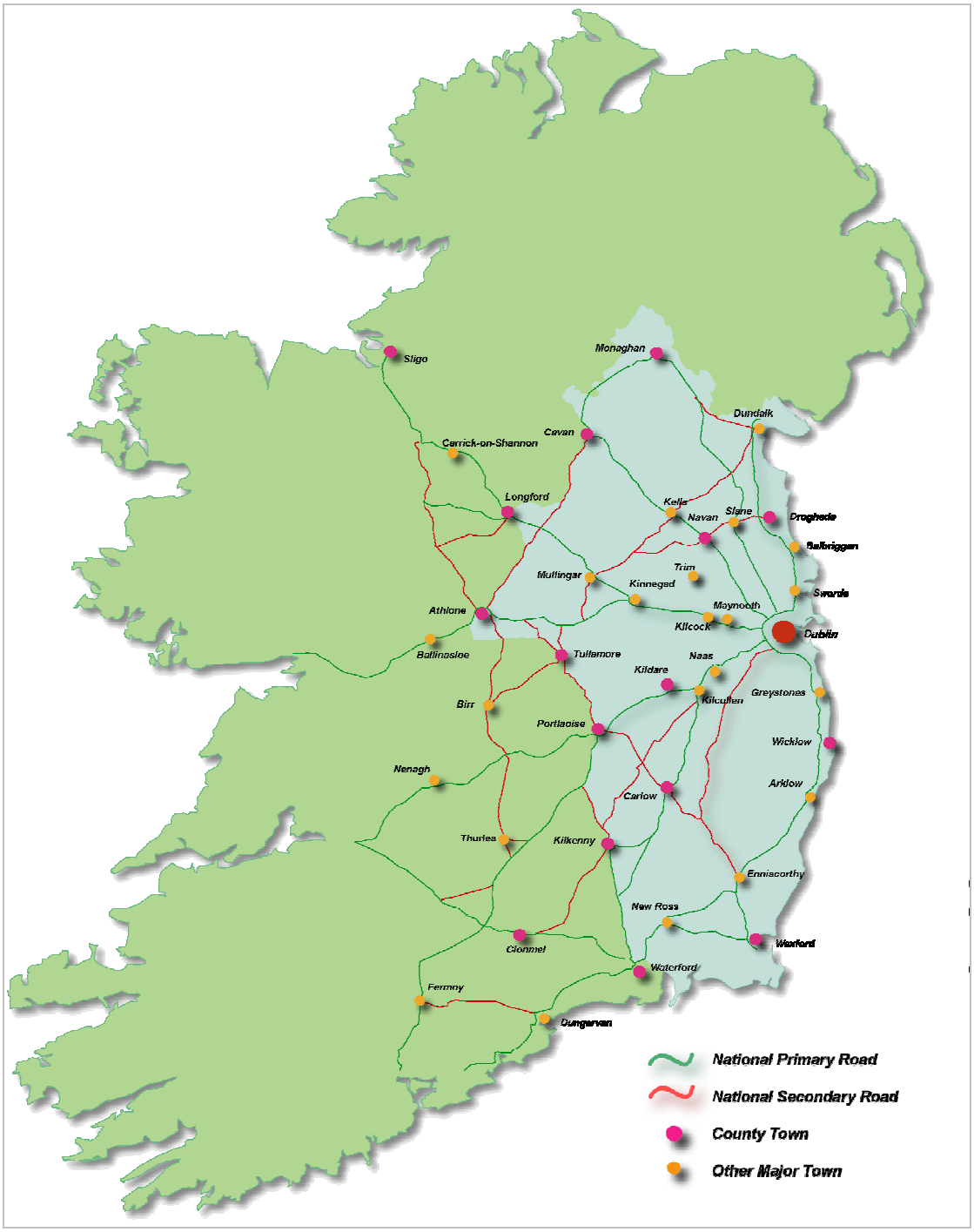


Figure 1-3: Leinster Orbital Route Feasibility Study : Study Boundary (shown in blue)

2.0 Context of the Study Area

2.1 Context of the Study Area

The Study Area for the Leinster Orbital Route is broadly contiguous with the Dublin, Midlands, Mid-East and South-East Regions. Preliminary results of the 2006 Census of Population indicate that the population of the Greater Dublin Area[1] (GDA) is almost 1.7m. This represents a population growth of 8.2 per cent in the GDA since the last Census in 2002. The region now accounts for 39 per cent of the national population.

In 2003, the last year for which there are data available, regional output in the GDA amounted to over €56 billion and accounted for 45.2 per cent of output for the economy as a whole. Between 2000 and 2003, regional output grew by 32.9 per cent in nominal terms. This was similar to economic growth nationally (35.1 per cent in nominal terms), implying that regional share of output continues to remain broadly static. The region is the major venue for inward investment in manufacturing and traded services and for the growth in business and leisure service sectors generally.

The number of people employed in the Greater Dublin Area has risen to 820,000, an increase of 9 per cent since 2003. This compares to an increase of just 5.1 per cent over the preceding three-year period between 2000 and 2003, suggesting an increasing rate of growth in employment in the region.

Within the GDA as a whole, the Dublin Region is more successful than the Mid-East region in attracting inward investment and service sector industries. In order to avoid increased infrastructure pressures, there is an accepted need for some rebalancing of economic activity in favour of the Mid-East region. Strong transport links within the latter region are required to ensure that critical mass is attained in economic terms.

2.2 Existing Development Patterns

2.2.1 Employment and Industry

Strong growth in the Irish economy commenced in the early 1990s. In the decade since 1994, the economy of the Study area, in Gross Value Added (GVA) terms, has tripled from €24.4bn to €76.6bn.[2] The proportion of national gross value added, which arises in the Study area remained constant at 59 per cent over the period. Within the Study area, the main contributors to growth were the Dublin and Mid-East regions, with the South-East performing less well.

This growth in the Study area economy was due to both population increases and increased per capita output. However, the latter dominated with GVA per capita increasing by 175 per cent over the period.

During this period, both the manufacturing and services sectors experienced very strong growth, with the latter accounting for two-thirds of GVA by the end of the period. This

[1] Area comprising Counties Dublin, Wicklow Meath and Kildare
[2] As measured by nominal GVA at basic prices. Real GVA measures are not available at regional level.

strong growth performance and the resultant growth in personal incomes were the driving forces behind increases in vehicle use in the Study area during the decade.

Table 2.1 Overview of Economic Growth in the Study Area 1994-2004

Sector	GVA 1994 €bn	%	GVA 2004 €bn	%
Agriculture, Forestry and Fishing	0.9	3.9	1.3	1.7
Manufacturing, Building and Construction	9.0	36.6	24.6	32.1
Market and non-Market Services	14.5	59.5	50.7	66.2
Total	**24.4**	**100.0**	**76.6**	**100.0**

Source: CSO, County Incomes and Regional GDP

Nationally, there has been substantial growth of the labour force (as defined by the International Labour Office) and the numbers in employment since 1983. The total number at work was 1.08 million in 1985. By 1995, this had increased to 1.25 million and then increased by 690,000 between 1995 and 2006 to 1.94 million. The increased population of working age coupled with higher female participation rates have each contributed to the high labour force growth in recent years. Ireland's female labour force participation rate reached 51.4% in 2005 compared with around 30% in 1985.

The numbers employed in the Services sector increased by 276,900, or 27.6%, between 1999 and 2005 while there were 86,800 more employed in Industry. Employment in Agriculture continued to fall, accounting for 5.9% of total employment in 2005.

In 1985, the number of persons unemployed stood at 219,600 and this represented approximately one sixth of the labour force. With some variations, unemployment remained at this level for most of the following decade. However, it subsequently declined from 1995 to reach 85,600 or just 4.2% of the labour force in 2005. The fall in unemployment has also been notable amongst those unemployed for one year and over (long-term unemployed) where the number has fallen from 41,500 in 1999 to 27,600 in 2005.

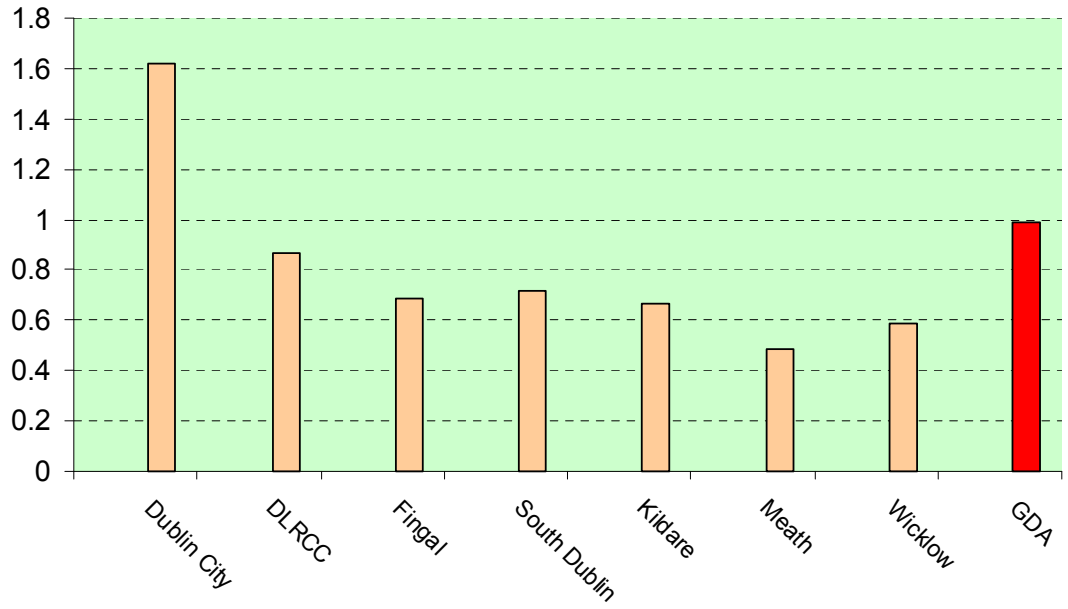
Given that the Census is undertaken on place of residence as opposed to place of work, it is difficult to ascertain exact locations of labour force and employment growth. However, given the locations of population growth and travel patterns, it is clear that in the Study Area, most growth has taken place in the Dublin counties.

Dublin City Centre remains the largest location for employment in the City region and the consequent prime focus for public transport routes. Located within the general city centre area are clusters of specialised industrial/commercial activity such as Dublin Port and the Financial Services Centre. Outside of the City Centre there are significant employment clusters in the surrounding Metropolitan Area, which have grown significantly over the last twenty years. These include Dublin Airport, the North Blanchardstown area, Leixlip,

City West and the Sandyford area. In the Hinterland Area the concentration of employment is generally in the Primary Development Centres as identified in the Strategic Planning Guidelines 1999.

The Regional Planning Guidelines for the Greater Dublin Area derived a Jobs Ratio for each Local Authority area based on the labour force and number of jobs in each. This comparison is useful in understanding the economic 'draw' of different counties, and shows a clear dominance of Dublin and to some extent Dun Laoghaire Rathdown over neighbouring counties such as Wicklow, Meath and Kildare.

Figure 2-1 Job/Population Ratios for Local Authorities in GDA



2.3 Car Ownership and Travel Patterns

2.3.1 Trends in Car Ownership

Vehicle ownership has experienced very strong growth in the Study area in the last fifteen years. In 1990, there were just over 436,000 cars in the Study area, but this had more than doubled to 924,000 by 2005. This rate of growth in car numbers exceeded that for the country as a whole (see Table 2.2).

The strongest growth in car numbers has occurred in the Mid-East Region, which comprises the counties of Kildare, Meath and Wicklow. In that region, car numbers grew from 70,000 in 1990 to over 190,000 in 2005. This largely reflects both the very substantial population growth in the Region in the period and an increasing rate of car ownership per capita. The Dublin region, while experiencing strong growth in car numbers, did not achieve the growth levels of the Mid-East. This was due to the fact that population growth in the Dublin region was significantly lower. Table 2.3 further illuminates these trends by presenting data on car ownership (cars per person) in the study area.

For the study area as a whole, car ownership increased by almost 73 per cent over the period since 1990. Again, this is broadly in line with equivalent national growth rates. In 2005, car ownership rates stood at 0.39 cars per person both in the Study area and nationally.

Table 2.2: Growth in Car Numbers, 1990-2005

Region	1990	1995	2000	2005	% Change 1990-2005
Dublin	229,443	280,158	376,547	444,898	93.9
Mid-East	70,478	96,859	140,031	190,495	170.3
Midlands	46,181	56,106	72,935	95,675	107.2
South-East	90,252	111,059	149,315	193,098	114.0
Total Study Area	436,354	544,182	738,828	924,166	111.8
Total National	796,408	990,384	1,319,250	1,662,157	108.7

Source: Compiled from the Vehicle Census

Table 2.3: Growth in Car Ownership, 1990-2005 (cars per person)

Region	1990	1995	2000	2005	% Change 1990-2005
Dublin	0.22	0.27	0.34	0.38	67.6
Mid-East	0.22	0.28	0.36	0.40	85.1
Midlands	0.23	0.27	0.35	0.38	67.3
South-East	0.24	0.29	0.37	0.42	78.0
Total Study Area	0.23	0.27	0.35	0.39	72.9
Total National	0.23	0.28	0.35	0.39	73.8

Source: Compiled from the Vehicle Census and the Census of Population

2.3.2 Car Ownership Forecasts

Up-to-date forecasts of car numbers are not available for the Study area. However, some existing forecasts are available at the national level and are reproduced below. These national forecasts are broadly in line with current growth in car numbers, in that the 2006 forecast is close to the actual recorded for 2005. The national forecasts envisage a further growth in car numbers of 36 per cent by 2026.

Table 2.4 National Car Number Forecasts, 2006-2026

Year	Car Numbers
2006	1,661,655
2011	1,876,168
2016	2,028,235
2021	2,160,704
2026	2,262,455

Source: NRA. Future Traffic Forecasts, 2002-2040

2.2.3 Commuting in the Study Area

The peak demand for road space is strongly influenced by the number of commuters. As a direct result of the increase in population and car numbers, the total number of commuters in the Study area grew by 23 per cent between 1996 and 2002, to stand at 0.9 million.[3] There was also a strong tendency for commuting distances to increase in the Study area during this period creating further demand for road space. This increase in trip length was particularly pronounced in the Mid-East Region, where the proportion of commuters with trip lengths over 15 miles increased from 28.5 per cent in 1996 to 35 per cent in 2002 (see Figure 2-2). This reflects the changes in the settlement pattern over the period, with Mid East counties of Meath, Kildare and Wicklow attracting an increased population commuting to work in Dublin.

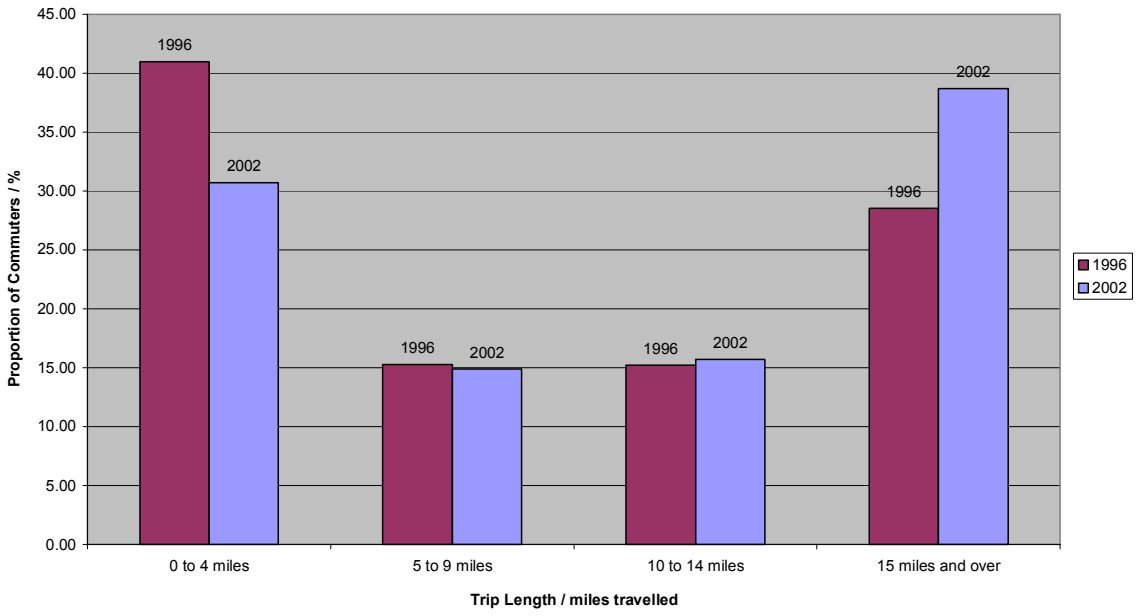


Figure 2-2 Proportion of Commuting Journeys by Journey Length

[3] Data from the 2006 Census of Population are not yet available

2.2.4 Goods Vehicle Numbers

Over the period 1990-2005, goods vehicle numbers in the Study area doubled, which was broadly in line with the national trend. All of this increase has taken place since 1995, coinciding with the commencement of strong economic growth in the early 1990s. The growth in goods vehicle numbers has been strongest outside the Dublin Region, perhaps reflecting the increasing concentration of the Dublin Region on service sector rather than manufacturing activities. In addition to the increase in the number of goods vehicles, there has been a modest increase in average vehicle size since 1995, which has added to the carrying capacity of the goods vehicle fleet.

Table 2.5: Growth in Goods Vehicle Numbers, 1990-2005

Region	1990	1995	2000	2005	% Change 1990-2005
Dublin	33,144	31,059	47,076	54,669	64.9
Mid-East	14,056	14,070	22,407	33,994	141.8
Midlands	8,297	8,596	12,557	19,168	131.0
South-East	17,823	18,144	25,130	37,242	109.0
Total Study Area	73,320	71,869	107,170	145,073	97.9
Total National	143,166	141,785	205,575	286,548	100.2

2.3.3 Population and Settlement

The Greater Dublin Area and the surrounding Leinster counties have been a key driver of population growth in the country. In 1971, Leinster's share of the national population accounted for less than half of the total population of the State. Since then the share of national population in the Leinster area has increased, and currently stands at over 54%.

Table 2-6 Existing Population Trends in Leinster Region

County	1996	2002	2006	96-2006 Change	96-2006 % change
Dublin City	481,854	495,781	505,739	23,885	5.0
Dún Laoghaire/Rathdown	189,999	191,792	193,688	3,689	1.9
Fingal	167,683	196,413	239,813	72,130	43.0
South Dublin	218,728	238,835	246,919	28,191	12.9
Carlow	41,616	46,104	50,471	8,855	21.3
Kildare	134,992	163,944	186,075	51,083	37.8
Kilkenny	75,336	80,339	87,394	12,058	16.0
Laois	52,945	58,774	67,012	14,067	26.6
Longford	30,166	31,068	34,361	4,195	13.9
Louth	92,166	101,821	110,894	18,728	20.3
Meath	109,732	134,005	162,621	52,889	48.2
Offaly	59,117	63,663	70,604	11,487	19.4
Westmeath	63,314	71,858	79,403	16,089	25.4
Wexford	104,371	116,596	131,615	27,244	26.1
Wicklow	102,683	114,676	126,330	23,647	23.0
Dublin (total)	**1,058,264**	**1,122,821**	**1,186,159**	**127,895**	**12.1**
Greater Dublin Area	**1,405,671**	**1,535,446**	**1,661,185**	**255,514**	**18.2**
Counties Outside GDA	**519,031**	**570,223**	**631,754**	**112,723**	**21.7**

Dublin City is the most populated of the counties in the Leinster province, with over twice the population of the next most populated counties. It also has one of the lowest recent growth rates in the region (5.0% between 1996 and 2006). The counties closest to Dublin City remain the next highly populated.

Meath, Fingal and Kildare experienced the highest growth rates since 1996, of between 38 and 48%. These three counties accounted for about 29 per cent of the 609,000 growth in population at State level. Whilst the counties within the Greater Dublin Area have collectively over twice the population of those counties outside it, the ten year growth rate was higher in the counties outside the GDA.

The settlement patterns in the area are reflective of both planning policy and recent population trends. In the Greater Dublin Area, the Metropolitan Area and the towns which have been designated as Primary and Secondary Growth Centres in the Strategic Planning Guidelines and the Regional Planning Guidelines have tended to have experienced the largest increases.

Swords, Celbridge, Maynooth, Kilcock, Bray and Greystones, all within the Metropolitan Area, have experienced significant expansion the last 10 years. In the Hinterland Area, significant growth has occurred in Balbriggan, Athy, Naas-Newbridge-Kilcullen, East Meath, Drogheda, Navan and Arklow. The rural hinterlands of these towns, and the GDA in general also had significant growth in terms of one-off dwellings.

The Mid-East region, comprising the counties of Kildare, Meath and Wicklow had the highest population growth (+15.1%) between 2002 and 2006. The Midland region (+11.5%) also comfortably exceeded the national average rate of increase of 8.1 per cent. The counties involved (Laois, Longford, Offaly and Westmeath) form part of the wider Dublin commuter belt.

2.4 Existing Traffic Patterns

2.4.1 Overview

Existing traffic patterns in the study area are heavily influenced by current population and employment patterns throughout the Greater Dublin Area. While the provincial towns have seen residential populations grow considerably over the last few years this has not yet been reflected in an increase in available employment in those areas. Consequently, this urban sprawl has resulted in a pattern of commuting from towns as far from Dublin as Virginia, Co. Cavan, and Mullingar, Co. Westmeath, leading to tidal traffic patterns on all radial routes into Dublin City. Congestion on routes into Dublin has also been exacerbated by a high reliance on orbital connections around the city. A brief overview of current traffic patterns throughout the study area is presented below.

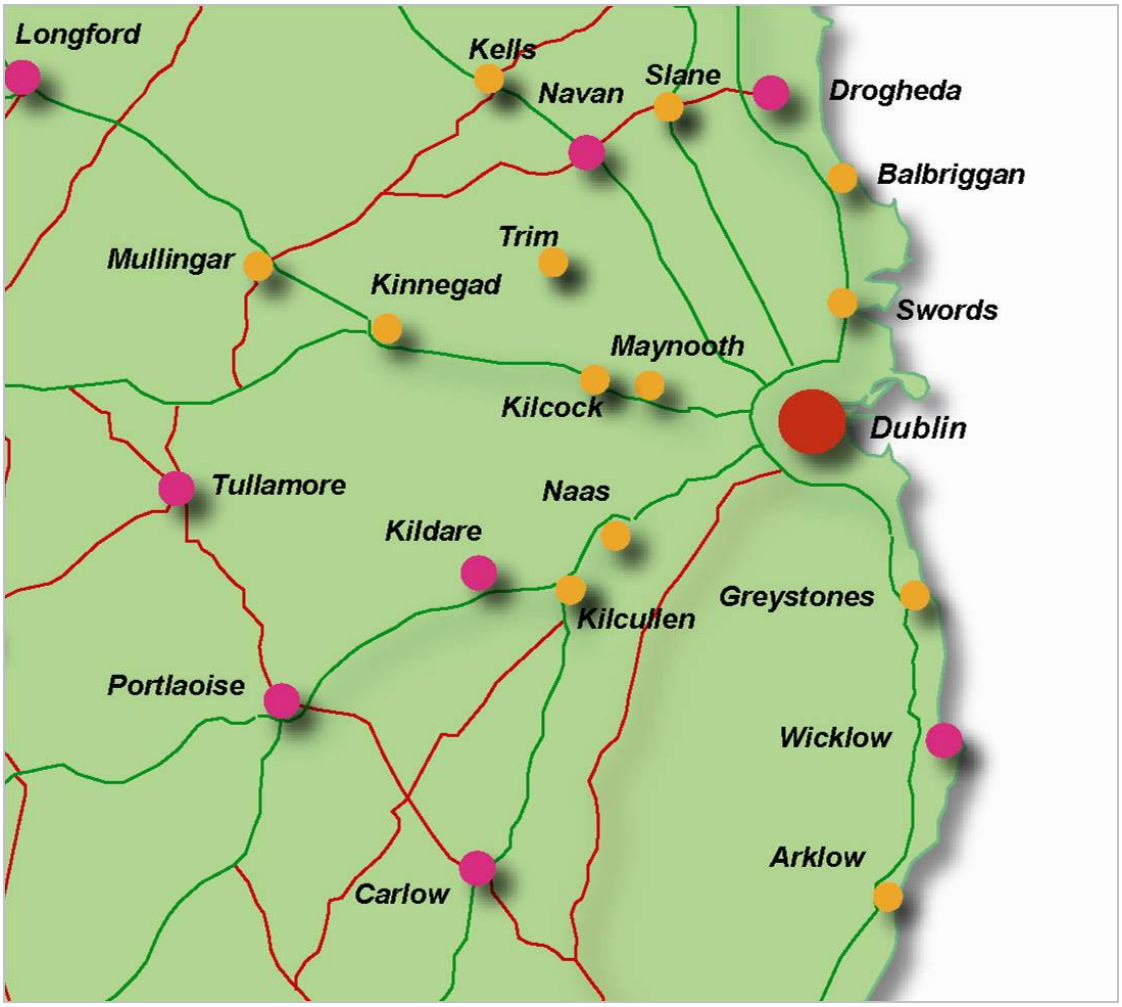


Figure 2-3: Existing Roads and Settlements in the Leinster Orbital Study Area

2.4.2 M50 Dublin Ring Road

The M50 Ring was completed in 2005 and serves as a strategic orbital route around the fringes of Dublin City Centre. The road is the most heavily congested in the country with lengthy queues throughout most of the day. Rapid development in the environs of the route has resulted in large numbers of vehicles accessing the M50 through increasingly congested interchanges. The section of the M50 from the N3 to the N4 is particularly heavily trafficked due to the limited provision of alternative crossings of the River Liffey. An upgrade scheme is currently underway along the M50 to alleviate current difficulties.

Strategic orbital movements are significant with the busiest feeder routes being the N4 and N7. Both these roads account for some 40% of vehicles on the terminating stretches of the M50 (i.e. the M1 and M11). 'Through' vehicle movements (M1 – M11) account for approximately 10% of the traffic travelling on the M50 between the N4 and N7. These patterns suggest that the M50 acts more as a feeder from the N4/N7 corridor to the M1 and M11, as opposed to forming any important strategic connection between the M11 and M1.

In addition to providing an important connection between the National Primary Roads, the M50 also facilitates a high level of Dublin City trips (i.e. those beginning *and* ending their journey at points within the M50). As such, the M50 serves an important function in providing additional cross-city capacity for urban trips, with limited other parallel routes providing such a function.

A number of other factors lead to long delays on the route. These include the barrier tolling point on the West Link Bridge and the limited capacity through the interchanges at the junctions with the national roads. Heavy congestion during the Peak Period has more recently led to a significant 'peak spreading' effect with the traditional 'rush hour' beginning earlier and finishing later as traffic volumes increase.

2.4.3 National Primary Roads

The National Primary Roads provide the main transport connections between Dublin and the regional towns and cities, all of which converge into Dublin City, with existing linkages between them provided by the M50.

The increase in employment in the Greater Dublin Area over the last few years allied with an increasingly dispersed settlement pattern has resulted in heavy congestion on these routes in the environs of Dublin. This has occurred despite large increases in capacity on many of the national primary roads in recent years. Such improvements have included the widening of the Naas Road (N7) to three lanes in each direction, the construction of a dual carriageway to Ashbourne (N2), and the extension of the M4 to Kinnegad and beyond. Lengthy delays on the National Primary Roads have further contributed to a 'peak spreading' effect.

2.4.4 National Secondary Roads

The National Secondary Roads provide mainly cross-country access between major County Towns. The N55, N51, N52 and N80 are the main National Secondary Roads through the Leinster Region, but provide limited functionality as orbital routes around Dublin. These routes instead provide important connections from the Midlands to

Northern Ireland via Monaghan, and to Rosslare/Wexford in the South East via Kilkenny.

Traffic conditions on the National Secondary Roads continue to deteriorate as a result of the generally low quality of such roads in comparison to the National Primary Routes. In particular, the N52 and N55 provide important strategic links between Northern Ireland and the Midlands, but the quality of such roads remains low. For such traffic, routing via the National Primary Roads and M50 is becoming less attractive as a result of the delays experienced through the Dublin Area. This further increases traffic pressure on the National Secondary Roads.

2.4.5 Regional and Local Roads

There currently exists a dense network of regional and local roads throughout the study area. The network of regional roads is particularly dense on the outskirts of Dublin City where, in addition to providing local connections into the smaller towns in the Dublin hinterland, they also perform the functions of providing more strategic connections between the radial National Primary Roads.

Of particular note are the local roads connecting the N4 and N7, such as the R405 through Celbridge and the R407 through Clane. These roads, and other similar parallel roads are being used as 'rat runs' by traffic affected by congestion on the radial routes and the M50. This movement is also in evidence between the N4 and N3 where Dublin bound traffic from the Kildare area use roads such as the R125 to make orbital movements while avoiding the N4 and M50. Approximately 50% of northbound traffic on the R125 (north of Kilcock), and the R157 (northeast of Maynooth) currently travel to destinations within the M50 via the N3.

2.5 Key Policies and Future Infrastructure

2.5.1 Overview

A number of current and future initiatives in the Leinster Region will be of significant relevance to the development of a Roads Strategy. Key issues which have a bearing on the study are outlined below:

Transport 21

Transport 21 is the capital investment framework through which the transport system in Ireland will be developed, over the period 2006 to 2015. The Transport 21 framework set out a series of road, public transport and accessibility improvements throughout the Country over the period to 2015. The following proposals are most relevant to the consideration of a Roads Strategy for the Leinster Region over the period to 2025:

- The continued development of the Inter-Urban Road Network, which is substantially completed within the Study Area. Remaining schemes include the upgrading of the M50, the construction of the M3 from Clonee to Kells, the completion of the M4/N4 as far as the Athlone Bypass, and N4 improvements between the M50 and Leixlip. Such schemes will greatly increase road capacity from Regional Towns and Cities into the Greater Dublin Area, with some additional orbital road capacity provided as a result of the M50 upgrading;

- The expansion of the existing rail network serving Dublin City and the Greater Dublin Area. Such schemes include the Kildare Route Project, the Interconnector, the reopening of the Navan Rail Link, electrification of the Maynooth Line, and resignalling through Connolly Station. Metro-North to Dublin Airport/Swords and Metro-West to Tallaght are also proposed. Finally, a significant expansion of the Luas network to serve Dublin Docklands, Bray, Lucan, Citywest and Glasnevin is also included. In addition to providing additional rail capacity into Dublin City, the development of new links and improved interchange will facilitate the use of rail for more complex trips, thereby reducing traffic demand;

National Spatial Strategy (2002 – 2020)

The National Spatial Strategy (NSS) was published in late 2002, and outlined a mechanism for dispersing the intense levels of economic growth observed in the Dublin area by encouraging greater growth in the regions. The strategy outlined a series of regional Gateways which would be supported and interconnected by a network of Hubs.

The objective of the strategy is to address the imbalance in growth rates in Dublin, with a corresponding distribution of growth to the various Hubs and Gateways defined in the Strategy. Such a shift in growth patterns would, however, be dependant on the provision of appropriate transport links. The consideration of the National Spatial Strategy is therefore an important element of the Feasibility Study for the Leinster Orbital Route.

National Development Plan 2007-2013

The €184 billion National Development Plan 2007-2013 launched in January 2007 provides €54.6 billion for investment in economic infrastructure over the next seven

years. Projects include further development of the Road network, in addition to continued support of the Public Transport proposals set out in Transport 21.

Bremore Port

Within the Eastern Region, a number of strategic nodes in the national freight distribution network exist, and lead to the consideration of the Leinster Region as a major contributor to the national requirement for freight management capacity. Freight facilities in Drogheda have limited growth potential, and the expansion of Dublin Port is significantly restricted as a result of limited availability of additional land. As such, there has been ongoing discussion regarding the identification of additional port capacity elsewhere to facilitate continued growth in the region.

In 1994, a report entitled "Transport Demand" by Goodbody Economic Consultants outlined a relative stagnation of freight tonnage in Ireland over the 10 years to 1994 at some 85m tonnes/year. Since 1994, however, the Road Transport Freight Survey has reported national freight tonnage to have increased dramatically to over 230m tonnes in 2002. The Leinster Area remains one of the largest sources of freight tonnage, second only to the South West. The volume of tonnage is therefore significant, and the vast majority of this freight remains within the region. A doubling in freight activity through Irish Ports is expected over the period 2000 – 2020.

The development of a new Port facility in Bremore, located on the Fingal/Meath Boundary, has been identified to facilitate this regional growth. It is supported by Fingal planning policy, and a Joint Venture partnership has recently been announced to develop the proposal. The nature of this site would suggest that some 20 million tonnes per annum of freight throughput could be achieved. This level of activity could lead to additional road requirements to ensure effective distribution onto the various National Primary Roads linking the Greater Dublin Area with Regional Towns and Cities. The proposed site already benefits from proximity to the national rail network which would enable a freight terminal to be developed, therefore optimizing both rail and future potential road infrastructure. The development of the Leinster Orbital Route Feasibility Study therefore needs to consider the implications of developing such a facility at Bremore, whilst understanding that such a proposal is in the early stages of development.

Development of Dublin Airport

Since beginning services in 1940, Dublin Airport has expanded to become the busiest airport in the Country. Growth in the last 15 years through Dublin Airport has been significant, growing from 5 million passengers in 1990 to some 21 million passengers carried in 2006. Construction of additional terminal capacity is ongoing, and the planning processes for Terminal 2 and the Dublin Airport Metro Railway Link are both underway to facilitate continued growth.

3.0 Review of Planning Policy

3.1 Overview

This section examines the Transport Planning and Transport Policy background in the area of relevance to the current study. The review examines the current infrastructure programme for the Leinster Region, as well as schemes and policies being progressed at Local and National Level.

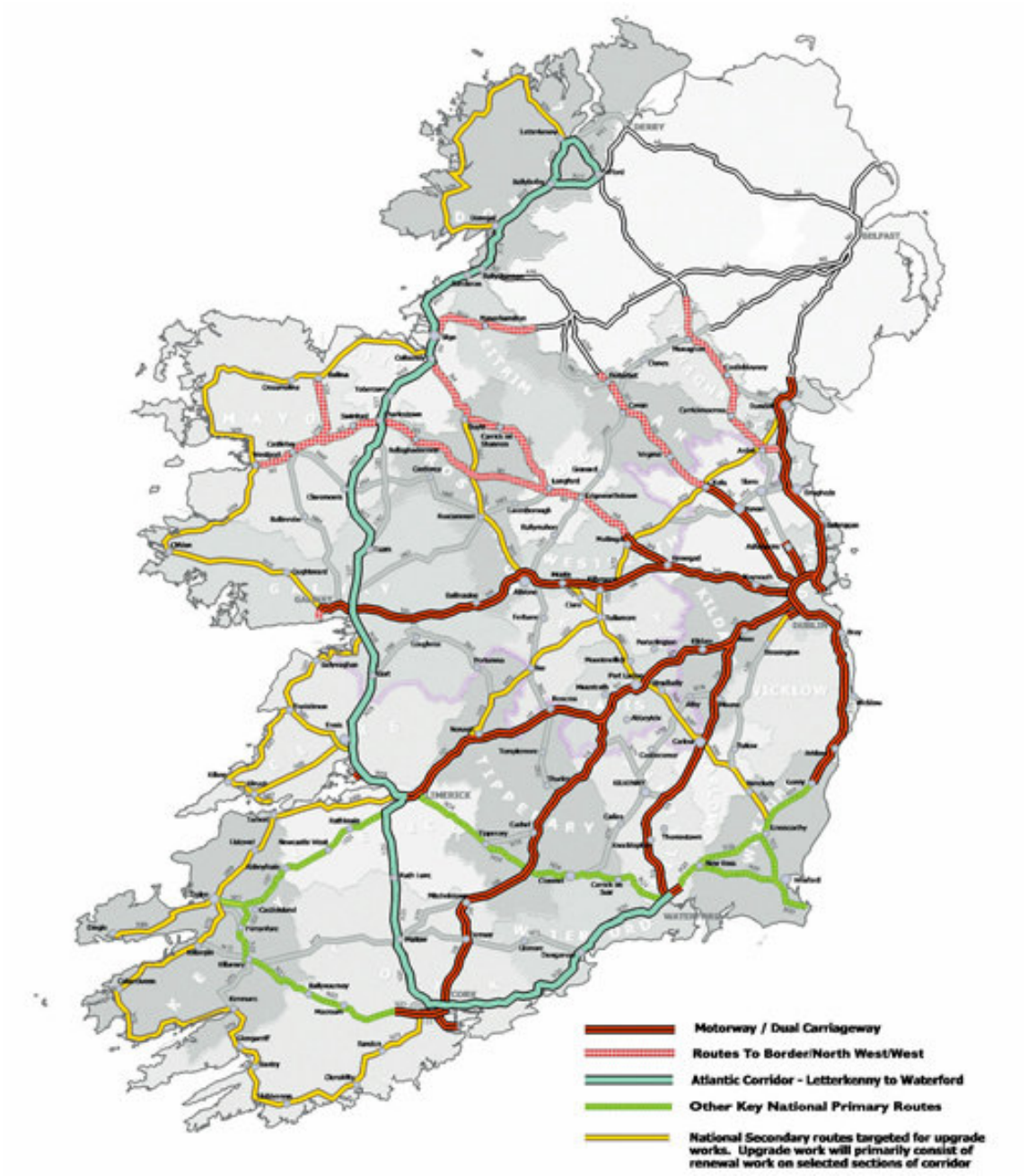
3.2 Transport 21

Transport 21 is a €34 billion infrastructure plan announced in November 2005 by the Minister for Transport. It includes massive investment in the rail network, including an Interconnector tunnel under the city centre connecting Heuston Station with Spencer Dock, several new Luas lines, a Metro line from the centre of Dublin to Dublin Airport, Swords and Lissenhall, expansion of the DART network, reopening of a rail link to Navan, upgrading and extending the Cork Suburban Rail, and better integration of all transport systems.

Transport 21 also envisages the completion of the main Inter-Urban road links connecting Dublin with Cork, Waterford, Limerick, Galway and Newry. The M50 motorway will be upgraded to three lanes each way and free flowing interchanges constructed. An "Atlantic Corridor" from Letterkenny to Limerick and Waterford is also proposed.

To date, much of this work has already been progressed. The M1 is substantially complete to the Northern Ireland Border, the M7/M8 has been upgraded to Motorway Standard as far as Portlaoise, with the remaining sections either in Planning Stage or under construction. The M4 has been upgraded as far as Kilbeggan, and two sections of the N9/N10 between Dublin and Waterford are currently under construction.

The diagram overleaf illustrates the strategic road network as envisaged for 2015, following implementation of Transport 21, clearly demonstrating the long term vision to connect all of the major population centres outside of Dublin to the capital.

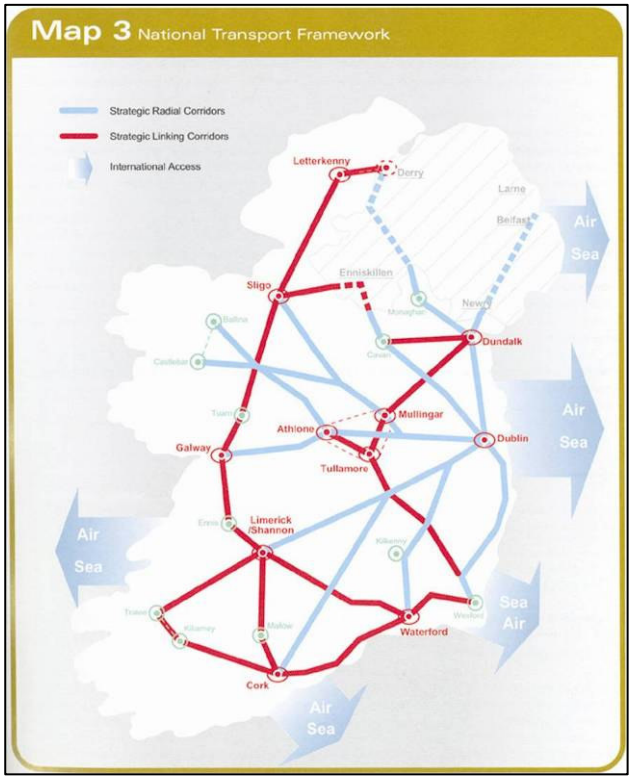


3.3 National Spatial Strategy 2002 - 2020

The National Spatial Strategy (NSS) provides a 20-year planning framework that is designed to achieve a better balance of social, economic, and physical development between the regions and a better spatial distribution of population growth in Ireland. To achieve its objectives, the NSS identifies broad spatial development patterns for areas and sets down indicative policies in relation to the location of industrial, residential and rural development, the location of services, tourism and Ireland's heritage. In doing this, the NSS adopts the principles of sustainable development.

The Strategy develops a hierarchy of development locations based around major centres that have, or have the potential to achieve, critical mass – Gateways. Below this there is a second tier of regional hubs to transmit the driving force of the Gateways to the local

areas, and self-sustaining development centres forming key urban nodes that provide high quality residential locations. It also advances the notion of balanced regional development where investment and infrastructure are directed to where demand is greatest. The NSS does not, therefore, seek to reduce or remove disparities between regions; rather to develop the true potential of each region thereby optimising the performance of the state as a whole.



With regard to the Greater Dublin Area (GDA), it is the objective of the NSS to enhance the competitiveness of the GDA as the driver of national development; and to physically consolidate the growth of the metropolitan area. Development in the hinterland area is to be concentrated in Primary Development Centres, such as Drogheda, Balbriggan, Navan, Naas/Newbridge/Kilcullen and Wicklow.

In terms of transport the NSS identifies strategic radial corridors, strategic linking corridors and strategic international access points. From Dublin, all major radial corridors extend to the various parts of the country. The corridor to the North seeks to achieve good quality road and public transport connections between Dublin and Belfast and international access through ports and airports, and onwards to other parts of the country through the corridors to the South West, Mid West, North West, West and South East.

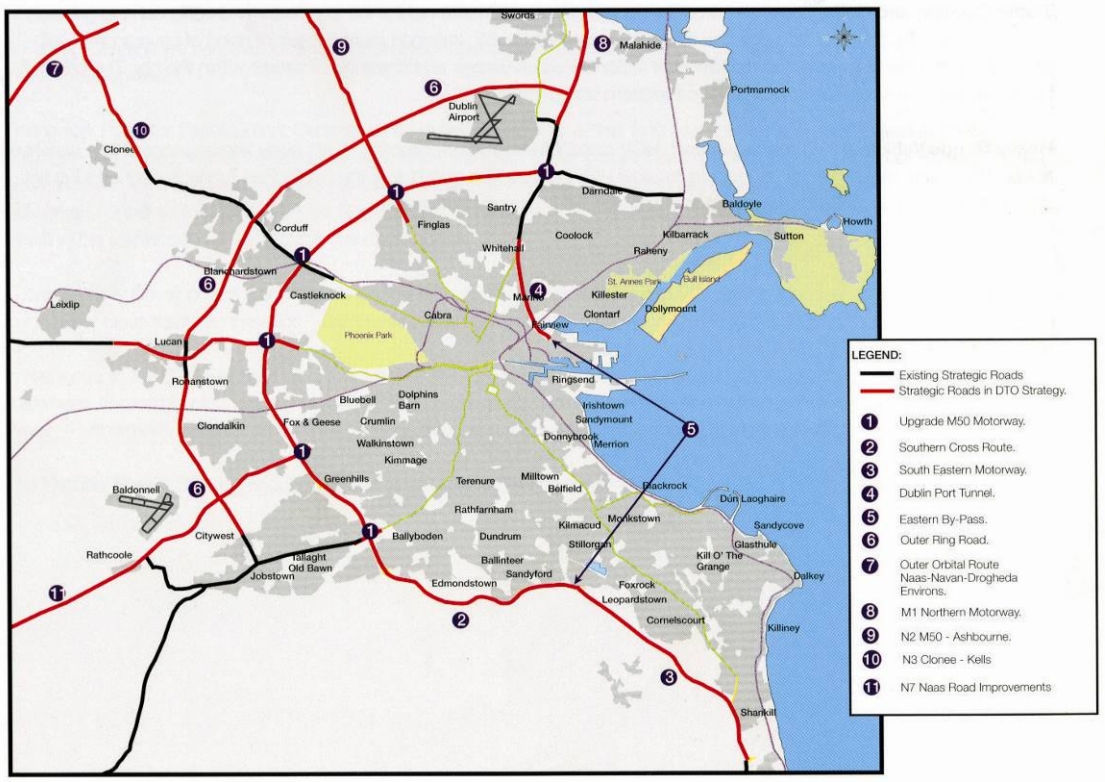
The NSS identifies four linking corridors; the Western Corridor, the Southern and South Eastern International Access, the North Western International Access and the Central Spine. The Central Spine from Dundalk to Rosslare via Athlone/Mullingar/Tullamore and Portlaoise is the closest linking corridor to Dublin. The provision of a Leinster Orbital Route is not referred to in the NSS, although the document does suggest the development of linkages that effectively form a wider outer connection around the Dublin Area, focusing on the existing N52 (Midlands to Dundalk) and N80 (Midlands to Wexford) corridors.

3.4 Dublin Transportation Office – "Platform for Change"

The DTO's strategy for transportation in the GDA is outlined in "Platform for Change", which in turn is fully co-ordinated with the objectives of the Strategic Planning Guidelines, now revised by the Regional Planning Guidelines for the GDA. The DTO's overriding strategy consists of two interdependent elements: to implement transport infrastructure and service improvements including a substantial expansion of the public transport network, with some strategic road construction and traffic management whilst managing demand to reduce the overall growth in travel through the application of land use and other policies. In particular, demand management is targeted at encouraging a transfer

of trips, where appropriate, from the private car to walking, cycling and public transport. The DTO envisages an extensive, high quality, fully accessible, integrated networks for DART/ suburban rail, Luas, METRO, bus, roads, cycling and walking.

The Figure below illustrates the strategic road network within the GDA as proposed in the Platform for Change. The Strategy includes an Outer Orbital Route (Drogheda-Navan-Naas/Newbridge) as well as the Dublin Outer Ring Road which has already been partly constructed.



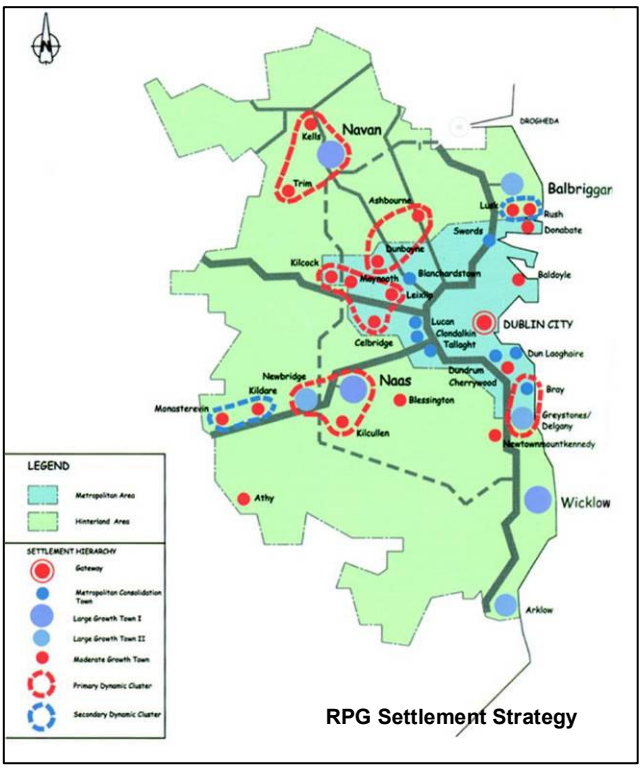
DTO, Platform for Change: Strategic Road Network

3.5 Regional Planning Guidelines Greater Dublin Area 2004-2016

The Regional Planning Guidelines (RPGs) represent a review of the Strategic Planning Guidelines for the Greater Dublin Area (GDA), and set out a 12-year strategic policy for the region. They provide a regional context to the National Spatial Strategy and the individual Development Plans contained within the GDA. The RPGs effectively implement the National Spatial Strategy, whilst providing more detail and establishing a development and spatial framework that can be used to strengthen Local Authority Development Plans and other planning strategies at county, city and local level.

As directed by the NSS, the Regional Guidelines establish a hierarchy that will determine strategic planning in each area of the GDA. The main distinction is between Metropolitan and Hinterland Areas, consolidating the development of the former around a multi-modal transport system and directing a certain amount of development to the latter into identified settlement centres whilst maintaining a greenbelt between such centres. The towns identified are in line with those outlined in the NSS with emphasis placed on the development of centres with good public transport links.

The Metropolitan Area consists of Dublin City, south Fingal (Donabate, Swords, Blanchardstown, Mulhuddart), south east Meath (Dunboyne) north east Kildare (Kilcock, Celbridge, Maynooth, Leixlip), South Dublin County Council, Dun Laoghaire-Rathdown County Council, and north east Wicklow (Bray and Greystones). The Hinterland Area comprises lands between the edge of the Metropolitan Area and the outer boundary of the GDA. The figure opposite illustrates the settlement strategy for the GDA.



RPG Settlement Strategy

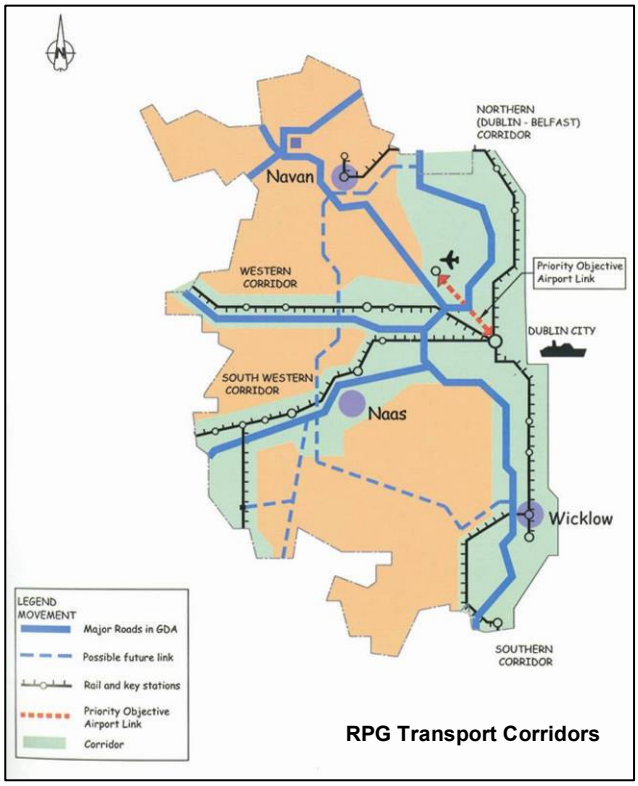
Within the GDA, Large Growth Towns (I) are Wicklow, Naas and Navan, with population targets of 25,000 to 40,000. The Large Growth Towns (II) are Arklow, Greystones/Delgany, Newbridge and Balbriggan, all with population targets of 15,000 to 25,000.

Within the Regional Planning Guidelines for the Border Region, Drogheda is designated as a "Primary Development Centre" with a projected population of 50-60,000 in the period to 2020 and beyond. Furthermore, the RPGs recognise that while the town is technically part of the Border region, its development is strongly influenced by its proximity to Dublin. The RPGs state that in seeking to develop the potential future role of Drogheda, the following issues have to be taken into account:

- Drogheda's relationship with its own catchment;
- Its role within the Border region;
- Its role as a significant port; and
- Its role in the spatial development of the Greater Dublin Area having regard to the town's close functional and physical links with the area.

With regard to transport the RPGs seek to improve the accessibility and connectivity of the Greater Dublin Area in an international and national context and in terms of accessibility and connectivity of settlements across the GDA. It is an objective of the RPGs to integrate all the market areas within the GDA to create a single market area with the lowest feasible travel costs. To achieve this, the RPGs place particular emphasis on the orbital transport corridors, which will intersect the main radial corridors, such that major urban nodes lie at the intersection of the radial and orbital routes. This would improve the intra-regional connectivity and accessibility of the Hinterland "satellite towns", which are envisaged as major economic investment locations and thus deliver job and service access in peripheral areas, reduce commuting and alleviate pressure on the M50.

The RPGs consider an Outer Orbital Route (referred to as the Dublin Outer Orbital Route) of particular significance in the context of the sustainable regional planning strategy outlined above, and the importance attached to providing improved accessibility and connectivity between towns in the Hinterland Area. The RPGs recommend extending this Outer Orbital Route, initially proposed by the Strategic Planning Guidelines for the GDA and the Dublin Transportation Office's *Platform for Change,* to Wicklow town and Arklow. The document also suggests that the alignment of the route should also include the urban areas of Trim, Kilcock and Clane. The RPGs further recommend designating this route as a National Primary Route. It is the objective of the RPGs to identify and preserve a corridor or corridors in the short term and to construct the route in the medium term.



RPG Transport Corridors

The figure opposite illustrates the transport corridors in the GDA as envisaged by the RPGs. The provision of an Orbital Route linking the Primary Development Centres is clearly shown as a dashed blue line.

3.6 Local Authority Development Plans

An examination of the various Development Plans that exist for the Local Authorities throughout the Study Area has been undertaken. In broad terms, the Local Authority Development Plans reflect the Policies and Strategies set out in the National Spatial Strategy, Regional Planning Guidelines, and '*Platform for Change'*. In addition, however, local road and public transport improvements or aspirations exist that are not reflected at the National or Regional level, but can nevertheless have a distinct impact on travel patterns. Although the nature and extent of these improvements vary widely they can be grouped into broadly similar categories.

3.6.1 Town Bypasses

Increasing urbanisation within the Leinster Area has resulted in increasing traffic congestion in the major towns within each county. The routing of National Roads through the centre of such towns has exacerbated the congestion caused by local traffic. Plans for distributor roads and bypasses of significantly populated towns have been put forward by the Local Authorities and they are actively lobbying the NRA to include those which are not already included in the NRA list of approved schemes.

3.6.2 Development of Regional Connections

The major national routes and high quality roads currently radiate out from Dublin to the surrounding regions. This amplifies the attractiveness of Dublin to surrounding areas and ensures the continual increase in traffic within the confines of the metropolitan area. In order to address the shortcomings of this approach a number of broad regional strategies have been formulated. These take into account the likely growth in importance of the gateway towns identified in the National Spatial Strategy. Developing north/south or east/west routes between the major regional centres has become an important objective of many Local Authorities. These strategic routes cross county and in some cases provincial boundaries. Examples of such regional strategies include:

- East - West Link Dundalk- Shercock- Cootehill- Cavan- Belturbet- Sligo
- Gateway Triangle (Mullingar- Tullamore- Athone) – Portlaoise – Kilkenny
- Arklow – Central Wicklow – Kildare/Carlow.

Development of these routes are being achieved by improvements to existing roads, re-alignments and bypasses of regional towns.

3.6.3 Additional Local Routes to Relieve M50

Within the Greater Dublin Area the emphasis of the Local Authorities is on relieving the congested M50 motorway. Despite the M50 Improvements which are scheduled to take place over the next few years, congestion is likely to continue due to the absence of alternative routes. Construction of distributor and relief roads which perform the function of alleviating the busy M50 are considered important objectives by the Local Authorities affected. An important consideration is that these new proposed roads do not become another Dublin Ring Road which would likely attract additional traffic and not achieve the required relief. South Dublin City Council and Fingal County Council are currently co-operating in the planning of a series of such links which provide coherent routes across the north and west of the city.

4.0 Population and Employment Projections

4.1 Introduction

This section of the report considers the demographic and economic background to the study. In this context, there is a need both to describe current demographic and economic conditions of the study area, and to predict future outcomes to 2025, which is the study horizon year. As the traffic modelling relies to a large degree on simulating movements between major towns, predicting future population and jobs levels for these towns is a prime requirement.

In undertaking population predictions for major towns, it is recognised that they need to be compatible with official predictions made by planning authorities and, in particular, the Central Statistics Office. It is further recognised that reliance on locally based predictions of populations may give rise to a situation where the sum of predictions so made may exceed the aggregate regional predictions made by the CSO. The methodology employed by the study took account of these issues by not only obtaining the views of the local authority on population growth and other issues, but also providing a broad regional context against which the local predictions could be validated.

This broad regional context embraces not only the regional population predictions made by the CSO, but also the Regional Planning Guidelines (RPGs) published by the various regional authorities. These were developed in the context of the National Spatial Strategy published by the Government in 2002.

4.2 Data issues

Economic and demographic analysis is complicated by the fact that much economic data are available only at the regional (NUTS3) level and the study area is not contiguous with the regions so defined. Similarly, demographic projections are disaggregated to the regional authority level only.

Appendix A shows a mapping of the study area against NUTS3 regions. This shows that all of the Dublin and MidEast regions and most of the Midlands and South East Regions fall within the study area. With regard to the Border region, most of this lies outside the study area, with the exception of counties Louth and Monaghan. As a result, when regional demographics are discussed in this Section, the data refer to the sum of the Dublin, Mid East, Midland and South East Regions.

4.3 The National Population

A preliminary census estimate of the national population for 2006 indicates that there are 4.23m persons in the country, compared with 3.92m in 2002. The national population is rising at a rate in excess of 2 per cent per annum. The most significant factor influencing population growth is net immigration, which amounted to an average of 46,000 per annum in this period.

The CSO has made a number of alternative population projections based on different scenarios with regard to fertility and migration. Their M1F2 projection assumes net

immigration per annum of 30,000 up to 2016, declining to 20,000 for the further period to 2026. With regard to fertility the assumption is that it will decline from 2.0 in 2003 to 1.85[4] by 2011 and remain constant thereafter. Based on these assumptions the national population is projected to reach 5.26m by 2025. The most optimistic projection considered by the CSO is for 5.35m by that year.

The 2020 Vision report provides a slightly more optimistic estimate of 5.522m by 2025. [5]This is as a result of higher net immigration of 53,000 annually in the years to 2010, falling to 25,000 by 2015, with zero migration post 2020. Thus, as well as being slightly higher, the 2020 Vision projections predict much faster population growth over the short to medium term. In general terms, the implicit 2020 Vision population projection for 2025 is some five percentage points above that of the CSO.

Table 4-1 National Population Projections, 2006-2025 (000s)

Source	Year					
	2002	2006	2011	2016	2021	2025
CSO (M1F2)	3,917	4,235	4,488	4,811	5,070	5,256
Vision 2020	3,917	4,235	4,667	5,072	5,372	5,548
NSS	3,917	4,235	4,558	4,814	5,064	N.A.

Sources: CSO, NSS and 2020 Vision. The figures for 2002 and 2006 are actual

The National Spatial Strategy (NSS) provided two sets of population projections up to 2020. The first was based on a current trends analysis, while the second was based on a high economic growth scenario. The current trends scenario now appears too low, while the high economic growth scenario produces estimates close to those of the CSO. [6]

4.4 Study Area Population Projections

The CSO 2025 population projections for the key regions of the study are set out in Table 4-2 together with comparative statistics for the national population. The data show that whereas the national population is predicted to grow by 29.4 per cent by 2021, the regional population growth will exceed this by three percentage points (32.5 per cent). As a result, the regional share of the national population will rise slightly over the period.

[4] Fertility Rate expressed as Children per Woman
[5] 2020 Vision – Ireland's Demographic Dividend. NCB Stockbrokers 2006.
[6] National Spatial Strategy for Ireland 2002-2030

Table 4-2 CSO Regional Population Projections

Region	Year					
	2002	**2006**	**2011**	**2016**	**2021**	**2025**
Dublin	1,123	1,186	1,281	1,374	1,440	1,493
Mid-East	413	475	515	572	623	646
Midland	225	251	262	280	296	307
South East	424	460	482	512	537	557
Total Regional	**2,185**	**2,372**	**2,540**	**2,738**	**2,896**	**3,002**
Total National	3,917	4,235	4,488	4,811	5,070	5,256
Regional Proportion (%)	55.8	56.0	56.6	56.9	57.1	57.1

Note: the regional projections were made before the 2006 Census results became available. These indicate that regional population growth is running slightly ahead of the above projections. The CSO do not provide a regional projection for 2025. The above figures for that year are based on a constant regional share of the national population projection.

4.5 Regional Population Settlement Patterns

The future population settlement pattern in the study area will be an important determinant of traffic demand on National Primary and Secondary Routes. The greater the concentration of population in the major urban centres, the greater will be the traffic volumes that will occur on these routes. Conversely, if population growth is more widely dispersed across rural areas and small towns and villages, traffic volumes will be spread more thinly and the relative burden on the National Routes is likely to be less.

Table 4-3 sets out the trends in settlement patterns over the period 1996-2002 for the study area. The most noteworthy feature is the increase in the share of towns greater than 10,000 population, with a somewhat smaller increase for towns greater than 1,500. This reflects the reduced share in rural areas and in the Greater Dublin Area.

Table 4-3 Distribution of the National Population by Settlement Type (%)

Settlement Type	Year		
	1991	**1996**	**2002**
Towns >100,000	30.9	31.2	30.4
Towns 10,000-100,000	14.3	15.5	17.8
Towns 1,500-10,000	11.8	11.4	11.4
Towns < 1,500	7.6	7.3	7.2
Rural Areas	35.4	34.5	33.2
Total	**100.0**	**100.0**	**100.0**

Source: CSO

4.6 Projection of Regional Population Settlement Patterns

In order to project future settlement patterns, it was necessary to combine population estimates for the region with estimates of the distribution of the population by settlement type. Projection of the population distribution by settlement type was accomplished by assuming that the absolute growth in the proportion of the population in each settlement type experienced over the period 1996 - 2002 would continue. In implementing this projection, Dublin and the rest of the region were considered separately.

Table 4-4 presents the results of the analysis for both Dublin and the rest of the region combined. All areas show an increase in population to 2025. Rural areas and small towns are predicted to experience marginal growth in population. Dublin City is predicted to enjoy significant growth. However, the major growth will be experienced in the medium to large sized towns. The latter in particular are predicted to more than double in population and achieve an annual rate of growth of 3.1 per cent.

The purpose of this analysis is to form projections for each settlement type which act as control totals for projections of population in towns and villages. This is necessary, because if projections on population in, say, individual towns were made on a bottom-up basis, the aggregation of these would lead to aggregate regional population projections that would be incompatible with official CSO or National Spatial Strategy projections.

Table 4-4 Regional Population Projections by Settlement Type, 2025 (000s)

Settlement Type	2025 Projection	2002	Overall % Change	% Change per annum
Towns >100,000	1,308	1,005	30.1	1.2
Towns 10,000-100,000	743	365	103.5	3.1
Towns 1,500-10,000	319	225	41.5	1.5
Towns < 1,500	120	111	8.0	0.3
Rural Areas	513	479	7.2	0.3
Total	**3,002**	**2,185**	**37.4**	**1.4**

4.7 Population Projections for Major Towns in the Study Area

4.7.1 Indicative Population Growth Rates

In 2002, there were 20 towns with a population over 10,000 in the study area. These are listed in Appendix A. The objective of this part of the analysis was to derive an indicative growth rate up to 2025 for these towns that would be compatible with the changing settlement patterns outlined above. It should be noted that the average growth rates for towns in any of the settlement type categories may differ from that of the category as a whole. This is because of the movement of towns between the two categories. For example, a number of towns have populations just below 10,000 and will contribute to the increase in the share of the above 10,000 category by moving into it over the period to 2025. This means that average annual growth rate for towns already in the above 10,000 category will be below 3.1 per cent.

The methodology for estimating population growth rates for towns in excess of 10,000

population was as follows:

- The aggregate population of towns over 10,000 (in 2002) in the study area was assumed to grow by 103 per cent in line with the settlement pattern projections;
- A projected 2025 population of 809,000 was thus predicted for this group, up from 398,000 in 2002;
- A number of towns with 2002 population over 6,000 and below 10,000 and experiencing growth rates in excess of 2 per cent per annum were assumed to enter the greater than 10,000 category by 2025 (see Appendix A); and
- By combining the two categories of town, average growth rates for these towns as a whole were devised.

The average growth rates 2002-2005 thus devised were as shown below. The towns to which each standard projection applies are set out in Appendix A.

Towns over 10,000

Aggregate growth over the period:	75 per cent
Average annual growth rate over the period:	2.5 per cent

Towns 1,500 to 10,000

Aggregate growth over the period:	119 per cent
Average annual growth rate over the period:	3.5 per cent

Table 4-5 presents a summary of the revised indicative population growth rates for towns in the study area based on the above aggregate projections.

Table 4-5 Hierarchy of Annual Average Growth Rates applied to Major Towns

Description	Annual Growth (%)
Gateway	2.5
Hub, Primary Development Centre, Principal Towns, Large Growth Towns, metropolitan consolidation[7]	1.8
Moderate Growth town, Larger towns, Key service town	1.75
Transition towns	2.6
Towns < 10,000 (non transition)	4.0

Source: Goodbody Economic Consultants

4.7.2 Refinement of Population Growth Rates in Major Towns

Further policy and demographic analysis together with the results of the consultation processes held with local authorities and knowledge of the situation on the ground, produced in some instances growth rates for individual towns departing from the indicative norms outlined above.

The policy and demographic review process resulted in a revised methodology for estimating population growth rates for individual towns. The revised methodology

[7] Unless population is less than 10,000 then 4.0 per cent average annual growth rate applies.

produced a tiered hierarchy of growth rates, as follows:

- It was considered reasonable to assume that towns designated as Gateways within the National Spatial Strategy would experience population growth in excess of the 1.8 per cent norm. An average annual growth rate of 2.5 per cent was considered appropriate for Gateway towns.

- Below the classification of Gateway, a second order group was determined encompassing towns including Hubs, Primary Development Centres, Principal Towns, Large Growth Towns and Metropolitan Consolidations[8]. It was considered appropriate that towns within this group would adhere to the norm accorded to towns with population levels exceeding 10,000 in 2002, and witness population growth of 1.8 per cent annually to 2025.

- A third order group encompassing moderate growth towns, larger towns and key service towns was created where it was deemed that population growth of 1.75 per cent would occur annually over the period 2002 - 2025.

- It was assumed towns making the transition to the 10,000 to 100,000 category would adhere to the norm of population growth of 2.6 per cent annually to 2025. It was also assumed that all non-transition towns with population levels below 10,000 in 2002 would adhere to the norm of 4.0 per cent annual population growth to 2025.

Discussions with local authorities together with an analysis of the situation on the ground resulted in some instances in further deviations to the forecast population growth rates outlined in Table 4-6. For example, the growth rates for a number of towns were revised upwards having regard to the availability of zoned land and the extensive plans for the future development of these towns. Conversely, other towns were revised downwards owing to factors including a restricted level of zoned land available for development[9].

Based on the finalised growth rates, population projections for the major towns in the study area were prepared. The population levels of some of the larger towns in the study area are outlined in Table 4-6.

[8] These classifications are contained in the National Spatial Strategy and /or the various Regional Planning Guidelines.

[9] It should be noted that where the Consultants considered that local authorities were over or under estimating the future growth potential of a particular town the Consultants produced their own estimates of the future growth anticipated for the towns to 2025.

Table 4-6 Population Projections for Larger Towns in Study Area to 2025

Town	2002 Population	2025 Projection	Average Annual Growth Rate (%)
Blanchardstown	71,673	123,667	2.4
Tallaght	62,799	96,819	1.9
Waterford	46,736	82,471	2.5
Swords	27,175	66,979	4.0
Clondalkin	42,829	66,030	1.9
Drogheda	31,020	61,221	3.0
Dundalk	32,505	57,359	2.5
Bray	30,951	46,652	1.8
Navan	19,417	38,321	3.0
Naas	18,288	36,093	3.0
Kilkenny	20,735	31,254	1.8
Athlone	15,936	28,121	2.5
Carlow	18,487	27,865	1.8
Mullingar	15,621	27,565	2.5
Wexford	17,235	25,978	1.8
Newbridge	16,739	25,231	1.8
Greystones	11,913	24,860	3.3
Balbriggan	11,132	24,018	3.4
Celbridge	16,016	22,557	1.5
Portlaoise	12,127	21,399	2.5
Leixlip	15,016	21,148	1.5
Malahide	13,826	20,606	1.8

As can be seen from Table 4-6 towns anticipated to experience above trend growth in population include Swords, Balbriggan and Greystones. Other towns anticipated to experience more modest above trend growth include Drogheda, Navan and Naas. Blanchardstown is also forecast to experience significant population growth to 2025 from a relatively high base. Towns forecast to experience below trend population growth include Leixlip and Celbridge.

Figure 4-1 outlines existing and future population centres throughout the Leinster Region for 2025.

4.8 Employment Projections for Major Towns in the Study Area

Having reviewed the job levels in the major towns in the study area, the view was formed that there were a number of contributory factors influencing the Jobs to Population (J/P) ratio in each town. It was considered that towns with larger populations were more likely to have a higher J/P ratio. It was also considered that a town's status as a county town was likely to have a positive impact on the J/P ratio in the town. It was believed that distance from Dublin was also a contributory factor to a town's J/P ratio, with towns located further from Dublin more likely to have more jobs per head of population relative to 'commuter' towns located closer to Dublin. Finally, dramatic population growth over recent years was also deemed to be an influencing factor affecting J/P ratios. It was

considered that more established towns were more likely to have higher J/P ratios relative to towns that had emerged as a result of significant population growth over recent years.

Regression analysis was used to test the hypothesis that the J/P ratio in a town was influenced by:

- the town's population size;
- the town's distance from Dublin;
- the town's status as a County Town; and
- the average annual change in population experienced in the town over the period 1996 – 2002.

The results confirm that population size is positively correlated to the J/P ratio in a town. The results also confirm the positive impact both distance from Dublin and county town status have on J/P ratios. Finally, the regression results validated the view that significant population growth over the period 1996 – 2002 was likely to have a negative impact on the J/P ratio in a town. Using the forecasted population levels in each major town in the study area the regression results facilitated the forecasting of future job levels in each town. Table 4-7 sets out the predicted job levels in some of the larger towns in the study area in 2025.

Table 4-7 Job Projections for larger Towns in Study Area (source CSO 2002)

Town	2002 Jobs	2025 Jobs	Average Annual Rate of Growth (%)	J/P 2002	J/P 2025
Tallaght	37,262	58,123	2.0	0.59	0.60
Waterford	28,595	52,785	2.7	0.61	0.64
Clondalkin	25,277	40,107	2.0	0.59	0.61
Blanchardstown	23,028	52,709	3.7	0.32	0.43
Dundalk	15,487	28,914	2.8	0.48	0.50
Kilkenny	12,928	21,028	2.1	0.62	0.67
Drogheda	12,556	28,779	3.7	0.40	0.47
Bray	12,293	19,987	2.1	0.40	0.43
Wexford	10,357	16,605	2.1	0.60	0.64
Navan	9,522	25,452	4.4	0.49	0.66
Carlow	9,256	16,240	2.5	0.50	0.58
Mullingar	8,928	18,533	3.2	0.57	0.67
Leixlip	8,849	13,502	1.9	0.59	0.64
Tullamore	8,592	16,344	2.8	0.77	0.83
Athlone	7,976	14,393	2.6	0.50	0.51
Portlaoise	7,963	16,810	3.3	0.66	0.79
Naas	7,729	18,460	3.9	0.42	0.51
Swords	6,280	17,900	4.7	0.23	0.27
Newbridge	6,037	10,705	2.5	0.36	0.42
Longford	5,821	11,156	2.9	0.77	0.82

Source: Estimated

4.9 Summary and Conclusions

The population of the region will rise to over 3m by 2025. This is 27 per cent above its 2006 level of 2.4m. Much of this increase will occur in the larger towns in the region.

Based on the broad population and settlement projections, indicative population growth rates for major towns in the study area were produced. Consideration of the Regional Planning Guidelines and the National Spatial Strategy, as well as consultation with the Local Authorities resulted in a refinement of the growth rates applicable to towns in the study area. Based on the refined growth rates population forecasts were produced for the major towns in the study area. These are predicted to have population growth rates of between 1.8 and 4 per cent over the period to 2025, depending inter alia on the town status, its anticipated role, land availability and planning development considerations. On aggregate, the analysis revealed that the total population of the major urban centres in the study area will grow by 2.6 per cent annually to reach 1.5 million in 2025[10].

Having reviewed the job levels in the major towns in the study area, it was established that there were a number of contributory factors influencing the number of jobs in each town. These factors included town size; county town status; distance from Dublin and population growth experienced over the period 1996 – 2002. Projections of future job levels in each town were made, having recourse to the projected population levels in each town and these factors. It is predicted that the number of jobs in the major urban centres will grow by 3.1 per cent annually on average, to reach 0.7 million in 2025

[10] Including Blanchardstown, Clondalkin and Tallaght.

5.0 Traffic Forecasting

5.1 Introduction

The Feasibility Study for the Leinster Orbital Route is supported by a comprehensive traffic forecasting exercise to determine traffic flows on the proposed alignment, its impact on other roads, and the network-wide travel time benefits than can be expected to accrue. This chapter of the report will describe the development of the traffic model (the Leinster Model), and how it has been used to develop the traffic forecasts.

5.2 Traffic Model Development

5.2.1 Boundary of the Traffic Model

The development of a traffic model is based on well documented procedures outlined in the Design Manual for Roads and Bridges (DMRB) Vol.12[11]. The DMRB describes the process of network development, data collection, and model calibration.

The boundary of the Traffic Model includes within it an area from Monaghan to Wexford, and as far west as Longford, Athlone and Kilkenny. The network includes all National Primary and Secondary routes, in addition to a high number of Regional roads to allow a better reflection of residual flows on the National road network. The selection of a large Study Area ensures that the full impact of regional growth patterns in population and employment can be fully taken into account. It also allows a better understanding of how the Leinster Orbital Route influences traffic and travel patterns throughout the Eastern Region. Figure 5-1 below shows the extent of the traffic model.

[11] Design Manual for Roads & Bridges Vol 12 , UK Department for Transport, 1997

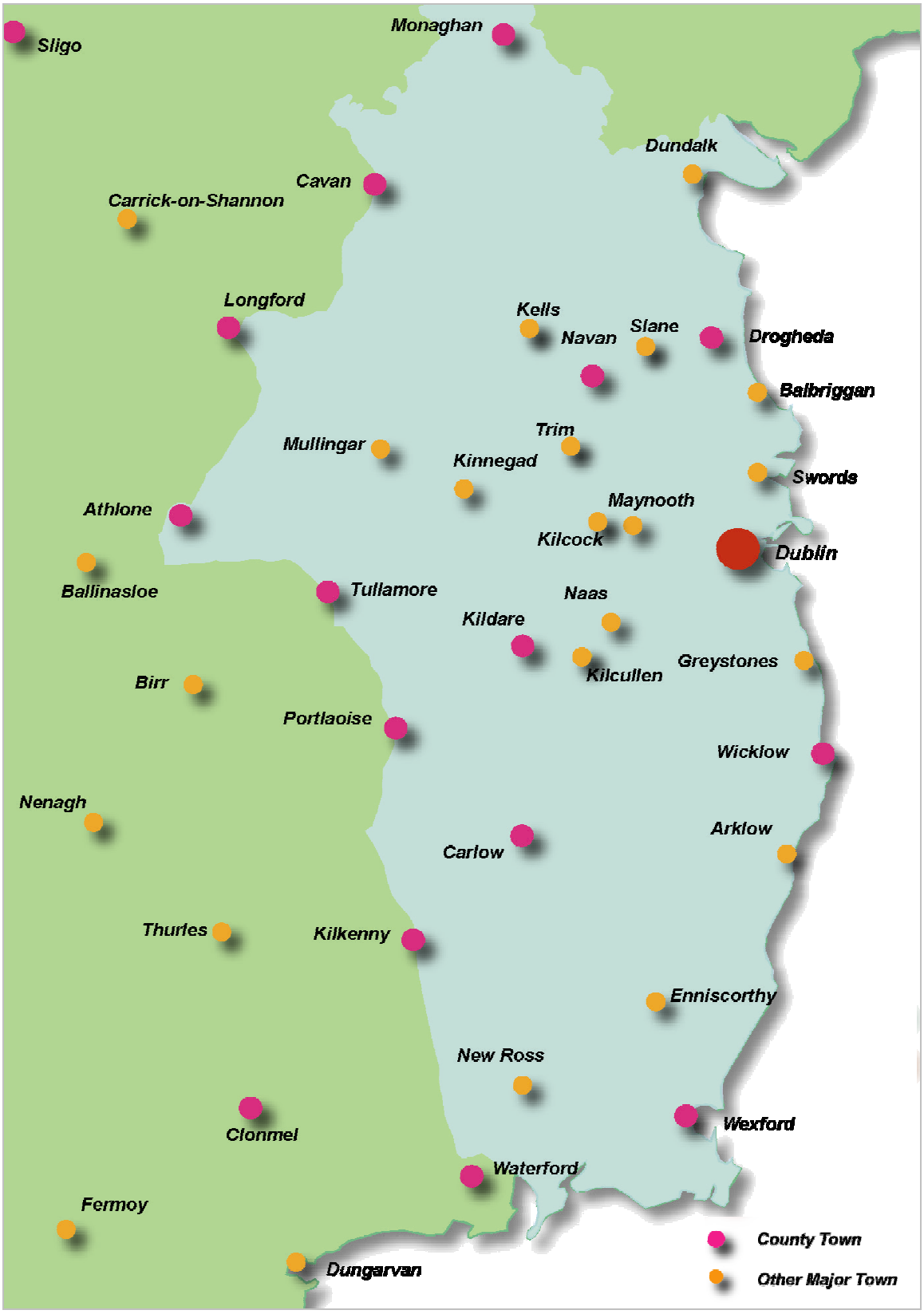


Figure 5-1: Extent of Traffic Forecasting Model (shown in blue)

5.2.2 Base Year Model Development (2006)

The Traffic Model is based on the Dublin Transportation Office Traffic Model for the Greater Dublin Area. The DTO Model is currently one of the largest multi-modal transportation models of its kind in Europe, and is an essential tool in the ongoing transportation planning process. The model has been used as the principal design and evaluation tool for all major development, road infrastructure and public transport proposals currently being planned and implemented in the Dublin Region.

The DTO Model has the capability of assessing changes in demand and characteristic patterns of private and public transport travel, with the highway element running on the SATURN suite of programs, and public transport modelled on TRIPS software. The Leinster Model is an evolution of the DTO model which includes both a broader geographical area, and more detailed definition of the existing and future road network outside Dublin City.

Construction of the base network was successfully completed with the inclusion of a zoning structure which was largely developed along the lines of the Census District Electoral Division (DED) geography.

5.2.3 Traffic Data Collection

The development of the Traffic Model involves a significant enlargement to the DTO model and as such has required the collection of additional traffic and origin/destination data to build a validated base model. A detailed survey programme was developed consisting of:

- 40 Roadside Interview Survey (RSI) Sites with manual classified counts undertaken throughout 2006
- 36 Automatic Traffic Count (ATC) Sites (7 day classified counts)

The RSI surveys were carried out using prepaid postcards. The surveys were conducted from 07:00 until 10:00 on each survey day, to provide robust data for the morning peak hour model. Origin and destination addresses were then converted to an equivalent zone number defined within the model. This process was undertaken using maps and zone plans, with each record checked for consistency with the survey location and direction. The coded postcard data was stored in an Excel spreadsheet for each individual RSI site for the AM peak hour 0800 to 0900. The zone numbering system used the current CSO Enumeration Districts such that information could be easily compiled with CSO data to complete the matrix development process.

5.2.4 Development of Trip Matrices

Roadside Interview Survey Information was coded to individual matrices for each RSI site. Each individual matrix represented a block of journeys from different sections of the full matrix. These individual matrices were combined to form the overall 'Observed Matrix' of movements, with one matrix each for Light Vehicles and Heavy Vehicles. The result was a set of observed trip matrices representing the AM peak hour (08:00-09:00). These partial observed matrices were then taken forward into the next step of the matrix development process.

The key source of information for the development of the full area matrices was the 2002 CSO POWSAR (Place of Work – Sample of Anonymised Records) information, which

details all work based trips on a typical day in 2002. This information was used to expand the DTO trip matrices, with appropriate extrapolation of work trips such that all AM Peak hour trips could be represented. This extrapolation was based on trip purpose information obtained during the RSI surveys. This produced a full area matrix, and data from the RSI Sites could then be substituted for individual cells in the matrix to produce a full matrix which accounts for observed traffic flows and origin/destination patterns on key roads. This process was undertaken using an Excel spreadsheet and the SATURN MX module where the Matrices are compared with the observed RSI matrix, and the Origin/Destination pairs from the RSI matrix replacing those cells in the full matrix. The resulting trip matrices formed the basis for the traffic model calibration which is described in the next section.

5.2.5 Model Calibration and Validation

The methodology adopted in calibrating the Model to a Year 2006 AM peak hour has been undertaken in line with guidance presented in the DMRB (Design Manual for Roads and Bridges) Volume 12. This is an internationally recognised standard for traffic model development.

The model calibration was achieved through a comparison of observed traffic counts for the AM peak hour against the assigned flows extracted directly from the Base Year Model. The calibration process was undertaken by:

- Adjusting the vehicle trip matrices; and
- Adjusting specific aspects of the highway network definition.

In achieving a better fit between observed and modelled traffic volumes, a technique known as Matrix Estimation was employed. This process can be undertaken wholly within the SATURN suite of programs using the programs SATPIJA and SATME2. This process takes an old or prior trip matrix (in this case the AM matrix derived from the DTO model) and current traffic counts to estimate the most likely trip matrix consistent with the information contained in the counts using the prior matrix as a starting point. In order to do this it requires a "PIJA" file, each element of which represents the proportion of trips between a particular origin-destination pair, which uses the counted link. The model uses an iterative procedure to find a set of balancing factors for each counted link to ensure that the assigned flows match the counts within certain user-defined limits.

In order to retain the integrity of the observed information extracted from the RSI surveys, a process known as 'freezing cells' was adopted. By identifying those parts of the prior trip matrices that are not to be changed within the matrix estimation process (i.e. the observed data), these values can be fixed, and therefore are unaffected by the SATME process. Utilising this process separately for the Light and Heavy prior matrices, a new set of trip matrices were derived for the 2006 Base Year Model. In line with the DMRB requirements for calibration, all three tests for the Light Vehicle matrix have achieved the required 85% compliance as shown:

Flow > 700: Modelled within 15% of Observed	***=***	***94%***	***30 out of 32***
Flow < 700: Modelled within 100 of Observed	***=***	***88%***	***95 out of 108***
All Links – GEH Statistic < 5.0	***=***	***87%***	***122 out of 140***

In addition, all tests for the Heavy Goods Vehicles matrix have achieved the required 85% compliance as shown:

Flow > 700: Modelled within 15% of Observed	***=***	***No Flows > 700 Vehicles***
Flow < 700: Modelled within 100 of Observed	***=***	***100% 140 out of 140***
All Links – GEH Statistic < 5.0	***=***	***85% 119 out of 140***

On the basis of the calibration results presented above, it has been demonstrated that the Traffic Model satisfies the requirements of the DMRB, and for this reason it is concluded that the model is fit for purpose of evaluating road scheme proposals for the Leinster region.

5.2.6 Development of Future Year Matrices (2025)

The forecast year was selected as 2025. The selection of a longer term horizon allows consideration of the long term changes in the population, jobs and the economy that are forecast for the Study Area. The development of population and employment targets for the Study Area has been outlined earlier in this Report, and this information has been used as the primary basis for the traffic forecasting.

Transport 21 is the capital investment framework through which the transport system in Ireland will be developed, over the period 2006 to 2015. The strategy consists of two interdependent elements: to implement transport infrastructure and service improvements including a substantial expansion of the public transport network, some strategic road construction and traffic management whilst addressing the overall growth in travel through the application of demand management policies. In particular, demand management is targeted at encouraging a transfer of trips, where appropriate, from the private car to walking, cycling and public transport. The DTO envisages an extensive, high quality, fully accessible, integrated networks for DART/ suburban rail, Luas, METRO, bus, roads, cycling and walking. The effect of this strategy on private vehicle demand across the Greater Dublin Area is to reduce the level of car based trips significantly by 2016 and beyond. Such impacts have an important influence on travel demand throughout the Study Area, and the impacts on reducing traffic demand to and from the Greater Dublin Area have been accounted for as part of the forecasting.

Whilst there are a number of existing sources of information on traffic growth in the Study Area, it was more appropriate to undertake the forecasting from first principles, drawing on population and employment information for the region, in addition to accounting for the impacts of the *Platform for Change/Transport 21* schemes currently under development. The development of the Traffic Forecasting Model has accounted for the level of modal shift onto Public Transport as part of the future year forecasting.

A comparison of the trip matrices derived using the process described above between 2005 and 2025 is shown in Table 5-1. It will be noted that this revised approach results in growth of some 42% in light vehicles across the study area, with significant growth anticipated for Heavy vehicles over the same period.

Table 5-1 Comparison of Total Trip Growth Factors by Vehicle Class – AM Peak

Vehicle Type	2006 Base Year Matrix	2025 Future Year Matrix	Growth Factor
Heavy Vehicles	8,084	32,510	4.02
Light Vehicles	162,466	230,614	1.42
(%) Heavies	4.97%	14.09%	n/a
Total	170,550	263,124	1.52

5.3 Assessment of Future Year Traffic Flows (Without Leinster Orbital)

As described elsewhere in this report there will be a rapid expansion in the residential population of all the medium and large towns in the Greater Dublin Area over the course of the next 20 years. This is likely to have a substantial effect on travel demand, with particularly large increases in traffic on the radial routes in and out of Dublin City. Allied to the large increase in demand there is also a large increase in capacity on certain routes such as the construction of the M3 and the upgrade of the N81. The increase in capacity has an impact on the relevant corridors and on some longer distance movements but does not prevent a region wide increase in congestion. Despite the capacity increase along the M50, many orbital movements will continue to take place along the regional and local road network.

5.3.1 The M50 Dublin Ring

In 2025 the majority of the M50 will have four lanes each way between intersections as well as free flow junctions with the main National Primary roads. While these improvement works significantly increase the capacity of the route there remain significant capacity issues due to existing suppressed demand and an increase in inbound and orbital traffic connected with the population increase of the region.

As with the existing situation on the M50 the busiest sections will remain between the N7 and the N3 with AADT reaching approximately 185,000 AADT along the most congested link. Although the most congested links will remain in the central section of the motorway length there will be an extremely large increase in existing traffic flows on all sections of the route.

Widespread congestion along the M50 contributes to the movements between the National Primary Roads outside of Dublin as motorists attempt to minimise their time travelling on the congested M50. The massive increase in flows on the M50 will also have implications for the road network between it and the city centre.

5.3.2 National Primary Roads

The traffic model shows a substantial increase in traffic on all the National Primary Routes in the environs of Dublin. This results in a large drop in the Levels of Service on these roads and on the road network around them due to traffic diversion. With the exception of the M3, all major radial routes show signs of significant congestion at lengthy distances from the M50.

Congestion on the radial routes gradually increases in an anti-clockwise direction between the M3 and the N11. The N81 experiences northbound congestion from the junction with the R758 south of Blessington. This becomes particularly acute north of the junction with the R114. The M7 will become congested from its intersection with the M9 and will continue to attract more inbound vehicles from the neighbouring population centres as it approaches the M50.

Congestion on the M4 is expected to commence east of the Kilcock Interchange and continue to the junction at the M50. A significant amount of traffic will join this route from Kildare towns such as Clane in preference to the N7. The M3 will continue to have adequate capacity although there are clear indications of traffic congestion on the N3 southeast of Dunboyne due to a decrease in capacity and traffic from the Clane area accessing the less congested M3 and N3 in preference to the M4.

The N2 shows signs of limited congestion south of Ashbourne while the M1 is congested from as far north as Drogheda during the AM Peak Hour. This results in traffic diversion onto neighbouring routes, particularly the N2.

The most severe lack of capacity on the network is in evidence along the N11 corridor north of Arklow. There are lengthy inbound delays along the N11 and all complementary routes during the AM peak. Substantial northbound flows of approximately 5,000 vehicles are recorded on the N11 as far south as Wicklow Town. In addition to delays on the N11, the large inbound demand manifests itself in traffic diversion onto the N7, N81 and all regional roads in between. The congestion on the N11 is illustrated by the fact that a significant volume of northbound traffic on the Arklow Bypass will divert west onto the R747 to avail of the improved N9 to access the Dublin Area. It is also of note that existing rail capacity to/from the N11 corridor is extremely restrained, with long journey times and limited train paths as a result of single-line operation. This contributes somewhat to the high level of congestion on the N11, and the consideration of public transport based solutions may offer significant benefit to relieving existing pressure along this corridor.

5.3.3 National Secondary Roads

The National Secondary Roads provide mainly cross-country access between major County Towns, and east/west and north/south outer orbital routes between the National Primary roads. The N55, N52 and N80 are the main National Secondary Roads through the Leinster Region, but with the exception of the N80, north of Portlaoise, do not show signs of congestion in 2025. This is due to the outlying nature of these routes and the fact that the regional road network compares well in quality.

The N80/N52 between Portlaoise and Kilbeggan exhibits mild congestion during the AM Peak Hour. In excess of 1,000 vehicles are recorded travelling northbound between Portlaoise and Tullamore which places a significant strain on the capacity of the road. Traffic on this route includes a substantial element of local trips as well as long distance traffic between the N7/N8 and N6/M4.

5.3.4 Regional and Local Roads

The Regional Road network in 2025 becomes more heavily used by commuters and long distance travellers alike due to congestion along the National Primary Roads. Rapid population growth in the provincial towns creates both additional Dublin bound

commuters and a large number of new trips between those towns which are only directly served by the regional and local road network.

Considerable traffic flows are already evident along the M1 corridor between Drogheda and Dublin. Capacity issues on the M1 are causing diversion of traffic to less suitable regional routes such as the R108, R122 and R130. There are 1,800 southbound vehicles on the R108 south of Drogheda. This regional route (via Naul) captures Dublin bound movements from Laytown and Drogheda due to M1 congestion and records approximately 1,800 southbound vehicles. A significant proportion of these Dublin bound vehicles split onto the parallel regional roads R122 and R130. The R122 captures movements from Balbriggan and Laytown and carries over 1,000 southbound vehicles. The R130 captures movements from all these locations as well as vehicular movements to the N2 where there is more capacity available than at the M1.

Many of the same patterns of regional road congestion occur along the N11 corridor, leading to significant flows and consequent delays along parallel regional routes such as the R755 and R117. The R755 between Roundwood and Enniskerry will experience a considerable increase in traffic which would place serious strain on the existing infrastructure. The R115 mountain road through Glencree could experience a northbound flow of approximately 1,500 during the AM peak. Heavy use of these regional routes is unsuitable due to their poor condition and alignment. 'Rat-running' between the N11 and N81/N7 also results in heavy flows along the R756 and R759 valley roads. In excess of 1,000 westbound vehicles across the Wicklow Gap (R756) during the AM peak will cause lengthy delays and environmental problems in a sensitive location. It is evident that congestion on the N11 is causing diversion of trips between local towns in addition to diversion of long distance commuting trips to the Dublin area.

Outside of the N11 and M1 corridors the greatest pressures on Regional Roads occur between the N7 and N4/N3. Two distinct corridors between these national primary roads show signs of strain. The first is an area stretching between Naas and Newbridge on the N7, and extending through growing towns of Clane and Celbridge to the M4 at Maynooth and Kilcock. A portion of this traffic also uses the R125 to continue an orbital movement towards the N3. This corridor is also under pressure on two fronts; a dramatic increase in local traffic due to population expansion, and a significant orbital movement from the severely congested N7 corridor to the less congested M4. There is a two-way AM peak hour flow of 2,400 recorded on the R407 between Naas and Clane. The R403 between Clane and Celbridge/N4 is even more congested with a two-way AM peak hour flow in excess of 3,300. Other regional roads experiencing severe congestion in the area are the R407 (Clane to Kilcock) and the R408 (Clane to Maynooth).

The second N7/N4 corridor which has been identified as congested is the Portlaoise/Monasterevin to Kinnegad/Enfield area. Pressure has already been identified on the N80/N52 between Portlaoise and Kilbeggan due to north/south movements. A number of roads in the vicinity of Edenderry, which lies in the middle of the corridor, are also under stress. These include the R401 (south of Edenderry) and the R402 (west of the R401 junction). Both these regional roads carry an AADT of approximately 40,000 (2,500 AM peak hour two-way flow) and lengthy delays result. The primary movement in the AM peak is a northbound strategic orbital movement.

The R161 and R162 linking Navan with Trim and the N52, respectively, also experience significant increases in traffic due to growing links between local towns and strategic movements. The R161 south of Navan is expected to carry an AADT of some 35,000.

5.4 Conclusions

The assessment of future year deficiencies has therefore highlighted continuing reduction in levels of service on the M50. Although capacity on the M50 is currently being increased through the development of additional lane capacity and the introduction of freeflow interchanges, future demand for the M50 is expected to exceed capacity. In essence, the M50 is currently required to operate a number of functions as follows:

- It acts as a cross city route, connecting South Dublin with North Dublin. The M50 is the only high-capacity route which provides this connection without the need to travel through the heart of the City Centre, or established residential areas. Some 30% of the traffic on the M50 use the route for this purpose, representing a considerable volume of traffic on the route;

- It is an orbital route outside the City which allows traffic entering the city to chose an appropriate radial route into the City Centre. Indeed, such activity is currently encouraged, whereby traffic from Dublin City to the N7 is routed via the N4 and M50 to join the N7 at the Red Cow. This use of the M50 will cater for some 40% of the total traffic flow;

- It provides connectivity between the growing settlements around the periphery of the M50, such as Tallaght, Blanchardstown, Clondalkin, Lucan and Swords. As outlined later in this report, South Dublin County Council and Fingal County Council are currently examining local roads to improve such connections. Nonetheless, the M50 will remain an attractive route for many such movements, and will continue to provide one of the few crossings of the River Liffey; and

- It is a strategic road connecting the National Primary Routes. The M50 provides the only high quality connection between all National Primary Radial Routes, and the current geography encourages significant volumes of long distance inter-urban traffic into the M50 as part of their journey. For example, a journey from Drogheda to Naas is most effectively achieved via the M1, M50 and N7. The local pressures on the M50, however, inhibit easy movement of such strategic trips, and therefore has a negative impact on the development of economic links through the region in line with the objectives of the National Spatial Strategy. The volume of Strategic movements on the M50 is some 30% of the total traffic flow, when strategic trips are defined as those with an origin and destination both outside the M50.

All the above issues point to the need to develop alternative road capacity which will allow the existing functions of the M50 to be more evenly distributed throughout the road network. The Development of a Leinster Orbital Route would facilitate a high quality connection between the National Primary Routes, which would greatly improve connections between the different towns in the Leinster Region. It could therefore benefit up to 25% of the existing traffic on the M50, in addition to attracting a notable volume of traffic away from Regional and Local Roads. It is noted, however, that any transfer of traffic from the M50 to the Leinster Orbital Route is expected to result in traffic from parallel local roads transferring onto the M50 to take advantage of the additional roadspace. As such, the actual impact on M50 traffic conditions may be limited.

The future year assessment of traffic flows therefore highlights the need for definite consideration of the Leinster Orbital Route. It is, however, acknowledged that there are considerable difficulties with identifying an appropriate route for the Leinster Orbital Route to extend into Wicklow. The National Roads Authority will separately consider the examination of a possible route further south to link the N11 with the N9 corridor, thereby providing onward access to the Leinster Orbital Route.

6.0 Constraints Study

6.1 Overview

In order to develop a route corridor that can be used in the Feasibility Study, it is necessary to identify appropriate constraints such that an outline alignment can be identified. This section of the report describes such a process.

At a strategic level, a typical corridor width of 1km is used to define a feasible route past major constraints such as urban areas, major topographical features or significant large scale heritage areas. In this first route planning phase, a coarse selection process will allow the most appropriate corridor to be determined before proceeding to the next stage. Later in the route planning process a more refined study will provide detailed local information for the design of a feasible route in the context of smaller scale constraints within the selected corridor.

Urban areas along the proposed Leinster Orbital Route corridor are concentrated at major towns such as Drogheda, Navan and Trim. Any orbital route through this area needs to skirt the edge of the zoned lands for urban expansion in accordance with the Regional Planning Guidelines for the Greater Dublin Area, as well as to pick a way through the ribbon development that lines the roads radiating from each town. The many towns and villages in the rural stretches of this region must also be avoided.

There are few significant topographical constraints in most of the study area. The main feature is the Dublin / Wicklow mountain range, which extends at elevations of up to 1,000m for a distance of 45km south of the capital, thus effectively blocking the provision of a high quality road linking most of east Wicklow to the Midlands. At a smaller scale there is a an upland area extending from Ballyboughil in north County Dublin to Bellewstown in East Meath with elevations of up to 150m, which forms a modest barrier between the N2 corridor and the coastal plain. Another example is the ridge at up to 200m elevation at Lyon's Hill east of Newcastle and north of the N7 corridor in southwest County Dublin. Otherwise the study area is relatively flat with only localised hills that might influence route planning for a major road.

Major heritage constraints exist at the Boyne Valley complex and the Tara Hill areas in County Meath. Various Special Areas of Conservation (SAC) and Natural Heritage Areas are scattered across the region, with a cluster of SAC's in the midland bogs of northwest Kildare and east Offaly. In general the proposed route corridor has avoided or skirted these areas. A summary of constraints is outlined in drawings included as Appendix B of this report.

6.2 Other Relevant Local Road Proposals

6.2.1 Fingal County Council Road Network Proposals

In the Dublin suburban part of the Fingal County Council area that extends from the coast near Swords in the east, to Blanchardstown in the west, the existing orbital routes outside of the M50 are very limited as follows:

- The **R121** from the N4 at Lucan Village to the N3 at Blanchardstown via Clonsilla, and then linking to the N2 at the Ward. This is the only route that crosses the River Liffey between the M50 Westlink Bridge and Leixlip in County Kildare, over a distance of 7km. This route is generally very poor in geometric terms with a restricted cross-section, sub-standard alignment, frequent junctions and restrictions such as the railway level crossing in Clonsilla. This route does not extend eastward from the N2; and

- Local roads provide a poor quality orbital route from Blanchardstown to Dublin Airport and Swords via Ballycoolin, Kilshane and St. Margaret's.

In recognition of the deficiencies in the existing road network outside of the M50, Fingal County Council is developing proposals for a number of additional regional routes and improvements to existing routes described as follows:

- **N4-N3-N2 Link Route**: From the N4 Leixlip Interchange directly north to cross the River Liffey east of Leixlip Village, linking to the existing Ongar Road at Hansfield west of Blanchardstown, to cross the N3 at an upgraded interchange at Castaheany. The section from the N3 to the N2 will pass via Damastown and Tyrellstown to the N2 Cherryhound interchange. Various sections of this route have received planning approval and are proceeding to construction, while other sections, such as the N4 link from Hansfield are at conceptual stage only; and

- **N2 at Cherryhound to Swords:** From the N2 directly eastward to the western edge of the Dublin Airport area, and then north-eastwards to provide a Western Ring Road for Swords. This route has not been defined on plan, and the connection point to the M1 remains uncertain, but is likely to be at the existing Lissenhall Interchange north of Swords.

Most of the above links will be single carriageways, some with bus lanes, and with frequent at-grade junctions for local connections in addition to grade-separated junctions at the national road crossings. It is expected that these roads will provide a suitable alternative to the M50 for local trips in the surrounding area within Fingal, and will therefore draw some traffic away from the ring motorway. It is noted that the above new road links are proposed along corridors close to the M50, and hence they will have only a limited impact on the feasibility of the Leinster Orbital Route, which as proposed is quite a distance from these areas.

6.2.2 South Dublin County Council Road Network Proposals

During consultations with South Dublin County Council it was highlighted that there are emerging proposals for a link road from the N4 at Leixlip to the N7 at Rathcoole, travelling via Adamstown at the western edge of the urban area. This scheme is included in the current county development plan and is at an early stage of planning with no specific route yet identified.

The proposed roads in the Fingal and South Dublin areas will provide a continuous local distributor route around the edge of the Dublin area. This route will not be suitable for long distance traffic, but it will facilitate short distance local traffic between the developing areas in this part of the city.

6.3 Identification of Route Corridor

This section provides a description of the process by which the Leinster Orbital Route corridor has been identified. For simplicity, the route has been broken down into a number of sectors.

6.3.1 Drogheda to Navan

There are major constraints along the River Boyne Valley between Drogheda, Navan and Trim. Parts of the valley are designated a UNESCO World Heritage Site because of the number of megalithic remains at Newgrange, Knowth and Dowth on the northern bank of the river between Drogheda and Slane. Various other cultural heritage sites extend along the river valley corridor, such as the Village and Hill of Slane, and numerous castles, monastic sites and historic houses. There are also many significant landscape constraints associated with the river valley and protected views.

At Drogheda the route would begin at the M1/R152 Duleek Road Interchange, which would require a suitable upgrade. It should be noted that access to the new route from the northern side of Drogheda would be either through the town centre, or via the toll motorway section of the M1 over the Boyne Bridge. Consideration will be required of the impact of potential short-hop traffic on that section of the M1 and of the inter-relationship with the toll plazas on the M1.

North of the River Boyne, between Drogheda, Slane and Navan, the terrain is quite hilly and it would be difficult to develop a route through this area without major impacts on the landscape due to deep cuttings and high embankments, which would also add significantly to the construction cost. Conditions are much more suitable south of the river, and it is therefore proposed that the route will run south of the Boyne between Drogheda and Navan, at a considerable remove from the valley. This landscape while remaining hilly with rolling drumlins is essentially that of lowland farmland with medium sized fields separated with sometimes-dense wooded hedgerows and shelterbelts of ash and larch.

Southwest of Drogheda there are several constraints formed by the Platin cement works and associated quarries, and other industrial sites. Beyond that the town of Duleek and outlying settlements form another obstacle. Duleek holds importance in the form of an historic core that contains within and around the town several building and artefacts of interest. To the north and east of Duleek is Duleek Commons holding, comprising over 40 hectares of natural history interest in terms of unique flora and fauna and designated as a proposed Natural Heritage Area (pNHA). Further west within the route is Thomastown Bog, also designated as a pNHA. It should, however be feasible to develop a new route through this area, avoiding most constraints and largely following the Drogheda to Navan railway line that passes north of Duleek.

Few constraints occur on the remaining section to Navan, with the village of Kentstown being the main place to avoid. A golf course is located to the south east of Navan and a number of ring forts and other archaeological features are present along the route though easily avoided. Some patches of woodland may be of ecological significance and require further study.

6.3.2 Navan to Enfield

Passing south of Navan will require careful route planning, as it will cross the River Boyne near the edge of the urban area and not far from the Tara area, which has a sensitive landscape constraint.

The route will cross the proposed M3 motorway in the vicinity of the Navan South Interchange. Provision of a junction between the two routes at this location will require careful design in conjunction with retention of the local road links that are part of the M3 scheme. Due to the other significant constraints in the area, it would be difficult to develop a fully separated junction with the M3 at sufficient separation to the north or south of the Navan junction.

Between Navan and Trim the route will stay several kilometres north of the River Boyne Valley so as to avoid important cultural heritage sites and landscape constraints along the river corridor. At Trim there are two route options available. One option is to pass north and west of the town where there are no major constraints as the route crosses predominantly agricultural landscape consisting of medium to large land parcels with some value from hedgerows. Alternatively, the route could turn south and pass east of Trim, but this route would need to keep about 3km downstream of the town so as to avoid several historical sites along the banks of the River Boyne.

The landscape south of Trim is predominately rolling hills and lowland. Farming consists of a mix of pastoral and arable farms. Land parcels become larger moving south away from Trim and are often of poor condition with a poor hedgerow structure. The River Boyne will again need to be crossed in a sensitive manner. Although these higher reaches are of lesser landscape value than that found in the Boyne Valley, the river is still of conservation importance. South of the river within the path of the proposed route is Doolystown Bog pNHA.

As the route moves south toward Enfield there are some smaller areas of woodland and wetland that may hold some ecological potential but that are easily avoided or mitigated against. Directly north of Enfield the Royal Canal requires crossing. The landscape here is of rolling lowlands with large arable field patterns and less densely vegetated lands. This pNHA holds importance in terms of natural and built heritage.

The Canal itself holds several popular walking routes and is important for its wealth of habitats and assemblages of species living within its environs. From a built heritage perspective, canals are of considerable importance with bridges, locks and associated building all protected. Any crossing at this or any point of the canal will need to be carried out with sensitivity. Between Trim and the M4 corridor, there are potential variant routes that would pass near Kilcock rather than Enfield. There are few constraints to route planning in this area, and the scope for route planning is relatively broad.

6.3.3 Enfield to Naas

South of Enfield and the Blackwater River a number of small to medium forest plantations exist along the route. Several kilometres south of here the route will enter the northwest Kildare bog-lands and will skirt a number of cSACs (candidate Special Areas of Conservation) and pNHAs before the reaching the area between Prosperous and Allenwood. These sites include Hodgestown Bog and Ballynafagh Bog. Ballynafagh Bog is of European importance as a large proportion of the site still consists of raised bog,

which is considered rare. Directly south of Prosperous the route crosses the Grand Canal, similar in conservation status to the Royal Canal. The Grand Canal is an important tourist site and contains both natural and built heritage value. The route then continues in a southeasterly direction though rolling farmland and crossing the upper stretches of the River Liffey as it leaves Newbridge to the west. The route then continues southeast to terminate on the M7 between Naas and Kildare.

It is noted that there may be opportunities for carrying the route further east, terminating on the N7 close to Kill. Such would require a realignment of the section between Enfield and Naas, with the revised route travelling to the east of Clane, or routing via the existing gap in developed lands between Prosperous and Clane.

Drawings showing applicable constraints along the corridor, and showing the Leinster Orbital Route corridor identified above are included as Appendix B.

6.4 Junction Strategy

In principle the Leinster Orbital Route should be a high quality road of dual carriageway or motorway standard, with junctions only at key crossings of other national routes. This will protect the strategic function of the route and constrain potential associated development pressures.

In this regard the route planning process has been influenced by the requirement of the NRA Design Manual for Roads and Bridges for a minimum 2km separation between successive junctions on high-speed roads. Thus locations for suitable junctions on the national radial routes emanating from Dublin were identified and the proposed route options developed to connect these points in the context of the other constraints described above.

7.0 Scheme Traffic Forecasting and Evaluation

7.1 Overview

The results of the SATURN model for 2025 have been extracted and used to develop traffic forecasts for 2025 on the Leinster Orbital Route, in addition to understanding changes in traffic flows that will occur on other routes. This section of the Report provides a discussion of the main findings of this process. The assessment has been based on the provision of a Dual Carriageway/Motorway for the Leinster Orbital Route.

7.2 Traffic Forecasting

The 2025 Traffic Model for the Leinster Region has been used to assess the impact of the Leinster Orbital Route in capturing traffic from existing roads. A discussion of the impact of the proposed scheme on traffic flows and movement patterns throughout the road network is described below. All results are presented for a forecast year of 2025.

As stipulated in the project brief, and in accordance with applicable National and Regional Policy, the proposed Leinster Orbital Route will connect Drogheda on the M1 with Naas on the M7. As such, it intersects a number of National Primary Radial Routes, and the effects on traffic movements can be broken down into a separate discussion of these different sectors.

7.2.1 Anticipated Scheme Flows (2025)

The scheme attracts a significant demand, with forecast two-way traffic flows during the AM peak in 2025 of over 4,000 PCU's per hour, equating to an AADT of approximately 55,000 vehicles/day. The most heavily trafficked section of the Route is between the M4 and M7, with traffic volumes reducing gradually to less than 20,000 AADT between the M1 and N2. A summary of the key traffic impacts is provided below;

M1 (Drogheda) – M3 (Navan)

The section between Drogheda and the M3 at Navan is the least trafficked section of the scheme, with a two-way flow in 2025 of approximately 20,000 AADT east of the N2 and 30,000 between Slane and Navan. The new scheme provides connections between the growing towns of Drogheda and Navan and provides upgraded links from the coastal towns of Balbriggan and Laytown to Co. Meath and the Midlands.

This section of the Route carries a significant amount of cross border traffic with up to 10,000 AADT travelling to/from locations in Northern Ireland.

- There is a significant decrease on the N51 between Navan and Drogheda, which runs in parallel with the new scheme. Traffic flows reduce by some 5,000 AADT on the N51 east of Slane with a more significant reduction of almost 15,000 AADT between Slane and Navan. This traffic will transfer onto the new route;

- There are reductions in east-west traffic volumes on a large number of regional routes between the M1 and N2. Two-way flow reductions range from

approximately 2,500 AADT on the R156 west of Dunboyne, to less than 1,000 on the R122 between Naul and Balbriggan. There is a minor increase on the R125 between Dunshaughlin and Swords. This route performs an orbital function and increases by about 1,000 AADT as more traffic into Swords travels via the M3 to Navan;

- An increase in traffic on the N2 north of Slane of approximately 5,000 AADT is expected as a result of the attraction of traffic from the N52 through Kells and the R164 between Kells and Kingscourt; and

- Limited impact on the M50, as the majority of traffic drawn to the Leinster Orbital Route is drawn from Local and Regional Roads. In addition, any draw of traffic from the M50 is replaced by other local movements taking advantage of the spare capacity released on the M50.

M3 (Navan) – M4 (Enfield)

There is a notable increase in traffic flows on the section of the Leinster Orbital Route between the M3 and M4. The traffic model forecasts a 2-way flow in 2025 of some 35,000 AADT between Navan and Trim, rising to almost 50,000 AADT between Trim and Enfield.

It is noted that there is some transfer between the M4 and the R154 (Trim Road) for accessing the Greater Dublin Area. The attractiveness of this routeing to Dublin indicates that delays on the M4 and M50 are encouraging orbital trips to access more attractive radial routes such as the R154 and M3. Key traffic impacts are outlined below:

- A significant reduction of almost 25,000 AADT on the R161 between Trim and Navan. There is also a decrease of over 5,000 AADT on the R161 northeast of Kinnegad as vehicles divert to the new route via the M4;

- Major reductions in traffic on the R159 between Trim and Enfield, where most traffic diverts to using the new scheme;

- There are minor increases of some 3,000 AADT on both the R156 through Summerhill and the R154 from Trim. These increases are as a result of traffic using these roads to access the Leinster Orbital Route;

- Increase in two-way flows on the M4 between Kinnegad and Kilcock of some 6,000 AADT. This occurs as a result of vehicles diverting from regional roads onto the M4 in order to access the new scheme at Enfield;

- Decreases on other parallel routes such as the N52 from Mullingar to Kells (6,000 AADT), and the R160/R161 connecting Trim with the N4; and

- A minor reduction in traffic volumes on the M50. Again, the majority of traffic drawn to the Leinster Orbital Route is drawn from Local and Regional Roads. In addition, any draw of traffic form the M50 is replaced by other local movements taking advantage of the spare capacity released on the M50.

M4 (Enfield) – M7 (Naas)

The final section of the Leinster Orbital Route connects Enfield with the Naas bypass. The highest traffic flows are forecast on this section of the route with a two-way flow of up to 55,000 AADT. This section of the new scheme provides both long distance strategic connections between the M7 and the midlands and north east, and high quality local connections between the rapidly growing Naas/Newbridge/Kildare cluster and the M4 corridor. The particularly large flows between the M7 and M4 in this area indicates the strong demand for orbital movements in this region and the requirement for improved connectivity between the large towns in this Region. A number of key impacts are noted below:

- A significant decrease is expected on the Regional Roads connecting the M7 with the M4. The R401 and R402 between Edenderry and the M4 show substantial two-way flow reductions of over 10,000 AADT. Similarly, the R403 and R407 on the Naas/Clane/Celbridge route experience flow reductions of over 8,000 AADT as traffic takes advantage of the new route. This impact of reducing traffic on Regional Roads is widespread through this area, and reflects the significant need for the Leinster Orbital Route along this corridor;

- The assessment forecasts a diversion of radial traffic from the N7, N81 and the R403 to the new scheme. This results in decreases in two-way flow of up to 5,000 AADT on the R403 and N7 and approximately 2,500 on the N81;

- Strong reductions are expected on the R417. A reduction in two-way flow of up to 5,000 AADT is forecast between Athy and Monasterevin, with much of this traffic diverting to the Leinster Orbital Route via the M9;

- An increase in traffic flow of some 5,000 AADT on both the M7 and M9 south of Naas, with this traffic diverting from the R417 and R419. The increase in traffic flow approaching the Leinster Orbital Route is expected to be in the order of 20,000 AADT; and

- A reduction of approximately 5,000 AADT on this section of the M50. Again, the limited reduction is as a result of the majority of traffic drawn to the Leinster Orbital Route being attracted from Local and Regional Roads. In addition, any draw of traffic form the M50 is replaced by other local movements taking advantage of the spare capacity released on the M50.

7.2.2 Connectivity between Regional Towns

The scheme provides a strategic outer orbital bypass of the Greater Dublin Area, leading to a significant improvement in connectivity between the M7, N4, M3, N2 and M1. Such will support connectivity between towns such as Naas, Kildare, Enfield, Trim, Navan and Drogheda, thereby supporting the economic development of these towns and facilitating interaction between them. Improved connectivity into Ashbourne and Dunshaughlin is also facilitated through junctions on the N2 and M3. This therefore provides an alternative connection from these towns into the Leinster Region without undue reliance on the M50 to provide the connection to other National Primary Routes. This effect is central to the objective of the Leinster Orbital Route as set out in policy guidance, and will assist with reducing the reliance on Dublin City as the sole economic focal point of the Leinster Region.

The best indicator of the improvements in connectivity between the different settlements along the Route corridor can be provided by a comparison of typical peak hour journey times between the key areas. A comparison of journey times before and after the construction of the Leinster Orbital Route is provided below in Table 7-1.

Table 7-1 Comparison of Journey Times (minutes) – AM Peak in 2025

From \ *To*	**Drogheda**	**Navan**	**Trim**	**Enfield**	**Naas**
Drogheda					
No DOOR		*21.5*	*36.8*	*51.1*	*79.9*
With DOOR		**16.9**	**25.0**	**35.9**	**48.8**
Navan					
No DOOR			*15.2*	*29.6*	*63.1*
With DOOR			**8.9**	**19.8**	**32.6**
Trim					
No DOOR				*14.3*	*47.8*
With DOOR				**11.3**	**24.3**
Enfield					
No DOOR					*33.4*
With DOOR					**12.9**

The data shows potentially significant reductions in journey time between the key towns. End to end journey times for a typical journey between Navan and Naas reduces by some 50%, with Trim to Naas reducing by a similar level. The reduction on the section between the M4 and M7 corridor is highly notable. Enfield to Naas reduces by some 65%, reflecting the current difficulties that exist with connectivity between these two corridors for the Do-Minimum scenario.

7.3 Scheme Assessment

The assessment of the Proposed Route was undertaken using the Draft Transport Project Appraisal Manual that is under consideration by the Department of Transport.[12] This manual assesses the impacts of transport projects using five criteria:

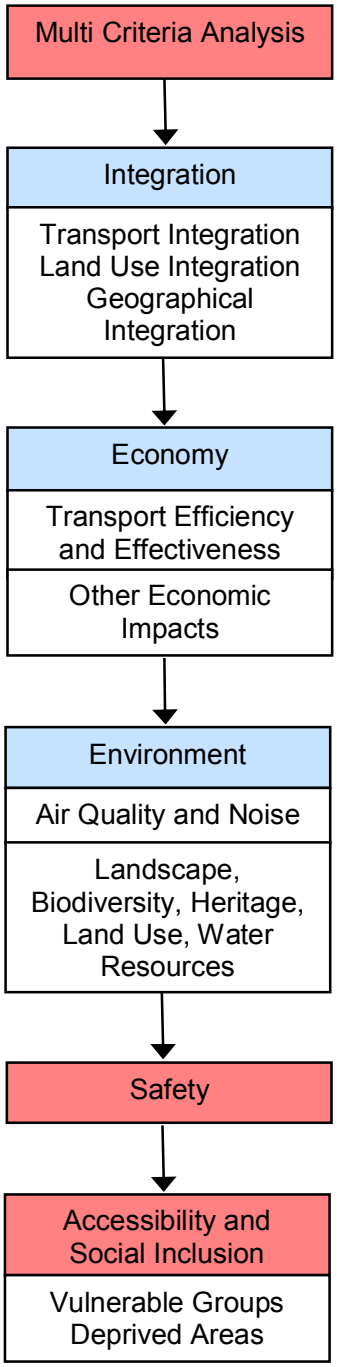
- Integration;
- Economy;
- Environment;
- Safety; and

[12] Goodbody Economic Consultants et al. Transport Project Appraisal Manual. December 2005.

- Accessibility and social inclusion.

Each of these criteria gives rise to a number of dimensions. The principal dimensions are identified below in Figure 7-1, which provides an overview of the scheme assessment. It should be noted that the estimation of monetised transport users benefits forms part of the Economy criterion. The results of the user benefit calculation are often added to monetised safety and environmental benefits to arrive at an aggregate monetised economic rate of return. This approach has not been implemented in this Feasibility Report, so that safety and environmental benefits are separately considered. This Section of the report assesses the proposed Route under the criteria set out above.

Figure 7-1 Overview of Assessment Framework



7.3.1 Integration

The integration of the Route with both transport and non-transport policies and priorities is a key benefit arising from it. This Section of the report analyses the impact of the Route on integration issues, beginning with an assessment of its compatibility with the Regional Planning Guidelines.

Transport Integration – providing good connections with other transport infrastructure

This comprises the promotion of the integration of transport infrastructures and services through the development of missing transport links, and improving the opportunities for interchange. The Route will provide substantial route integration benefits, as it provides a non radial routing option that will benefit a range of journeys. A particularly attractive feature of the route is that like the M50, it offers opportunities for north-south traffic movements to access the key M4 and M7/N7 radial routes. In this respect, it offers substantial integration prospects as it ties into the M7/N7 close to the M9 junction and thus offers integration benefits to traffic to/from the south east.

With regard to integration with the rail mode, the roads offer integration benefits where they provide better access to existing rail stations that have or will have high frequency rail services. Again, the principal benefits would arise where a route provides opportunities to link to radial rail services. Where these rail stations are situated in significant urban areas, the benefits will be reduced by the need to access the rail station through relatively congested urban road networks. It needs to be recognised also that such road rail interchanges are most likely to occur at suburban stations, where car commuters are incentivised to avoid road congestion in the approach to Dublin by transferring to rail. The preferred Route will offer few possibilities in this regard.

Unlike many other inter-urban links the proposed route will not compete with any existing or proposed railways, and provides for journeys of a dissipated nature that are best served by road rather than rail. The route does, however, have considerable potential to support bus services that would be more viable as PT links between the scale of towns served.

Land Use Integration – compatibility with regional and local development plans

The Regional Planning Guidelines for the Dublin and Mid East Regions set out a 12-year strategic policy for most of the relevant study area. They provide a regional context for the National Spatial Strategy and for the individual development plans contained within the Greater Dublin Area. A major feature of the land-use strategy centres on the distinction between the Metropolitan and Hinterland areas. The overall approach is to:

- Consolidate the development of the metropolitan area around a multi-modal transport system; and
- Direct a certain amount of development into the Hinterland in identified settlement centres, while maintaining a greenbelt between the two areas.

Consolidation of development in the Metropolitan area means that urban sprawl should cease. The Metropolitan area consists of Dublin City, South Fingal, South East Meath North East Kildare, South Dublin, Dun Laoghaire-Rathdown, and North East Wicklow.

The Hinterland Strategy envisages that building in the open countryside will be reduced and there will be a concentration of development in particular settlement centres.

The Regional Planning Guidelines for the Dublin and Mid East Regions recognise the role of an orbital route in providing improved accessibility and connectivity between the towns in the Hinterland area. It is considered that this will help deliver job and service access in the Hinterland and alleviate pressure on the M50.

There are two significant urban centres that lie outside the scope of Regional Planning Guidelines for the Dublin and Mid East Regions. Drogheda lies within the Border Region and the Planning Guidelines for that region designate it as a primary development centre. The town's role in relation to Dublin is also recognised within the Border Region Planning Guidelines. Within the Midland Region Planning Guidelines, Portarlington is designated as a key service or moderate growth town.

Based on the above, the land use impact of the Route may be assessed along three dimensions:

- The extent to which it links identified growth centres generally;
- The extent to which it links growth centres in the Hinterland; and
- The extent to which it promotes consolidation of the Metropolitan Area;

The Route links development centres with an aggregate predicted 2025 population of 172,000. It has strong potential to strengthen the economy of the Hinterland as it links Drogheda, Navan, and Trim with the Primary Dynamic Cluster of Naas–Newbridge. Improvements to the road links between these development centres will make them more attractive to firms through increasing:

- The efficiency with which firms in those centres source materials and deliver their products – **product market effects**; and

- The extent to which firms have access to a enhanced labour supply and a reduction in the costs of that access – **labour market effects**.

Both product and labour market effects can act to increase the efficiency and market effectiveness of existing firms, leading to an expansion of output and employment. They can also influence the locational behaviour of firms, increasing the attractiveness of the development centres to **inward investment.** It is noted that although they can be significant, these benefits are not captured in the assessment of Transport User benefits.

With regard to the product market, the Route will impact on firms not only through transport cost reductions for transport between them, but also through the scope for cost reductions throughout the logistics chain. Changes to the logistics chain mean that the reliability of transport networks is important as well as the speeds that they offer.

Ireland's economic success has given rise to tighter labour markets. This means that transport has a key role to play in enlarging the labour catchments of firms. This implies that Hinterland towns should not only have good transport links to the Metropolitan area and the East Coast ports, but also that there should be high quality transport links between towns themselves. Because the Route strengthens the links between the development centres, firms locating in them will have access to larger labour markets and

a larger range of business services and sub-suppliers.

The Route should therefore encourage the growth of firms in the Development Centres. This will make jobs available for residents of these towns and attract in new residents. As was indicated earlier, towns in the Hinterland tend to have low levels of economic balance in terms of the matching of population with jobs. The economic growth of the development centres and the ensuing improved settlement patterns will contribute to **sustainable development.** Mixed-use settlement forms, in which jobs and residences are in balance, encourage short trips and use of walk and cycle modes. Furthermore, settlement forms, which are compact and contain mixed uses that encourage autonomy, are also likely to promote sustainable local transport.

Because it is situated at approximately 30 km from the Metropolitan Area throughout its length, the Route carries no risk of contributing to urban sprawl. It thus supports the consolidation of the Metropolitan area.

Geographical Integration – providing good connections with Northern Ireland and Europe

Geographical integration refers to the integration of transport networks across geographical; and judical boundaries. Two aspects of geographical integration are particularly relevant:

- Improved internal transport links with Northern Ireland; and
- Access transport links with Europe and the rest of the World.

With regard to links with Northern Ireland, the Route opens up alternative routes to Northern Ireland for a range of traffic movements that would normally use the M50/M1 routes. Essentially, the new Route would allow traffic from the principal urban centres of Limerick and Cork to avoid travelling as far as the M50 and to access points on the M1 further north of the junction with the M50. Of particular note is the fact that the Route caters for traffic from the South East directly as it ties in to the existing road infrastructure close to the M7/M9 junction.

With regard to transport links with Europe, the Route is unlikely to be used to a significant degree for accessing Dublin Port. However, it would be very beneficial to port traffic, if Bremore Port were to be constructed. It accesses the M1 south of Drogheda and thus affords reasonably ready access to Bremore via the M1, provided a port link road is constructed. The provision of such a Port Link Road would require consideration as part of any port development proposal rather than being part of the Leinster Orbital Route.

Integration with Regional Development Policies – supporting the National Spatial Strategy

The National Spatial Strategy provides a 20 year planning framework that is designed to achieve a better balance of social, economic and physical development between the regions and a better spatial distribution of population growth in Ireland. The strategy develops a hierarchy of development locations based around major centres that have or have the potential to achieve critical mass – Gateways. Below this, there is a second tier of regional hubs to transmit the driving force of the Gateways to local areas.

In terms of transport, the NSS identified strategic radial corridors, strategic linking

corridors and strategic international access points. The Route does not impact on the radial corridors, which relate to routes linking Dublin with other Gateways. Of particular relevance is the strategic corridor identified by the NSS to link the Dundalk Gateway directly with the Midlands Gateway of Athlone-Mullingar-Tullamore and then proceeding to the Wexford hub. This corridor offers scope for further linking to the Gateways of Limerick, Cork and Waterford as it traverses the radial routes emanating from Dublin.

The Route does not form a direct corridor linking the Gateways mentioned above. However, it offers opportunities to North-South traffic for better linkages with radial routes emanating from Dublin. In particular, the Route intersects the M3, M4 and M7/N7. This then facilitates linkage of, say, Dundalk with the Gateways of Limerick, Galway, Waterford, Cork and the Midlands, without having to access the M50.

The Route is thus highly compatible with the National Spatial Strategy as it provides a relatively direct linking of the Dundalk, Midlands and Galway as well as improved linkage between the Dundalk, Limerick, Cork and Waterford Gateways.

Integration with Other Government Policies – compatibility with the National Development Plan

The preceding sections considered the level of integration of the Route with key national and regional policies that have a spatial dimension viz. the Regional Planning Guidelines and the National Spatial Strategy. However, the overriding planning document is the National Development Plan 2007-2013. This Plan acknowledges the vital role that economic infrastructure and particularly transport infrastructure has to play in ensuring economic progress and a higher quality of life. With regard to project selection the Plan notes that "It will be absolutely crucial therefore that in the selection of projects priority is given to the promotion of the key Plan goals notably sustainable growth and competitiveness, regional development in line with the template of the National Spatial Strategy, environmental sustainability and the All-Island dimension". The compatibility of the Route with regard to a number of these aspects has been covered in the consideration of the Integration Criterion above.

The Leinster Orbital Route therefore scores well on the Integration criterion. It links the major growth centres, serves the Hinterland well, and does not promote urban sprawl. It provides good links between Gateways and ties into the existing road network very well.

7.3.2 Economy

Two dimensions are normally considered as part of the Economic assessment. These are:

- Transport User Benefits; and
- Other economic impacts;

Transport efficiency and effectiveness is normally captured by a comparison of transport user benefits with scheme costs. Other economic impacts arise where the user benefit calculation does not capture the full benefits because of market failure or the method of computing benefits. Although transport investments may generally have such economic impacts, they are not amenable to quantification at present. Accordingly, the Economy impacts of the Route were assessed through a comparison of transport user benefits and scheme costs.

Transport User Benefits

The assessment of user Benefits involves the estimation of journey time and vehicle operating cost savings, their conversion to a monetary value based on 'Willingness to Pay' principles, and a direct comparison of these monetised benefits against the scheme cost. Whilst not providing a final conclusion on the validity or otherwise of any particular scheme or variant of a scheme, it provides a useful quantitative indication of value for money, and hence the return on the investment. The assessment of user benefits typically includes:

- Travel time savings;
- Vehicle Operating Cost Savings;
- Road Safety Benefits (i.e. reduction in the number of accidents); and
- Changes in network maintenance costs.

The assessment of these various elements is typically undertaken at a more detailed level as a scheme is taken through the stages of feasibility, route selection and preliminary design. The current assessment considers the value of Travel Time Savings and Vehicle Operating Costs. An additional assessment of Road Safety Benefits has also been made, based on experience of the impact of similar schemes in reducing road accidents.

A the end of every SATURN Model run, the traffic model generates a set of global statistics which are useful Key Performance Indicators (KPI's) for comparison at the strategic level. The principal statistics are:

- PCU-Hours – Is a measure of the total travel time (by all vehicles) across the network during the modelled period. The lower this number, the lower the relative vehicular delay across the full network. and
- PCU-Km – Is a measure of the total travel distance travelled (by all vehicles) across the network during the modelled period. The lower this number, the more direct is the routeing of traffic across the full network.

Together, these KPI's provide a good indication of the relative network performance for the options tested. A comparison of Network KPI's is provided below in Table 7-2.

Table 7-2 shows that implementation of the Leinster Orbital Route will lead to a network reduction in journey times. Although some limited increases in journey kilometres is evident, this is typical for a new scheme, where road users divert to take advantage of the new road capacity.

Table 7-2 Comparative Key Performance Indicators

Scheme	PCU Hours/Hour	PCU Km/Hour
Without DOOR	*241,738*	*7,631,287*
With DOOR	**239,284**	**7,671,137**

The above values have been monetised using the parameters set out in the NRA Guidelines for Cost Benefit Analysis, and following the principles of the Draft Transport Project Appraisal Manual, and such benefits compared against the mid-range cost

estimate for the scheme.

The Outturn Feasibility Cost Estimate for the scheme is in the range €1.4 to €2.2 billion inclusive of VAT, assuming an opening year of 2016. Based on a midpoint cost estimate, this equates to a Present Value of Costs of some €768m (excluding VAT) in 2006 prices.

The assessment assumes an opening year of 2016, with subsequent benefits accruing over a 30 year period in accordance with the current guidelines. This process is not intended to provide a definitive valuation of the return on the Route, but instead can provide an indicative estimate of the scale of return on the investment. Results are outlined below in Table 7-3.

Table 7-3 Economic Assessment of User Benefits (2002 Prices and Values)

Scheme	Net Present Value (€m)	Benefit Cost Ratio (Ratio)
Leinster Orbital Route	€535m	2.0

The scheme therefore provides benefits in excess of costs of some €535m in net present value terms, thereby providing a robust economic rate of return. The Benefit Cost Ratio for the project is expected to be approximately 2.0. It is noted that this figure does not capture the broader regional economic and social benefits described in the above paragraphs, but it does include an allowance for the road safety benefits that will accrue as a result of the scheme.

Other Economic Benefits

A significant economic impact not captured through the analysis of user benefits is the contribution that the Route could make to attracting inward investment to the Hinterland. As indicated above, the Route will tend to widen both product and labour markets. This makes the Hinterland more attractive for foreign industry and improves the capacity of IDA Ireland to market the area to potential inward investors.

7.3.3 Environmental Impacts

The environmental impacts of road schemes include the following elements:

- Air quality;
- Cultural heritage;
- Biodiversity;
- Noise and vibration;
- Landscape and visual quality;
- Land use; and
- Water resources.

Air Quality

With regard to air quality, there is a need to distinguish between CO_2 and non CO_2 emissions. CO_2 emissions are directly related to road vehicle fuel consumption. The Route shows a reduction in fuel consumption, although the change in fuel consumption is

slight. With regard to non-CO_2 emissions, the situation is more complex. Traffic on high capacity roads tend to operate more efficiently, thus reducing emissions. Moreover, where development close to a high capacity road is controlled, the population affected tends to be low. As a result, the monetary cost of emissions per vehicle mile can be up to one third lower for high capacity roads than for ordinary two lane rural roads.

The Leinster Orbital Route results in the consolidation of traffic onto high capacity road networks. It is likely, therefore, to give rise to a reduction in non-CO_2 emissions. Such emissions include Carbon Monoxide, NO_X emissions and other harmful particulates which can be linked directly to respiratory and other health problems. Detailed assessment of these impacts must await detailed design.

Cultural Heritage and Biodiversity

The Route passes though an area of Meath that holds numerous man made and natural attractions. There are major constraints along the River Boyne valley between Drogheda, Navan and Trim. Parts of the valley are designated a UNESCO World Heritage Site because of the number of megalithic remains at Newgrange, Knowth and Dowth. In addition, the river valley is a designated special area of conservation and in terms of landscape is considered to be that of outstanding beauty. The Route Corridor runs well south of the valley, thus avoiding negative impacts on this key heritage area. However, careful planning of the Route will be required as it runs close to the Tara area and over the River Boyne.

A number of National Heritage Areas (NHA) can be found between Trim and Enfield. Again South of Enfield, and at Prosperous the Route finds itself passing a number of Special Areas of Conservation (SAC) and NHAs. South of Prosperous, the Grand Canal crosses the Route, while further south is the nature reserve Pollardstown Fen.

Other Impacts

Of the other environmental impacts, analysis of the effects of the Route on noise, landscape and visual quality, land use and water resources must await detailed road design and development of measures to mitigate any such effects. With regard to cultural heritage and biodiversity, the Route was designed so as to avoid Special Areas of Conservation, Natural Heritage Areas, Cultural and Archaeological Reserves.

Based on a consideration of environmental constraints, the Route has been designed to avoid major negative environmental impacts. Nevertheless, careful planning of the Route and appropriate mitigation measures will be required to ensure that environmental impacts are avoided. However, it is clear that there are no major environmental concerns that would rule out this route alignment at this stage in the analysis.

7.3.4 Road Safety

The Route should produce positive safety benefits. Because it will be constructed to a high capacity and standard, road accident rates will tend to be lower than regional and county roads from which traffic will transfer.

The assessment of Road Safety benefits was based on the discussion of Traffic Impacts and how traffic has been drawn onto the new scheme. The Route, to a large extent, attracts traffic from National Secondary and Regional Roads. A motorway would as a

general rule provide a better and safer alignment than National Secondary and Regional Roads, in particular those Roads currently providing the N3 to N4 to N7 connections. As such, the road provides a higher standard of safety, and the road safety benefits are therefore expected to be positive.

7.3.5 Accessibility and Social Inclusion

This criterion focuses on the impact of a project on vulnerable groups and deprived geographic areas. It is much more likely to be significant in urban areas, where transport improvements may have substantial impacts on local deprived communities. Government has two programmes in place to address deprivation on an area basis. The CLÁR programme is a targeted investment programme in rural areas. RAPID is its urban equivalent.

The CLÁR areas in the immediate study area are outlined below, and both of which are outside the sphere of influence of the Route.

- An area in Meath to the west of Kells; and
- An area in Laois to the east of Portlaoise.

With regard to RAPID, it is divided into two strands. Within the urban strand, the only relevant location is Drogheda. Within the provincial towns strand, Navan is the only relevant town.

On the basis of the above analysis, it is considered that the Route will have a positive but small impact on social inclusion, in that it serves the Rapid areas of Navan and Drogheda.

7.3.6 Conclusions of Scheme Assessment

The Route links development centres with an aggregate predicted 2025 population of 172,000. It has strong potential to strengthen the economy of the Hinterland as it links Drogheda, Navan, and Trim with the Primary Dynamic Cluster of Naas–Newbridge.

Because the Route strengthens the links between the development centres, firms locating in them will have access to larger labour markets and a larger range of business services and sub-suppliers.

The Route will strengthen the links between the development centres and firms locating in them will have access to larger labour markets and a larger range of business services and sub-suppliers. The Route should thus encourage the growth of firms in the Development Centres of the Dublin Hinterland. This will make jobs available for residents of these towns. The ensuing improved settlement patterns will contribute to sustainable development**.**

Because it is situated at approximately 30 km from the Metropolitan Area throughout its length, the Route carries no risk of contributing to urban sprawl. It thus supports the consolidation of the Metropolitan area. It offers opportunities to North-South traffic for better linkages with radial routes emanating from Dublin. In particular, the Route intersects the M3, M4 and M7/N7. This then facilitates linkage of, say, Dundalk with the Gateways of Limerick, Galway, Waterford, Cork and the Midlands, without having to access the M50. The Route is thus highly compatible with the National Spatial Strategy

as it provides a relatively direct linking of the Dundalk, Midlands and Galway Gateways, as well as improved linkage between the Dundalk, Limerick, Cork and Waterford Gateways.

The Route will provide substantial route integration benefits, as it provides a non radial routing option that will benefit a range of journeys. A particularly attractive feature of the route is that like the M50, it offers opportunities for north-south traffic movements to access the key M4 and M7/N7 radial routes. In this respect, it offers substantial integration prospects as it ties into the M7/N7 close to the M9 junction and thus offers integration benefits to traffic to/from the south east.

Based on a consideration of environmental constraints, the Route has been designed to avoid major negative environmental impacts. Nevertheless, careful planning of the Route and appropriate mitigation measures will be required to ensure that environmental impacts are avoided. However, it is clear that there are no major environmental concerns that would rule out this route alignment at this stage in the analysis.

The Route, to a large extent, attracts traffic from National Secondary and Regional Roads. As such, the road safety benefits are expected to be a significant proportion of the overall scheme benefits. The scheme will also have a positive but small impact on social inclusion, in that it serves the Rapid areas of Navan and Drogheda. It provides net benefits in excess of costs of some €530m in net present value terms, thereby providing a robust economic rate of return. The Benefit Cost Ratio is expected to be approximately 2.0.

The Leinster Orbital Route corridor is therefore a balanced solution, performing well across the range of criteria. It will have a particularly strong impact on the integration criterion, while returning substantial transport user benefits. It thus has the potential to impact very positively on the GDA Hinterland economy.

8.0 Further Considerations

8.1 The Role of Public Transport

A considerable investment programme in Public Transport Infrastructure throughout the Leinster Region, and in particular the Greater Dublin Area has been outlined for the period up to 2016. The development of the public transport network has focused heavily on the development of a high quality rail network, drawing passenger traffic from the regional towns into the Dublin City Area, with strategic connectivity achieved at a number of interchange points. Whilst provision has focused heavily on radial trips to/from Dublin City, Metro West (Tallaght to Ballymun) provides orbital capacity along the M50 corridor.

The difficulty in providing public transport capacity is that it relies heavily on appropriate densities in the catchment areas, and strong desire lines for movement between relating centres of population and employment. This pattern exists between the regional towns and Dublin City as a result of the strong attraction of Dublin City, and hence there is good justification for the provision of high quality rail links. Preliminary assessment has demonstrated that there would be an extremely poor economic case for the development of an Orbital Rail Link following the proposed Leinster Orbital corridor as a result of the limited catchment through this area.

Around the Leinster Region, however, this strong pattern of movement would not exist between adjacent towns, given the relatively limited population and employment catchments they support in comparison to Dublin. As such, the development of transport links could not justifiably rely on expensive rail based systems. Instead, the development of strategic road infrastructure can be more effective in such cases in facilitating general interaction between the different towns around the area. Also, by connecting to the National Primary Routes it would facilitate improved access throughout the Country, which is an important ingredient in facilitating economic growth in these towns.

Notwithstanding this, it is recognised that new road infrastructure will in itself strengthen interaction between associated towns. As such, there is good justification for the development of an improved network of orbital bus routes connecting the regional towns together, and feeding into key locations on the National Primary Road Network. This could reduce the reliance on Dublin as a major interchange point for public transport trips within the Region. For example, public transport trips from Navan to Galway could travel to Maynooth, Enfield or Kinnegad, along an Orbital Route and connect to Inter-Urban services using the N4/M4. This would encourage the development of a number of regional transport interchanges where bus and rail services combine, leading to an overall improvement in accessibility throughout the Region.

Even still, such a network would require the development of good quality road links to support a reliable operation. The development of a Leinster Orbital Route therefore supports the development of Regional Public Transport services.

8.2 Scheme Funding

8.2.1 Introduction

With the increasing cost of providing necessary infrastructure, agencies have, in recent

years, been exploring alternative mechanisms for funding major infrastructure projects. This process has seen two key mechanisms emerge for funding the provision of infrastructure in Ireland:

- The use of Public Private Partnership (with or without Tolling); and
- The use development contributions under the Planning Acts.

8.2.2 Public Private Partnerships with Tolling

Road User tolling has existed for some time in Ireland, having been first introduced in the 1980's following construction of the East Link and West Link. The development of the Inter-Urban Routes has seen an increase in the use of tolling to fund road schemes, and brings us in line with several European Countries where tolling has become quite a common feature in the provision of road transport. Tolling can also be used as a demand management measure to discourage commuter-type urban sprawl along new roads.

In essence, tolling attempts to charge the final user for the development of any element of road infrastructure, thereby reducing the net cost to the exchequer. Typically on Irish tolled road projects, the private finance element of schemes has contributed in excess of 50% of the construction cost of a project. The remainder of the construction and other costs- in particular the land costs – have been borne by the state.

Preliminary analysis of the Leinster Orbital Route indicates that the project would be likely to represent a viable toll scheme. A full analysis of its potential for delivery through a tolling-funded arrangement would be carried out at a later development stage.

8.2.3 Public Private Partnerships without Tolling

An alternative approach to delivering Private Sector Finance into Road Schemes is the use of Public Private Partnerships without tolling. In this case, the concessionaire recoups the initial investment not through the introduction of tolls, but through alternative payment mechanisms funded by the public sector partner. Such mechanisms can include availability based payments, where the concession company is paid a fee based on maintaining the road in full use, or shadow tolling where the state pays for use of the road based on actual traffic levels.

8.2.4 Development Contributions

Under the Planning and Development Acts there are currently two methods of contributing towards the cost of public infrastructure:

- Development Contribution Schemes as outlined in Section 48 of the Panning and Development Act 2000.
- Supplementary Development Contribution Scheme as outlined in Section 49 of the Panning and Development Act 2000.

Section 48 of the Planning and Development Act, 2000, requires every local authority in the country to have adopted a Development Contribution Scheme for their administrative area by March 2004. The Development Contribution Scheme sets out the estimated costs to the local authority for the provision of 'public infrastructure and facilities' over the next five years.

Section 49 of the Planning and Development Act, 2000, allows Planning Authorities to adopt Supplementary Development Contribution Schemes, the purpose of which is to provide funding for specified 'public infrastructure projects or services'. The Supplementary Scheme differs to the Development Contribution Scheme in that it does not provide funding for all infrastructural projects across the particular local authority area, but rather a specified project.

Given the nature of the Leinster Orbital Route and its purpose, coupled with the need to manage development adjacent to junctions along the route in accordance with NRA Policy Documentation, it is unlikely that either scheme of contribution funding will have any significant applicability to the project.

8.3 Land Use Effects of New Road Infrastructure

A significant issue requiring consideration is the risk that the Leinster Orbital Route could lead to unsustainable patterns of development around the edges of the towns that it serves. Such development has in the past, typically occurred along routes in direct response to the provision of new road infrastructure, and tends to focus on development close to the key interchanges. Appropriate acknowledgement of this issue is important at this early stage of the Leinster Orbital Route Project. Indeed, this issue is core to the guidance set out in the National Roads Authority document "*Policy Statement on Development Management and Access to National Roads*", which attempts to address such risks.

Whilst the Leinster Orbital Route is provided to serve a strategic function, the provision of a high number of interchanges can lead to it becoming attractive to serve local trips between residential areas and local retail/employment centres. This can quickly lead to a situation whereby local trips represent a significant proportion of traffic using the 'Strategic Road', hence reducing the ability of the road to fulfil its strategic function. A number of initiatives are available to address such risks;

- Appropriate local planning policy which ensures that local services and the catchments they serve do not rely on the use of strategic routes for access between them;
- Restriction of the frequency of junctions along strategic routes such as to mitigate against their use for local trips. Use of strategic routes should be for movements between the different settlements along the corridor they serve;
- Demand Management along the strategic routes, to mitigate against the potential for increasing commuting distances that can result from higher average travel speeds on the network. Tolling provides one such option for effective Demand management;
- Discouraging the development of large scale retail developments that are intended to serve large catchment areas and rely on car-based access through key junctions on the National Road network; and
- Local Authorities and developers are required consult with National Roads Authority as part of the preparation of any scheme which has the potential to impact on the Leinster Orbital Route.

Such initiatives will play a key role in protecting the Leinster Orbital Route from generating unsustainable development along its corridor

Appendix A
Economic & Population Projections

Study Area and Regional Authority (NUTS3) Regions

Region	Local Authority	Within Study Area
Dublin	Dublin City	Yes
	Dun Laoghaire-Rathdown	Yes
	Fingal	Yes
	South Dublin	Yes
Mid East	Kildare	Yes
	Meath	Yes
	Wicklow	Yes
South East	Carlow	Yes
	Kilkenny	Part of
	South Tipperary	No
	Waterford City	Yes
	Waterford County	Part of
	Wexford	Yes
Midland	Laois	Part of
	Longford	Yes
	Offaly	Part of
	Westmeath	Yes
Border	Cavan	Part of
	Donegal	No
	Leitrim	No
	Louth	Yes
	Monaghan	Yes
	Sligo	No

Towns over 10,000 in 2002

Region	Towns	Population 2002
Mid East	Navan	19417
	Naas	18288
	Newbridge	16739
	Celbridge	16016
	Leixlip	15016
	Greystones	11913
	Maynooth	**10151**
	Bray	30951
Midlands	Athlone	15936
	Mulingar	15621
	Portlaoise	**12127**
	Tullamore	11098
South East	Carlow	18,487
	Wexford	17235
	Waterford	46736
	Kilkenny	20735
Border	Dundalk	32505
	Drogheda	31020
Dublin	Swords	27175
	Balbriggan	10294
Total		**397460**

Additional Towns over 10,000 by 2025

Town	2002 Population
Arklow	9993
Wicklow	9355
Skerries	9149
Enniscorthy	8964
Tramore	8305
Rush	6769
Ashbourne	6362
Athy	6049
Total	**64946**

Towns with Population over 1,500 and less than 10,000 (2025)

Trim
Kildare
Laytown etc
Dunboyne
Kells
Clane
Ratoath
Dunshaughlin
Sallins
Kilcoole
Kilcock
Monasterevin
Blessington
Rathcoole
N,townmountkennedy
Kill
Duleek
Rathangan
Enniskerry
Prosperous
Athboy
Longford
Edenderry
Portarlington
Clara
Moate
New Ross
Gorey
Tullow
Dunmore East
Muinebeag
Cavan
Monaghan
Ardee
Carrickmacross
Cootehill
Clones
Castleblaney
Baileborough

Appendix B

Existing Constraints and Route Identification