A96 CORRIDOR CAPACITY ASSESSMENT

Highland Council

Transportation Analysis - Supplementary Report

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HIGHLAND COUNCIL

A96 CORRIDOR CAPACITY ASSESSMENT

TRANSPORTATION ANALYSIS - SUPPLEMENTARY REPORT

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1 INTRODUCTION



1. Introduction

Supplementary analysis has been undertaken in order to inform the following aspects associated with the development of the final A96 Corridor Masterplan.

This report develops further the original Transportation Analysis document, which was finalised in October 2004.

The analysis included within this report covers the following aspects.

- A96 Dualling Alignment;
- A96 Raigmore – Longman Link Road;
- Potential Bus Transit Technologies;
- Settlement Access – Proposed new central corridor settlement; and
- Settlement Access – Ardersier Yard.

The work provides the transportation input required for the finalisation of the preferred masterplan solution, and arises following discussion with the client group of the draft masterplan proposals.

2 A96 DUALLING ALIGNMENT



2. A96 Dualling Alignment

2.1. Introduction

Analysis undertaken earlier within the study confirmed the likely requirement to increase the capacity of the A96 between Nairn and Inverness, and that this may become desirable even with no consideration of additional development within the corridor. The introduction of additional development increases the likely requirement for capacity enhancement, most likely through a dualling of the existing route. Our analysis also found that the proposed development on the A96 corridor strengthened the case for the proposed Nairn bypass. Our work confirmed the requirement for additional, more detailed, capacity analysis, based on a detailed understanding of traffic flow characteristics.

In terms of junction capacity, our analysis also reviewed the current operation of the Raigmore A96/A9 interchange. In the absence of detailed traffic flow and queue information, it was not possible to clearly determine the performance of this junction, either in current or future scenarios. However, anecdotal evidence suggested the prevalence of peak period queuing, and the introduction of peak period traffic signals also indicated that the junction is nearing operation capacity during specific periods of the day.

Work, commissioned by Highland Council, is currently ongoing for the development of a strategic simulation model of the road network across the wider Inverness area, including the A96 corridor. This model will in the future provide a tool for the development of more robust analysis of capacity requirements, given specific travel demands.

2.2. A96 Dualling Alignment

The potential dualling of the A96 between Inverness and Nairn provides an opportunity to consider the optimum alignment of the route, with reference to the planned future development proposals.

One option would be to undertake the dualling along the existing alignment of the route. Potential advantages of this option include the directness of the route, and the limitation of environmental impacts, as the route would be within the existing transport corridor. However, potential disadvantages include the increased difficulty of undertaking the construction “on-line” with associated additional traffic management costs, disruption, delays, and increased safety risks.

With respect to the proposed new development, situated broadly to the south east of the airport and business park development, the existing trunk road effectively severs the two developments. This could limit a large opportunity for real integration of land uses, and the encouragement of local access by bus, cycle and for pedestrians, with the two land use developments becoming divorced from each other by the A96.

A second option would be to consider a new, off-line alignment, passing to the south of the proposed development. This would enable greater integration of land uses, and limit potential severance. It would also assist in the creation of a more sustainable location, with more opportunities for local trips to be undertaken by bus, cycle or walking. Disadvantages of this option may relate to the less direct nature of such an alignment, and the introduction of new environmental impacts. Parallel service roads would act as a local distributor, accommodation local trips and access, and thus assist with limiting the number of interchanges on the new off-line alignment. We would suggest that the existing alignment of the A96 be used to provided such a function, providing local access.

Potential advantages stem from off-line construction, which can allow greater efficiencies to be achieved with less overall disruption.

At this stage of masterplan development, we suggest that the two possible alignments are included for further appraisal and option development. Initially, a full STAG appraisal would be required to appraise these options, with subsequent adherence to Highway Design procedures outlined in the Design Manual for Roads and Bridges.

2.3. Raigmore Interchange

Previous analysis suggested the development of a southern bypass of Raigmore, so as to link to the main southern distributor road.

Two other options have also been suggested following discussions with the client group. These are a northern bypass of Raigmore junction, and also an in-situ junction upgrade.

The northern bypass option could provide a more direct linkage to the significant employment area situated in the Longman Industrial Areas, and open up development opportunities adjacent to (and to the south of) the Caledonian Stadium. Furthermore, by linking this route into the established Longman Roundabout, the

resultant trip re-distribution may provide an operational performance at this junction, due to a better balancing of demand from each arm of the roundabout. In comparison with a southern bypass, such a route would also avoid encroachment upon the proposed “Green Wedge” which is identified within the development plan for amenity uses.

The in-situ option could have less of an impact on land take and environmental impacts, and may be a more affordable option.

The scope of the current report does not provide the opportunity to determine the feasibility, or appraise in detail, either of the options considered. However, the development of a strategic traffic model will provide the opportunity to assess the traffic network performance of the options under consideration.

In terms of engineering feasibility of the northern option, constraints include:

- the requirement to maintain sufficient spacing between junctions to allow for safe merging and lane change manoeuvres, implying a new junction is unlikely to be acceptable between the Raigmore and the retail park access;
- the proximity to the Aberdeen-Inverness rail line, which runs adjacent to the north side of the A96;
- the suitability of the landfill site over which the proposed northern bypass route would run;
- the necessity to reclaim land upon which to found the proposed northern option;
- the requirement to provide adequate sea defence/flood protection for the northern route;
- the policy to protect as a green wedge land to the south of the A96 and the A9 for amenity uses;
- the engineering difficultly in providing a “step change” in junction capacity at the existing site, and which due to site constraints may tend to require additional grade separation.

With respect to the proposed northern route, it is noted that the provision of a road formed by the combination of reclamation and rock armoured berm has already been established in the area.

The combination of these constraints suggest that the northern option would be more expensive and complex than a southerly option. However, whilst a southern option may be feasible in engineering terms, its effectiveness in improving the overall operation of the road network may be more limited, particularly considering the peak period network capacity constraints currently associated with the Inshes Junction area. If feasible, an situ development of Raigmore may also provide advantages with respect to minimising land take, and affordability.

It is only through a more detailed network and engineering feasibility analysis, and subsequent scheme appraisal that a preferred solution can be identified. At this stage, we recommend that the three options be considered in subsequent analysis.

A full STAG appraisal would be required to appraise these options, (along with a do-minimum option), to accompany the standard Highway Design procedures outlined in the Design Manual for Roads and Bridges.

3 BUS TRANSIT TECHNOLOGIES



3. Bus Transit Technologies

3.1. Introduction

Previous analysis highlighted the preference for a bus-based public transport system, providing a high quality, high frequency and attractive link between new settlement areas, and existing key destinations.

Further discussions with the client group highlighted a desire to develop the concept further, and to consider specific technologies that could be employed.

A range of potential technologies are available, and could be considered within a more detailed option appraisal. These technologies include:

- Conventional Light Rail Transit / Trams;
- Ultra Light Rail;
- TramBus;
- Guided Bus; and
- Conventional Bus with Prioirty Measures.

The attributes and suitability of each option are briefly considered below.

3.2. Light Rail / Tram

Conventional Light Rail / Tram provides an attractive, although particularly expensive option for the corridor. Dedicated track-way removes problems of on-road congestion, although on-street running is possible to achieve maximum penetration in urban situations. Light rail and tram can have the feel and image of train, and are popular.

However, relatively high costs associated with construction, maintenance and operation demand high patronage levels and urban densities to enable the scheme to be financially viable. Despite the scale of development envisaged for the A96 corridor, it is doubtful whether such a scheme could be demonstrated to be economically viable.

Successful schemes are operational in several English cities, including Manchester and Birmingham, and are being considered in other locations such as Edinburgh, Glasgow and Leeds.

3.3. Ultra-Light Rail

Ultra-light rail is a novel concept which has previously been considered for application in some English cities. Self powered units, with up to 20 passengers could be run on less expensive track and infrastructure. Currently, the application has not been associated with any commercial applications, with the limiting factor of viability being the low number of passengers capable of being transported in any one unit.

3.4. Trambus

In order to overcome the perceived poor image of conventional buses, bus manufacturers have been developing new “concept” vehicles, generically known as Trambus. The aim has been to provide the step-change in vehicle image, and passenger comfort, associated with urban tram or light rail systems, whilst maintaining the basic principle of conventional buses, ie driver operated, requiring no additional on-road infrastructure.

The FirstGroup have begun testing the market with such vehicles, but have stated that such vehicle would only be suitable for high frequency urban routes, where high levels of priority have been provided. Fundamentally, there would appear to be no reason why such vehicles could not be adapted for use within a guided busway system, described below.

3.5. Guided BusWays

Guided Busways provide an intermediate step in technology between tram/LRT systems, and conventional bus systems. Special buses can utilise the existing road network, or utilise specifically reserved busways which are separate from the main carriageway thus avoiding congestion problems. The schemes can be associated with a high quality of vehicle, and correspondingly higher perceived image.

Guided busways are currently being utilised in Edinburgh as part of the FastLink scheme. A £85m 20km guided busway is currently being proposed in Cambridgeshire between Cambridge and St Ives, along a converted former rail line. This combines on-street running with guided bus way. The busway itself can cost between £1m and £2m per km to construct.

Glasgow City Council is developing a scheme, which may provide the first stage of eventual LRT/Tram development.

The attractiveness of the system is the ability to provide a high quality system, with specific opportunity for segregation along specific links, as well as the flexibility and penetration for on-street running. Combined with lower patronage to make the system viable, such as system could form the most appropriate technology, subject to further appraisal.

3.6. Conventional Bus Priority

The final solution would be the application of more conventional “on carriageway” bus priority measures at specific points on the highway network.

Whilst providing cheap and proven technologies, which are now potentially enforceable through cameras, such systems do not provide opportunity for a perceived “step change” in transportation provision, and thus would not necessarily attract high levels of patronage and mode shift desired by the masterplan vision.

4 DEVELOPMENT ACCESS



4. Development Access

4.1. Introduction

The masterplan proposals that have been presented include the introduction of two new significant areas of development. The first development is at the former Platform Construction Yard at Ardersier, whilst the other more significant development is in the centre of the corridor study area, near to the airport and business park.

Each of the two development requires consideration of an appropriate road network access strategy.

4.2. Ardersier Yard

The new development at Ardersier perhaps provides the most challenging access considerations.

The existing yard is accessed by a two-lane access road, which is approximately 2km long, on a straight alignment.

Two issues are raised by this arrangement. Firstly, the necessity to provide an alternative access into the proposed new settlement, so as to ensure that access onto the A96 can be provided by a secondary means. There is an opportunity for this access to link into the existing village of Ardersier, so as to provide a coherent public transport link. An additional point of access is highly desirable, as a single access could limit the development potential of the area.

The second issue relates to the suitability of the existing link road's alignment. There will be safety concerns regarding the length and straightness of the road, which would tend to potentially encourage high speeds. The opportunity to introduce a more varied horizontal alignment may require to be considered.

4.3. New "Central" Settlement

Details of access to the proposed settlement will depend upon whether the opportunity is taken to provide an alignment of the A96 to the south or north of the new development. In chapter two of this supplementary report we note that both options be retained for further development and appraisal.

4.3.1. Current Policy Context

Current policy advice regarding the development of new access onto the trunk road network is contained within the Scottish Executive's Planning Advice Note 66 – Annex B: Advice on Major Developments Affecting Trunk Roads and Motorways.

In paragraph 2, this states:

"The primary purpose of this network is to provide for the safe and efficient movement of long distance through traffic. This means strictly limiting the number of direct accesses on to trunk roads and ensuring the full implications for traffic and road safety are taken into account. It also means restricting access where new developments are proposed in the vicinity of trunk roads, particularly on to dual carriageways where speeds are high. This is the case whether development involves the creation of a new access or increased use of an existing access."

The document continues in paragraph 16 that the Scottish Executive:

"will consider the impact of the development under the headings of **trips, traffic** and **safety**. Some effects may take place at a considerable distance from the development and Transport Assessments will be required to be sufficiently widely drawn to identify these.
Trips – The effect of trips or journeys generated by the development on the transport infrastructure as a whole, including public transport, cycling and walking, should be fully assessed. The relationship between the number of journeys on each mode and the level of provision should be clearly established.
Traffic – Traffic effects will be considered principally in terms of congestion. Where congestion occurs at present, or where a trunk road is approaching capacity, attention will be focussed on increases in queuing or delay, not only at junctions but also on the trunk road between junctions where appropriate. Most congestion occurs at peak periods, and analysis should be concentrated on these. Many roads cannot accept more traffic at peak periods, and increased demand results in peak-spreading. Analysis should explore these effects fully, and it will not be acceptable merely to look at peak **hour** flows which may not show an increase.
Safety – Road safety problems arise usually as a result of increased use of junctions. In some cases, existing junctions may no longer be appropriate for the volume and/or speed of traffic. **There is a presumption against new junctions on the trunk road and motorway network."**

Clearly, this highlights the requirement for detailed appraisal and analysis to satisfy the existing policy conditions, or develop a case for a departure from policy. A full STAG appraisal will typically form the basis for this assessment, along with a detailed transport assessment.

4.3.2. Junction Accesses – Design Principles

A series of over-riding principles determine the implementation of junctions on the trunk road network.

- number of junctions;
- spacing of junctions; and
- junction type.

The policy guidance states that the number of direct trunk road junctions should be minimised, with an assumption initially placed upon the development of a coherent parallel road hierarchy, consisting of regional and local distributor roads, to be designed for the majority of local road trips. At this stage of the process, it should be assumed that most probably two junctions, no more than three junctions, would be provided onto the trunk road.

The spacing of junctions is also a key safety and capacity consideration. The optimum spacing depends critically upon the chosen design speed, associated sight distance, and junction complexity. At this stage, minimum junction spacing of 2km should be assumed.

The design manual for roads and bridges[1] sets out a range of different junction configurations that can be considered for the trunk road, varied with respect to capacity. With respect to increasing levels of traffic level are:

- priority junction;
- signalised junction;
- at grade roundabout;
- diamond or half cloverleaf;
- dumbbell roundabout;
- 2 bridge roundabout;
- 3 level roundabout; and
- full interchange.

The guidance does not provide specific capacity categories for each junction type, emphasising the requirement for detailed capacity assessment, and the need for the development of a coherent route strategy, considering environmental as well as economic considerations.

At this initial stage of master-plan development, it is considered that at-grade roundabout accesses, or grade separated junctions (dumbbell or two bridge roundabout) form the basis of initial consideration.

4.3.3. Junction Accesses – Existing Alignment

If the A96 continues to be routed on the existing alignment, then trunk road access arrangements are potentially more complex, and greater consideration is required of the impacts upon the safety of the route, and its strategic function. Greater consideration will also be required of how to manage potential severance between the proposed settlement, the airport, and associated airport business park developments.

4.3.4. Junction Accesses – Southern Alignment

If the A96 is routed to the south of the development, it would form a virtual bypass. With such an arrangement, it is typical that two access junctions be provided, in this instance to the east and west of the settlement, allowing access onto the former alignment of the A96. More detailed appraisal could determine the case for additional junctions onto the network.

Maintenance of access onto the local road network to the south of the new alignment would also be required, such as the B9090 and B9101, although this need not be through direct access onto the new alignment of the A96.

4.3.5. Internal Road Hierarchy

Key principles for the development of an internal road layout are as follows:

- Enable the safe and convenient movement of all types of transport.
- Enable the provision of a coherent urban framework;
- Enable high levels of accessibility to the different elements of the proposed development, especially pedestrians, cyclists; and
- Enable the provision of viable and attractive sustainable transport options.

[1] Design Manual for Roads and Bridges, Volume 6, Section 2, Part 2, TA 48/92, Chapter 2

Highland Council have published road development guidelines, recommending that the internal road network should be based on a defined and standard road hierarchy consisting of

- District Distributor Roads – for strategic traffic flows
- Local Distributor Roads, linking District Distributor Roads to Access Roads. Typically, these serve around 1,000 dwellings, have 6.0m minimum width (7.3m on bus routes), with segregated footways preferred. Typically, no frontage access is permitted, with the roads forming the main spine routes in the development.
- General Access Roads, serving 3 to 200 dwellings, 6.0m wide, with frontage access permitted.
- Short cul-de-sacs and Minor Access links

Historically, the adoption of housing development layouts geared towards the safe and convenient movements of motor vehicles has been commonplace, and are often based on the Roads Development Guide of the Local Authority. Although typical layouts based initially on the requirements of the internal road layout provide benefits, they can lead to restrictions of movement, especially for cyclists and pedestrians, and an over-reliance on cars. It can also remove from the development a sense of place, and local character. More varied forms of housing development, based on pedestrian streets, squares, terraces, along with cul-de-sacs, closes and courtyards can help deliver a more sustainable development. Development densities can also be varied, with higher densities surrounding centres, and less dense development towards the edges of the development.

Recent design advice[2] suggests that the design of new developments should be based primarily on a network of spaces rather than a hierarchy of roads; a layout of development in which roads play their part but are not dominant. Priorities for movement should be clearly defined; firstly by foot, also by bicycle, public transport and car. The needs of disabled persons should receive particular attention.

The extent to which more recent design guidance should be adopted within the development should be explored at an early stage through discussions with officers of Highland Council.

[2] DETR 1998 “Places, Streets and Movement – A companion guide to Design Bulletin 32, Residential roads and footpaths”