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HIGHLAND MAIN LINE: UNFAZED

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EXECUTIVE SUMMARY

HITRANS commissioned SYSTRA to undertake a review of the current operation of, and investment in, the Highland Main Line (HML) between Perth and Inverness. This report will seek to understand the possible interventions required to address journey time and connectivity issues that previous investments have not resolved.

The Highland Main Line runs for 118 miles through the Scottish Highlands between Perth in the south and Inverness in the north. The route provides long-distance links between Inverness and Edinburgh, Glasgow and London, as well as providing local connections for intermediate stations between Inverness and Perth. Inverness provides a gateway to enable connectivity with the rest of the Highlands and Islands, allowing connections to the north coast via the Far North Line and to the west towards Kyle of Lochalsh.

The route is currently served by 12 daytime trains per day in each direction, with all except one daytime and one sleeper service to London operated by ScotRail. Some freight services also operate along the route. Analysis of the changes to the timetable over the last 20 years indicates that the number of daily passenger services between Inverness and the Central Belt has increased by three or four (depending on the direction). However, the existing timetable still falls short of the frequency of services to Edinburgh and Glasgow found on other ScotRail 7-Cities routes, with journeys often requiring an interchange at Perth, further increasing end-to-end journey time and customer inconvenience on an already relatively slow service. In addition to this low frequency and long journey time, it is currently not possible to arrive in either Edinburgh or Glasgow from Inverness prior to 9am. This contrast poorly with promises (discussed below) of headline journey times of 2 hours 45 minutes and average journey times of three hours that have been promised since 2008.

Analysis of generalised journey times (i.e. the perceived journey time including frequency and connectional issues) over the last 20 years demonstrates that there has only been a 7% improvement between Inverness and Perth since 1998, with no improvement at all since 2013; services to the Central Belt have seen similar levels of improvement and have also remained relatively constant since 2013.

In contrast, the A9 trunk road corridor is receiving significant investment (approximately £3bn) that will generate anticipated journey time savings that could make rail less competitive against road. This necessitates a step-change in investment in order to equal or better these journey times, compete with the upgraded road corridor and attract more users to rail.

In terms of rolling stock, the recent introduction of ScotRail's refurbished 7-Cities High Speed Trains (HSTs) has increased capacity and journey quality, but their operation has reduced service flexibility and their fuel consumption and greenhouse gas emissions mean that they are not compatible with the Scottish Government's zero carbon targets in the long term. Given the age of the HSTs, they will require replacement in the medium term, presenting an opportunity to invest in decarbonisation and journey time reductions through an electrification programme.

A significant number of investment and service enhancement promises have been made over the last decade or so, but many of these have not been delivered. Average journey times between Inverness and Edinburgh and Glasgow have not improved significantly since 2006, when an intended sub 3-hour journey time from Inverness to Glasgow and Edinburgh was announced in the "Scotland's Railways" report, and later the Strategic Transport Projects Review. Similarly, services between Inverness and

Perth have increased in frequency but have not achieved the 2-hour timing proposed as the average journey time in the 2011 Initial Industry Plan.

Transformational station investments have also remained elusive, with promised investments at Inverness and Perth yet to be delivered. Without these promised improvements, the necessary modal shift from road to rail, the opportunity to decarbonise Scotland's transport network and the wider economic benefits that enhanced rail connectivity will bring to communities along the HML will continue to be out of reach.

In order to deliver these promised investments a number of possible interventions have been identified that would deliver the aspirational 2 hours 45 minutes journey time between Inverness and the Central Belt as soon as possible.

Given the significant planned investment in dualling the A9 trunk road corridor, it should be argued that a similar "step-change" level of investment is required on the HML that would deliver competitive journey times compared to highway journeys and allow the line to perform at a level that a key strategic route demands. This investment would also respond to the current climate agenda; the Scottish Government's declaration in 2019 of a climate emergency has brought into sharp focus the contribution of transport to emissions, with a commitment to decarbonise Scotland's passenger rail services by 2035 through the continued electrification of the network.

Electrification of the HML would make a significant contribution to meeting both these key objectives, allowing the rail service to compete on journey time with the upgraded A9 corridor, delivering improved journey times, increased reliability and resilience, and delivering the zero carbon benefits that have been pushed to the forefront of the political agenda. Furthermore, providing low carbon freight services on an electrified route could instigate a modal shift from road freight, a sector in which decarbonisation is proving difficult. Full electrification would deliver the greatest benefits in all these areas, and should remain the ambition. However, given that continuous electrification may prove to be challenging from an engineering perspective or too costly to represent a value for money investment, it is possible that a discontinuous electrification programme – including the use of battery or hydrogen powered trains –should be considered as a potential first step towards the longer-term benefit of full electrification.

In terms of station improvements, a programme of investment in the smaller stations along the route, creating high quality community centres – or localised mobility hubs, with linkages with local bus services, and vehicle and cycle charging stations – would provide benefits for the local rail users. Significant station investment such as this at stations would also enhance the visitor experience at destinations such as Aviemore and Pitlochry, facilitating the growing rail tourism sector in this region.

The following target for a transformational future service specification that would achieve the level of service required has been the stated ambition for the HML for the last 20 years:

- Inverness to Edinburgh and Glasgow Queen Street:
  - An **average** journey time across the day of 2 hours 45 minutes.
  - A balanced service between Edinburgh and Glasgow Queen Street throughout the day.
- Inverness to Perth:

- A sub-2 hour average journey time (this is essential to the delivery of the overall 2 hour 45 minute journey time to Edinburgh and Glasgow).
- Improvements to the interchange at Perth for connecting services to Edinburgh and Glasgow Queen Street.
- A late evening (after 9pm) stopping service departing Inverness.
- An early morning service giving pre 0900 arrivals in both Edinburgh and Glasgow

- Improvements in cross border direct services from Inverness via the West or East Coast Mainlines.
- Improved sustainability of services to address the carbon agenda and reduce the carbon footprint of the rail network.
- The delivery of transformational station investment at the key interchanges of Inverness and Perth, as well as the development of community and mobility hubs at local stations such as Pitlochry and Aviemore.
- Improvements in the punctuality and reliability of services and resilience of the route.

In order to achieve the future outputs set out above, the following infrastructure investment would be required.

- **Electrification** – full electrification of the route should be the long term objective, with discontinuous electrification a key interim solution to bring-forward some of the benefits of electrification.
- **Line speeds** – electrification may allow increased maximum speeds on sections with steep gradients, and more "differential" speed restrictions where lighter, higher performing trains can operate at a higher speed than other trains may be appropriate.
- **Capacity** – in the long term, the aim should be to introduce more passing places or develop "dynamic" loops to provide more service flexibility.
- **Rolling stock** – the future replacements of HSTs may allow a return to multiple unit operation, and will also need to have a significantly lowered (or zero) carbon impact.

This study demonstrates that, whilst the relative lack of progress on the HML can be seen as regrettable, through a combination of circumstances a number of opportunities are emerging to develop the case for investment in the route to provide both a more attractive, faster and sustainable service. It is recommended that support be sought from all potential stakeholders for a "Task Force" approach to developing a comprehensive cross-industry consensus based on local needs.

1. INTRODUCTION

1.1.1 HITRANS commissioned SYSTRA to undertake a review of the current operation of and investment in the HML between Perth and Inverness. This report will seek to understand the possible solutions or interventions that might be required to address current journey time and connectivity issues that previous investments have not resolved.

1.1.2 The report will also undertake a review of policy in terms of investment in the Highland Mainline that has been declared by Transport Scotland, the Scottish Government and Network Rail since rail powers were transferred to Scottish Ministers in 2006, and how much of this proposed investment and resultant improvements have been achieved.

2. BACKGROUND AND CONTEXT

2.1 The route

2.1.1 The HML runs for 118 miles through the Scottish Highlands between Perth in the south and Inverness in the north. The route provides long-distance links between Inverness and Edinburgh, Glasgow and London, as well as providing local connections for intermediate stations between Inverness and Perth.

2.1.2 There are currently several single track sections with passing loops at stations, causing capacity and operational constraints which, in combination with restrictive line speeds, restricts end-to-end average speeds and operational flexibility.

2.2 The importance of the Highland Main Line

2.2.1 The HML forms a strategic link between the Scottish Highlands and the Central Belt, with a daily direct daytime service to North East England, Yorkshire, London and connections to the rest of the UK. Long distance services are operated by London North Eastern Railway (LNER) between Inverness and London, whilst Caledonian Sleeper operate overnight services between Inverness and London Euston.

2.2.2 As well as passenger services, some key freight flows also operate on the HML. These include the intermodal service, primarily carrying containers for Tesco, a flow of pipes for North Sea oil installations and a Lafarge cement train from Oxwellmains to Inverness.

2.2.3 Inverness also acts as a gateway to the rest of the Highlands and Islands, providing rail access to the north coast via the Far North Line and to the west towards Kyle of Lochalsh. Inverness also provides long distance connectivity to the rest of the UK for approximately 250,000 people in the Highlands and Islands.

2.2.4 ScotRail operates services to the Central Belt, providing regional connectivity to Glasgow and Edinburgh. ScotRail services also serve a local function, providing local services to a number of small towns and villages on the route between Inverness and Perth.

2.2.5 Given the remote nature of the communities that the HML serves, it could be argued that the longer distance links are more important and are the services that provide connectivity with activities and opportunities in the Central Belt and beyond; National

Travel Survey data indicates that the distance people in Scotland travel has been increasing for a number of years.

2.2.6 The following sections outline the various economic sectors that rely on the HML and its services.

Energy

2.2.7 The high-value energy sector has experienced a significant boom in the last decade, and the Highlands is able to offer a strategic base for oil, gas and renewable energy production.

2.2.8 Renewable energy now meets half of Scotland's electricity needs, and is a important growth area. Inverness, with its harbour and airport, acts as a key strategic centre for the energy sector in the Highlands, underlying the importance of maintaining and enhancing connections to here from the Central Belt.

2.2.9 Scotland currently hosts 25% of each of Europe's offshore wind and tidal energy resource, and much of this resource relies on connections in the Highlands. Inverness provides the gateway to key locations such as the Beatrice offshore wind farm and the Pentland Firth tidal array. Furthermore, Wave Energy Scotland, set up in 2014 by the Scottish Government, is investing heavily in new tidal energy technologies. Its central base is in Inverness and boasts an annual budget of £13m.

2.2.10 In terms of nuclear energy, the decommissioning of the site at Dounreay on the north coast has required a permanent workforce of around 850, with a significant contractor workforce also deployed at a number of stages of the project. This has attracted a large number of highly skilled workers to the region and, with the site not due to close until 2036, connectivity via the Central Belt and Inverness will continue to support this high value project for years to come.

2.2.11 Traditionally, oil and gas has had a strong presence in the Highlands and, despite recent uncertain times, it will still be responsible for 70% of the UK's energy requirements up to 2030[1]. There has also been a recent revival in the port operations to support this sector, including at Nigg and Ardersier, north-east of Inverness. The opening of the Inverness Campus, a centre developed by the Highlands and Islands Enterprise, provides the opportunity to establish a research, education and innovation hub for the industry. It is hoped that this could re-establish the industry in the Highlands, attracting key skills and investment to the region.

Life sciences

2.2.12 The new Inverness Campus will also support the development of a number of other sectors, including life sciences. Inverness already boasts the Centre for Health Science, making it a recently established research hub, and the planned expansion will enhance this offer and maximise the opportunity of a rapidly expanding sector for the region.

[1] Enterprising Highland (2019).

2.2.13 The new Campus will also provide land for small and medium-sized enterprises, bringing private investment and employment opportunities for the central Highlands, further making the case for continued investment in connectivity to support these opportunities. Given the large catchments that stations on the HML serve, connectivity investment has the opportunity to capture skills and investment from a relatively wide area.

2.2.14 The New Campus will support the generation of agglomeration benefits. At their broadest level, agglomeration economies occur when individuals benefit from being "near" to other individuals, and exist when the spatial concentration of economic activity gives rise to increasing returns in production. Transport and communications play a crucial role because, in most contexts, speed and low costs in transportation and communication provide a direct substitute for physical proximity[2] where businesses operate more productively and stimulate innovation from being co-located. The HML has a critical role to play in this, providing wider accessibility to other similar organisations across Scotland and further afield.

Sustainable tourism

2.2.15 The tourism industry is a key beneficiary of investment in connectivity along the HML, and its success is of vital importance to the Highlands economy. The line provides connections to popular tourist destinations such as Inverness, Aviemore and Pitlochry, and from here visitors can venture to destinations further afield. Inverness provides visitors with onward rail connections towards Wick and Thurso, as well as into Aberdeenshire in the east and the west coast in the direction of Kyle of Lochalsh. Access into the Cairngorms National Park, which provides significant outdoor attractions and activities for visitors, is possible from most station stops along the route. Inverness Airport also provides visitors with flight options to the Scottish Island destinations of Shetland, Orkney and the Western Isles.

2.2.16 The tourism sector sustains many of the smaller and less accessible communities along the HML, as well as providing over one million visitors per year to Inverness, providing vital economic activity and supporting a large tourism workforce. As well as the town-centre attractions in terms of restaurants, bars and shopping, the world famous Loch Ness and the nearby village of Culloden are important cultural and historical tourist destinations

2.2.17 Tourism by rail is a sector that has experienced significant growth in recent years, and is being promoted as part of a nationwide campaign by the HML Community Rail Partnership, encouraging people to explore the historic and scenic destinations and attractions that surround local railway lines. Nationally, tourism by rail has increased by 30% in the last ten years, generating £510m to the UK economy. As well as the national park and the wider Highlands and Islands noted above, the visitor attractions such as the Beatrix Potter Centre and Blair Castle can be accessed by rail.

2.2.18 Despite its recent growth, rail tourism is an opportunity that could be explored further. ScotRail markets a number of its routes under its Great Scenic Rail Journeys brand, providing advice and information on places to visit on the routes, key tourist destinations,

[2] Daniel Graham & Patricia Melo, *Advice on the Assessment of Wider Economic Impacts: a report for HS2,* March 2010

and the opportunity to purchase accompanying local food and drink for the journey. Two of its Great Scenic Routes, the Kyle line and the Far North line, can be accessed via Inverness. Promoting these Great Scenic Routes across the HML stations could help to take advantage of the continued growth in this sector.

2.2.19 Marketed as one of the UK's most scenic rail lines, the HML has also become a tourist attractor in its own right. The route includes attractions such as the Druimuachdar and Slochd Summits. Druimuachdar is the highest point on the British railway network and the route allows the HML to showcase the Scottish Highlands to tourists through the course of their journey.

Food and drink

2.2.20 The food and drink sector employs approximately 32,000 people in the Highlands, generating GVA output in excess of £1bn per annum. In employment terms, this makes this sector the largest in terms of employment of all growth sectors in the Highlands.

2.2.21 There is a wide range of diverse products and an equally diverse profile of businesses, from world-renowned businesses, including the Dalwhinnie Distillery in the Cairngorms National Park, to small innovative producers. The sector also supports visitor attractions such as various food and drink tours, festivals, visitor experiences and other events, complimenting the vital tourism sector. These events and experiences require connectivity solutions to support their growth, and play a key role in the growth and attraction of tourism by rail outlined above.

2.2.22 To illustrate the growth in this sector, in September 2019 Highlands and Islands Enterprise approved investment to develop a new food and drink technology hub in the region. The sector is one of the four key growth sectors that will be supported by the North Innovation Hub, which has received financial support from the UK Government and the European Regional Development Fund, and intends to increase productivity, access new markets and create high value jobs.

2.2.23 In the past, the food and drink industry utilised rail for the movement of both raw materials and finished products, particularly for whisky production and distribution. In the future, the need to improve the sustainability of distribution networks may mean that rail access again becomes important to this sector.

University of the Highlands and Islands

2.2.24 The only university based in the Highlands has a campus at Inverness College UHI on Inverness Campus, and offers courses in arts, social sciences, history, healthcare, engineering, business, sports and science. Inverness College UHI has over 6,500 students. Inverness is also home to the Scottish School of Forestry at Balloch. Connections to the campus from Inverness station can be made via walk, cycle or bus.

2.2.25 It is expected that the university campus would attract students from a wide area given the rural nature of the wider region and the lack of other higher education institutions in the Highlands. Furthermore, given lower and declining car ownership and usage levels

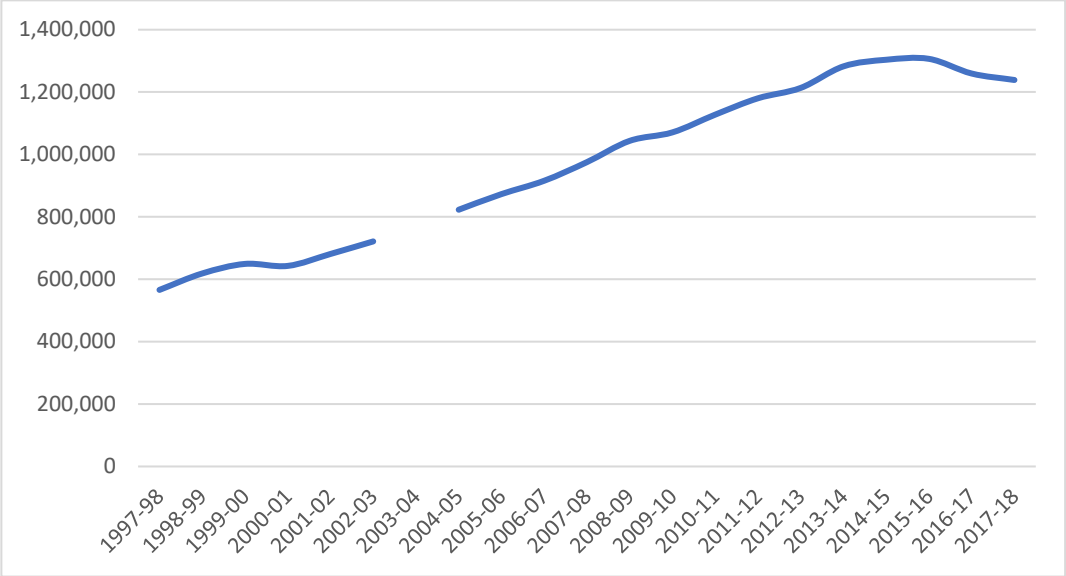
amongst young people, the HML provides a vital connection to higher education opportunities for a number of smaller communities along the route.

2.3 Usage

2.3.1 The following section presents station usage data between 1997-98 and 2017-18 for each of the stations at Inverness, Perth, Aviemore, Pitlochry and Blair Atholl. It should be noted that due to changes in the methodology used for producing station usage estimates, data was not produced by the Office of Rail and Road (ORR) for 2003-04.

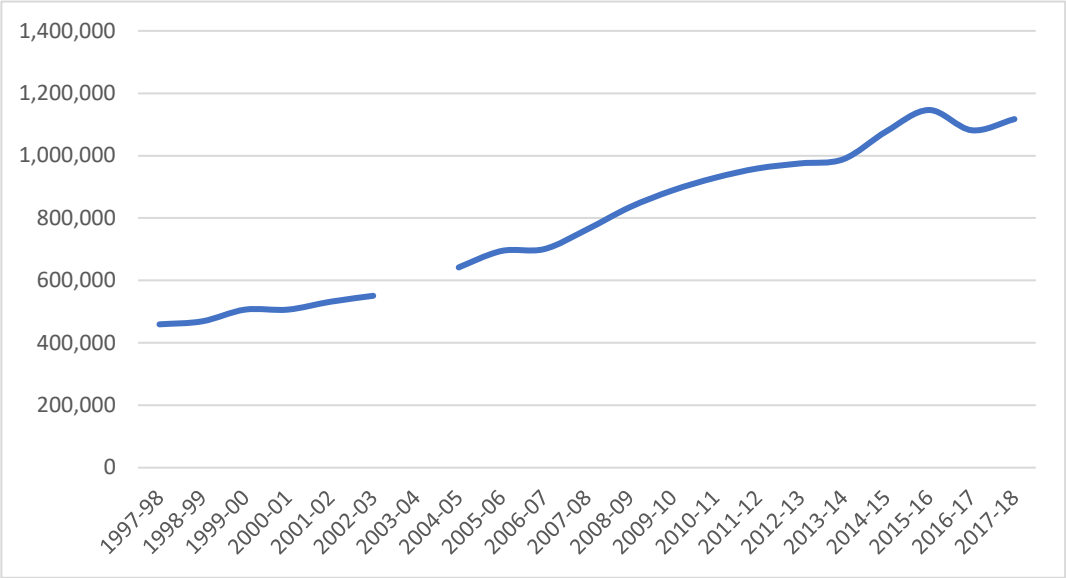
Inverness

Figure 1 Inverness station usage data



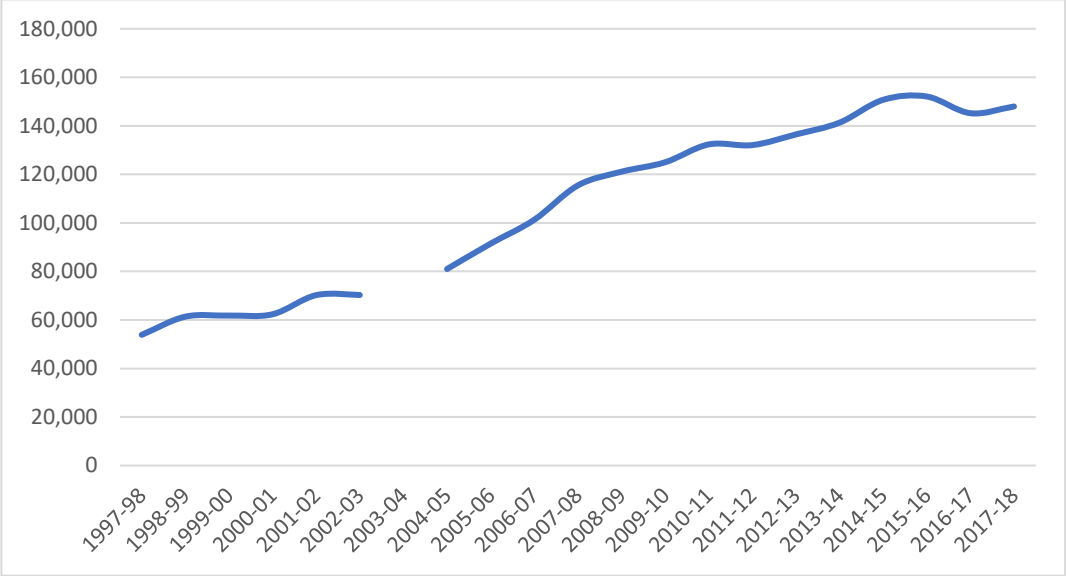
2.3.2 Although the data shows that passenger numbers at Inverness have declined for the two years since 2015-16, since 2007-08 Inverness has experienced an uplift of 27%. Since 1997-98, passenger numbers have more than doubled.

Figure 2 Perth station usage data



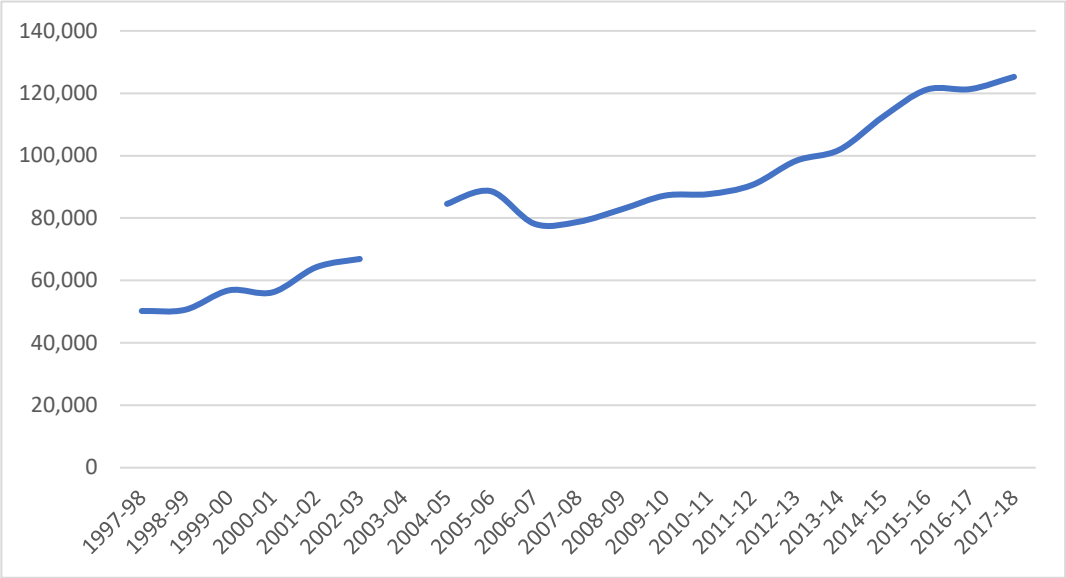
2.3.3 At Perth passenger numbers since 1997-98 have also more than doubled, and have increased by 46% since 2007-08, despite a decline in 2016-17.

Figure 3 Aviemore station usage data



2.3.4 Passenger numbers at Aviemore experienced a similar decline in 2016-17, but recovered the following year. Since 1997-98, passenger numbers have almost tripled.

Figure 4 Pitlochry station usage data



2.3.5 At Pitlochry, passenger numbers have increased by 59% since 2007-08. This is the largest proportional increase of all four of the above stations.

2.3.6 The substantial increases in passenger numbers at Pitlochry and Aviemore have occurred despite a relatively modest service improvements over the last 20 years. This suggests that investment in an improvement in service levels may unlock the potential for further increase in demand at intermediate stations over and above the usual background growth.

2.3.7 Visitor numbers at Aviemore are partly dependent on the ski season and the influence of the winter weather conditions. According to Ski Scotland, the 2016-17 season was the worst in history in terms of suitable winter conditions, which could explain the dip in passenger numbers at Aviemore station during this period.

2.3.8 Additionally, during June and July 2016 a number of strikes were held on ScotRail services in protest at the introduction of driver-only train operation. The dispute was brought to an end in September 2016.

2.3.9 Additionally, engineering work across the Central Belt took place between October and December 2016, with a revised timetable put in place to increase reliability and prepare for the introduction of electric trains. The effect of the revised timetable was the cancellation of some services and an increase in some journey times; this disruption to services may have been responsible for the reduced demand at Perth and Inverness at this time.

2.3.10 It is also important to note that, between March and August 2016, the main tunnel serving Glasgow Queen Street was closed as part of an upgrade scheme to allow faster and long trains to use the station. This closure had an impact on services into and out of Glasgow, which may be a contributory factor in the dip in passenger numbers in 2016-17, particularly at Perth and Aviemore.

2.3.11 Despite these occasional fluctuations due to outside influences, the above data demonstrates the continued growth in passenger numbers on the HML. However, it also suggests that the demand is sensitive to external factors that increased investment could address. As discussed in detail later in this report, this route is subject to resilience and reliability issues due to its single track sections, reliance on passing loops, and some sections of track being in remote and difficult to access locations. Given its geography, the line is also sensitive to weather-related incidents during the winter months.

2.3.12 ScotRail performance data covering the HML is very aggregate and includes a number of other "Express" routes across Scotland, making interpretation of HML performance difficult.

2.3.13 Instead open source data[3] can be used to examine the performance of individual trains on the route over a 100 day period, giving a cross sample of service performance. The table below presents the percentage of trains arriving within 10 minutes of booked arrival time for weekday services on the HML.

Table 1 Highland Main Line performance arrivals in Inverness

OPERATOR	PLANNED DEPARTURE FROM PERTH, GLASGOW OR EDINBURGH	PLANNED ARRIVAL IN INVERNESS	% WITHIN 10 MINUTES	AVERAGE DELAY (MINUTES)
SR	05:03 (PTH)	07:54	97%	1
CS	05:44 (PTH)	08:42	80%	11.5
SR	07:07 (GLQ)	10:29	68%	11.5
SR	08:34 (EDB)	12:01	78%	6
SR	10:10 (GLQ)	13:24	80%	7
SR	10:37 (EDB)	14:13	85%	7
SR	12:08 (GLQ)	15:22	70%	10.5
SR	13:33 (EDB)	16:55	47%	12.5
SR	15:08 (GLQ)	18:26	58%	11
GR	16:34 (EDB)	20:05	66%	15
SR	17:42 (EDB)	21:01	40%	20
SR	18:06 (GLQ)	21:28	32%	15
SR	19:39 (EDB)	23:21	80%	6.5

2.3.14 The table shows that the performance of services arriving in Inverness is not good (although this does include part of the 2019 leaf fall season where performance is often worse than average), with only six services arriving within 10 minutes of planned arrival time on more than 80% of occasions.

[3] Recent Train Times: https://www.recenttraintimes.co.uk/ data 28-07-2019 to 05-11-2019

Table 2 Highland Main Line departures from Inverness

OPERATOR	PLANNED DEPARTURE FROM INVERNESS	PLANNED ARRIVAL AT GLASGOW OR EDINBURGH	% WITHIN 10 MINUTES	AVERAGE DELAY (MINUTES)
SR	05:36	09:17 (EDB)	90%	5
SR	06:50	10:07 (EDB)	81%	6.5
GR	07:55	11:21 (EDB)	88%	7.5
SR	08:45	12:07 (GLQ)	86%	6
SR	09:44	13:20 (EDB)	88%	6
SR	10:46	14:27 (EDB)	94%	6
SR	12:48	16:34 (EDB)	84%	7
SR	14:48	18:09 (GLQ)	86%	5
SR	15:54	19:34 (EDB)	91%	5
SR	17:27	20:45 (GLQ)	80%	7
SR	18:54	22:23 (EDB)	75%	8
SR	20:16	23:45 (GLQ)	81%	6

2.3.15 Southbound services show a much higher level of reliability than northbound services. This is likely to be due to a conscious decision on the part of Network Rail and train operators to prioritise southbound services when delay occurs to higher level of reactionary delay (delay to other services) in the Central Belt, with northbound services being held at passing loops on single line sections either to await late running southbound services or, if they are late themselves, to be held to avoid impacting on southbound services that are on time.

2.3.16 The issue of service resilience and reliability is one that needs to be addressed if the service is to become more attractive to potential passenger and if mode shift is to be encouraged.

2.4 Catchment area

2.4.1 Given the predominantly rural area served and the lack of non-car alternatives, the HML has a geographically large catchment area and therefore its influence on and importance to local economies, businesses and communities is far-reaching and significant.

2.4.2 Table 3 below presents the Scottish Parliament constituencies that the HML passes through and their populations. While the route does not serve all the area covered by these constituencies due to their wide geographical reach, it illustrates the potentially wide catchment area of the route.

Table 3 Scottish Parliament constituencies served by the Highland Main Line

SCOTTISH PARLIAMENT CONSTITUENCY	POPULATION (2018)	HIGHLAND MAIN LINE STATIONS
Inverness and Nairn	89,755	Inverness, Carrbridge
Skye, Lochaber and Badenoch	76,018	Aviemore, Kingussie, Newtonmore, Dalwhinnie
Perthshire North	72,577	Blair Atholl, Pitlochry, Dunkeld and Birnam, Perth
Perthshire South and Kinross-shire	78,713	Perth

In terms of population growth, since 2011 the population of these constituencies has increased by between 2 and 4%; this is representative of Scotland overall, at 3%. Coupled with the station usage data presented above, this further demonstrates the need for investment to keep pace with spend in other regions to accommodate both population and mobility growth.

3. THE CURRENT OPERATION OF THE HIGHLAND MAIN LINE

3.1 Introduction

3.1.1 In order to understand the current issues and possible solutions on the HML, it is important to consider what the existing service is and how this has developed in recent years. This will help to identify the success of previous investments and the current service shortfalls that, if addressed, would help to maintain the competitive position of the route in the face of the alternative modes of road and air.

3.2 Existing service

Calling pattern

3.2.1 The Perth to Inverness route is currently served by 12 daytime trains per day in each direction, of which ten are operated by ScotRail. All trains call at Aviemore, Kingussie and Pitlochry; the other stations on the route have a less frequent service; the calling pattern is set out below.

Table 4 2019 Perth-Inverness services

STATION	NUMBER OF DAILY SERVICES	
	SOUTHBOUND	NORTHBOUND
Inverness	12	12
Carrbridge	6	6
Aviemore	12	12
Kingussie	12	12
Newtonmore	5	6
Dalwhinnie	5	7
Blair Atholl	6	9
Pitlochry	12	12
Dunkeld and Birnam	11	9
Perth	12	12

3.2.2 Of the 12 trains per day between Perth and Inverness in each direction, five services originate and four terminate at Glasgow Queen Street. Edinburgh has five originating seven terminating services.

3.2.3 In addition to the ScotRail services, Caledonian Sleeper operates the Highlander service between Inverness and London Euston. It stops at all stations apart from Carrbridge for services departing Inverness. The sleeper trains depart Inverness each evening at 2045 Monday to Friday and 2026 on a Sunday, providing an additional late evening southbound departure. The service from London Euston arrives at Inverness at 0842 on all days, and picks up morning commuters at its stops at Kingussie, Aviemore and Carrbridge. It should

be noted, however, that the inherent unreliability of from using a long-distance service in this way means that it is difficult to build and sustain a commuter market

3.2.4 SYSTRA has conducted analysis of how the ScotRail services from Inverness to Edinburgh and Glasgow have developed since 1998. This analysis is presented below.

Figure 5 Daily services to Edinburgh and Glasgow Queen Street from Inverness (southbound)

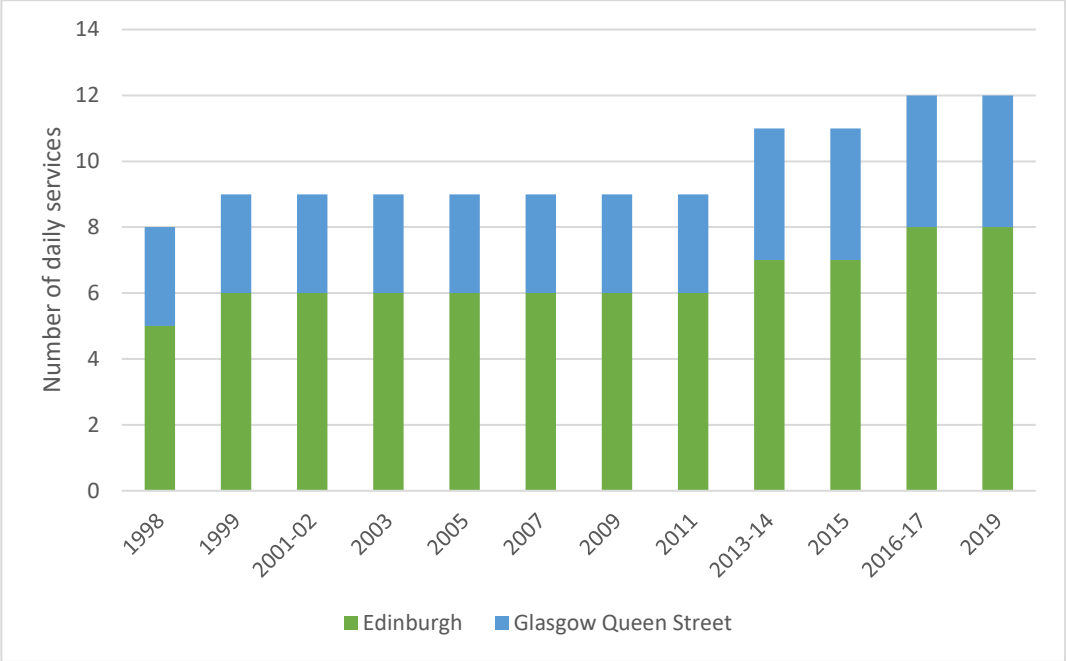
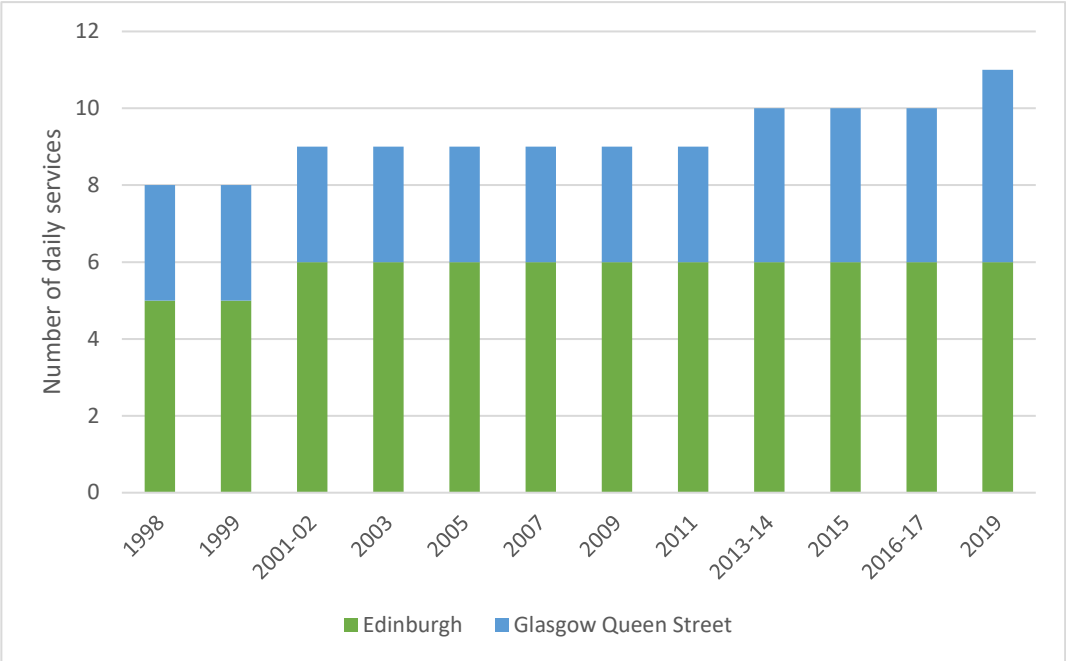


Figure 6 Daily services from Edinburgh and Glasgow Queen Street to Inverness (northbound)



3.2.5 The route had a relatively poor service in the late 1990s, which was recast in 2001with the addition of one extra train each way.

3.2.6 Between 2011 and 2013, the timetable saw a further increase from 9 to 11 trains per day, increasing to 12 trains southbound in 2016. The 2019 timetable saw the same service level rolled out northbound.

3.2.7 From Inverness, southbound services to Edinburgh have increased from five to eight per day since 1998, although the northbound service is still only six per day.

3.2.8 In contrast, passengers travelling between Inverness and Glasgow Queen Street only received one additional service, from three to four per day, between 1998 and 2016-17; this increased to five per day northbound in 2019.

3.2.9 Given the importance of serving Scotland's main urban centres of Edinburgh and Glasgow, the service is necessarily split between the two, limiting the frequency of services to each. This means that many journeys require an interchange at Perth, particularly for travellers to and from Glasgow; this increases end-to-end journey time and passenger inconvenience, reducing their willingness to travel.

3.2.10 Additionally, the existing timetable currently limits the effectiveness and attractiveness of business connections between Inverness and the Central Belt by curtailing the working day. It is currently not possible to arrive in either Edinburgh or Glasgow before 9am when travelling from Inverness, and the latest direct departure from either is at 1941 from Edinburgh. The latest direct departure from Glasgow Queen Street is 1806, and there is an option of a later departure at 1938 which requires an interchange at Perth.

3.2.11 The route also experiences a relatively poor Sunday service, with only eight services between Inverness and Perth southbound and seven northbound. The earliest a passenger service arrives in Perth from Inverness on a Sunday is 1156.

3.2.12 The Sunday timetable to the Central Belt is even less balanced than the weekday service, with six southbound services to Edinburgh and two to Glasgow Queen Street. There are four northbound services from Edinburgh and three from Glasgow Queen Street.

Journey times

3.2.13 Table 5 below presents current journey times between Inverness and Perth, Edinburgh and Glasgow.

Table 5 2019 Highland Main Line journey times

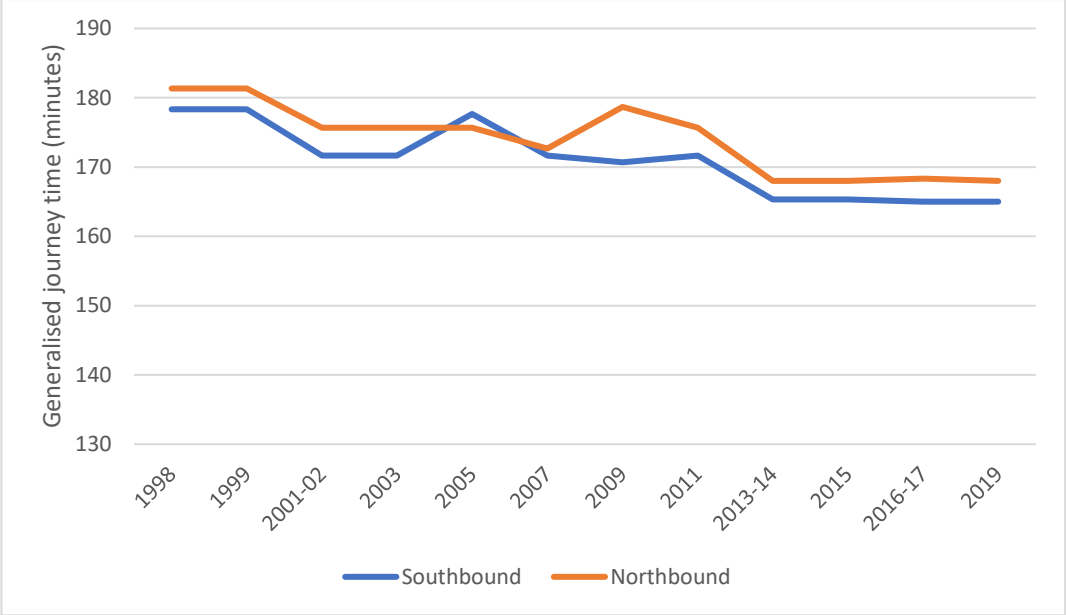
STATION	SOUTHBOUND			NORTHBOUND		
	MINIMUM	MAXIMUM	AVERAGE	MINIMUM	MAXIMUM	AVERAGE
Inverness						
Perth	01:59:00	02:23:00	02:10:00	02:00:00	02:51:00	02:13:10
Edinburgh	03:17:00	03:46:00	03:34:30	03:19:00	03:40:00	03:29:10
Glasgow Queen Street	03:18:00	03:29:00	03:22:30	03:14:00	03:22:00	03:17:48

3.2.14 The above data shows that the fastest journey time between Inverness and Perth is approximately 2 hours, with the average journey around 10-15 minutes slower. The notably longer maximum journey time on the northbound service is due to the 0503 stopping service from Perth having long dwell times at Kingussie and Carrbridge waiting to cross southbound services.

3.2.15 The average journey time between Inverness and Edinburgh is approximately 3 hours 30 minutes, and between Inverness and Glasgow is approximately 3 hours 20 minutes.

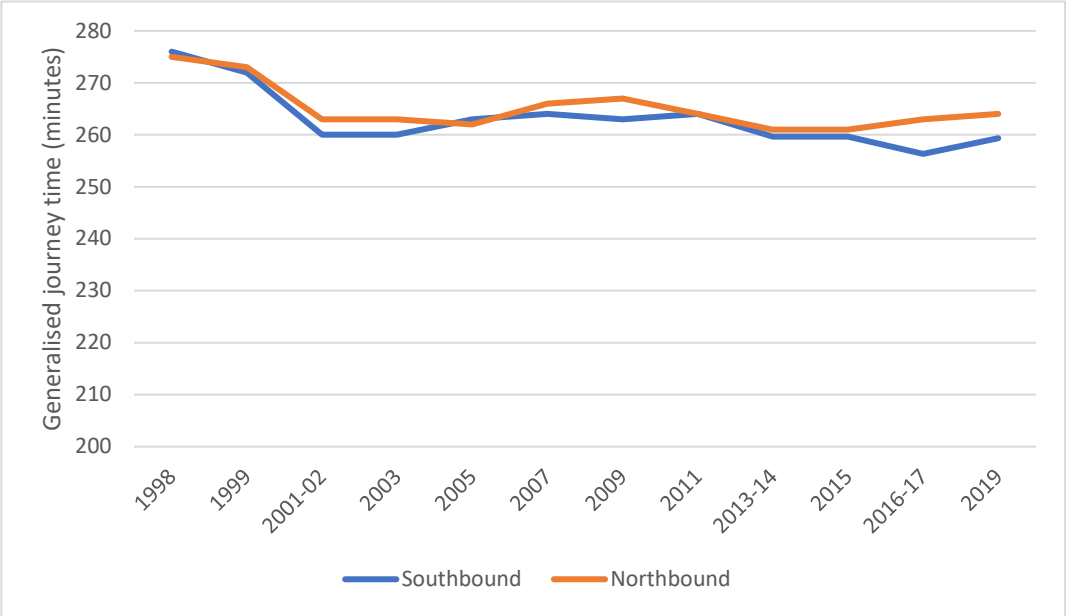
3.2.16 SYSTRA has also conducted analysis of the progression of generalised journey times on the route since 1998. Generalised journey times have been calculated using the service interval penalty guidance in the Passenger Demand Forecasting Handbook and the average journey times in Table 5. This analysis is useful to determine whether investment up to this point has had a positive impact for passengers in regard to journey times.

Figure 7 Progression of Inverness-Perth generalised journey times



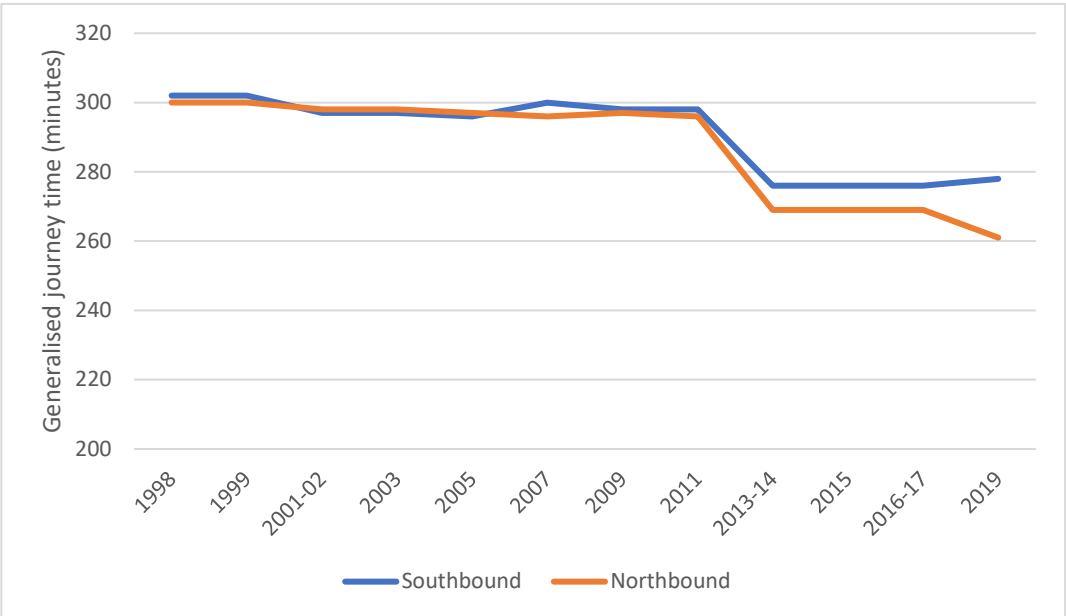
3.2.17 Figure 7 above demonstrates that while there has been some positive progress in the last 20 years towards reducing journey times between Inverness and Perth, it has only been a 7% improvement since 1998. Furthermore, generalised journey times (which include the impact on passenger's *perception* of journey time of service frequency and interchange as well as actual train running time) have remained constant since 2013, demonstrating that passengers have not benefited in terms of journey times from investment during this period.

Figure 8 Progression of Inverness-Edinburgh generalised journey times



3.2.18 The progression of journey times between Inverness and Edinburgh demonstrates that very little journey time benefit has been achieved since 1998, with only a 4-6% improvement during this period. Since 2013-14, generalised journey times have mostly increased or remained relatively constant. Indeed, the 2019 timetable does not represent an improvement over the generalised journey times achieved in 2001-02.

Figure 9 Progression of Inverness-Glasgow Queen Street generalised journey times



3.2.19 Generalised journey times between Inverness and Glasgow Queen Street have shown some improvement over the study period, although this benefit is primarily generated from the increase in services in the 2013-14 timetable. Generalised journey times for southbound services have improved by 8% since 1998, with northbound services

improving by 13% over the same period. However, since 2013-14, generalised journey times have remained relatively constant. The most recent timetable change has seen around a 4% reduction in GJT from Glasgow to Inverness, although as shown earlier in the report the current reliability of northbound services is poor.

3.2.20 Despite the relatively modest progression of generalised journey times along the route, particularly to Perth and Edinburgh, passenger numbers at places such as Pitlochry and Aviemore have continued to grow at a fast rate, as noted previously. This suggests that further significant demand increases could be generate, if a significant improvement in journey times or service levels could be achieved through frequency or line-speed improvements.

3.2.21 In principle the forthcoming 2020 timetable change should provide a more consistent service pattern with reduced journey times and a better balance between Glasgow and Edinburgh services.

3.3 Freight services

3.3.1 There are currently three main flows of freight traffic on the HML; the intermodal service, primarily carrying containers for Tesco, a flow of pipes for North Sea oil installations and a Lafarge cement train from Oxwellmains to Inverness. Until 2017 an Oil Train ran to the terminal at Lairg but this has now been lost to road haulage.

3.3.2 The distance from Inverness and points north, to the Central Belt and England means that the area should in principle be well placed for rail freight, with the distance making it competitive with road haulage, this can however be offset by the volume of traffic generated by individual flows which in some cases may not be insufficient for rail freight. This has seen fluctuations in different flows over recent decades. The decarbonisation agenda may begin to switch the balance backs towards rail freight, with a view developing that it may not be possible to decarbonise road haulage[4]. This would therefore make rail more attractive for freight traffic, both on political and environmental grounds but also on economic grounds if costs and charges associated with fossil fuels changed significantly.

3.3.3 This would open the door for the movement of a number of flows by rail including timber traffic (potentially including line side loading north of Inverness), the resumption of Whisky traffic, and an increase in inter-modal flows. The latter would be supported by full electrification of the route as this would present the opportunity for gauge enhancement allowing larger containers to be moved on the route. Currently the route is gauge constrained, with notable issues around Killiecrankie tunnel. With a variety of traffics it may be possible to justify mixed freight flows formed of wagons dealing with a number of different commodities rather than the current practice of focusing on single flow block trains.

3.3.4 Linked to freight there may also be the opportunity to develop parcels and mail by rail, either as bulk loads on dedicated trains or by conveying smaller volumes by passenger train. As an alternative to both HGV and LGV traffic this would make a contribution to the decarbonisation agenda. Whilst such traffic was lost in the Highlands over 25 years ago

[4] Decerbonising freight 'may be impossible' Local Transport Today 789, 10th January – 23rd January 2020

the rise of internet shopping and their associated deliveries may support a return of this traffic.

3.3.5 Capacity for more freight services north of Perth has not been a significant issue in recent years, as many existing paths are not used on a daily basis, although capacity south of Perth and in the Glasgow and Edinburgh is much more limited. However as more and faster passenger trains are introduced, additional capacity for passing freight trains on single line sections is likely to be needed, particularly in the context of performance improvements for both passenger and freight services. It will also be important to ensure that journey times for freight traffic remain as competitive as possible, with for example, long waits in passing loops avoided as much as possible.

3.3.6 The length of passing loops between Perth and Inverness has also proved to be a constraint on freight services, with the current loops constraining the lengths of freight trains, particularly the intermodal service, therefore limiting its efficiency in moving goods. Addressing these infrastructure issues would increase freight capacity on the route and contribute towards the decarbonisation of the haulage industry at a time when environmental concerns are at the forefront.

3.4 Benchmarking against the A9 trunk road corridor

3.4.1 When considering the operation of the HML and its ability to be competitive with alternative transport modes, it is useful to analyse the performance of, and recent investment in, the parallel A9 trunk road corridor.

3.4.2 The A9 is the major trunk road between the Central Belt and the Highlands. Between Perth and Inverness, it runs for approximately 112 miles. The alignments of the road and rail corridors follow each other for much of this section.

3.4.3 Approximately 25% (48km) is currently dual carriageway, with the rest single carriageway. On the Perth to Inverness section, the A9 carries over 40,000 vehicles per day, equivalent to over 65,000 people.

3.4.4 In 2008, the Scottish Government announced its intention to dual the remaining single carriageway sections between Perth and Inverness. This was confirmed in a commitment in 2011 to complete the dualling programme by 2025. Transport Scotland estimates the cost of the programme to be approximately £3bn.

Car journey times

3.4.5 Transport Scotland, in its report on the A9 dualling programme[5], extracted forecast journey times for the existing A9 between Perth and Inverness in 2027 from the Transport Model for Scotland. These are reproduced in the table below[6], alongside the expected improved journey times if the dualling programme was implemented.

[5] A9 Dualling: Case for Investment (Transport Scotland, 2016).

[6] It is assumed that these car journey times from the Transport Model for Scotland are edge of town to edge of town journey times, based on analysis using Google Maps. Current centre to centre car journey times are comparable to rail journey times, however the proposed future car journey times (assuming

Table 6 Forecast 2027 do minimum A9 journey times (Transport Scotland)

ORIGIN-DESTINATION	DO MINIMUM JOURNEY TIME (H:MM)	DO SOMETHING JOURNEY TIME (H:MM)
Perth-Inverness	2:07	1:47
Inverness-Perth	2:09	1:49
Glasgow-Inverness	3:05	2:37
Inverness-Glasgow	3:06	2:38
Edinburgh-Inverness	2:57	2:30
Inverness-Edinburgh	2:56	2:29
Perth-Pitlochry	0:40	0:34
Pitlochry-Perth	0:41	0:34
Aviemore-Inverness	0:41	0:34
Inverness-Aviemore	0:43	0:36
Aviemore-Edinburgh	2:28	2:05
Edinburgh-Aviemore	2:29	2:06

3.4.6 These journey times are heavily-dependent on traffic conditions, weather (particularly in the winter months), slow moving vehicles and accidents, particularly on the single carriageway sections, which have less resilience to major incidents. The A9 has a high proportion of buses, agricultural vehicles, HGVs and tourist vehicles (such as camper vans), which creates a wide range of vehicle speeds. Given the existing alignment and sections of single carriageway, overtaking opportunities are limited and, subsequently, journey times are more variable.

3.4.7 This is supported by evidence from Google Maps, which produces a typical Inverness to Perth journey time by car of between 2 hours and 2 hours 40 minutes depending on the time of day (for the purposes of comparison to rail, journey time has been measured between Perth and Inverness rail stations).

3.4.8 The minimum Inverness-Perth journey time by road of approximately 2 hours is similar to the existing minimum rail journey time, however travel time by both modes are likely to be longer than this for the majority of journeys due to incidents, road congestion and rail service specifications. Furthermore, incorporating the impact of a service-interval penalty, undertaken in the section on generalised journey times in section 3.2 above, demonstrates that rail can be uncompetitive against an uncongested, incident-free car journey time.

3.4.9 It is estimated that the dualling programme will deliver average journey time reductions of between 18 and 20 minutes between Perth and Inverness, representing a reduction of

the dualling programme was in place) would still be lower than those by rail, even if a centre to centre route is used.

approximately 14-16%. The scheme is also anticipated to improve journey time reliability by reducing the occurrence of incidents and reducing the delay impact of each incident.

Coach and bus journey times

3.4.10 When assessing the A9 corridor against the HML, it is also important to include journey times between Inverness and Perth using local bus services.

3.4.11 A combination of operators run services between Inverness bus station and Broxden Park & Ride on the western outskirts of Perth. Limited services also run directly to Perth Bus Station. These services also continue on to Glasgow and Edinburgh, providing a bus link between Inverness and the Central Belt.

3.4.12 Between them, Scottish Citylink, Megabus and Parks of Hamilton operate 14 services per day in each direction between Inverness and Perth, with journey times mostly ranging between 2 hours 25 minutes and 2 hours 35 minutes (there is also one stopping service per day which has a journey time of 3 hours 7 minutes). However, it should be noted that these represent timetabled journey times and would be subject to similar levels of unreliability caused by congestion and incidents that car journeys are affected by.

3.4.13 It would be anticipated that bus services would benefit from the average journey reductions anticipated as part of the A9 dualling programme, as well as the improvements to journey time reliability.

Summary

3.4.14 The table below provides a summary of the journey times between Inverness and Perth for all modes.

Table 7 Summary of Inverness-Perth journey times

RAIL		CAR		2019 BUS (MINIMUM)
2019 ACTUAL JOURNEY TIME (AVERAGE)	2019 GENERALISED JOURNEY TIME (AVERAGE)	2027 DO MINIMUM	2027 DO SOMETHING	
2 hours 12 minutes	2 hours 47 minutes	2 hours 7 minutes	1 hour 47 minutes	2 hours 20 minutes

3.4.15 Table 7 illustrates that, if a service interval penalty is taken into account, rail journey times in 2019 are not competitive when compared to the do-minimum car journey times, and are only comparable with bus. While the minimum rail journey times are similar to an uncongested car journey, these services are infrequent and do not represent the current overall service level on the HML.

3.4.16 Given the significant investment being undertaken on the A9 trunk road corridor, minimum journey times and reliability for car and bus are expected to improve further, as illustrated by the do-something times. This demonstrates that, in order for rail to provide an attractive and sustainable alternative to car journeys using the A9, a step

change in investment is required in order to equal or better these journey times, compete with the upgraded road corridor and attract more users towards rail.

3.5 Benchmarking against the Inverness-Aberdeen line

3.5.1 When discussing HML services, it is useful to contrast against the service levels on the Inverness to Aberdeen line. This line serves as a good comparator as, at 108 miles, it is similar in length, serves a number of rural markets between the regional economic hubs of Inverness and Aberdeen and is primarily single track with some passing loops.

Calling pattern

3.5.2 The Inverness to Aberdeen route is currently served by 11 through trains per day westbound and 10 through trains per day eastbound. Inverness has a total of 17 services throughout the day, including short services to Elgin. Including services to and from Inverurie, Aberdeen has 38 services westbound and 41 eastbound. The calling pattern is set out below.

Table 8 2019 Inverness-Aberdeen services

STATION	NUMBER OF DAILY SERVICES	
	EASTBOUND	WESTBOUND
Inverness	17	17
Nairn	17	17
Forres	17	17
Elgin	17	17
Keith	11	11
Huntly	12	11
Insch	12	11
Inverurie	40	37
Dyce	41	38
Aberdeen	41	38

Journey times

3.5.3 The table below presents current journey times between Inverness and Aberdeen.

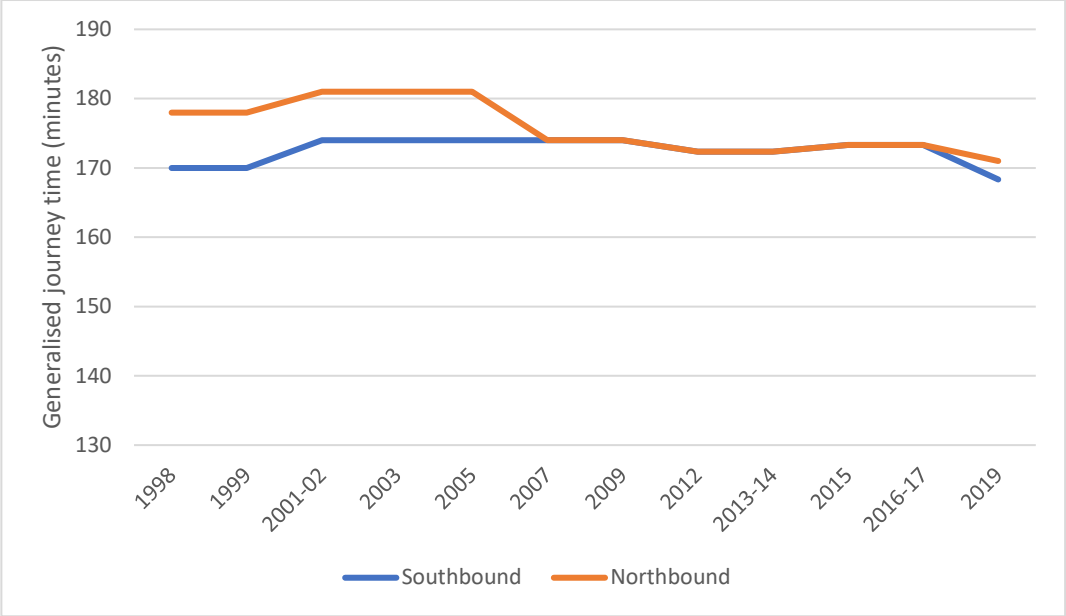
Table 9 2019 Inverness-Aberdeen journey times

STATION	EASTBOUND			WESTBOUND		
	MINIMUM	MAXIMUM	AVERAGE	MINIMUM	MAXIMUM	AVERAGE
Inverness						
Aberdeen	02:03:00	02:21:00	02:11:33	02:05:00	02:21:00	02:12:11

3.5.4 The above data shows that the fastest journey time between Inverness and Aberdeen is just over 2 hours, with the average journey time approximately 5-10 minutes slower.

3.5.5 SYSTRA has also conducted analysis of the progression of generalised journey times for Inverness to Aberdeen through services on the route since 1998. This is presented overleaf.

Figure 10 Progression of Inverness-Aberdeen generalised journey times



3.5.6 The analysis undertaken demonstrates that, while generalised journey times have seen only modest improvement over the last two decades, the investment that has been made into this route (outlined in Section 4.3) has achieved a greater degree of incremental service enhancement than the HML.

3.5.7 Intermediate stations have seen a dramatic increase in service levels, with Dyce and Inverurie benefiting from around 40 daily services in the current timetable, a nearly threefold increase since 1998. Nairn, Forres and Elgin have also seen services increase from 11 to 17 per day.

3.5.8 This is in contrast to intermediate stations on the HML such as Carrbridge and Blair Atholl, service levels at which have remained relatively static.

3.6 Infrastructure constraints and opportunities

3.6.1 The line between Perth and Inverness has a number of infrastructure constraints that affect the operational performance and reliability of its services. Investment into these constraints would have the effect of providing enhanced journey times and a more resilient service.

3.6.2 Approximately 80 miles of the line, over two thirds of the total distance, is single track with passing loops only. This restricts the number of services that can be operated and

causes long dwell times for some services at passing loops to allow for faster trains or freight services to pass.

3.6.3 In terms of line speeds, only 2% of the Inverness to Perth section has a 100mph maximum speed. This short 2.2 mile section is between Kingussie and the Kincraig passing loop. Furthermore, only approximately 14% of the line has a maximum speed of 90mph or more.

3.6.4 There are also a number of other constraints that restrict the line speed, affecting the end-to-end journey time of the route:

- The single track section through Killiecrankie Tunnel, between Pitlochry and Blair Atholl, causes services to slow to 30mph.
- The majority of an 11 mile section of down line between Blair Atholl and the Druimuachdar Summit has a maximum speed of just 60mph.
- Between Carrbridge and Inverness, a section of approximately 28 miles, the line speed is mostly 75mph or below, with only some short sections where certain classes of train can run at higher speeds.

3.7 Rolling stock

3.7.1 Services on the HML have for the last twenty years have predominantly been operated by Class 170 Turbostar trains, with services to London operated by High Speed Trains (HSTs). The Turbostars, whilst adequate for medium distance journeys, are less suitable for long distance services such as Edinburgh to Inverness. Since 2018 this issue has begun to be resolved with the operation of former Great Western Railway HSTs. These trains (when fully refurbished) provide a level of comfort and facilities equal to the existing HSTs in use on the LNER service to London, as well as providing an increase in capacity.

3.7.2 The operation of more HSTs represents a clear step forward in terms of quality, however they do represent a compromise in terms of flexibility, with the fixed formation train providing less scope for tailoring capacity to demand than multiple unit trains.

3.7.3 The HSTs are likely, when taking a long view, to represent a medium term stop-gap measure rather than a long term solution on the route. The trains, although heavily refurbished, are over 40 years old and with two Power Cars for five coaches are relatively expensive to operate.

3.7.4 Additionally, the fuel consumption and carbon and particulate emissions of a HST is much higher than a modern multiple unit train, meaning that their operation in the medium to long term is not conducive to the Scottish Government's commitment to reduce carbon emissions to net zero by 2045. It is therefore likely that the HSTs have around 10 years of service left before withdrawal.

3.7.5 Whilst the prospect of the need for rolling stock change in the medium term might be seen as a challenge, it also represents a significant opportunity to develop the case for the most appropriate train to operate on the route in the future, and link this to other opportunities around decarbonisation and journey time reductions. This is a clear opportunity to press the case for early electrification of the route, particularly in the

context of the development of battery powered trains allowing discontinuous electrification.

3.7.6 LNER have recently introduced Class 800 Azumas on the Inverness – London "Highland Chieftain" service, replacing HSTs. These are bi mode trains and currently operate using electric traction between London and Stirling, changing to diesel traction at on the move near Dunblane, facilitated by the completion of the Edinburgh/Glasgow – Stirling – Alloa/Dunblane electrification scheme. Whilst the section between Stirling and Edinburgh has seen some small journey time reductions as result of the use of electric traction the journey time between Perth and Inverness (and vice versa) has been lengthened very slightly to accommodate the poorer performance on diesel of the Azuma trains relative to HSTs. As the trains have only been introduced very recently (and a number of services have been disrupted) it is not yet possible to say how well the trains perform in practice.

4. RAIL POLICY AND INVESTMENTS

4.1 Planned and proposed improvements

4.1.1 Planned improvements to the HML have been proposed by Transport Scotland, the Scottish Government and Network Rail since rail powers were transferred to Scottish Ministers in 2006. This section summarises how these improvements were developed and have evolved since 2006.

2006

Scotland's Railways

4.1.2 Scotland's Railways[7] is a vision for rail in Scotland for the 20 years following the transfer of rail powers to Scottish Ministers and the creation of Transport Scotland. The report was published in 2006 and identified a number of aspirations for rail across Scotland including strategic outcomes for the HML. These included:

- Short term
  - Reduce journey times from Inverness, Aberdeen, Dundee and Perth to Glasgow and Edinburgh through revised stopping patterns.
  - Timetable alteration to maximise the role of Dundee, Perth, Aberdeen and Inverness as key interchange stations.
  - Introduce higher standards for these key interchange stations with defined interchange times, better facilities and information.
- Medium term
  - Introduce a faster hourly service between Glasgow/Edinburgh and Inverness.
- Long term
  - Examine how best to improve capacity, reliability and journey times including exploring the value of electrification of the routes southwards from Aberdeen and Inverness.

2007

Scotland Route Utilisation Strategy, 2007

4.1.3 The Scotland Route Utilisation Strategy (RUS)[8] was published in 2007 and sets out the strategy for Scotland's railways over the following 10 years. The strategy was a result of

[7] Transport Scotland, Scotland's Railways, December 2006
[8] Network Rail, Route Utilisation Strategy, March 2007

analysis and consultation and the following elements were proposed for inclusion in the strategy on the HML:

- Short term (Control Period 3: 2007 – 2009)
  - No specific short term measures for Route 25: Highlands
- Medium term (Control Period 4: 2009 – 2014)
  - To meet the requirement of a faster and more frequent service between Inverness and Perth additional infrastructure is recommended, combined with rolling stock with enhanced performance.
- Long term (Control Period 5: 2014 – 2019)
  - Forecast information taken from the Room for Growth study suggests that, as demand continues to grow, the current combination of infrastructure and train service will not meet demand. Scottish Ministers have set out in their National Transport Strategy, "Scotland's Railways", their aspiration to introduce a faster hourly service between the Central Belt and Inverness.

2008

4.1.4 The Strategic Transport Projects Review (STPR)[9] was published in December 2008 and set out the Scottish Government's 29 transport investment priorities over the period to 2032. Rail enhancements on the HML between Perth and Inverness were identified as an intervention (Option 17). The following improvements to the HML were proposed:

- An increase in service frequency (minimum of hourly between Inverness and Perth with additional peak express services); and
- A reduction in journey times of approximately 35 minutes, resulting in Edinburgh to Inverness journeys of under three hours, with similar reductions for services to Glasgow.

4.1.5 The review stated the following:

> "Journey time reductions to benefit passenger services would be delivered through line speed improvements, additional loops, dynamic loops or lengthening of double track sections, signalling improvements and more powerful traction. It is envisaged that this could be delivered in two phases. Phase 1 would comprise the recognised HML improvements as proposed in the Highland Room for Growth Study. Phase 2 would comprise a more significant enhancement to allow faster services to operate.
>
> Additional freight improvements: The passenger enhancements could be optimised to also benefit freight operations. It is envisaged that this would include:

[9] https://www.transport.gov.scot/publication/strategic-transport-projects-review-report-4-summary-report/j10194c-22/

- Provision of bi-directional signalling to reduce the impact of engineering works on the route (permitting the route to remain open for freight throughout the day and week);
- Increased length of freight loops (allowing longer freight trains); and
- Removal of speed limits below 75mph Permanent Speed Reductions (PSRs) for freight trains."

4.1.6 In the STPR, the service improvements were linked to other strategies, including Scottish Ministers' High Level Output Specification and the Highland "Room for Growth" Study, and interface with the Scottish Rail Planning Assessment and the Network Rail Route Utilisation Strategy for Scotland. The option was included as a 'Tier 3' intervention in the Scottish Ministers' High Level Output Specification (HLOS), and Network Rail were asked to produce a credible and affordable delivery plan to progress development of this intervention for potential implementation during Control Period 4 (2009-2014).

4.1.7 Prior to the publication of the STPR, the then First Minister Alex Salmond was quoted in The Herald as saying:

"Railways must at least compete with the roads. […] Work being negotiated with Network Rail will cut journey times [from Edinburgh to Inverness] to two hours 45 minutes – 35 minutes less than at present. This at least makes railway travel to the heart of the Highlands, in terms of time, competitive with roads. The railway journey times will be cut by a mixture of projects including line improvement, additional passing loops, double-tracking and signalling upgrades. They will cost £54.5m and the timescale for implementation is 2011-2012.[10]"

2011

Initial Industry Plan Scotland Proposals for Control Period 5 and beyond September 2011

4.1.8 The Initial Industry Plan (IIP) for Scotland outlined key choices and options facing Scottish Ministers in specifying the future outputs of the railway and the level of funding required. This informed the subsequent HLOS described below.

4.1.9 The IIP included details of the HML (Phase 2). The upgrade was described as increasing increase the number of passenger and freight paths between Inverness and Perth, as well as reducing the end-to-end journey times to provide better access for the communities of Northern Scotland to employment and business opportunities in central Scotland. The IIP stated that the first phase would be completed in Control Period 4 (CP4) delivering journey time improvements. Phase 2 would allow an hourly service in each direction between Inverness and Perth with an average journey time of two hours making rail a more attractive alternative for passengers as well as improving freight paths. The business case for the scheme was developed for the Strategic Transport Projects Review with a

[10] http://transformscotland.org.uk/blog/2018/08/06/campaigners-attack-broken-promises-on-highland-main-line-rail-upgrade/ accessed on 19/09/19

Benefit Cost Ratio (BCR) of between 0.75 and 1.25 for Phase one. The scope of the work changed following this BCR calculation and is now not representative.

2012

Network Rail's Route Specifications 2012 – Scotland

4.1.10 Network Rail's Route Specifications 2012 outlined the proposed infrastructure investment for Control Period 5. This reiterated the STPR option to reduce journey times by around 35 minutes and details of the HML Phase 2 project to achieve an hourly service to the Central Belt, an approximately ten minutes end-to-end journey time reduction and a freight enhancement with an implementation date of 2019.

High Level Output Specification for Control Period 5, 2012

4.1.11 The Scottish Ministers' HLOS for Control Period 5 was published in 2012 and set out Ministers' plans for continued investment to support growth over Control Period 5. These included HML Rail Improvements Phase 2 to support an hourly train service in both directions between Inverness and Perth, extended to either Glasgow or Edinburgh with an average end-to-end journey time reduction of approximately ten minutes in both directions (measured against the timetable in place on the date of the publication of this HLOS or any improvements introduced between then and 31st March 2014) and more efficient freight operations that better respond to the demand from freight customers.

4.1.12 Future network developments identified included the HML Corridor Phase 3.

2016

Scotland Route Study, July 2016

4.1.13 The Scotland Route Study[11] was published to provide an evidence base that will inform funders in Scotland when considering rail industry investment choices for Control Periods 6 and 7 between 2019 and 2029. A number of options proposed impact on the HML, including the following:

- Central Belt to Inverness enhancement – to provide packages of timetable and infrastructure enhancement options to deliver incremental outputs, including journey time reduction and improved connectivity, at a corridor level, working towards the 2043 Conditional Outputs. Interventions to be considered were:
  - Greenhill Upper Junction grade separation to increase the flexibility of the timetable by removing the conflict between Edinburgh/Glasgow and interurban services.

[11] https://cdn.networkrail.co.uk/wp-content/uploads/2016/12/Scotland-Route-Study.pdf

- Fife enhancements including a Dunfermline Bypass, Cowdenbeath to Thornton line improvements and pre-works for electrification to improve capacity and journey times through Fife.
- Ladybank to Hilton enhancement to improve capacity and journey times.
- Dunblane to Perth capacity enhancement to improve capacity and journey times.
- Stanley Junction relocation on to a straight track to enable a higher line speed.
- Signalling enhancements to allow the simultaneous acceptance of trains into both platforms at HML stations.
- Inverness layout flexibility – revisions to the existing track and platform layout at Inverness station to improve operational efficiency and flexibility, including the introduction of new rolling stock.

4.1.14 The long distance passenger connectivity Conditional Outputs for 2043 for the HML, as referenced above, are summarised as follows:

- To provide sufficient capacity over the day for passengers travelling on rural services in Scotland in 2043.
- To provide sufficient capacity for passengers travelling on the interurban services between Glasgow, Edinburgh, Stirling, Perth, Dundee, Aberdeen and Inverness in 2043.
- Glasgow Queen Street-Inverness:
  - 1 or 2 opportunities to travel per hour
  - Reduce journey time
- Perth-Inverness:
  - 1 or 2 opportunities to travel every 2 hour
- Edinburgh Waverly-Inverness:
  - 1 or 2 opportunities to travel per hour
  - Reduce journey time

2019

4.1.15 The Network Rail website[12] currently presents details of the HML upgrades which support the introduction of the HSTs and an improved timetable. The HML programme of improvements is being delivered in two phases. During Phase One, a programme of infrastructure improvements were undertaken in 2012 which increased the number of services from 9 to 11 trains per day in each direction. According to Transport Scotland, Phase One delivered average journey time improvements of six minutes (with some services seeing savings of up to 18 minutes) at a cost of £1.2m.

4.1.16 The £57m Phase Two of the scheme aims to deliver an hourly service with average journey times reduced by around 10 minutes. The enabling infrastructure works were completed in 25th March 2019 and passenger benefits will be realised when the new timetable is introduced, having been deferred in December 2019.

[12] https://www.networkrail.co.uk/running-the-railway/our-routes/scotland/highland-main-line/ accessed on 19/09/2019

4.1.17 Phase Two has included works at Aviemore, Pitlochry and three level crossings. These works enable the longer HSTs to pass each other more efficiently at both stations, with the signalling works at the two stations allowing services to arrive and depart both platforms simultaneously. This has provided an immediate performance and resilience enhancement along the route, and also generates a time saving freight services.

4.1.18 In addition to the ten minutes average journey time reduction, Phase 2 will also deliver an improved level of service for all stations along the route. The number of ScotRail and long distance trains between Inverness and the Central Belt will have increased from 11 in each direction at the start of the project to 15 in 2019. The new timetable will provide an hourly service between Inverness, Aviemore and Pitlochry to Perth and Edinburgh or Glasgow. Carrbridge, Kingussie, Newtonmore, Dalwhinnie, Blair Atholl, and Dunkeld and Birnam will have a better spread of services throughout the day to Inverness, Perth, Edinburgh and Glasgow. It is also expected that freight operations will benefit from greater efficiency.

2020 onwards

4.1.19 According to Transport Scotland, the long term target of the enhancement programme on the HML seeks to achieve an hourly service with a fastest journey time between Inverness and the Central Belt of 2 hours 45 minutes (with an average journey time of 3 hours) by 2025[13].

4.1.20 However, a detailed programme of works in order to achieve these benefits have not yet been identified and will be initially led by the forthcoming refresh of the Scottish Government's STPR.

4.2 Delivery of improvements

Journey times and service frequency

4.2.1 In 2006, the publication of Scotland's Railways in 2006 set out key aspirations in the short term to reduce the journey times from Inverness to the Central Belt. In 2008, these aspirations were developed in more detail in the Scottish Government's STPR, with a proposed reduction in journey times between Inverness and Perth of approximately 35 minutes. This reduction was intended to achieve a sub 3-hour Inverness to Glasgow and Edinburgh journey time. Then First Minister Alex Salmond stated that the improvements would be implemented in 2011-2012 and were necessary to achieve a modal shift from road to rail. The intention to implement these improvements were also reiterated in the IIP for Scotland in 2011.

4.2.2 However, despite these promised investments being first announced over a decade ago, since then, average journey times between Inverness and Edinburgh and Glasgow have not improved significantly. Indeed on average, journey times to Edinburgh since 2006 have actually increased by approximately 4 minutes, while journey times to Glasgow have only reduced by approximately 3 minutes. Even when considering minimum journey

[13] https://www.transport.gov.scot/projects/highland-main-line/project-details/

times, journey time savings of only 2-5 minutes have been achieved since the publication of the promised investments in the STPR.

4.2.3 Over Control Period 4 (2009 and 2014), services between Inverness and Perth increased from 9 to 12 trains per day. However, journey times over this period have primarily remained constant or increased, and no trains have yet achieved the two hour timing proposed as the average journey time in the 2011 IIP.

4.2.4 The improvements proposed in the 2008 STPR (and subsequent announcements) also highlighted an increase in service frequency, with a minimum hourly Inverness-Perth service. While a roughly hourly service has been achieved up to 2019, with Phases One and Two of the HML upgrade programme expected to achieve further services frequency improvements. Promised timetable improvements were postponed in December 2019 but when delivered will provide a train in every hour with nine services calling only at principal stations from Inverness to Perth and seven services calling at all stations. The best journey time from Inverness to Edinburgh would be 3 hours 6 minutes.

4.2.5 It is also worth noting that the conditional outputs for 2043 for the HML, as defined in the Network Rail Scotland Route Study, were for 1 or 2 opportunities to travel every 2 hours between Perth and Inverness. While this output will be largely achieved when the new timetable is introduced, this level of service is not considered to be transformational, and the aspiration should be to deliver a service level over and above the hourly Inverness-Perth service set out in the STPR.

4.2.6 In the new December 2019 timetable, the promised improvement to Edinburgh and Glasgow journey times, as noted above, remains unachieved to date.

Station improvements

4.2.7 In terms of station improvements, the investment announcement in 2006 also identified enhancements at key interchange stations to be implemented in the short term.

4.2.8 In regard to delivery, automatic ticket gates were installed at Inverness in 2014. However, a planned £6m revamp of the station, including improvements to the frontage, main concourse and new retail units, has been delayed as of September 2019 and currently does not have a completion date.

4.2.9 Perth station saw investment in its retail facilities in 2017 and the opening of a new £1.6m guest lounge for passengers on the Caledonian Sleeper service in 2018. However, ScotRail's long term redevelopment plans for the station are currently described as aspirational and are yet to come forward.

Summary

4.2.10 Despite the outlined investment to date, the often-stated promises and targets of the last decade or more of a three hour journey time to Edinburgh and Glasgow, improvements to journey times between Perth and Inverness, and significant investment at Inverness and Perth stations have remained elusive. Without the delivery of these promised improvements, the necessary modal shift from road to rail, the opportunity to

decarbonise Scotland's transport network and the wider economic benefits that enhanced rail connectivity will bring to communities along the HML will continue to be out of reach.

4.3 Investment in the Aberdeen-Inverness line

4.3.1 As previously noted, the Aberdeen-Inverness line serves as a good comparator when discussing the HML due to its length, location and track infrastructure.

Phase one

4.3.2 In October 2017, a loop extension of the track and a relocated station was completed at Forres, along with extended platforms at Elgin to accommodate HSTs and upgraded signalling between Inverness and Keith.

4.3.3 Further improvements followed in 2018 and 2019 with the doubling of the track between Aberdeen and Inverurie and various associated signalling enhancements. Infrastructure is now also in place to accommodate new stations at Kintore and Inverness Airport.

4.3.4 The improvements have seen benefits to passengers in 2019 in terms of a half hourly peak service between Inverness and Elgin (with hourly services through the day), more through services to the Central Belt via Aberdeen and a half hourly service between Aberdeen and Inverurie. The December 2019 timetable would have seen further improvements but these were postponed.

4.3.5 Phase One is estimated to cost £240m, £170m of which has been invested by the Scottish Government.

Future phases

4.3.6 Although the scope and timing of further investment has yet to be confirmed, the intention is to support an hourly Aberdeen-Inverness service (up from the current two hourly) with an average journey time of two hours (a saving of around 12 minutes based on current average journey times). This would fulfil the priorities for the line set out in the Strategic Project Review.

4.4 Investment in the Central Belt

4.4.1 It is also useful to consider the context of the recent and significant investment in rail infrastructure in the Central Belt and how this compares to that of the HML. The Edinburgh Glasgow Improvement Programme is a package of improvements being delivered by Network Rail.

4.4.2 The programme has included the £858m electrification of the line between the two cities, delivering journey time improvements and an estimated 30% increase in capacity via new electric rolling stock. The electrification programme has delivered a fastest journey time between Edinburgh and Glasgow of 42 minutes. The programme also includes:

- the new Edinburgh Gateway station, opened in 2016
- three redeveloped stations at Cumbernauld, Haymarket and Queen Street
- platform extensions at Linlithgow, Polmont, Falkirk High and Croy

4.4.3 Major redevelopment of Glasgow Queen Street and Edinburgh Waverley stations are also in the pipeline. The project at Glasgow Queen Street is due to complete in 2020 and will encompass longer platforms and enhanced station facilities. The emerging Edinburgh Waverley masterplan will set out the priorities for the station in the short, medium and long term, and intends to set out a number of options for its future development.

5. THE FUTURE

5.1 Introduction

5.1.1 The sections above have considered the significance and current operation of the HML, and what has been achieved in terms of investment and enhancement in recent years. The review that has been undertaken finds that many of the promised investments and journey times benefits have not been achieved. It is considered that the aspirational 2 hours 45 minutes journey time between Inverness and the Central Belt should be delivered as soon as possible, and that the opportunities presented by the current decarbonisation agenda and the requirement to replace existing rolling stock should act as a springboard for transformational investment.

5.1.2 The following section seeks to understand the possible solutions to the issues outlined and the strategic case behind these interventions.

5.2 Electrification

5.2.1 Given the significant planned investment in dualling the A9 trunk road corridor, with the cost of dualling all sections between Perth and Inverness estimated at £3bn, it should be argued that a similarly "step-change" level of investment is required on the HML to ensure that a more sustainable mode remains attractive in the long term. The analysis in section 3 demonstrates that current rail journey times, particularly taking into account the service intervals, are poor compared to highway journeys and fail to represent an attractive alternative. When this is compared against similarly key intercity routes, such as Glasgow to Edinburgh, it demonstrates that the HML is not performing to the level that such a key strategic route demands.

5.2.2 Furthermore, the current climate agenda and the Scottish Government's declaration in 2019 of a climate emergency has brought into sharp focus the contribution of transport to emissions and the interventions that can be implemented to address these. In 2019, the Scottish Government published a programme for Scotland, Protecting Scotland's Future[14]. Within this programme, there is a commitment to decarbonise Scotland's passenger rail services by 2035 through the continued electrification of the network, the procurement of battery-powered trains and the exploration of the potential of hydrogen-powered trains. Given the presence of the renewable energy industry in Scotland, and particularly the Highlands, the prioritisation of the HML in the programme of decarbonising the rail network fits with an overall energy policy for the country. An announcement on the key actions and timescales for decarbonisation is expected in Spring 2020.

5.2.3 Exploring the electrification of the HML was outlined as a long term ambition in Scotland's Railways (2006) following the creation of Transport Scotland, and would represent the step change investment that would compete with the A9 corridor and deliver transformational service enhancements to the route.

[14] Protecting Scotland's Future (2019). The Scottish Government.

5.2.4 Given the nature of the HML alignment, it is possible that continuous electrification may prove to be challenging from an engineering perspective or too costly to represent a value for money investment. As well as the challenging topography of the route, achieving the necessary power supply for full electrification in some of the more rural and remote sections of the route may prove difficult.

5.2.5 The Scottish Government states that the investment in and development of battery or hydrogen powered trains may represent a solution to this issue. Discontinuous electrification – where sections of the route that would be challenging, costly or uneconomical to electrify – coupled with the use of "hybrid" diesel- or battery-electric trains could be a solution on the HML, achieving the majority of the journey time and decarbonisation benefits, and may overcome the barriers of making a strong economic case for electrification.

5.2.6 The case for electrification could be further enhanced through the potential to decarbonise the freight sector. Given the difficulty in decarbonising road freight due to its high growth rate and very heavy dependence on fossil fuel vehicles, the case for generating a modal shift onto rail for some freight flows could be made for environmental reasons if an electrification programme was realised.

5.2.7 The analysis in Section 4 demonstrates that, despite numerous promises for investment and targets for service improvements, the long stated target of a 2 hour 45 minutes journey time between Inverness and Edinburgh or Glasgow has not been achieved. Electrification would improve journey times, increase reliability and resilience, and deliver the zero carbon benefits that have been pushed to the forefront of the agenda. Therefore, there is the opportunity through an electrification scheme to bring together journey time and carbon reduction benefits in one transformational investment. Full electrification would deliver the greatest benefits in both these areas, and should remain the ambition. However, it is possible that a discontinuous electrification programme may become more viable as the scheme develops.

5.2.8 Given that the current HST rolling stock is approaching the end of its life, investing now in a low-carbon alternative to diesel traction could also fit with rolling stock procurement timetables and would have significant long term benefits.

5.3 Station investment

5.3.1 Investment in stations is also key to realising the potential of the route. Section 4 outlined that, while there has been some investment at Perth and Inverness in recent years, it has been relatively piecemeal and the planned £6m investment at Inverness, which would provide significant passenger benefits, is currently delayed.

5.3.2 A programme of investment in the smaller stations along the route, creating high quality community centres would provide benefits for the local users of the route. A programme such as this could also incorporate integration with other modes. This could include linkages with local bus services, and facilities such as vehicle and cycle charging stations, creating localised mobility hubs that would generate wider benefits for non-rail users. Providing better integrated connections at Inverness to services towards the north coast at Wick and Thurso would also be a key priority, generating wider benefits to the northern Highlands and further developing Inverness as the Gateway to the Highlands.

5.3.3 Furthermore, for the key tourist destinations along the route, such as Aviemore and Pitlochry, investment such as this at stations would enhance the visitor experience at these locations and facilitate the growing rail tourism sector in this region.

5.4 A future service specification

5.4.1 The following represents a target for a transformational future service specification that would achieve the level of service that has been stated as the ambition for the last 20 years:

- Inverness to Edinburgh and Glasgow Queen Street:
  - An **average** journey time across the day of 2 hours 45 minutes.
  - A balanced service between Edinburgh and Glasgow Queen Street throughout the day.
- Inverness to Perth:
  - A sub-2 hour average journey time (this is essential to the delivery of the overall 2 hour 45 minute journey time to Edinburgh and Glasgow).
  - Improvements to the interchange at Perth for connecting services to Edinburgh and Glasgow Queen Street.
  - A late evening (after 9pm) stopping service departing Inverness.
- Improvements in cross border direct services from Inverness via the West or East Coast Mainlines.
- An improved sustainability of services to address the carbon agenda and reduce the carbon footprint of the rail network.
- The delivery of transformational station investment at the key interchanges of Inverness and Perth, as well as the development of community and mobility hubs at local stations such as Pitlochry and Aviemore.
- Improvements in the punctuality and reliability of services and resilience of the route.

5.5 Delivery of the future outputs

5.5.1 In order to achieve the future outputs set out above, the following infrastructure investment would be required.

Electrification

5.5.2 As noted previously, full electrification would deliver the greatest benefits and should be the ambition for the HML. It has been a long term policy target for the route for a number of years and would achieve the targeted improvement in journey times to Perth and the Central Belt set out above.

5.5.3 It would also deliver the carbon reduction benefits that have been set out as a priority by the Scottish Government and would be consistent with the target to decarbonise Scotland's passenger rail services by 2035.

5.5.4 Furthermore, it would facilitate the decarbonisation of the freight sector, providing a low carbon alternative to road freight (which is still heavily reliant on fossil fuels), enhancing the environmental credentials of the HML, and would provide gauge enhancement benefits for freight flows.

5.5.5 It is possible that, as the scheme develops and detail regarding costs and engineering feasibility emerges, discontinuous electrification at some sections may be necessary. This should, however, be seen as an interim solution; the long-term objective should be for full electrification of the route to maximise the passenger and environmental benefits.

Line speeds

5.5.6 As part of any future upgrades to the route it would be worth reviewing the pattern of line speeds on the route. The route already enjoys short stretches of 100mph operation and some sections where certain classes of train (Sprinters and Turbostars) can operate at higher speeds. Electrification of the route may well bring the opportunity to improve acceleration of services and also increase maximum speeds on sections with steep gradients where diesel trains would struggle to achieve higher speeds. The introduction of more "differential" speed restrictions where lighter, higher performing trains can operate at a higher speed than other trains may be appropriate as a means of delivering reduced journey times more cost effectively.

5.5.7 Such changes might represent a series of incremental improvements but will collectively bring useful journey time reductions. It may be possible to bring efficiencies in the delivery of such improvements by delivering this as part of routine track maintenance and renewal.

Capacity

5.5.8 The route is always likely to retain sections of single track. However, in the long term, the aim should be to introduce more passing places or develop "dynamic" loops allowing services to pass each other on the move with less delay. The development of a greater number of passing loops, with longer stretches of double track, would provide more flexibility and thus improve service resilience and performance.

Rolling stock

5.5.9 In the medium term the HSTs will have to be replaced. Any future trains should be designed to be attractive for long distance services. However, a return to multiple unit operation might provide the opportunity to operate services as portions with, for example, an hourly service operating from Inverness to Perth with a portion running forward to each of Edinburgh and Glasgow, making access to both cities more attractive and increasing train capacity on the core route.

5.5.10 To meet Scottish Government objectives, the new fleet will also need to have a significantly lowered (or zero) carbon impact, which implies electric traction in some form. As outlined above, the optimum solution for reducing operating cost, journey time and

carbon footprint would be full electrification of the route. If this is not technically or economically feasible, the new trains may have to be powered in other ways, potentially using hybrid traction with hydrogen- or battery-electric drives alongside either diesel or discontinuous electrification.

6. CONCLUSION

6.1.1 This study has reviewed the recent history of the development of the HML and contrasted the aspirations and promises for delivery with the changes in the quality of the timetable operated. Over this period the proportional changes in journey times have been relatively limited, whilst investment has not been as widespread as anticipated.

6.1.2 The delivery of refurbished HSTs and recent investment on the route has begun to change this, however this sits in the context of £3bn of investment into the parallel A9 corridor and other rail corridors, such as Aberdeen-Inverness, seeing substantial route renewals.

6.1.3 Whilst the relative lack of progress on the HML might be seen as regrettable, through a combination of circumstances a number of opportunities are emerging to develop the case for investment in the route to provide both a more attractive, faster and sustainable route.

6.1.4 Electrification of the route would provide the most direct opportunity to reduce carbon impacts of both passenger and freight services and reduce journey times through the improved performance of electric trains, and ultimately this should be the aspiration for the route. However, if this were not feasible, the development of discontinuous electrification supported by new trains using battery and electric technologies might represent an alternative. Linked to this would be the opportunity to understand how the service might be restructured to provide more attractive journey options, for example by operating portions to both Glasgow and Edinburgh or operating more direct cross border services. All of this would need to be set in the context of improving the resilience of the route and improving punctuality and reliability, which is currently rather variable.

6.1.5 The delivery of the current interim infrastructure investment and changes to timetables and rolling stock provides a holding position during which the ultimate case for the investment required to support the long term development of the route can be determined.

6.1.6 A potential key driver of progress is the medium term need to replace the HSTs currently being introduced on the route; this presents an opportunity to develop a holistic case for a route modernisation programme. It is recommended that support be sought from all potential stakeholders for a “Task Force” approach to developing a comprehensive cross-industry consensus based on local needs.

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