A96 CORRIDOR CAPACITY ASSESSMENT

Highland Council

Transportation Analysis

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HIGHLAND COUNCIL

A96 CORRIDOR CAPACITY ASSESSMENT

TRANSPORTATION ANALYSIS

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1 INTRODUCTION



1. Introduction

1.1. The Commission

FaberMaunsell, in conjunction with a team led by FG Burnett, were commissioned by Highland Council to prepare a masterplan for the long-term development of the A96 corridor between Inverness and Nairn. This requirement emerges from the Highland Structure Plan (approved 2001) which outlines desires for the development of 10,000 new dwellings. The emerging Inverness Local Plan and City-Vision (2003) reinforces the importance of the corridor to accommodate these dwellings through a chain of new settlements linked to business opportunities and long term land management.

FaberMaunsell are responsible for undertaking an assessment of the traffic and transport implications associated with the new development and this report will outline the key findings from the study.

1.2. Structure of Report

Following this introductory chapter, the main report is divided into a number of chapters, as follows:

- Chapter Two – Policy Context;
- Chapter Three – Review of Existing Transport Provision;
- Chapter Four – Capacity Assessment
- Chapter Five – Preferred Transport Option;
- Chapter Six – Testing of Stakeholder and Technical Options
- Chapter Seven - Conclusions and Recommendations.

2 POLICY CONTEXT



2. Policy Context

2.1. Introduction

This Chapter will provide a brief overview of the national and local policy guidance relating to this study. This includes a review of Scottish Executive guidance, together with the Highlands and Islands Local Transport Strategy, Inverness Local Plan, and Highland Structure Plan.

2.2. National Planning and Policy Framework

The national policy framework for transport is set out in the White Paper, Travel Choices for Scotland (TSO, 1998); Scotland's Transport – Delivering Improvements (Scottish Executive, 2002); and more specifically in relation to planning and transport, in the Planning Advice Note 57 Transport and Planning, and in the National Planning Policy Guideline 17 (NPPG17) and emerging Scottish Planning Policy 17 (SPP17).

The national policy framework for housing is set out within Scottish Planning Policy 'Planning for Housing' (SPP3) and Planning Advice Note 67 Housing Quality.

The overarching transport and planning policy for Scotland is highlighted in the policy papers outlined below, together with the key policies relating to housing.

2.2.1. Transport White Paper - Travel Choices for Scotland

Published in July 1998, the Transport White Paper is the framework within which the Government aims to develop a transport system which recognises that:

"A sustainable environment requires, above all, an effective and integrated transport policy at UK, Scottish and local level that will provide genuine choice to meet people's transport needs."

The Government's transport policies seek to achieve improved integration:

- Within and between different modes of transport, to promote genuine choice, so that each mode contributes its full potential and people can move easily between different modes;
- With environmental aims and policies, so that transport choices do not conflict with the achievement of environmental objectives;
- With land use planning at national, regional and local level, so that the two work together to reduce the need to travel and support more sustainable regional travel choices;
- With Government policies on education, health, economic growth and the objective of a fairer, more inclusive society."

The White Paper states the development of a sustainable transport system can contribute to meeting economic, environmental and social inclusion goals, but in doing so a number of issues need to be addressed:

- Rising traffic levels, but there is a recognition that simply providing more roads is not a viable solution to congestion problems;
- Key blockages on the trunk road network that have negative economic impacts;
- Traffic related local air pollution; and
- The need for the transport network to counter social exclusion.

2.2.2. National Planning Policy Guideline NPPG17 / Scottish Planning Policy SPP17 - Transport and Planning

The aim of this planning guidance is to develop the integrated land use and transport planning elements proposed in the White Paper policy package.

On the whole, the guidelines are primarily concerned with how new developments can support a sustainable transport system.
Within both NPPG17 and the emerging SPP17, land use planning is stated as an important tool in:

- Reducing the need for travel by relating land use to transport facilities;
- Enabling access to local facilities by walking and cycling;
- Encouraging public transport access to developments; and
- Supporting essential motorised travel.

NPPG17 and the emerging SPP17 suggest that access to employment and facilities across the wider urban area should be a prime consideration. Accessibility of new developments is an important issue, and one that has historically been difficult to measure definitively.

It is recognised that the following are key considerations for development plans:

- To locate and integrate new development, including development of new settlements and expansion of existing built-up areas for housing, with existing or planned transport infrastructure, particularly for walking cycling and public transport, and with provision of public transport services;
- To plan development to bring together related land-uses which can benefit from being accessible to one another, and thereby reduce the length of journeys and the need for multiple journeys; and
- To establish green networks, protect and enhance green spaces and footpath provision in and around towns and cities, to provide high quality opportunities for informal recreation locally, without the need to travel by car.

2.2.3. SPP3 – Planning for Housing

The following extracts highlight relevant issues within Scottish Planning Policy 'Planning for Housing' (SPP3) issued by the Scottish Executive in February 2003.

In transport terms, the overall aim of SPP3 is to guide new housing developments to the right places by ensuring new developments are easily accessible by public transport and well integrated into walking and cycling networks. Extensions to cities, towns and villages or new settlements should be developed in a sustainable way. Key policies from SPP3 are provided below.

Design, Layout and Architecture

Paragraph 7
"…The overall design of development should be fully addressed, particularly matters such as microclimate; layout of roads, cycle routes and footpaths; the separation and collection of waste; links with local centres; and the relationship to existing development nearby."

Form of Development

Paragraph 14
"Good layout is at the heart of making residential environments safe and welcoming, and in helping people to find their way around. Pedestrian activity in a residential area adds vitality and increases the feeling of personal safety. Too many developments in recent years have given priority to car travel, both between the housing and other facilities, and within the development itself, and layouts have been dominated by access roads and parking areas. This disadvantages pedestrians, the disabled, and cyclists, and increases dependence on cars. NPPG17 highlights the importance of attractive walking environments, and sets out principles for development layout."

Paragraph 15
"Roads standards should serve as a guide and starting point, but should not deprive developers and planning authorities of the flexibility to be innovative in promoting a high standard of urban design, and increasing the attractiveness of walking and cycling. Masterplans for larger scale housing developments must take account of the existing urban fabric and layout of streets, and aim to add to and enhance connections. There is great potential to create pedestrian links between new developments and surrounding urban areas, providing safer routes to schools and other facilities, and improving security and surveillance. Larger developments should anticipate and provide for access by public transport. Where good access to public transport exists or can be provided, planning authorities may set lower maximum parking standards."

Paragraph 35
"The planning of new residential development offers opportunities for reducing travel demand. To contribute to the reduction of greenhouse gas emissions, the Scottish Executive is committed to the effective integration of land use and transport. Patterns of development should seek to reduce the demand for travel and reliance on the private car, and help to reduce general energy consumption."

Paragraph 36
"Access to jobs and facilities should be carefully considered by both planning authorities and developers. In planning the expansion of existing settlements or the development of new ones, preference should be given to locations which can be well integrated with existing and proposed public transport, walking and cycling networks. Such locations should be developed at higher densities. At central locations, integrating housing with commercial, community and leisure uses in mixed developments can give good access to jobs and a wide range of services."

Paragraph 37
"Where there is a supply of previously developed land, planning authorities should normally give priority to its reuse, in preference to Greenfield development. However, in seeking to locate new housing where it will be accessible by a range of forms of transport, planning authorities may conclude that the release of certain areas of Greenfield land would result in a more sustainable pattern of development."

2.2.4 PAN 67 – Housing Quality

The following extracts highlight relevant issues within Planning Advice Note 'Housing Quality' (PAN67) issued by the Scottish Executive in February 2003.

"New developments too often fail to create successful streets. The accessibility of many new developments depends too much on the car, and the car is often too dominant in the streetscape. Inadequate attention is given to separate and attractive pedestrian routes and links."

"The design of a successful place will begin with understanding how new housing can be connected to the movement patterns (street and routes) and settlement patterns (street blocks and layouts) of an area."

"Vehicle and pedestrian routes should connect the housing with facilities and spaces within the development, to the local area and more widely."

Issues that should be considered when looking at the accessibility and traffic management of housing areas include:

- Buildings whose access is from the street;
- Routes connected to existing routes and patterns of movement;
- Well connected or have the potential to be well connected to public transport;
- Pedestrian and cycle routes, which may be streets with vehicular traffic, that are continuous and connected, with no dead ends;
- Routes which are safe and convenient for people with limited mobility;
- Parking provision that does not overwhelm the development's visual appearance; and
- Traffic managed so that the road requirements do not detract from the quality of the development, and with roads designed to control traffic speeds without the need for traffic-calming devices such as speed humps and chicanes.

2.3. Local Planning and Policy Framework

This section examines the planning and policy framework for the study area in relation to transport and new development, in the local context. The local context is set out within Highland Council's Local Transport Strategy, the Highlands and Islands Structure Plan and the Inverness Local Plan. A brief summary of the key objectives arising from these documents is provided below.

2.3.1. Local Transport Strategy

The Highland Council Local Transport Strategy (LTS), produced in October 2000, incorporates the principles contained within National Policy document "Travel Choices for Scotland". Within the LTS, Highland Council have set out plans and priorities for the development of an integrated transport policy.

The following are of particular relevance to this commission:

- Reduce the number of accidents and improve safety on the road network;
- Make the best of existing roads for all users;
- Restrain the demand for travel by private cars for commuting, particularly at peak hours, and provide alternatives to enable this;
- Encourage responsible car usage and promote the alternatives of public transport, walking and cycling;
- Work with operators to provide a high quality integrated public transport network appropriate to the needs of communities;
- Support Community Transport projects;
- Improve the road network to support sustainable economic and social development;
- Improve the infrastructure on the road network to assist public transport services and users;
- Promote the provision for public transport, cycling and walking in all new developments; and
- Provide for the needs of people with disabilities.

2.3.2. Structure Plan

The Highland Structure Plan (2001) vision is founded on three interdependent principles of sustainable development, as follows:

- Supporting the viability of communities;
- Developing a prosperous and vibrant local economy; and
- Safeguarding and enhancing the natural and built environment.

The realisation of the Structure Plan's vision has resulted in the development of fifteen key objectives, of which the following are of particular relevance to this commission:

- The effectiveness and efficiency of infrastructure provision;

- Accessibility to housing;
- Accessibility to community facilities and services;
- Accessibility to education and training; and
- The quality of air, water and land.

The Structure Plan outlines desires for the establishment of comprehensively planned new settlements to meet future housing demand in the Inner Moray Firth area. This includes the development of 10,000 new dwellings along the A96 between Inverness and Nairn, by 2017. Development in this area will enable new housing developments to be linked to employment opportunities associated with the Airport and rail link to Inverness and Nairn.

2.3.3. Local Plan

The most recent version of the Inverness Local Plan was published in April 2003. This was open for consultation and a public inquiry was held which ended in June 2004. The plan will be modified and adopted by the Council later this year.

This Local Plan has been prepared for the Inverness Area. It will eventually replace four existing Plans:

- Beauly and District (adopted 1988);
- Drumnadrochit and Fort Augustus (adopted 1991);
- Inverness, Culloden and Ardersier (adopted 1994); and
- Strathdearn, Strathnairn and Loch Ness East(adopted 1997).

Further to the Council's review of Ward Boundaries in 1999, it also replaces parts of the Nairnshire Local Plan (adopted 2000) in respect of land in the vicinity of Croy and Clephanton; and parts of the Mid Ross Local Plan (adopted 1990) in respect of land in the vicinity of Dunmore to the north west of Beauly.

The Local Plan sets out its purpose as:

- Contribute to the wider corporate and public vision for the Area - taking forward the Community Plan and providing a basis for partnership working and securing resources, including European funds;
- Identify the most appropriate uses for land in the Area - allocating sites for redevelopment or new building for housing, business and other activities, together with policies to protect public amenity and heritage features;
- Provide co-ordination between the infrastructure, development and conservation programmes of public Agencies and voluntary groups, with the aspirations of the private sector; and
- Ensure effective participation by everyone with a legitimate stake in the Area's future, and in particular to enable local people to influence the planning of their own communities.

The Local Plan outlines the Council's strategy for the A96 corridor, "Very significant long term development potential is locked up in the narrow corridor of land which straddles the trunk road and railway through to Nairn, as recognised in the approved Structure Plan – a 'place in waiting'". The Plan states that early priority must be given to a major economic initiative utilising the transport of this zone as a counter to the major job losses at Ardersier and to help restructure the employment base.

Development will see early focus at the Airport and adjoining lands. These will include an air/rail/road distribution freight village and a major business park. Priority is also being given to re-using the large scale 'brownfield' construction site at Ardersier and expansion/diversification of established process industry at Morayhill.

The Local plan states that beyond 2011 new forms of urban growth will be at the heart of the region. Land adjoining Inverness to the south and west is constrained by altitude, access and heritage factors. Large scale reclamation of the Firths to the north is prohibited by international conservation designations. The Council state their aim for new sustainable communities designed for 3- 5,000 persons each, with a walkable radius of 500m and core facilities up to primary school level. Their high density residential cores would focus on bus/rail halts and taper to larger family houses and small-holdings around the settlement edges.

The coastal strip between Inverness and Nairn contains extensive flat land, communications and a fine environment. The Council feel new planned settlement structures extending in this direction would locate close to emerging employment nodes, transport opportunities and service networks. Dualling and realignment of the A96 including provision for cyclists, together with the extension of a separate local distributor/bus/cycle route taken eastwards from Balloch to service new developments would complete this transport 'triple helix'. The council recognise the strategic importance of the A96 corridor to Inverness and the region as a whole fully recognise and wish to protect against premature "piecemeal building".

The Local Plan states the wish for the adaptation of Inner Moray Firth rail network for increased passenger and freight use. A mainline halt and road-rail-air interchange can be developed at the Airport to connect with Inverness-Aberdeen and Inner Moray Firth services, buses and flights.

The Council wish to construct a 'green' framework for future development on the A96 corridor which will outline the need for retained farms, woodland and new structural forest areas should coincide with wildlife conservation corridors, sustainable drainage networks and connecting cycle/bridle/footpaths.

The Local Plan builds upon the council's polices, setting out specific development opportunities which are consistent with these policies. These developments are discussed in Section 3.3.

2.4. Summary

This Chapter has provided a brief overview of the national and local transport policy context and key issues pertaining to transport, accessibility and housing. Key themes emerging for the study area relate to the requirement to promote sustainable transport and enhance accessibility to support a strong regional centre.

The following Chapter will provide an overview of the existing situation with respect to transport provision and land use developments along the A96 corridor between Inverness and Nairn.

3 EXISTING SITUATION



3. Existing Situation

3.1. Introduction

This Chapter will provide a broad overview of the existing transport situation. This will include the road network, cycle network, and public transport provision and infrastructure.

A brief review of existing and proposed / desired developments within the study area will also be provided.

3.2. Road Network

3.2.1. Background

Table 3.1 Existing A96 Traffic Levels

ATC Number	Location	24 hour (AADT)	AM Peak (8.00- 9.00)			PM Peak (17.00-18.00)		
			East	West	E/W (%)	East	West	E/W (%)
ATC01062	Nairn – Delnies*	13239	299	464	39/61	686	497	58/42
ATC01064	Gollanfield - Newton of Petty	11764	281	524	35/65	620	402	61/39
ATC01067	Newton of Petty to Balloch	16215	400	567	41/59	694	590	54/46
ATC01066	Balloch - Smithton	15467	371	588	39/61	687	458	60/40
ATC01065	Smithton - West Seafield	26681	546	1157	32/68	1292	829	61/39
ATCNE011	West Seafield – Raigmore*	32488	661	1113	37/63	1559	1177	57/43

Note: Data received from the Scottish Executive.
* There were apparent anomalies in flow direction at these sites, with the source data reversed from that shown above. We have interpreted data to remove these anomalies based on-our site observations.

Appendix A Figures 1 to 4 show existing traffic levels.

On the eastern edges of Inverness, existing traffic count data indicates peak hour traffic flows of 1,559 vehicles (0800-0900 hours) travelling westwards along the A96 corridor towards Inverness and 1,113 vehicles (1700-1800 hours) travelling eastwards along the A96 corridor from Inverness.

On the western edges of Nairn, existing traffic count data indicates peak hour traffic flows of 464 (0800-0900 hours) on the A96 travelling eastwards to Nairn and 686 (1700-1800 hours) on the A96 travelling westwards from Nairn.

The east to west flow ratio statistics (shown in Table 3.1) consistently shows that in the AM peak approximately 60% of traffic is travelling west and 40% east.

A number of local roads provide tributaries to the A96, including:

- B9092 Ardersier to Nairn;
- B9091 Croy to Nairn;
- B9006 A9 to Ardersier;
- B851 A9 to Newlands / Culloden Muir;
- B9090 Brackley to Auldearn;
- B9109; and
- B9039 Newton to Ardersier.

Table 3.2 shows existing traffic levels on local roads.

Table 3.2 Existing Traffic Levels on Local Roads

Location	Approx. 24 hour Two Directional Flow
Delinies (B9092)	700
Brackley North (B9006)	900
Brackley South (B9090)	500
Newton (B9039)	4500
Allanfearn	6000
Smithton	10800
Retail Park	21500

3.2.2. Future Development

There are current proposals for a £10 million southern distributor road linking the A9 and A82 to complete the trunk road network around Inverness. It is forecast that 15% from the A82 of traffic will by-pass Inverness town centre.

In addition, there is a current application for a £8 million cross rail link in Inverness to improve traffic management and allow for more pedestrianisation in the city centre. The link will take traffic by dual carriageway between the Inner Relief Road at Longman Road and Millburn Road.

3.2.3. Constraints

There are a number of key difficulties experienced on the A96 between Raigmore and Nairn, including:

- The mix of vehicles using the A96, and prevalence of tourists, farm vehicles and HGVs, can result in slow moving traffic.
- Overtaking can be difficult due to the single carriageway nature of the majority of the A96 and absence of long and straight sections of road. Particular problems occur when slow vehicles such as tractors use the road, resulting in queuing traffic.
- The merging of dual carriageway to single carriageway to the east of the Raigmore Interchange (eastbound) increases the accident risk.
- Congestion at the A96 / A9 junction at Raigmore Interchange presents difficulties during the AM and PM peak periods.

In addition, Nairn suffers from congestion and has many tight, narrow roads which are not designed to accommodate large volumes of traffic. The mini-roundabout on the A96 in Nairn is unlikely to operate satisfactorily with additional traffic pressures. Discussions between Highland Council and the Scottish Executive are currently ongoing regarding the potential to construct a Nairn By-Pass.

3.2.4. Accident Statistics

Accident statistics for the A96 Inverness to Nairn and the Raigmore Roundabout between January 1999 to June 2004 are displayed in Tables 3.3 and 3.4.

Table 3.3: Accident Statistics A96 Inverness – Nairn (January 1999 – June 2004)

Year	Fatal	Serious	Slight	Total
1999	0	7	9	**16**
2000	1	5	13	**19**
2001	1	4	16	**21**
2002	0	4	12	**16**
2003	1	2	16	**19**
2004	1	0	7	**8**
Total	**4**	**22**	**73**	**99**

Table 3.4: Accident Statistics A9/A96 Raigmore Roundabout (January 1999 – June 2004)

Year	Fatal	Serious	Slight	Total
1999	0	0	2	**2**
2000	0	0	4	**4**
2001	0	0	2	**2**
2002	0	0	2	**2**
2003	0	1	5	**6**
2004	0	0	1	**1**
Total	**0**	**1**	**16**	**17**

Current accident statistics from Table 3.3 show that in total 99 personal injury accidents (PIA) occurred in the last 5 years on the A96 between Inverness and Nairn. The accident rate per million vehicle kilometres for this section of road can be calculated, and is 0.152. Reference to DMRB Volume 15, Section 1, Part 6, Chapter 5, table 6.5.2, reveals that the average accident rate per million vehicle kilometres for a typical rural single carriageway road with a lane width of 10m is 0.212. Therefore this section of the A96 has a lower than average accident rate.

3.2.5. Park and Ride

There are no formal Park and Ride facilities on the A96 corridor, however Park and Ride sites are proposed for Seafield and Nairn.

3.3. Cycle Network

National Cycle Route One passes through a section of the study area. Within the study area, this route forms a link from Beechwood at the Inverness city boundary, eastwards to cross the A9 and pass through Culloden and Balloch to Cumberland's Stone off the B851 where it then leaves the study area. That section of route between Inverness and Culloden is a traffic-free route and that section east of Culloden is an on-road route. No future National Cycle Routes are proposed in study area.

The existing east-west route does not facilitate effective connection between the main settlements and key destinations, such as the airport, and the business and retail park. There are also no specific cycling facilities associated with the A96 between Inverness and Nairn.

3.4. Rail

The study area is located between Nairn and Inverness. Services are currently operated by National Express through the ScotRail franchise. However from 17 October 2004 First Group will take over this franchise, and some of the service details described below may be subject to change (although it is noted that within the existing infrastructure, there is little opportunity to radically alter service provision).

3.4.1. Current Service Patterns

The rail service in this area is essentially inter-urban providing a city to city service between Aberdeen and Inverness. Existing rail stations associated with the study area are located within Inverness town centre and to the south of Nairn town centre. Other stations on the route are Forres, Elgin, Keith, Huntly, Insch, Inverurie, Dyce and Aberdeen. Within the study area, the predominant trip destination/origin is Inverness. The total number trips to/from Inverness and the other stations on the line are shown in table 3.5. This demonstrates the importance of the end-to-end trips, but also the use of Elgin, Forres and Nairn as commuting stations. Other data shows that the total usage of Nairn rail station in 2003/04 was 77,569 passenger journeys.

Table 3.5 – Passenger Journeys to/from Inverness

Station	Passenger Journeys 2003/04
Nairn	50,578
Forres	36,348
Elgin	50,123
Keith	4,802
Huntly	3,240
Insch	1,593
Inverurie	7,470
Dyce	18,514
Aberdeen	94,317

Source: ScotRail CAPRI data

Currently, Monday to Friday, there are ten full workings arriving and departing from Inverness. These are supplemented by one short working to and from Elgin each day. Whilst the services are typically each hour, they are not at regular times, due to the limitations of the track capacity. Table 3.6 shows the typical current timetable for Monday to Saturday. On Sundays there are five services between Aberdeen and Inverness, operating between 1000 and 2100. Additionally, there are two short workings from Inverness to Elgin.

Table 3.6 – Current Timetable to/from Inverness and Nairn

Aberdeen	-	0625	0728	0925	1140	1312	1523	1714	1819	2006	2155
Elgin	0658	0756	0858	1057	1304	1440	1656	1851	1945	2136	2320
Nairn	0723	0821	0927	1128	1330	1506	1730	1916	2014	2207	2346
Inverness	0741	0839	0945	1146	1348	1523	1748	1934	2032	2225	0005
Inverness	0500	0557	0842	1044	1219	1357	1525	1712	1808	1955	2122
Nairn	0517	0614	0859	1101	1236	1414	1542	1729	1825	2013	2139
Elgin	0543	0641	0910	1132	1305	1442	1608	1755	1854	2040	2208
Aberdeen	0714	0814	1053	1259	1432	1611	1736	1928	2029	-	2338

Source: ScotRail Timetable

The services are broadly two-hourly. There are only two suitable arrivals into Inverness suitable for commuters, and only two suitable departures. On this line, rail travel times are on a par with journeys by car. The journey time from Aberdeen to Inverness is approximately 2 hours 15 minutes, and the journey time for that section of the route between Nairn and Inverness is approximately 18 minutes. First class carriages and catering services are available on the majority of services.

The majority of these services are operated by Class 158 2-car diesel multiple units. However, where there is a requirement to increase capacity for commuter services, or when the train is used as a

through-service to or from Edinburgh or Glasgow alternative formations are used. The 06.25, and the 21.55 departing Aberdeen are both formed from 3 car Class 170 Turbostar trains, and the 15.23 and the 17.14 departing from Aberdeen are typically formed from 2 x 2 car Class 158 units. From Inverness, the 05.00 is formed from a class 170 Turbostar train. The 05.57 from Inverness is formed from a class 170 Turbostar joined to a Class 158 unit.

A survey of train passengers travelling to, from or within the Highlands and Islands was undertaken by Steer Davies Gleave in August / September 2003. Results of this research established that the journey purposes of passengers on the Aberdeen – Inverness line were as follows:

- Visiting friends and family 24%
- Employers Business 21%
- Commuting 19%
- Holiday 10%
- Shopping 10%
- Leisure 6%
- Other 4%
- Personal Business 3%
- Short break 1%

Currently, no freight is carried on the line between Inverness and Nairn. The nearest rail freight facilities are at Elgin and at Inverness. However, a luxury tourist train, "The Royal Scotsman" reserves several train paths per week on the line.

3.4.2. Constraints

The majority of the railway is single track with passing loops, and as such, track occupancy is at a premium. This has constrained the development of more frequent commuter services serving Inverness, and has also constrained the development of additional stations – due to the impact additional stops have on increasing journey times, and increasing track occupancy.

The long signalling blocks on the line, and limited "run-round" opportunities have also constrained the development of freight facilities on the line. Due to capacity constraints, this has favoured the strategic promotion of Inverness as a single regional focus for rail freight.

3.4.3. Future Developments

A review of policy documents, and discussions with the Highland Rail Development Partnership and Highlands and Islands Enterprise have identified the following proposals and aspirations for the railway.

Increased Operational Flexibility Improvements

A package of improvements has been identified for the railway in order to provide increased operational flexibility improvements. These improvements have been formally recognised in SRA's Incremental Output Statement (IOS). The scheme includes:

- Passing loop at Orton;
- Passing loop at Forres Station;
- Improvements to Forres Station; and
- Other Line Speed Improvements.

The Inverness to Aberdeen improvements have been subject to a number of recent studies, and are the most advanced of all of the aspirations identified. Ongoing work is currently being progressed by the rail industry, in partnership with the Scottish Executive, and the voluntary regional transport partnerships of HITRANS and NESTRANS. Network Rail has undertaken a level 4 costing for the scheme. The Minutes of the Highland Rail Development Partnership (07/10/03) noted that the costs of the proposed improvements totalled £42.2 million.

NESTRANS, HITRANS, in partnership with the Scottish Executive and the SRA have subsequently appointed consultants to develop an Outline Business Case for the improvements. This is due to be reported to the project partners in 2004. When the Outline Business Case report is completed, the findings will then be considered by both the Scottish Executive and the SRA.

The scheme will provide options to facilitate increased timetabling flexibility on the route; in turn this will allow the development of the Aberdeen CrossRail proposal which relies upon timetable co-ordination with the Aberdeen to Glasgow and Edinburgh services.

New Station at Dalcross

The development of a new rail station at Dalcross, has also been proposed in order to provide a rail connection for Inverness Airport. This would complement a proposal for a freight facility and business park at the airport. Whilst this scheme is included within Highland Council's Development Plan, firm proposals have yet to be drawn up for its development. Discussions with Highlands and Islands

Enterprise confirmed that in the medium to long term this would be a strategically attractive proposal, particularly as part of the business park and freight development. However, it was viewed that at the current time several factors mitigate against its early realisation. Principally, these include:

- relatively low levels of demand to and from the airport within current levels of airport operation;
- the current difficulty in achieving a sufficiently frequent rail service to provide travel times which are more convenient than alternative modes.

Due to current operational constraints, the additional time required to service the rail halt would consume some of the operational benefits achieved through the proposed IOS scheme.

Additional Local Rail Halts

Highland Council, within their Local Transport Strategy, their Structure Plan, and the Nairnshire Local Plan state a desire for improved local rail services between Nairn and Inverness, including additional rail halts.

The IOS scheme could potentially benefit local services (based on the existing stopping pattern) by increasing frequency and reducing journey times. However, the provision of additional train halts between Nairn and Inverness would dilute the aims of the IOS scheme, by increasing journey times, and using up any additional capacity generated. The feasibility of a separate local stopping service, in addition to the Inverness to Aberdeen service has not been studied. Such an improvement would form a medium to long-term aspiration, due to the anticipated additional capital investment and revenue support that would be required.

3.5. Bus

Within the study area, there are a mixture of bus services that operate. These range from express coach services operating to the central belt; longer distance regional coach services linking Inverness with Aberdeen along the A96 corridor; and lastly, more numerous local suburban services.

The express coach services are operated by Citylink on an hourly basis along the A9, but do not particularly provide any local connections within the study area.

Stagecoach operate longer distance regional services along the A96, including the number 10 service between Inverness, Nairn, Elgin and Aberdeen, and the number 315 service between Inverness, Nairn, Elgin and Buckie. In combination, these services provide a 2 per hour daytime frequency.

Rapsons and Stagecoach provide the majority of the local suburban services, many of which are supported for at least part of their timetable by Highland Council. The most frequent services are described below.

A number of services linking Inverness with the villages of Westhill, Culloden, and Balloch. Services 1/1A and 2 are operated by Stagecoach, and link the city centre to the Inverness Retail Park, Smithton, Culloden and Balloch on a 20min daytime frequency. Evening and Sunday services on this route are operated by Rapsons coaches as services 1C and 1D.

Stagecoach also operate the number 3 service, which is a 10 minute frequency link between the town centre, Raigmore Hospital, Westhill and Culloden.

Service 7 is operated by Rapsons Coaches, running on a daytime hourly frequency between the city centre, Raigmore Hospital, Inshes Retail Park, Culloden Battlefield, Croy, Cawdor and Piperhill. Rapson's also operate a daytime service, number 12, on a two-hourly frequency between the Inverness, Inverness Retail Park, then direct to Balloch, Sunnyside and Croy. Service number 28, also operated by Rapsons, is a circular service running between the city centre, Inshes and Westhill on a 30 minute frequency.

Finally, Service 11, operated by Rapsons, links Inverness, Inverness Retail Park, Inverness Airport, Ardersier and Fort George. A forty-minute day-time service is provided.

Altogether, the combination of services provided by the operators provides frequent services along the A96, and from the villages of Westhill, Culloden and Balloch. Less frequent services are provided to the airport and Ardersier. Finally, the more remote villages in the study area, such as Cawdor and Croy rely on public transport connections with relatively low frequencies.

Table 3.5 – Main Bus Services Within the Study Area

Operator	Service No.	Route	Weekday				Saturday				Sunday			
			Frequency Day	Frequency Evening	First Service	Last Service	Frequency Day	Frequency Evening	First Service	Last Service	Frequency Day	Frequency Evening	First Service	Last Service
Stagecoach	757	Elgin, Forres, Nairn, Inverness Airport, Inverness	2 per day	none	I=0925 N= A=1053	D=1125 A=1323	None	none	none	none	none	none	none	none
Stagecoach	1, 1A, 2, 2A	Inverness, Retail Park, Smithton, Culloden, Balloch	Every 20 mins	none	0635	1820	Every 20 mins	none	0635	1818	none	none	none	none
Stagecoach	3, 3A, 3B, 3C	Inverness, Raigmore Hospital, Westhill, Smithton, Culloden	Every 10 minutes	Hourly	0630	2358	Every 10 mins	hourly	0630	2358	none	none	none	none
Stagecoach	10, 315	Inverness (Tesco superstore, Balloch, Tornagrain) Nairn, Forres, Elgin, Huntly, Aberdeen,	Every 30-40 mins	Hourly	I=0615 N=0643 A=0954	I=2053 N=2053 A=N/A	Every 25 and 35	hourly	I=0615 N=0643 A=0952	I=2245 N=2313 A=N/A	Hourly	3 per night	I=0915 N=0941 A=1252	I=2115 N=2141 A=N/A
Rapsons	Airport 11	Inverness, Inverness retail park, Culloden Barn Chruch Road, Airport, Ardersier, Gollanfield Cross Roads, Ardersier Bus truning area, Fort George, Nairn, Firhall, Piperhill, Cawdor	Approx. every 20 – 40 mins	Every two hours	0645	2310	Approx every 40-60 mins	Every two hours	0735	2310	3	None	1100	1600
Rapsons	School 13	Inverness P.O, Cawdor, Little Urchany, Cawdor Church, cawdor Primary school, Culcharry, Piperhill, Regouil, Nairn Furhall vVillage, Nairn hospital, Nairn High School, Nairn Academy, Ardersier	5 per day	None	D=0736 A=0838 to Nairn Academy	D=1600 A=1705 to Nairn Academy	None	None	none	None	none	none	None	None
Rapsons	1C, 1D, 12A, 12S	Inverness, Retail Park, Smithton, Culloden Academy, Balloch, Sunnyside, Croy	0735, 0900, 1100, 1300, 1504,	Every hour	0735	2325	Every hour from 1925	Approx: Hourly	1905	2325	Approx: Hourly	none	0945	1645
Rapsons	7, 7A, 7B, 7C, 7S	Lochardi, City Centre, Raigmore Hospital, Croy, Cawdor, Piperhill	Every hour	3 services from Croy at 1943, 2242, 2352	0730	Piperhill 1817 Croy 2352	Every hour	3 services from Croy at 1943, 2242, 2352	0730	Piperhill 1817 Croy 2352	none	none	none	none
Rapsons	103	Culloden Academy, Oakdene Park, Smithton, Westhill, St Joseph's School	2 per day	none	0822	1505	none	none	none	none	none	none	none	none
Rapsons	105	City centre, Inshes Park, New Hilton, Castle Street, Central School, St Joseph's School	2 per day	none	0813	1545	None	None	None	None	None	None	None	None
Rapsons	28	Holm Park, City centre, Eastfdield Way, Caulfield Road, Inshes Wood, Westhill, Eastfields Way, City Centre, Holm Park	Every 30 mins	2 services	0730	2208	Every 30 mins	2 services	0730	2208	None	None	None	None
Citylink	963, 957, 588, 87, 538, 990, 995, 997	Inverness, Aviemore, Perth, Glasgow or Edinburgh	Hourly	No service	D=0630 A=1030	1820	Hourly	No service	0630	1820	Hourly	None	0630	1830

3.6. Ferry

Despite the proximity of the Moray Firth, there are currently no local ferry routes operating within the vicinity of the study area.

3.7. Land Use Developments

3.7.1. Existing Land Use Developments

An overview of existing land use developments within the study area is provided within the Sections below.

- Inverness Airport

Inverness Airport handled half a million passengers in year 2003-2004, and is currently experiencing 20% passenger growth per year. Significant redevelopment of the Airport and surrounding areas is proposed. This includes extension of the Airport, development of a business park and establishment of a rail/bus/air/car interchange.

- Timber Processing Plant at Morayhill

An existing timber processing plant is situated adjacent to the south edge of the Aberdeen - Inverness railway line, at Morayhill. The land to the east of this plant is ear-marked for expansion/diversification in the form of downstream or dependant activities and/or renewable energy production.

- Ardersier Fabrication Yard

After closure in 2002, the Ardersier Fabrication Yard has remained vacant. However, the Local Plan identifies that priority is being given to the re-use of this large-scale brownfield construction site. The site, including adjoining land, is 320 ha. Substantial infrastructure is in place including direct access to the A96 and a deep-water berth. There are proposals to use the site for future large-scale industrial/environmental technology purposes.

- Inverness Retail Park

Inverness Retail Park is located to the east of the Raigmore interchange and comprises a total gross floor area of approximately 20 ha. The retail park includes a cinema, restaurants and retail units, and a Tesco supermarket and petrol station are located within close proximity.

3.7.2. Proposed / Desired Land Use Developments

An overview of proposed / desired land use developments within the study area is provided within the Sections below.

- Inverness Airport Business Park

The proposed Inverness Airport Business Park will create at least 300 jobs in its first phase to be completed by 2011 with 16.5 ha of business accommodation, including an Airport hotel. Further planning consent has been given for 260 ha for business, freight 'village' and industry over the next 30 years (with up to 5,000 jobs). Construction of a new link road from the A96 to the Airport has begun.

The Local Plan states that proposed development at the Airport will include:

- 50 ha for business park;
- 2 ha for hotel/conference facilities;
- 1.5 ha for passenger rail halt and P&R facilities;
- 5 ha for rail/road/air cargo distribution centre north west of railway;
- 10 ha for industry joining existing Dalcross Industrial Estate;
- 8.5 ha for industry to south west of airport terminal;
- 8 ha warehousing to the west of terminal; and
- Further land to the north identified for hotel/business and airport services.

In addition, there are proposals to achieve more integrated transport to the Airport, in the form of a bus/rail/road/air transport interchange. This would provide a link between the Airport and Inverness-Aberdeen bus/rail services and Inner Moray Firth bus/rail services and flights.

- Expansion of Existing Villages

The Inverness Local Plan details the following proposals/allocations for villages to the east of Inverness in the Culloden area. These areas are planned communities within which development commenced in the 1970s and is expected to be completed by 2010. At present there remains capacity for 700 additional

dwellings and work is required on the Smithton distributor road and local rail halts in order to accommodate this additional development.

- Culloden: land stocks are largely taken up or partially developed
- Balloch: development land is 'virtually exhausted'. Small specialist housing is now the priority.
- Smithton: 200 houses have been built in the last 5 years. There is a local industrial estate which could provide focus for additional development.
- Cradlehall - Westhill: there is land at Woodside and Cradlehall Farm which could provide for more than 600 houses and land to the north-west which could be used for a business park, hotel and community uses (70 ha)

3.8. Summary

This Chapter has provided a broad overview of the existing transport provision and land-use developments in the study area. The following Chapter will provide details of the options developed during stakeholder consultations for the development of 10,000 new houses along the A96 corridor between Inverness and Nairn.

4 CAPACITY ASSESSMENT



4. Capacity Assessment

4.1. Introduction

This chapter considers the travel demand characteristics of the proposed long term development of 10,000 households within the study area, in terms of road, public transport, and walk/cycle. It then considers the capacity of the existing transport infrastructure, and considers options for effectively managing this additional demand.

It is noted that Highland Council have recently commissioned the development of a micro-simulation model covering the wider Inverness area, and including the study area for the current study. This model is due to be constructed and validated by January 2005, and thus will provide a tool for quantitative testing of different development scenarios, particularly at critical locations such as Raigmore.

4.2. Household Travel Characteristics

Data from the 2001 census enables information to be gleaned on method of travel to place of work and study. Table 4.1 presents this information. The data demonstrate the importance of bus in towns surrounding Inverness (Balloch and Culloden), and also highlights that car use is below regional and national averages. Cycling is also frequently used as a mode of transport to work/study.

Table 4.1 - Method of Travel to place of work or study by % of population travelling to work or study

	Population travelling to work or study	Underground, metro or light rail tube,	Train	Bus, minibus or coach	Taxi or minicab	Driving a car or van	Passenger in a car or van	Motorcycle, scooter or moped	Bicycle	On foot	Other
Scotland	3063206	0.4%	3.0%	16.5%	1.0%	41.1%	12.1%	0.4%	1.3%	23.4%	0.8%
Highland	122198	0.0%	0.4%	13.4%	1.0%	43.0%	12.7%	0.5%	3.3%	24.7%	1.0%
Inverness	34299	0.0%	0.7%	10.5%	0.9%	46.4%	12.0%	0.6%	4.9%	23.5%	0.5%
Nairn	4141	0.0%	0.3%	7.8%	0.8%	33.9%	12.6%	0.1%	8.6%	35.3%	0.6%
Culloden	1909	0.0%	0.2%	22.4%	0.5%	24.0%	13.2%	0.3%	3.6%	35.1%	0.7%
Balloch	522	0.0%	0.4%	16.1%	0.4%	22.8%	22.6%	0.4%	2.9%	33.0%	1.5%
Ardersier	271	0.0%	0.4%	9.2%	4.1%	34.7%	6.6%	0.0%	0.7%	43.2%	0.7%

Source: 2001 Census

Results from the Scottish Household Survey Travel Diary[1] can provide more information on the trip making characteristics of households, although with less geographical definition. Using the definition of "Accessible Small Towns", which are towns with a population of between 3,000 and 10,000 within 30 minutes drive of a major centre, the following typical trip characteristics can be provided (Table 4.2).

The results show that for all household trips, almost 75% are car based. Of the remaining 25%, walk (16%) and bus (6%) are important. The varied mix of trip types is also important to consider; traditionally the emphasis has been placed upon commuting trips, however these account for only 25% of a household's trip making patterns.

Also of note is the length of trip. Trips within an easy walking distance make up 34% of the trips made; trips within 5km make up 48% of the trips made, and over such distance the bicycle can be a realistic option, in certain circumstances.

[1] Scottish Executive (2004) *Scottish Household Survey Travel Diary Results for 2002,* Scottish Executive, Edinburgh

Table 4.2 – "Accessible Small Town" Trip Characteristics

Mode of Transport:	16% Walking 58% Car or Van Driver 16% Car of Van Passenger 1% Bicycle 6% Bus 1% Taxi/Minicab 1% Rail 1% Other – ie underground, motorcycle etc
Trip Purpose	23% Commuting 4% Business 2% Education 22% Shopping 2% Health related 6% Other personal business 12% Visiting Friends and Relatives 3% Eating/Drinking 6% Sport/Entertainment 4% Holiday/Day trip 6% Other / Not Known 9% Escort
Trip Length	34% Less than 2km 48% less than 5km 65% less than 10km 76% less than 15km 83% less than 20km 17% greater than 20km
Car Availability	28% 0 cars 49% 1 car 20% 2 cars 3% 3 or more cars

Source: Scottish Household Survey Travel Diary Results for 2002

The publication also provisional information on household trip rates, adjusted to take account of under-reporting. Across Scotland, a typical household can be assigned the following characteristics based on car ownership:

- 0 cars – 2.31 trips per day;
- 1 car – 5.49 trips per day; and
- 2+ cars – 10.73 trips per day.

Using the car ownership characteristics of "accessible small towns" a weighted average trip rate can be derived, which results in a trip rate of 5.8 trips per day per household. Applying the mode share details provided above, we can also estimate the modal split of these trips:

- 4.3 trips per day, car based
- 1.0 trips per day, walking/cycling
- 0.4 trips per day, bus/train
- 0.1 trips per day other – taxi, motorcycle

As an alternative to using information from the Scottish Household Survey, information on car-based trip rates is available from national trip rate databases. Interrogation of the TRICS database for housing sites (between 52 and 300 units) yielded the following car-based trip rates:

- 7.37 car trips per household (Based on 24 Survey days, at 7 sites, with an average size of 152 household units)

This trip rate is significantly higher than that suggested by analysis of the Scottish Household Survey results. The most likely reason is that the Scottish Household survey results consider all areas within a Accessible Small Town, whilst the TRICS survey is more focussed on specific newer housing developments, typically situated to the edge of existing towns, which often have higher rates of car ownership and use.

Given the *smart growth* principles include creating a range of housing opportunities, and delivering accessible, walkable, and cyclable places we would suggest that the TRICS car based trip rates would form the upper bound of any car based trip rate. This is supported by the census data, which shows a local acceptance of sustainable modes for travel to work and study.

However, use of the Scottish Household derived trip rates may not prove to be sufficiently robust, particularly at this stage of the project when there are a large number of uncertainties about the form of development. Accordingly, we would propose to use the following trip rates for the ongoing analysis, with the understanding that they be continuously reviewed and revised as the study progresses, and more details become available. These are based on a 30% uplift to the Scottish household survey results.

- **Total household trip rate** **7.5**
- Car, van, taxi, motorbike based trip rate 5.7
- Bus, Train 0.5
- Walking/Cycling 1.3

4.3. Capacity Assessment – Road Network

4.3.1. Base Road Capacity Assessment

Critical to the assessment of corridor capacity is the impact of the proposed level of development upon the A96 between Raigmore and Nairn, the impact on Raigmore junction itself, and the impact within Nairn itself.

The size and location of development will have a important bearing on the impacts on the main road network. A single large settlement will be able to support a larger range of facilities than a number of smaller settlements. Accordingly, many of the trips generated in a larger settlement can be contained within that settlement, without generating additional trip onto to the external road network.

Similarly, settlements located close to either the west or the east of the study area will have a greater impact on Raigmore junction and Nairn, respectively. Given that Inverness acts as the major strategic centre, total trip length will be reduced if the settlements are situated to the west of the corridor, as opposed to the east of the corridor.

The Design Manual for Roads and Bridges[2] (DMRB) provides advice on carriageway standards for specific ranges of traffic flow. Whilst not pertaining to represent carriageway capacities (which requires detailed understanding of hourly flows, and flow classification), they provide guidance on what carriageway standards are considered to be economically and operationally acceptable in terms of an "opening year flow" for new infrastructure. For single two-lane roads, a flow of up to 13,000 vehicles per day (AADT) is provided. For dual two-lane roads, a flow of between 11,000 and 39,000 vehicles is suggested.

Existing flows on the single two lane sections of the A96 vary along the corridor from 11,000 to 16,000. Flows on the dual two-lane section peak at 32,500 vehicles. Parts of the A96 already exceed what may be considered be optimal provision.

It will be a number of years before the proposed development will begin, and thereafter be completed. In the meantime, background levels of traffic are forecast to continue rising, even without the proposed development. National Road Traffic Forecasts 1997 provide three estimates of future levels of traffic growth – a high growth, a central growth, and a low growth scenario. Assuming a central growth scenario we can assess future base flows at different locations along the A96 in ten and twenty years (shown in Table 4.3 and Appendix A, Figures 5 to 10).

Table 4.3 Existing traffic levels and baseline growth in ten and twenty years

ATC Number	Location	Description	Optimal Flow Range	2004	2014	2024
ATC01062	Nairn – Delnies	Single two-lane	Up to 13000	13239	15467	17463
ATC01064	Gollanfield - Newton of Petty	Single two-lane	Up to 13000	11764	13744	15517
ATC01067	Newton of Petty to Balloch	Single two-lane	Up to 13000	16215	18944	21389
ATC01066	Balloch - Smithton	Single two-lane	Up to 13000	15467	18070	20402
ATC01065	Smithton - West Seafield	Dual two lane	11000-39000	26681	31172	35194
ATCNE011	West Seafield - Raigmore	Dual two lane	11000-39000	32488	37956	42854

Without any development, we can see that all single two-lane sections of the A96 will be beyond their optimal traffic flow range in 2014 and 2024. Furthermore, by 2024, the dual two-lane sections leading to Raigmore junction will also be beyond their optimal flow range.

Within Nairn, the current maximum peak hour flows are 464 vehicles per day (AADT) travelling west between 0800 and 0900 hours and 686 travelling east between 1700 and 1800 hours. Assuming central growth, as above, we can assess future base flows on the trunk road within Nairn. In ten years' AM peak hour flows travelling west will be 542, and 612 by 2024. 2014 PM peak hour flows will be 801 and 905 by 2024.

DMRB[3] also provides guidance on traffic capacity in urban areas. The trunk road through Nairn can be categorised as UAP3 with a carriageway width of 6.75m. For this, the DMRB suggests a traffic capacity flow of 1110 vehicles per hour, in the direction of greatest flow. Therefore without any development, the

[2] Design Manual for Roads and Bridges, Volume 5, Section 1, Part 3, Traffic Flow Ranges for Use In the Assessment of New Rural Roads
[3] Design Manual for Roads and Bridges, Volume 5, Section 1, Part 3, Traffic Capacity of Urban Roads

application of information contained in DMRB suggests that trunk road within Nairn will operate within capacity during at peak times in both ten and twenty years.

The absolute capacity of Raigmore junction can be assessed only following a detailed demand, geometric and queue length survey, and subsequent computer modelling. Such an exercise would form a separate commission, but with the development of a micro-simulation model for the area, such an exercise could be considered in later stages of masterplan development.

However, the fact that one arm has already been signalised tends to suggest that the junction is beginning to operate at capacity during peak times. Futhermore, the fact that the A96 link onto Raigmore junction is forecast to be operating beyond its optimal capacity in 2024 also highlights a specific problem at this location.

4.3.2. Assigning Development Traffic

A development of 10,000 houses could generate 57,000 additional car trips per day onto the road network. A successfully designed settlement layout would maximise the amount of these trips that could be contained locally, and minimise the number of trips that would be applied to onto the strategic road network. This would be achieved through the provision of locally accessible facilities (schools, shops, health facilities, leisure facilities etc), viable public transport options, and attractive walking and cycling facilities. Data from the Scottish Household survey suggests whilst up to a third of all trips are under 2km, 25% of car based trips typically under 2km. Accordingly, we can assume that at least 14,250 total trips would be internal to the development – although good design should enable to be reduced further.

Of the remaining 42,750 daily trips, a gravity model and an analysis of existing flows on the trunk road suggests a 60:40 split between Inverness and Nairn respectively. Thus, depending on the layout and spatial locations of the proposed settlements, a maximum additional flow on the A96 towards Nairn would be 17,100 vehicles, and towards Inverness 25,650 vehicles. Table 4.4 illustrates the potential full impact of this level of traffic, tested for 2014 and 2024 future year flows, assuming a single location for the development mid-way along the corridor (also shown in Appendix A, Figures 11 to 19).

Table 4.4 Traffic levels in ten and twenty years with development

ATC Number	Location	Description	Optimum Capacity (AADT)	2014 + development (AADT)	2024 + development (AADT)
ATC01062	Nairn - Delnies	Single two-lane	Up to 13000	32567	34563
ATC01064	Gollanfield - Newton of Petty	Single two-lane	Up to 13000	30844	32617
ATC01067	Newton of Petty to Balloch	Single two-lane	Up to 13000	44594	47039
ATC01066	Balloch - Smithton	Single two-lane	Up to 13000	43720	46052
ATC01065	Smithton - West Seafield	Dual two lane	11000-39000	56822	60844
ATCNE011	West Seafield - Raigmore	Dual two lane	11000-39000	63606	68504

Note: these flows assume 10,000 new homes between ATC01067 and ATC01064 located close to the Airport

The results of our initial analysis highlight that full assignment of the development's external car trips onto the A96 cause all links to operate beyond their optimum capacity. It is noted that a dual three lane carriageway has an optimum flow capacity of 23,000 – 54,000. Even this level of provision may not be sufficient.

Analysis using TRICS shows that for 10,000 houses, 6% of total daily trips were made in the AM peak departing the development. Also, 5.7% of total daily trips arrive at the development during the PM peak hour. If these peak hour percentages are applied to a daily trip rate of 5.7 for cars, vans, taxis and motorbikes from the Scottish Household Survey, approximately 0.36 departure trips per household in the AM peak hour and 0.33 arrival trips per household in the PM peak hour would be generated. Assuming a 60:40 ratio of traffic flow in favour of the west in the AM peak and east in the PM peak, Table 4.5 outlines the additional traffic as a result of 10,000 new homes, forecast in the peak hour.

Table 4.5 Peak hour traffic flows with development

	AM peak (0800-0900) departures		PM peak (1700-1800) arrivals	
Trip Rate	0.36		0.33	
Direction (% of flow)	East (40)	West (60)	East (60)	West (40)
Additional Flow	1440	2160	1980	1320

If these additional development flows are then assigned to the base network, we can consider the impact of the development upon the trunk road through Nairn. This is shown in table 4.6.

Table 4.6 – Peak hour traffic flows + development on A96 within Nairn

Location	Description	Peak hour Capacity	2014 + development	2024 + development
Nairn - am peak, westbound	Single two-lane	1100 vph	1982	2052
Nairn – pm peak, eastbound	Single two-lane	1110 vph	2120	2224

The results of the analysis highlight that with full assignment of the development's external car trips through the A96 in Nairn cause the current link to operate beyond its peak capacity.

4.3.3. Summary of Road Network Capacity Assessment

1. Without any development traffic, the main A96 link between Inverness and Nairn is likely to operate beyond its capacity by 2024.

2. Without any development traffic, the peak hour capacity through Nairn on the existing road network will be reached, though not exceed.

3. Observations indicate that Raigmore junction is currently beginning to operate a capacity during peak periods, although detailed survey and modelling is required to verify this.

4. With the full assignment of the development's external car trips onto the A96, all links will operate beyond their optimum capacity.

5. With the full assignment of the development's external car trips on to the A96, and assuming a 40% distribution of traffic through Nairn, the peak hour capacity of the trunk road through Nairn will be exceeded.

4.4. Rail Capacity

The rail capacity in the area is in the form of the Aberdeen - Inverness railway line which acts as both a local service and long-distance service. The railway is single track, and constrained by long signalling blocks and few passing loops. Two stations current serve the study area, Nairn and Inverness – both of these are in the town centres, and in the case of Inverness, does not very well serve outlying employment areas, which are currently growing. A new station to serve Inverness Airport and associated business park has also been proposed.

4.4.1. Rail Trip Generation

Trip generation for 10,000 new homes is estimated to be 7.5 per day per household. Nationally, an average of 1% of household trips are rail travel, therefore an additional 750 trips per day could potentially be generated for the rail network. This is probably an upper limit, as census data revels that for journeys to work or study, Nairn and Inverness are below national averages.

The main capacity constraint on the rail network would occur during the am and pm peak periods. Across Scotland, data from the Scottish Household Survey indicates that during the am peak period (07.00 to 09.30) 26% of rail trips are undertaken; during the pm peak period (16.30 to 18.30) 28% of rail trips are undertaken. During these periods, there are two trains into Inverness in the am period, and two trains departing Inverness in the pm period. Accordingly, the development proposal could generate up to 195 rail trips in the am peak period to be accommodated on two trains, and 210 trips in the pm peak, again to be accommodated on two trains.

No information is currently available on typical train occupancies during the peak period, and this would be required in order to estimate a potential requirement for revised peak period train formations arising from the proposed development. However, it is known that there is no current restriction due to platform lengths in providing longer trains (up to six coaches); there are however significant difficulties in providing increased frequencies.

4.4.2. Capacity for Additional Stations

In relation to the development of additional stations, IHT guidelines for "Planning for Public Transport in Developments" (March 1999) outlines the population required to justify the provision of a new rail station as shown in Table 4.7, below. It should be noted that Table 4.7 is based upon mid-1980s costs and the capital costs of new stations have increased sharply since that time.

Table 4.7: Population Required to Justify a New Rail Station

New Station Type	Number of Weekday Ons and Offs Required	Population Within 800m Required
Single platform	81	2,550
Small double platform	125	3,900
Larger double platform	177	5,500

Note: Calculated for the mid-1980s – station costs are now much greater

By way of comparison, Table 4.8, below, indicates the populations of towns (2001 census) along the Aberdeen – Inverness rail route where existing stations are located.

Table 4.8: Population of Towns on Aberdeen-Inverness Rail Route Where Stations Exist

Station	Population of Town (2001 Census)
Dyce	5,661
Inverurie	10,882
Insch	1,523
Huntly	4,412
Keith	4,491
Elgin	20,829
Forres	8,967
Nairn	8,418

On one hand the statistics in table 4.7 and 4.8 above show that in this area settlements as little 1,500 population have a rail station, and stations could possibly be justified at settlements with just 2,550 population (albeit based on 1980's costs), particularly if Park and Ride facilities could be used to increase a station's catchment.

However, this apparent capacity for additional stations does not take account of the capacity constraint that currently exists on the line, which places track occupancy at a premium. This demands that the most efficient use is made of the existing infrastructure.

The SRA's publication "Everyone's Railway, The Wider Case For Rail" (2003) outlines that rail works best as a transport mode when it provides the following:

- Fast, long-distance passenger services between principal cities and towns;
- Commuter services on busy corridors into large cities;
- Services to major airports;
- Rail freight services for regular high-volume flows; and
- In addition, it is recognised that rail has a "high fixed-cost base and so thrives on carrying high volumes".

Additional local rail stations, over and above that proposed for the rail station at Inverness airport, would begin to compromise the above criteria, by slowing strategically important rail trips between Aberdeen and Inverness. It will also increase track occupancy, making the possibility of any future frequency increases, or rail freight services particularly difficult to achieve.

The economic case for the substantial capital improvements in signalling and track capacity required to service a local rail service with a string of rail stations, combined with the additional revenue support would be particularly difficult to make within the current national context. It is highly unlikely that the overall benefits would even begin to approach the sum of the operating and capital costs.

The additional revenue generated by the relatively short distance trips between Nairn, intermediate stations, and then Inverness would be unable to generate a significant revenue stream, sufficient to off-set additional costs. These would be local, and relatively low-volume trips.

However, a rail station at Inverness airport and business park may become more viable if easily accessible to the proposed development, supported by a multi-modal park and ride facility.

4.4.3. Summary of Rail Capacity Provision

1. There are significant capacity constraints in terms of increasing frequency of service, although the proposed IOC scheme will provide some additional operation flexibility.

2. The rail service is also constrained in that the key destination (Inverness town centre) serves only a small proportion of employment location.

2. There is currently capacity to extend existing train lengths – Nairn can accommodate 6 coaches.

3. There is limited capacity to add further stations without compromising the integrity of the inter-urban route.

4. The development of any local services, whilst being desirable, would require significant investment, including re-signalling and dual tracking. Such a scale of capital investment will be difficult to justify and to afford in the light of other competing rail projects nationally.

5. The increased revenue to be gained from additional local stations would be unlikely to off-set significant additional revenue costs with a local service.

6. Focussing upon a single additional station, supported by park and ride facilities, at Inverness Airport provides the prospect of combining commuting trips with airport related trips. This would help to increase the feasibility of such a facility.

4.5. Bus Capacity

In comparison to rail transport, bus services are more flexible and relatively inexpensive to operate. At present, there is an extensive network of buses operating within Inverness and serving nearby towns, villages and the Airport. Successful services run along the A96 corridor between Inverness and Nairn at a frequency of approximately two services per hour Monday to Saturday and one service per hour on Sunday. These services are able to serve not only the principal destination (Inverness town centre) but also a number of intermediate destinations such as the Inverness retail and business park.

We have assumed that the development of 10,000 new homes would have a household trip generation of 7.5 trips per day. National averages suggest that up to 5% of this could be bus travel, meaning 3,750 trips per day extra demand. However, census data from 2001 shows that local settlements of Culloden and Balloch have high mode share for trips to work or education by bus, 22.4% and 16.1% respectively, and this presents evidence that there is a strong base upon which to grow.

There are assumed to be few constraints in providing additional bus capacity. Buses have relatively low capital and operating costs, and can be routed in flexible patterns. Express style limited stop services, park and ride services aimed at drivers, and more traditional local based service patterns can all be developed, targeted at specific markets and locations. The two constraints to achieving an appropriate and attractive level of service is to ensure a high frequency, and also competitive, reliable journey times.

Achieving a high frequency of service means seeking to maximise potential revenue along the whole route of the service. A high frequency route between Nairn and Inverness may be possible if it could be directly and efficiently routed through the new development areas. A range of origins and destinations can be provided, most notably the Retail and Business Park at Raigmore, as well as the town centre, hospital and employment areas. There is also the potential to provide Park and Ride facilities, potentially at the new airport rail station, or near to Raigmore.

The second constraint is that of congestion on the road network slowing the bus service. Dedicated bus priority and corridor treatments can be applied to overcome this problem – these can range from guided bus solutions, to more traditional bus only lanes with camera enforcement.

It is noted that IHT Guidelines outline the requirement for bus stops to be located no greater than 400m from the households it is intended to serve, and this should be used to influence the road network design within the new settlements, and the provision of services.

4.5.1. Summary of Bus Capacity

1. There is considered to be an opportunity for bus patronage levels to be greater than national averages for “accessible small towns”.

2. An initial estimate of daily bus patronage is around 3,750 trips per day.

3. Constraints on achieving an attractive service relate to ensuring sufficient patronage for a frequent service, and maintaining competitive and reliable journey times.

4. Locating settlements such that they can be directly serviced by frequent bus routes, and providing bus priority solutions can be used to overcome these potential constraints.

5. Settlement design is important to ensure that households are within 400m of a bus stop, and that buses can service these in a relatively direct manner.

4.6. Ferry Service

Initial consideration has been given to the capacity to develop a passenger ferry service along the Moray Firth into Inverness town centre.

There are few physical restrictions to developing such a service: suitable ferries are available to lease on either a crewed or un-crewed basis, and whilst a pier / berth would be required, this could be constructed at a location such as Ardersier. It is initially suggested that a two-ferry operation could provide a 30minute frequency service.

However, the main problems with such a service would be in generating sufficient passenger revenue in order for a robust business case to be developed.

Most successful ferry operations work on a cross-estuary basis – ie there are no other feasible means of transport. In the case of the Moray Firth, there is the full range of land based transport options to compete with, including a subsidised rail service, bus links, and an extensive road network.

Secondly, any ferry, on a door-to-door basis, is likely to be slower and more expensive than any of the competing forms of transport. For the majority of the catchment, the journey to the ferry terminal at Ardersier would be a deviation away from their typical route. Furthermore, the location of the ferry terminal at Inverness is unlikely to be convenient for many employment locations.

Overall, we consider that there is little merit in considering this option further.

4.7. Walking and Cycling

This area of the Highland and Scotland experiences higher than average cycling mode share with 4.1% of travel to work and education by bicycle compared to 1.3% Scottish average. This could be partly due to the flat topography of this area. Similarly, within the small towns contained within the study area, there is evidence of high levels of walking to work and study, compared to national averages.

Many of the walking and cycling trips generated are likely to be short distance trips within the proposed settlements. A critical element is in designing successfully for such trips, not only with respect to the standard and routing of cycle paths and footpaths, but also with respect to the locations, densities, and ranges of facilities provided.

Cycling for longer distances can also be encouraged, both for its utility value (ie trips to work and study) and recreational value. Such trips are currently constrained due to the lack of safe and attractive provision along the A96 corridor, between Nairn and Inverness.

High quality cycle routes, designed to National Cycle Route standards, can be developed in order to overcome this constraint. To work effectively, they should link settlements with key leisure, retail and employment destinations along the corridor.

4.8. Summary

This chapter has considered the capacity of the corridor, in transport terms, for the proposed scale of housing development.

Background growth on the A96 over the next ten and twenty years is forecast to mean that the current strategic road network will be operating beyond it's optimum capacity without further development.

The addition of trips associated with the development causes significant problems with respect to the available road capacity – through Nairn Town Centre, between Nairn and Inverness, and at Raigmore junction.

The rail network is currently constrained by it being only single track, with long signalling blocks. This constrains the development of a more frequent service, but also the development of additional stations. There is physical capacity for the introduction of longer trains.

The high costs of upgrading the physical infrastructure to enable local services, along with limited opportunity to generate significant additional passenger revenue, is likely to prohibit the development of a frequent, rail based, local transport solution. Many trip patterns are not compatible with the origins and destinations offered by the rail service.

The bus network already enjoys good patronage in some of the towns within the study area. There are few constraints to the development of an attractive, high frequency service. However, it is necessary to ensure that sufficient revenue can be generated, and this implies focussing settlements where they can be directly and efficiently served by corridor-based services. It also requires consideration of appropriate and effective bus priority measures at specific locations.

There is little likelihood of developing a robust business case for a passenger ferry link along the Moray Firth to Inverness town centre.

Walking and cycling are important and popular. Settlement design needs to take account of best practice to ensure opportunities are maximised for these trips. Encouraging longer distance cycle trips requires the implementation of high quality cycle routes between settlements and key destinations such as retail, employment and leisure.

5 PREFFERED TRANSPORT OPTION



5. Preferred Transport Option

5.1. Introduction

This chapter outlines the development of a preferred transport option. Responding to the planning objectives established for the study, it justifies in transport terms a series of recommendations relating to settlement size and locations, public transport provision, road network improvements, and walking and cycling facilities.

5.2. Planning Objectives

The overall study objective was confirmed within the study brief.

- *Collaboratively, prepare a master-plan for the long-term sustainable development of the strategic A96 Corridor between Inverness and Nairn forming a comprehensive planning framework for the Corridor as a whole.*

- *Establish a complete living environment for the A96 Corridor that is of the comparatively highest standard and best quality.*

Specific transport objectives were confirmed using Smart Growth principles, adapted to the local context following the stakeholder *collaboration for success* sessions.

- *Ensure that new housing development is linked to business, servicing and employment resources through public transport facilities.*

- *Relate development density to accessibility to help ensure viable public transport service.*

- *Deliver walkable and cyclable places that are distinctive and attractive with a strong sense of place through legible and permeable design with cultural and recreational services provided early that are accessible within 10 minutes of the majority of residents.*

- *Ensure accessibility through mobility choice through actively promoting attractive public transport.*

The planning objectives place the emphasis on sustainable transport solutions to create a functional and attractive environment. Mobility choice is important – provision for the private motor car is necessary to achieve this, although opportunities to manage this demand should be sought to control the external costs of motoring, predominantly congestion, air pollution and greenhouse gas emissions.

5.3. Transport Problems and Constraints

The preceding capacity review has highlighted some of the key transport capacity problems facing the study area.

- Background traffic growth on its own is likely to cause the A96 to operate beyond its capacity by 2014 and 2024.

- The addition of development trips will significantly exceed the current capacity of the A96. Additional specific problems will be experienced at both Raigmore junction and through Nairn town centre.

- The rail network requires significant investment in order for it to offer a viable and attractive local service, with numerous additional rail stations. The likely benefits to be derived from such investment are unlikely to outweigh the capital and revenue costs.

- There are few constraints on developing new high frequency bus based solutions along the corridor, provided that settlements are designed to support such a service, and bus priority is implemented along the corridor.

- Walking and cycling is important for local trips, but depends upon high quality settlement design. Longer distance cycle trips require continuous, and high quality links between settlements and potential employment, study and leisure destinations.

- There is little prospect of developing a viable passenger ferry service along the Moray Firth.

5.4. Settlement Location and Size

One of the first considerations is to consider the optimum location for new settlements and their optimum sizes. We are aiming to deliver a settlement strategy that reduces trip lengths, and supports viable and attractive public transport services.

Given that Nairn and Inverness are the two most important trip destinations in the area, placing new developments close to, or within these existing settlements would help to achieve this goal. Such a strategy also enables best use to be made of existing transport infrastructure and services, such as the rail and bus links between Nairn and Inverness, and also the existing bus services within the Eastern Villages. Whilst there is little prospect of increased patronage on the rail network leading to an increased frequency of service, it is likely that the bus network could respond in such a manner.

Given that expansion of the Eastern Villages and Nairn are already included in existing policies, it is doubted whether significant allocations could be achieved in such locations. Additional locations require to be considered.

In searching for additional development locations, a focus on the main existing public transport corridors (A96 and rail line) is desirable. ***The proposed rail halt at the airport provides a principal focus – a settlement in this area will help to maximise the potential contribution of this station, and help to off-set the disbenefits of slower end-to-end journey times. This location is focus for our recommended settlement location.***

Developing settlements within the A96 corridor between Nairn and Inverness also provides opportunities to directly support the existing express bus services. The combination of the existing patronage, and new development related patronage could support a much higher frequency service, and a greater range of services, than could be supported otherwise.

In terms of a settlement pattern that minimises the generation of car trips onto the strategic road network, the settlement size should be of a size that can support facilities such as supermarkets, a secondary school, range of retail and leisure opportunities etc. Ensuring such facilities are locally accessible, by walk, cycle and bus, as well as by car, can help to minimise trip generation onto the adjacent strategic road network.

The recommendation would therefore be for a discrete larger settlement, rather than for a string or patchwork of villages.

5.5. Road Network

The impact of the proposed development upon the strategic road network is potentially significant. Our analysis has demonstrated that background growth could lead to capacity problems on the existing single carriageway between Nairn and Inverness by 2014, and all sections (including the dual carriageway section) experiencing difficulties by 2024. With the addition of the envisaged development traffic, the analysis demonstrates that significant capacity improvements would be required to accommodate the anticipated traffic flows. We anticipate that these conclusions can be quantitatively tested through the proposed micro-simulation model which will be available during 2005.

However, significant increases in road capacity will tend to undermine objectives to encourage a sustainable development pattern, which maximises use of public transport. It also does little to address congestion developing within Inverness itself.

The analysis demonstrates the requirement for upgrades to the road network. However, it also emphasises the importance of minimising the impact of the proposed development on the strategic network. This can be achieved through creating settlements that are largely self-contained in terms of many facilities, but where many facilities can be accessed through walk, cycle and public transport. It also emphasises the requirement to deliver top quality public transport solutions for trips outwith the settlement, and a range of supplementary measures to further manage the growth in car-based trips.

The dualling of the A96 between Raigmore and Nairn appears necessary to maintain the strategic function of the A96. Such improvement is considered desirable with background traffic growth, and is necessary with the application of development.

Due to the adverse environmental and economic impact of congested traffic within the centre Nairn (caused by background growth, but also proposed developments to the east of Nairn), the proposed development is one further factor supporting the development of the Nairn bypass.

At Raigmore junction, there is limited opportunity for physical expansion, due to the constrained nature of the site. Junction improvements such as full signalisation should be considered. More strategic relief to the roundabout can be achieved by linking the A96 at the retail park to the A9 at Beechwood, where access to the southern distributor road can be gained.

We would also consider that an alternative route be developed between the proposed settlements and Inverness, which did not wholly rely upon the A96 trunk road. Dependent upon the location of the settlements, an upgrading of the B9006 and B9091 beyond Westhill is recommended.

Upgrading this route to a regional distributor road would bring benefits for network flexibility, and public transport operation and reliability. It would also remove existing road safety problems on the route, and help to distribute development traffic between different routes.

The upgrading work would focus on providing a consistent horizontal and vertical alignment, and road cross-section. Junction realignment, lighting, and signing upgrades would also be considered within the package of works.

For the Road Network we recommend the dualling of the current A96, provision of the Nairn Bypass, and a link from the A96 to the southern distributor road at the A9. We also consider there to be benefits from the up-grading of the existing B9006/B9091 route beyond Westhill to provide an alternative link to areas of new development.

5.6. Rail

In terms of public transport provision, a new rail station is proposed to be constructed at Inverness Airport to serve the Airport, the proposed industrial development. The benefits of this new rail station can be further enhanced if it was easily accessible from any new areas of settlement – by walk, cycle, bus, and car with a park and ride facility.

This rail station would provide an additional stop on the Aberdeen – Inverness rail line, between Inverness and Nairn, for local services. Supporting this rail station with new development will help to improve the viability and contribution of the station to the regional rail network.

Existing peak period trains will be require to be lengthened to cope with increased capacity. There is currently scope to accommodate up to six coaches at Nain rail station.

A new station at the airport, and lengthened trains form the recommendation for the rail network.

5.7. Bus

The preferred transport option outlines a high frequency bus services principally between Inverness to Nairn via new settlement in the proximity of the Airport, wholly to the south of the A96.

The distance between Inverness town centre and Nairn town centre is 16 miles. Assuming an average speed of 30 mph, it is estimated that the approximate city centre – town centre journey time is 32 minutes. In order to provide a 10-minute frequency of service, 8 vehicles per hour would be required. At a cost of £25 per hour per vehicle, the total cost of providing this level of service would be £200 per hour.

At a cost of £2 per passenger journey, 100 passenger trips per hour would be required, per hour, to make this level of service feasible.

In order for the preferred option to be successfully implemented, measures to encourage public transport usage would require to be implemented in Inverness and Nairn. Therefore this option includes the provision of bus priority on the approach to Raigmore junction in order to provide competitive and reliable journey times.

A bus based public transport strategy is promoted, with a high frequency service operating along the Nairn – Inverness corridor. Bus priority measures would be necessary on the approaches to Raigmore, and elsewhere within the town centre.

5.8. Park and Ride

Promoting Park and Ride facilities at Inverness Airport Rail Station and near the Inverness retail park on the A96 can help to relieve the operation of the Raigmore junction, and traffic flow within Inverness.

The park and ride at the proposed rail station can help to extend the catchment of this station, for those who would find the rail service convenient.

The park and ride on the A96 by the retail park can have several advantages. Firstly, it can help relieve some congestion in the area of Raigmore. Secondly, by locating the facility near to the retail facilities this can help to facilitate trip-linking, reducing separate trips to work and then to the retail park. Frequent services, with reliable and competitive journey times would be necessary to make such a facility a success, allied to demand management measures within Inverness town centre.

5.9. Walking and Cycling

The preferred transport option requires that opportunities for walking and cycling to local facilities are promoted through the design of each settlement. This means high quality links, but also a coherent relationship between houses and facilities that does not rely wholly upon car access.

Providing high quality cycle lanes between each settlement, and key destinations is also important to offer mode choice. This means cycle paths ideally constructed to the standards of the National Cycle Route, offering safety, coherence, and directness. Principal locations in the corridor in

5.10. Complementary Demand Management Measures

The provision of enhanced public transport services on their own is unlikely to achieve a significant mode shift from car to other modes; it is however part of the package.

Other elements of the package are measure designed to control traffic demand. These are often applied at significant trip destinations, and include parking management, traffic management, pedestrianisation, access control, and road space re-allocation to public transport use.

Without a complementary demand management strategy, efforts to encourage a high take up of public transport, walking and cycling will have limited effectiveness.

5.11. Conclusion

The elements of the preferred transport option are illustrated in figure 5.1.

This chapter has considered the travel demand characteristics of the proposed long term development of 10,000 households within the study area. It has proposed a preferred transport option considering the long-term capacity of existing transport infrastructure, and options for managing the additional demand . The following chapter will provide an overview of the stakeholder development model and technical options.

6 TESTING STAKEHOLDER AND TECHNICAL OPTIONS



6. Testing Stakeholder and Technical Options

6.1. Introduction

This Chapter will provide an overview of the stakeholder model options associated with the development of 10,000 houses between Inverness and Nairn generated by two stakeholder workshops held with Government and regulatory stakeholders and business/developer/landowner stakeholders. In addition, considers the options developed by specialist consultants for land use, landscape and infrastructure.

6.2. Development Model Options Considered

In total, four development model options were identified within the established constraints. These are described below.

6.2.1. Eastern Growth

This option focuses growth in a chain of settlements running from Nairn to Ardersier in the east of the corridor. Includes substantial growth of Ardersier and substantial new settlement located on the northern part of the Ardersier Fabrication Yard.

In transport terms, this option promotes the construction of the Nairn By-Pass, dualling of the A96 and a new connection from the A96 to the A9 which by-passes the Raigmore Interchange. A number of additional local roads will link new communities and provide linkage to the new employment area in Ardersier.

Public transport provision is primarily bus focused with limited upgrading halt provision on the existing rail line. One new rail halt is proposed within the study area at Inverness Airport.

A west-east recreation route for walking and cycling is proposed to the south of the A96, with further local recreation routes linking new settlements to the north.

Development Location and Size
This option outlines a large number of small-scale settlements to the north west of Nairn. This 'small and many' type of development may generate a high number of trips since local amenities are not immediately available. In addition the location of the settlements i.e. at the opposite end of the study area from Inverness, are conducive to longer trips since Inverness is the main destination in the corridor. Therefore, this is not complementary with transport objectives of minimising the number and length of car based trips.

Road
Analysis of road capacity in the previous chapter showed that the introduction of 10,000 new homes along the A96 corridor would result in extra demand for road capacity of such volume that dualling of the A96, Nairn By-Pass and improvements at Raigmore interchange would be necessary. This eastern growth option supports these requirements, and in addition promotes by-passing of Raigmore interchange to the south.

Rail
In terms of travel by rail this option denotes one rail station located at Inverness Airport on the Aberdeen-Inverness line. This is favourable with the rail capacity analysis shown in the previous chapter which suggested that one new rail halt could be sustained on this section of track. Although this station is strategic in its location in terms of business and industry, its distance from new and existing settlements would mean minimal supporting residential patronage. Therefore, it is that felt without patronage from all industry, airport and residents the viability of the rail halt may be threatened.

Bus
The main bus movement is between Inverness and Nairn in this area therefore any new bus services would be more suitably placed on this route in order to provide a high frequency service. If settlements, and therefore bus services are situated away from this main corridor, bus services will have to cover a greater area and will be unable to sustain a high frequency. This option is not favourable with a sustainable bus service since the two of the four proposed settlements are located away from the A96, towards the end of existing bus routes, and would result in difficulties with operating a fast, reliable, attractive service.

Walking and Cycling
The option for eastern growth denotes recreational routes for walking and cycling connecting Inverness and Nairn to the north and south of the A96 which support transport objectives.

Conclusion
Overall, we would conclude that the Eastern Growth option is feasible, although not desirable. Whilst the level of infrastructure proposed appears appropriate, the locations of the settlements would not
a) minimise trip generation and length
b) support the proposed rail halt
c) support a high frequency bus service

Placing the settlements closer to the A96 corridor would improve the feasibility of this option.

6.2.2. Polar Growth

This option promotes substantial growth at both ends of the corridor. At the eastern end a large extension of Nairn is proposed. Substantial extension of Inverness is envisaged in the west north of Culloden straddling the A96. In addition, an employment designation is made between the railway line and the A9.

In transport terms, this option promotes the construction of the Nairn By-Pass, dualling of the A96 and a new connection from the A96 to the A9 which by-passes the Raigmore Interchange.

Public transport provision is primarily rail focused with emphasis on rail halt provision in three locations to serve the new settlements. Three new rail halts are proposed: Blackhill, Inverness Airport and Mosshall.

Continuous west-east recreation routes for walking and cycling are proposed both to the north and south of the A96.

Development Location and Size
The polar growth option in compatible with transport objectives in terms of location and size of new settlements since the new settlements are an extension of the two main trip destinations of Inverness and Nairn and therefore close to local amenities. Therefore this option supports minimised trip generation and length of car based journeys and maximum use of public transport.

Road
The option promotes dualling of the A96, Nairn By-Pass and south by-pass of Raigmore Interchange. This supports transport analysis that shows the addition of 10,000 new homes in this area would seriously jeopardise the efficiency of the trunk road network, without road improvements.

Rail
Our analysis of rail capacity considered that within the constraints of existing infrastructure, the economic justification for additional rail halts, and operational feasibility for new rail halts were both problematic. Whilst we believe that a business case for a new strategic rail halt at the airport could be presented, if supported by both residential and business/industrial land uses, at other locations, the case is weaker. Either substantial new infrastructure would be required to support additional local services, or longer distance services would have to stop at the halts – slowing journey times, and reducing service frequencies. In both cases, the costs are likely to far outweigh the overall benefits.

Bus
This option promotes new settlements straddling the A96 which is conducive with the Nairn to Inverness bus service therefore it would be relatively easy to introduce an attractive, reliable, high frequency service.

Walking and Cycling
The option for eastern growth outlines recreational routes for walking and cycling connecting Inverness and Nairn to the north and south of the A96 and linking new and existing settlements which are favourable of transport objectives.

Conclusion
Polar growth is an attractive and broadly feasible option that builds upon the existing settlements, and encourages sustainable transport patterns. The only element that appears unfeasible is the aspiration for three new rail halts. However, the settlements to the west of Nairn and east of Inverness would work well without the proposed rail halts, provided that frequent and reliable bus links could be developed.

6.2.3. Island Growth

This option promotes a series of independent new settlements. Growth is focused on extension of the Fabrication Yard, development of Ardersier, and expansion of Newlands / Culloden Muir and Croy. In addition, two new settlements to the west of Inverness Airport (to the north of the railway line) are proposed. New recreational provision is proposed to the west of Inverness Airport.

In transport terms, this option promotes the construction of the Nairn By-Pass, dualling of the A96 and a new connection from the A96 to the A9 which by-passes the Raigmore Interchange. Very few new local roads are proposed.

Public transport provision is primarily rail focused with emphasis on rail halt provision in five locations to serve the new settlements. In addition, a further new rail halt is proposed at Inverness Airport.

A continuous west-east recreation route for walking and cycling, linking Inverness and Nairn, is proposed to the north of the A96, and a continuous link to the south of the A96 provides a link between Nairn and National Cycle Route One.

Development Location and Size
The high number of small development is not sympathetic with transport objectives as it is conducive with high trip generation since residents will have further to travel to get to essential amenities. Therefore, this option will promote a high number of car based trips.

Road
Island growth option supports dualling of the A96, a Nairn By-Pass and a southern by-pass of Raigmore interchange, i.e. those measures necessary to support the additional demand created by 10,000 new homes. Therefore this option is compliant with transport measures in terms of road infrastructure improvements.

Rail
This option promotes five new rail halts, four of which on the Inverness to Aberdeen line and one on the Inverness to Perth line. As described above, this is not compatible with analysis done on rail capacity, which suggests that without significant infrastructure provision and increased ongoing subsidy support, such a proposal would be unfeasible.

Bus
Bus services could be supported by this development option. Existing Nairn to Inverness services, improved to meet the additional demand, could serve settlements on the edge of the A96. The extension of the settlements at Newlands / Culloden Muir, Croy and Ardersier could also be served by existing local services. However, the new settlement at the Ardersier Fabrication Yard is not desirable in terms of bus services. In addition, the sporadic nature of these settlements and their relationship to the A96 would be less favourable to high frequency bus services.

Walking and Cycling
The option for eastern growth indicates recreational routes for walking and cycling connecting Inverness and Nairn to the north and south of the A96 and linking new and existing settlements which are favourable of transport objectives.

Conclusions
The dispersed nature of the settlements proposed within this option would tend to maximise trip generation, and limit opportunities for the provision of high frequency public transport options, given the constraints on the existing rail infrastructure.

To become more desirable, we would suggest a reduced reliance on a rail-based public transport solution, and a greater consolidation of settlements.

6.2.4. String of Pearls

This option promotes a more closely integrated approach than Island Growth. Growth is focused on the rail line, through a string of new settlements. Five new settlements are located along the length of the corridor and extension of the existing settlements at Gollanfield / Lochside, focused on the railway line and each served by a rail halt. The Fabrication Yard is identified for employment.

In transport terms this includes no proposals for the trunk road however a few local roads proposed between settlements.

A continuous west-east recreation route for walking and cycling, linking Inverness and Nairn, is proposed to the north of the A96, and a continuous link to the south of the A96 provides a link between Nairn and National Cycle Route One.

Development Location and Size
The string of pearls development option is unsympathetic with transport objectives in terms of the large string of small developments. This is likely to contribute to a high number of car-based trips. In addition, the developments are distributed along the corridor, therefore causing longer trips to the main destinations of Inverness and Nairn.

Road
This development option promotes no improvements to the trunk road. This is an optimistic assumption, with the road capacity analysis done previously in this report which showed that trunk road improvements would have to be made in order to sustain the addition traffic flow created by 10,000 new homes in this area.

Rail
The string of pearls development option is based around six developments straddling the length of the track between Inverness and Nairn, each with their own rail halt. It is unrealistic to suggest that such a number of stations could be justified without significant improvements to the rail infrastructure to maintain its integrity as a long distance, inter-urban route. In addition, these local services would only operate

successful with significant ongoing subsidies which is unlikely to be realistically achievable. Furthermore, the range of destinations, and trip purposes suited to rail, means a significant mode switch from road to rail would be achievable.

Bus
In terms of travel by bus this development option supports the introduction of a high frequency, reliable bus service. With each of the new settlement bordering the A96 existing Nairn to Inverness direct bus services could be enhanced with relative ease.

Walking and Cycling
The option for eastern growth shows recreational routes for walking and cycling connecting Inverness and Nairn to the north and south of the A96 and linking new and existing settlements which are favourable of transport objectives.

Conclusion
In transport terms, this option could be feasible, with a more realistic expectation of the potential of the rail service, increased emphasis on a high quality bus-based solution, and trunk road improvements in Nairn, at Raigmore, and along the A96.

6.3. Technical Development Options Considered

6.3.1. Land Use

This option promotes extension of the existing settlements of Ardersier, Croy and Newlands / Culloden Muir and new recreational provision is proposed to the west of Inverness Airport.

In transport terms this option promotes new road upgrade to the B9006 and B851 to the south of the A96, including improvements to public transport.

A continuous west-east recreation route for walking and cycling, linking Inverness and Nairn, is proposed to the north of the A96, and a continuous link to the south of the A96 provides a link between Nairn and National Cycle Route One.

Development Location and Size
This option promotes the extension of the settlements at Newlands / Culloden Muir, Croy and Ardersier. This supports transport objectives for fewer and shorter car based trips since it promotes larger town with existing amenities.

Road
This land use development option promotes no improvements to the trunk road. This is not sympathetic with the road capacity analysis done previously in this report which showed that trunk road improvements would have to be made in order to sustain the addition traffic flow created by 10,000 new homes in this area. This option does promote road upgrades to the B9006 and B851 south of the A96 linking Newlands / Culloden Muir and Croy with the A9, however such upgrades may not be sufficient for this volume of development. In addition, no road upgrades are shown for the local roads linking Ardersier to the A96.

Rail
The land use technical option promotes a new rail halt at Newlands on the Perth – Inverness line.

Similar considerations affect this location, as on the Inverness-Aberdeen line, due to resolving the conflict between providing fast and frequent inter-city connections (which generate higher revenue) and providing slower, more local services (which require significant subsidy support). Given the frequency of service that would be possible from such as station, and range of destinations served, and the limited catchment of the station (mainly residential) we would suggest that the feasibility of such an additional rail halt is marginal.

Bus
Bus services could be supported by this development option. The extension of the settlements at Newlands / Culloden Muir, and Croy could be served by extending existing high frequency local services. It may be more difficult to provide a high frequency service for Ardersier. This option does outline public transport improvements with the road improvements on the B9006 and B851 with could be in the form of bus priority in order to make bus services more attractive.

Walking and Cycling
The land use technical option shows recreational routes for walking and cycling connecting Inverness and Nairn to the north and south of the A96 and linking new and existing settlements which are favourable of transport objectives for promoting sustainable travel.

Conclusion
We would anticipate that with the addition of trunk road improvements, this option would become feasible in transportation terms. The new rail halt at Newlands appears attractive, but the advantages that it provides may not outweigh more strategic disadvantages.

6.3.2. Landscape

This option promotes a series of independent new settlements close to the A96 and some extension to Ardersier, Croy and Culloden / Smithton / Balloch. Included in this option are substantial new recreational and landscape areas next to the proposed settlements to the west of the Airport, and to the north of Ardersier, in addition to the west of Nairn.

In transport terms this option promotes dualling of the A96.

A west-east recreation route for walking and cycling is proposed to the south of the A96, with further local recreation routes linking new settlements to the north.

Location / Size
This option promotes a high number of car based trips through the high number of small developments. It is not favourable with transport objectives since residents will have to travel outwith the settlements to get to essential amenities.

Road
The landscape technical option supports dualling of the A96 which is compliant with transport measures in terms of road infrastructure improvements for 10,000 new homes. On the other hand, analysis of road capacity has shown that Nairn and Raigmore interchange may not manage the extra demand due to the new homes. In addition there are no local road improvements outlined for the new settlements. Therefore it is felt this option does not outline sufficient road improvements.

Rail
This option outlines no rail improvements. An opportunity to introduce a rail halt at Inverness Airport could be taken in order to provide a sustainable transport option the settlements surrounding the airport, and proposed industrial/business park.

Bus
In terms of travel by bus this development option supports the introduction of a high frequency, reliable bus service along the A96 due to the number of new settlements located on the trunk road corridor. The settlements extending Culloden / Smithton / Balloch, Croy and Ardersier could be served by existing bus services which could be improved due to higher demand. The other settlements, isolated from the A96 and other existing towns / villages cause more difficulty since new bus services would have to be started up, perhaps taking some frequency away from existing services therefore making them less attractive.

Walking and Cycling
The landscape technical option indicates recreational routes for walking and cycling connecting Inverness and Nairn to the north and south of the A96 and linking new and existing settlements which are favourable of transport objectives.

Conclusion
Some elements of this option are feasible. The addition of trunk road improvements at Nairn and Raigmore would be necessary, and also a greater consolidation of settlement would also improve its desirability in transport terms.

6.3.3. Infrastructure

This option focuses on two concentrated developments either side of the airport. In transport terms this option promotes a new rail halt at Inverness Airport.

A continuous west-east recreation route for walking and cycling, linking Inverness and Nairn, is proposed to the north of the A96, and a continuous link to the south of the A96 provides a link between Nairn and National Cycle Route One.

Development Location and Size
This option supports two large new settlements concentrated around the Airport and A96. This is conducive with transport objectives since larger developments create smaller internal trips and fewer, longer car based trips since local amenities are easily accessible.

Road
This land use development option promotes no improvements to the trunk road. This is not sympathetic with the road capacity analysis done previously in this report which showed that trunk road improvements would have to be made in order to sustain the addition traffic flow created by 10,000 new homes in this area. Analysis of road capacity also has shown that Nairn and Raigmore interchange would not manage the extra demand due to the new homes. In addition, there are no local road improvements outlined for the new settlements. Therefore, it is felt this option does not outline sufficient road improvements.

Rail
The infrastructure technical option promotes one new rail halt on the Aberdeen - Inverness line at Inverness Airport. It is likely this station would have sufficient patronage from the new settlements, the

Airport and surrounding industrial and business parks in order to mitigate the negative impacts on the lines ability to operate inter-urban services and the significant capital costs and fare subsides required to run short local journeys by train. In addition, the station could benefit from Park and Ride facilities for those residents out with the 800m walking catchment and from existing communities further a field. Therefore this option supports transport objectives for promoting travel by public transport with a feasible new rail halt.

Bus
In terms of travel by bus this option supports the introduction of a high frequency, reliable bus service. With each of the new settlement bordering the A96 existing Nairn to Inverness direct bus services could be enhanced with relative ease.

Walking and Cycling
The option shows recreational routes for walking and cycling connecting Inverness and Nairn to the north and south of the A96 and linking new and existing settlements which are favourable of transport objectives.

Conclusion
A central focus for the new settlement area, centred on both the main transport corridor (rail, road, bus) helps to reduce trip generation, and promote sustainable modes. The feasibility of the rail halt is strengthened by the combination of uses – airport; business/industrial; and residential.

Ensuring that the settlements were not dissected by the trunk road would increase the desirability of the option. Alternatively, it is possible that the trunk road be diverted around the settlement.

6.4. Summary

This Chapter has provided a broad overview of the four development model options generated by stakeholders and three technical options developed by consultants, for the development of 10,000 new houses along the A96 corridor between Inverness and Nairn. The following table provides a summary of the different options and their performance against transport criteria.

Table 6.1 Summary of Options Against Transport Criteria

	Development Size and Location	Road	Rail	Bus	Walking and Cycling
Eastern Growth	×	✓	×	×	✓
Polar Growth	✓	✓	×	✓	✓
Island Growth	×	✓	×	×	✓
String of Pearls	×	×	×	✓	✓
Land Use	✓	×	×	✓	✓
Landscape	×	✓	×	×	✓
Infrastructure	✓	×	✓	✓	✓

The next chapter outlines the preferred option in terms of transport provision.

7 CONCLUSIONS AND RECOMMENDATIONS



7. Conclusions and Recommendations

7.1. Introduction

This Chapter will provide an overview of the conclusions and recommendations of the study. It will firstly summarise the existing situation with regard to the study area. A summary of the preferred transport option and other stakeholder and technical will be provided.

7.2. Key Considerations

The study area comprises that section of the A96 corridor between Inverness and Nairn.

The A96 forms the main arterial route between Inverness and Nairn and is predominately single-carriageway in nature. A number of key difficulties are currently experienced on the road network, as follows:

- The mix of vehicles using the A96, and prevalence of tourists, farm vehicles and HGVs, can result in slow moving traffic.
- Overtaking can be difficult due to the single carriageway nature of the majority of the A96;
- Queuing traffic on A96;
- The merging of dual carriageway to single carriageway to the east of the Raigmore Interchange (eastbound) increases the accident risk.
- Congestion at the A96 / A9 junction at Raigmore Interchange presents difficulties during the AM and PM peak periods.

In addition, Nairn suffers from congestion due to the narrow nature of the road network through the town centre, and the mini-roundabout on the A96 in Nairn is unlikely to operate satisfactorily with additional traffic pressures.

National Cycle Route One passes through a section of the study area.

Existing rail stations are located within Inverness and Nairn and both stations are located on the ScotRail Aberdeen – Inverness route. The Aberdeen - Inverness rail route acts as both a local service and long-distance service. The railway is single track and, as such, track occupancy is at a premium.

Bus services along the A96 corridor between Inverness and Nairn are provided by Stagecoach, at a frequency of approximately two services per hour Monday to Saturday and one service per hour on Sunday. Additional circuitous local services are provided by Rapsons Coaches.

A number of existing land-use developments are located within the study area, including Inverness Airport, the Timber Processing Plant at Morayhill, Ardersier Oil Yard and Inverness Retail Park. In addition, there are a number of proposed / desired developments including Inverness Airport Business Park and the expansion of existing villages.

7.3. Preferred Transport Option

The key elements of the preferred transport option are illustrated in Figure 5.1 and can be summarised as follows:

- Large settlement located to the south of Inverness Airport, and A96.
- Smaller settlement constructed on the eastern fringe of Culloden / Smithton / Balloch.
- Smaller settlement constructed on the western fringes of Nairn either side of the A96.
- New local roads constructed to provide linkage to the A96.
- New local road linking settlements at Culloden / Smithton / Balloch with A9 to bypass Raigmore.
- Dualling of the A96 trunk road.
- Upgrade of the Raigmore Interchange, in the form of signalising or enlarging the Interchange, to accommodate additional traffic.
- Construction of a Nairn By-Pass as part of a wider route strategy upgrade.
- New rail station at Inverness Airport to serve both the Airport, the proposed industrial development and the proposed new settlement.
- High frequency shuttle bus service introduced along the A96 between Inverness and Nairn, supplemented by long-distance bus services.
- Bus priority measures on A96 between Smithton and Raigmore.
- Park and Ride at Airport rail halt and Smithton.
- Implementation of recreational cycle lanes to the east of Inverness and between Inverness city centre and the proposed new settlement at Inverness Airport.
- Implementation of measures in Inverness and Nairn to encourage public transport usage.

In terms of the preferred transport option, we have considered it against the following five criteria.

Development Size and Location
The development sizes and locations support transport objectives to reduce trip length and trip generation. The new settlement close to the airport is of sufficient scale to merit local amenities therefore fewer, shorter car based trips. The other smaller settlements are extensions of existing places, therefore shall be served by existing amenities. In addition, the location of these two settlements are close to the main destinations in the area, therefore promoting shorter trip lengths.

Road
This option promotes the dualling of the A96, Nairn By-Pass and upgrading of Raigmore interchange which we initially consider to be required in order to manage the additional demand for road capacity as a result of 10,000 new homes on the corridor. Proposals will become more refined during further development work, and testing of options using the micro-simulation model that is currently being developed.

Rail
The development of a new rail halt at the Airport on the Aberdeen – Inverness line is promoted in this option and supports transport objectives for improved public transport. The station can be viable since the negative impacts of a new rail halt on this line such as slower journeys times of inter-urban existing services, capital costs related to the introduction of a new station, high fare subsides associated with short local rail travel, upgrading of infrastructure due to increased rail services, could be mitigated by the strategic position of the station next to residential, business and industrial areas. The level of patronage for the station could be further enhanced by a park and ride facility to cater for those residents in surrounding communities.

Bus
This option recommends a high frequency service between Inverness and Nairn also serving the new settlement at the Airport. This provision supports transport objectives for accessible and attractive public transport. The direct route, additional road capacity of the A96 and bus priority measures between Smithton and Raigmore will allow the service to have competitive journey times and high frequency in order to be attractive for users.

Walking and Cycling
This development option promotes high standard urban design for walking and cycling within the settlements, to provide for short journeys and promote decreased car dependence. In addition, the creation of a new recreational walking and cycling route to the north of the A96 between Inverness and Airport shall provide infrastructure to National Cycle Network standards for longer journeys.

7.4. Development Model and Technical Options

Four development model option were created from stakeholder consultations and three technical options were developed by specialist consultants. They were appraised against transport criteria which is summarised below.

Eastern Growth
This option promotes new settlements in the north east corner of the corridor near Ardersier. In terms of transport it supported road improvements and walking and cycling provision however has inadequate rail and bus provision. In addition, the 'small and many' nature of the developments, coupled with the distance from the main destination of Inverness would result in a high number of long car based trips.

Polar Growth
This option shows new settlements extending from Inverness and Nairn. This option performs well against transport criteria. The size and location of developments are such that promote local trips and reduce longer car based trips. It outlines road capacity improvements to cope with additional demand, the settlements are located on the A96 therefore bus services can be provided easily and effectively, and walking and cycling provision is also shown.

Island Growth
This option outlines many small settlements 'scattered' across the study area. In terms of performance against transport criteria, this option performs will against road capacity criteria as it outlines trunk road improvements, and walking and cycling provision but not against other criteria. The 'small and many' settlements are unfavourable with sustainable transport objectives as they create large numbers of long car based trips. The option outlines five new stations which are unlikely to be feasible in terms of cost, infrastructure and patronage.

String of Pearls
This option promotes new settlements bordering the railway line between Nairn and Inverness. This option performs well against transport criteria for bus services due to the proximity of the settlements to the A96, they could easily be served by a high frequency shuttle bus service. Also, this option promotes extensive walking and cycling links which support transport objectives for offering alternatives to car travel.

However, this option outlines no trunk road improvements which is inadequate for the scale of development. The 'small and many' layout of developments is conducive with large number of long trips which is incompatible with reducing car based trips. In addition the proposal for new rail halts at each new settlement is likely to be unfeasible operationally, and economically.

Land Use
This option outlines three new settlements extending from the existing communities at Newlands / Culloden Muir, Croy and Ardersier. This option performs well against transport objectives for reducing car usage in that the development size and locations will encourage internal trips and not longer distance. Also, the extensive walking and cycling provision ill help promote more sustainable travel. The rail halt proposed at Newlands may be only marginally feasible due to its location, the negative impacts may outweigh the residential patronage levels. Furthermore, no improvements to the A96 are outlined.

Landscape
This option promotes eleven new small-scale settlements spread over the study area. Such developments type and conductive in producing large numbers of long car based trips. This option does outline adequate trunk road improvements and walking and cycling infrastructure. There would be difficulty in providing attractive bus services due to size of area the settlements cover.

Infrastructure
This option shows two new large settlements either side of the airport, spanning the A96. This option is good in terms of reducing car based trips due to the large scale and concentration of settlements. This also allows rail to be a attractive option for travel, with this scheme proposing a new rail halt at the Airport. In addition the proximity to the A96 will allow an attractive, high frequency bus service to be developed. Extensive walking and cycling links are provided, however no trunk road improvements are proposed. Locating the settlements either side of the trunk road, or diverting the trunk road around the settlements would improve the feasibility of this option.

Appendix A – Traffic Flow Diagrams