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NEWBURGH & OUDENARDE: **INITIAL** RAIL DEMAND FEASIBILITY STUDY

SYSTRA

NEWBURGH AND OUDENARDE: INITIAL RAIL DEMAND FEASIBILITY STUDY

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1. INTRODUCTION

1.1 Overview

1.1.1 In March 2014 SYSTRA was commissioned by a Client Group comprising SEStran, Tactran, Fife Council and Perth & Kinross Council to complete a feasibility study of potential new station openings at Oudenarde and/or Newburgh in the Fife Council and Perth & Kinross Council areas.

1.1.2 The study aimed to update the previous considerations of the business case for these two new stations (Oudenarde had previously been considered by WS Atkins in 2005, while Newburgh had been considered by WS Atkins in 2005 and by Deltix in 2011[1]).

1.1.3 While this report includes some consideration of the local transport context in this North Fife/Perth & Kinross area, the modelling exercise is not a STAG-based appraisal. In particular it does not include a detailed consideration of the transport-related problems or opportunities in the North Fife/Perth & Kinross area, nor does it consider any alternative non-rail-based solutions to tackling these problems.

1.1.4 This study highlights, but does not address, potential timetabling and infrastructure concerns for detailed analysis at a later stage.

1.1.5 The costs used here are derived from those estimated in previous studies, adjusted to take account of construction inflation and to take account of changes in the relevant assumptions. No detailed costings have been undertaken.

1.1.6 The purpose of this feasibility study is to provide a demand forecast and outline economic appraisal for the two potential new stations and an update on previous studies. If it is considered that the modelling work provides a robust platform on which to advance the proposal of rail stations, then this modelling work may be supplemented by further reviews of alternative transport solutions for Newburgh and Oudenarde. This report could then form a starting point for the 'Appraisal of Rail Options' chapter of a more-comprehensive STAG report.

[1] Review of potential for a Newburgh rail study, Deltix, 2011 and An appraisal of the viability of developing new rail station/rail halt facilities in Perth and Kinross, Atkins, 2005

2. REVIEW AND UPDATE OF OVERALL CONTEXT

2.1 Introduction

2.1.1 This chapter provides a brief overview of the overall context underlying this study, including:

- existing transport network;
- the land use planning context and population estimates; and
- local socio-demographic data, including analysis of Census Travel to Work data (2001, as 2011 is not publicly available).

2.2 Existing transport network

2.2.1 There are currently a total of 26 train stations within the Fife and Perth & Kinross Local Authority areas, which combine to provide direct rail links to all of Scotland's cities.

2.2.2 The proposed site of the potential Oudenarde station is to the east of Bridge of Earn and the M90 south of Perth, while Newburgh station would lie approximately mid-way between Perth and Ladybank stations (see Figure 1).

Figure 1. Existing and proposed railway station locations

2.2.3 The 'free-flow' drive-time by car from Oudenarde to Perth train station is approximately 11[2] minutes, while Dundee train station can be reached via the M90/A90 in around 27 minutes (in free-flow conditions) and central Edinburgh is around 50 minutes via the M90 and the Forth Road Bridge. All of these drive-times increase significantly during peak-hour congestion.

[2] Google maps journey times

2.2.4 The corresponding car-based journey times from Newburgh are 19 minutes to central Perth (via the A913, A912 & M90), 25 minutes to Dundee (via the A913 & A92) and 59 minutes to central Edinburgh (via the A913, A912, M90 and Forth Road Bridge). Cupar is around a 18-22 minute drive east from Newburgh, along the A913 and is another key destination for Newburgh residents.

2.2.5 Table 1 presents approximate car peak and off-peak journey times alongside proposed rail journey times.

Table 1. Approximate current car and proposed rail journey times (minutes) [3]

	CAR PEAK	CAR - NO CONGESTION	PROPOSED RAIL
Oudenarde – Perth	14	11	7
Oudenarde – Edinburgh	55 - 90	50	93
Oudenarde – Dundee	28-35	27	50
Newburgh – Perth	20-24	19	15
Newburgh – Edinburgh	60-110	59	84
Newburgh – Dundee	26-30	25	41

2.2.6 To identify the existing public transport provision at the new settlement at Oudenarde the buses serving the existing Bridge of Earn settlement have been identified. Both Newburgh and Bridge of Earn are currently served by bus/coach public transport with Stagecoach operating a number of services. Bridge of Earn benefits from a greater number of routes and frequency than Newburgh. The current bus services are summarised below:

[3] Google maps journey times

Table 2. Newburgh bus services

SERVICE	ROUTE	FREQUENCY
Stagecoach 94 (A/M)	Newburgh – Ladybank – St Andrews	Hourly service Monday – Saturday
Stagecoach 35	Cupar – Newburgh – Bridge of Earn – Perth	1 service per day Monday – Friday
Stagecoach 36	Glenrothes – Newburgh – Bridge of Earn – Perth	Hourly service Monday – Saturday, limited service Sundays

Table 3. Bridge of Earn bus services

SERVICE	ROUTE	FREQUENCY
Stagecoach 56/B	Halbeath P&R – Kelty – Kinross – Bridge of Earn – Perth	Hourly service Monday – Saturday, limited service Sundays
Stagecoach 17	Gleneagles – Auchterarder – Dunning – Bridge of Earn – Perth	4 AM peak services then bi-hourly Monday – Saturday. Two Sunday services
Stagecoach 35	Cupar – Newburgh – Bridge of Earn – Perth	1 service per day Monday – Friday
Stagecoach 36	Glenrothes – Newburgh – Bridge of Earn - Perth	Hourly service Monday – Saturday, limited service Sundays

2.2.7 Growth in rail patronage at the stations close to Newburgh and Oudenarde show a somewhat inconsistent pattern over the previous five years as shown in Table 4 and Figure 2, which report the Office of Rail Regulation estimates of annual station entries and exits at some of the nearby stations.

Table 4. Growth in Local Rail Patronage based on Office of Rail Regulation Estimates of Station Use

STATION	2008/09 ENTRIES AND EXITS	2012/13 ENTRIES AND EXITS	2012/13 ENTRIES AND EXITS
Cupar	226,654	190,820	-16%
Ladybank	47,028	64,238	+37%
Perth	834,726	975,364	+17%
All stations above	1,108,408	1,230,422	+11%

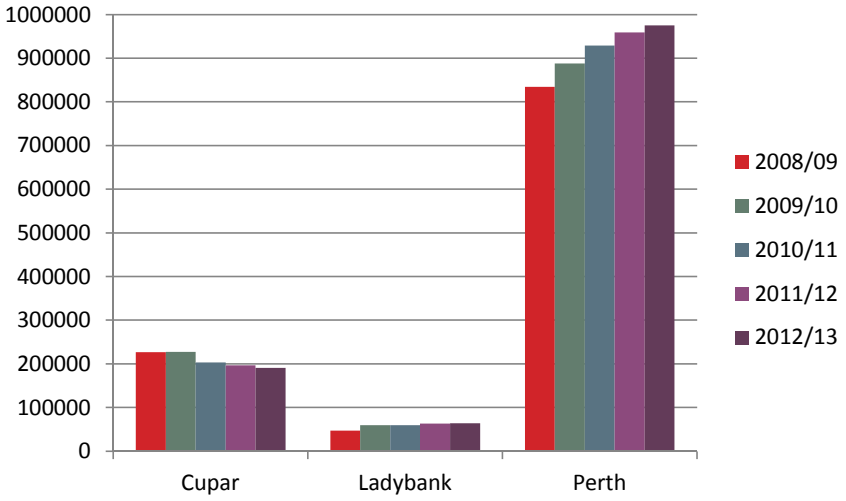


Figure 2. Recent growth in annual rail patronage at nearby stations[4]

2.2.8 The overall rail demand using these nearby stations suggests an average growth of around 3% per annum in local rail patronage between 2008/09 and 2012/13.

2.3 Socio-economic background

2.3.1 Newburgh is a small town in Fife with a population of 2,137 (Census 2011) and strong industrial history particularly in linoleum and salmon fishing. However as these industries have declined, the town's location close to the employment centres of Perth and Dundee has proved popular with commuters. Similarly Bridge of Earn (Oudenarde)[5] with a population of 2,709 (Census 2011) also benefits from its proximity to the employment centre of Perth and the easy access on to the M90 corridor. There are a number of planning proposals in place for Oudenarde which will be discussed in Section 3, which considers how travel demand to/from these station catchment areas may change over time. Table 5 below shows the recent change in population in the two settlements.

Table 5. Mid-year General Register Office for Scotland population estimates and 2011 Census population

YEAR	NEWBURGH AND BURNSIDE	BRIDGE OF EARN (OUDENARDE)
Mid – 2012	2,060[6]	2,790
2011 Census Population	2,137	2,709
Mid-2010	2,130	2,720

[4] Excludes Invergowrie and Springfield patronage which are both too low to be seen clearly in this chart
[5] As defined by the National Records of Scotland settlement of Bridge of Earn which encompasses Oudenarde. Referred to as Bridge of Earn (Oudenarde) for the remainder of this section
[6] Newburgh/Burnside is the settlement definition for the Newburgh area used until mid-year population estimate 2010 as defined by the National Records of Scotland. Burnside is not included in the definition for mid-year population estimate 2012.

Mid-2008	2,160	2,440
Mid-2006	2,100	2,330
Mid-2004	2,040	2,310

Travel to Work Patterns

2.3.2 At the time of writing this report the Scottish 2011 Census Travel to Work data have not been released to SYSTRA at a sufficiently detailed geography to support detailed analysis of the local travel to work patterns.

2.3.3 The travel to work analysis reported here is therefore based on the most up-to-date data available, namely the Census Travel to Work 2001 data.

2.3.4 Figure 3 shows the mode of journey to work for all persons aged 16-74 in employment (excluding students) for Bridge of Earn (Oudenarde), Newburgh and Burnside and Scotland to all work destinations. Analysis of the method of travel to work data from the Census 2011 shows an almost identical level of bus and coach use compared to the Scottish average (Figure 3). Given there is not a train station in close proximity, the results also show a lower than average use of train (1% for both Bridge or Earn (Oudenarde) and Newburgh and Burnside[7] compared to the Scottish average of 3%) and higher than average use of cars.

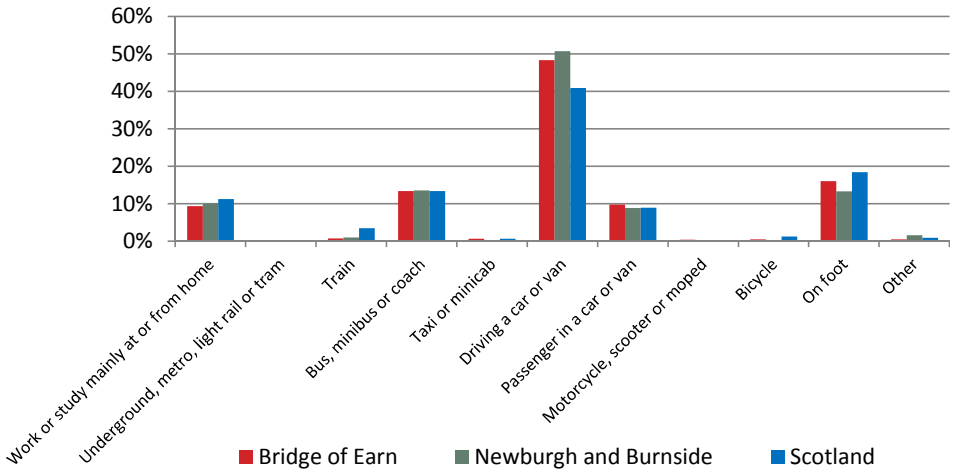


Figure 3. Method of travel to work or study (Census 2011)

2.3.5 Table 6 shows the 'Top 10' travel to work destinations from Newburgh and Burnside, as recorded in the 2001 Census. Two of these (Perth and Edinburgh) representing 34% of the total commuter travel pattern, would be accessible by a direct train from the new station, while many of the other could be accessed by rail via an interchange at Ladybank or by a combination of bus and rail.

[7] As above

Table 6. Top 10 Travel to Work Destinations from Newburgh and Burnside

TOP 10 WORK DESTINATIONS FROM NEWBURGH AND BURNSIDE	NUMBER OF WORKERS[8]	% OF TOTAL WORKERS
Perth	186	32%
Cupar	72	12%
Dundee	66	11%
Glenrothes	31	5%
Leuchars	21	4%
Abernethy	21	4%
St Andrews	18	3%
Dunfermline	15	3%
Auchtermuchty	15	3%
Edinburgh	12	2%

2.3.6 Table 7 shows the Top 10 travel to work destinations from Bridge of Earn (Oudenarde) based on the Census 2001 Travel to Work data. Again, two of these destinations (Perth and Edinburgh, representing almost 70% of the commuter travel pattern) would be accessible by direct rail services via the potential new station at Oudenarde, while several of the others (notably Dundee, Dunfermline, Glasgow and Stirling) could be reached by rail by interchanging at Ladybank or Perth.

[8] Excludes full time students

Table 7. Top 10 Travel to Work Destinations from Bridge of Earn (Oudenarde)

TRAVEL TO WORK TOP 10 WORK DESTINATION FROM BRIDGE OF EARN (OUDENARDE)	NO OF WORKERS	% OF TOTAL WORKERS
Perth	551	66%
Forgandenny	50	6%
Dundee	45	5%
Edinburgh	24	3%
Abernethy	15	2%
Auchterarder	9	1%
Dunfermline	9	1%
Glasgow	9	1%
Glenrothes	9	1%
Stirling	9	1%

Note: Census 2011 Travel to Work data has subsequently been released. A high level comparison of the new 2011 census data shows that there have been small increases in the proportion of employed persons in Newburgh and Oudenarde (1% and 2%) respectively. These increases are not expected to impact on the results of this report significantly. The commuter patterns have also not changed significantly between 2001 to 2011.

3. PROPOSED FUTURE HOUSING AND EMPLOYMENT DEVELOPMENTS

3.1 Oudenarde

3.1.1 Oudenarde has been the subject of a major redevelopment programme for a number of years with a Masterplan proposed in May 2001[9]. The Masterplan proposes a development site for Oudenarde located east of the M90 with the existing settlement of Bridge of Earn located to the west as shown in Figure 4 (site H15).

3.1.2 The Oudenarde site is included in the adopted Perth & Kinross Local Development Plan (2013). The approved Masterplan and affordable house building has started with 107 affordable units constructed as of August 2013 and outline planning consent for a business development area and a new funding package agreed by Council for new school (Summer 2013).

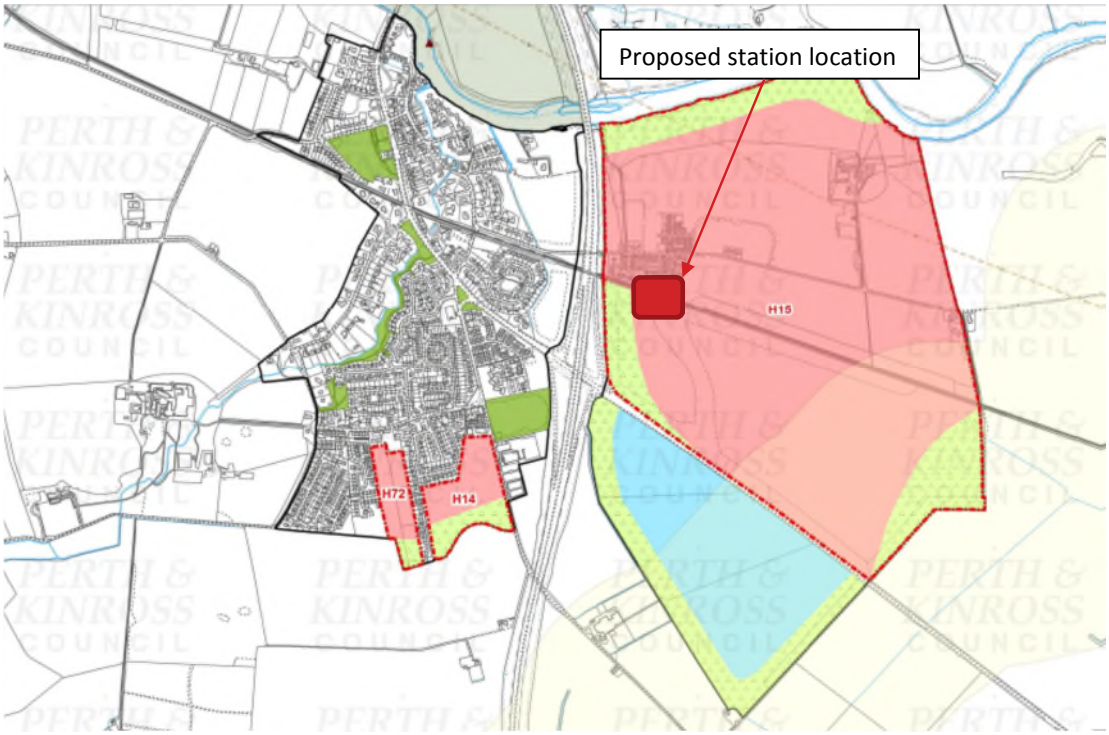


Figure 4. Bridge of Earn and Oudenarde[10]

[9] Oudenarde Masterplan and Design Principles (May, 2001)
[10] Perth and Kinross Adopted Plan

3.1.3 The masterplan has an emphasis on sustainability and includes a number of key initiatives:

- Walking distance to key amenities (i.e. village centre, school);
- Integrated pedestrian and cycle routes
- External links from the settlement to nearby local towns to be facilitated by public transport provision (i.e. park and ride, potential **Rail Halt**).

3.1.4 Land has been allocated for a 'Park and Ride' facility to the south of the railway line, adjacent to the preferred location for a future rail halt facility. The site will initially provide spaces for 50 cars, with a possible future extension to 250 cars.

3.1.5 The Perth and Kinross Council Local Development Plan (LDP) (adopted February 2014) focuses on the Oudenarde development as described above. The LDP states that the total number of houses at Oudenarde has increased by 400 to 1,600 to reflect higher densities and the capacity of the site, however there will be no increased house numbers within the pipeline consultation zone which covers the eastern part of the site.

3.1.6 Table 8 details the sites identified in the Oudenarde and Bridge of Earn area.

Table 8. Oudenarde/Bridge of Earn Strategic Development

REF	LOCATION	SIZE (HA)	HOUSING
H15	Oudenarde	123	1,600 (increase by 400)
H14	Old Edinburgh Road/Dunbarney Avenue	5.2	100

3.2 Newburgh

3.2.1 Consultation on FIFEplan, Fife's local development plan Proposed Plan closed in December 2014. In June 2015 Fife's Executive Committee agreed the Council's proposed responses in advance of submitting to the Scottish Government for Examination.

3.2.2 The Main Issues Report (MIR) states that there is interest in seeing a small amount of new housing being created on a regular basis within Newburgh including designation of some land for development as currently Newburgh is very much a commuter town and there are no business premises for potential entrepreneurs.

3.2.3 The St Andrews & East Fife Local Plan has significant housing allocation as detailed in Table 9 and Figure 5 which it identifies as supporting the development of a new rail halt.

Table 9. Newburgh and Burnside - Local Plan Proposals and Development Requirements[11]

REF	LOCATION	SIZE/ TYPE (HA)	HOUSES	COMMENTS
NEB 01	South of Cupar Road	Housing - 5.3	150	This site is a Local Plan allocation. Total site capacity is 225 houses, of which 75 houses should be developed beyond the Local Plan period.
		Employment – 1.5		
		Primary school expansion – 0.6		
		Cemetery expansion – 1.2		
NEB 02	Mugdrum East	Brownfield site – 0.3	10	This site presents a development opportunity. It has the potential to contribute 10 houses to the housing land supply.
NEB 03	Newburgh Rail Halt	New rail halt with P&R and employment		This site is a Local Plan allocation
NEB 04	Cupar Road	Transportation		This site is a Local Plan allocation. Environmental improvements and traffic management.

3.2.4 Regarding the proposed rail halt at Newburgh the St Andrews & East Fife Local Plan (Adopted October 2012), Newburgh and Burnside Settlement Plan states that Transport Scotland has no commitment towards funding the delivery of a station at this location. Transport Scotland's policy is to promote better utilisation of the existing network as a first choice and, as such, welcomes proposals for Park-and-Choose sites which complement established rail facilities.

[11] Adopted St Andrews & East Fife Local Plan – Action Programme 2013

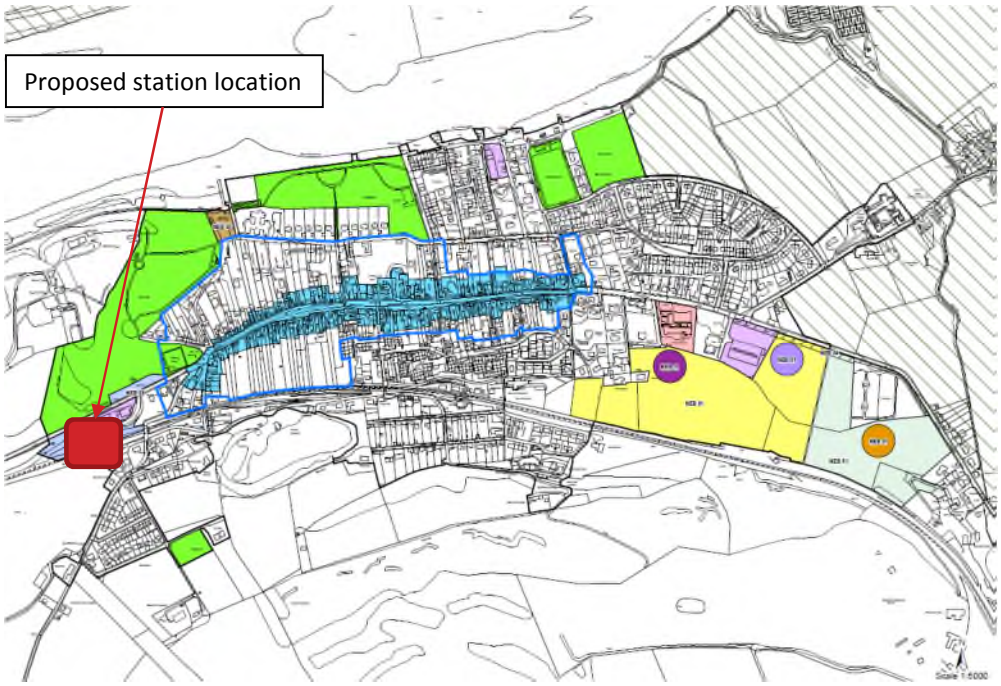


Figure 5. Newburgh and Burnside Proposed Developments[12]

[12] Adopted St Andrews and East Fife Local Plan 2012

4. REVIEW OF PREVIOUS STUDIES

4.1 Scottish Strategic Rail Study (2001)

4.1.1 The Scottish Strategic Rail Study was carried out in parallel with a number of other major studies in 2001, including the Central Scotland Rail Capacity Study for the SRA. Of the scenarios tested the following were relevant to this study:

- Perth to Ladybank line: examined the case for an hourly local service stopping at Newburgh and Oudenarde operating as an extension of the existing Edinburgh to Markinch service. Enhancements to track and signalling were assumed including the doubling of the track between Hilton junction and Bridge of Earn and the provision of passing loops at Abernethy and Newburgh. Conclusion - useful contribution to planning objectives, but marginal in terms of value for money.
- Local service and an express service from Edinburgh to Perth / Inverness via Ladybank. Concluded that the benefit to cost ratio between the two service options are indistinguishable and that the local service would contribute more to the planning objectives of the Tay area than the express service to Perth and Inverness does for the planning objections defined for inter-regional services.

4.2 An appraisal of the viability of developing new rail station/rail halt facilities in Perth and Kinross (2005)

4.2.1 This study was commissioned by Perth and Kinross Council, Scottish Enterprise Tayside, Fife Council, Highland Spring and the Highland Rail Partnership to examine the feasibility of new rail stations at Blackford and Greenloaning, Oudenarde and Newburgh. The appraisal investigate a number of options relating to Newburgh and Oudenarde including:

- Oudenarde/Bridge of Earn only (served by extension of Edinburgh to Markinch service);
- Newburgh and Oudenarde (served by extension of Edinburgh to Markinch service); and
- Newburgh only (served by extension of Edinburgh to Markinch servce).

4.2.2 The study made a number of conclusions and recommendations for stations at Oudenarde and Newburgh:

- New stations would require additional local rail services to be operated to avoid a negative journey time impact on existing services;
- Benefit of a new local service would be strengthened by the introduction of both stations and identified that the opening of Newburgh rail halt would be dependent on development at Oudenarde to supply sufficient demand to such a service;
- Revenues generated by a new local train service (calling at both Newburgh and Oudenarde) are unlikely to cover the additional train operating cost, though almost two thirds of the operating costs are predicted to be covered if future planned development in the Newburgh and Oudenarde area takes place;
- This train service option could only be introduced if the signalling is improved between Perth (Hilton junction) and Ladybank;

- The best means of serving the new stations would appear to be by extending the existing local service between Edinburgh and Markinch to Perth;
- Demand projections indicate that there is only likely to be justification for a train service every alternate hour;
- Provision of new rail halts at Newburgh and Oudenarde may potentially require signalling; and
- A detailed study of the new rail halts at Newburgh and Oudenarde served by extending the existing Edinburgh to Markinch service to Perth is required.

4.3 Review of potential for a Newburgh rail station (Deltix, 2011)

4.3.1 The review of the potential for a Newburgh rail station was commissioned by the Newburgh Community Trust in 2010 to establish the viability of reinstating Newburgh's rail halt. The study provided an update to the Atkins report with a particular focus on policy, demand and supply changes supplemented by a questionnaire survey of residents in Newburgh.

4.3.2 The study made a number of conclusions and recommendations for station at Newburgh:

- Increased frequency in Edinburgh – Perth service provides an opportunity to introduce stops on the through service;
- Acknowledgement of Transport Scotland's policy to reduce the impact of journey time increases for long distance travel;
- Proposes a "swap stop" with Ladybank as the most feasible option;
- Proposes that a single-station strategy is the most economically viable and would reduce construction costs and times associated with the construction of a new passing loop on the single-track Hilton Junction to Ladybank section;
- Capital cost of a single platform at Newburgh likely to be £1m, not £2m as stated in the Atkins report and there would be minimal operating cost given the frequent Edinburgh to Perth services;
- CO_2 savings from Newburgh station reinstatement;
- Household questionnaire found overwhelming support for Newburgh station;

4.3.3 The study concluded that further dialogue with Transport Scotland and a positive pre-feasibility study would be required prior to the commissioning of a full feasibility study with robust estimates of demand, revenues, costs, wider benefits and potential funders.

5. SPREADSHEET APPRAISAL TOOL

5.1 Introduction

5.1.1 A spreadsheet appraisal tool was developed to predict passenger demand at the two proposed stations. This tool was designed to provide detailed insight into the likely travel demand patterns generated by the new stations and the associated user and non-user benefits generated by the changes to the rail service[13] and the resulting mode-shift.

5.1.2 Prior to the development of the spreadsheet appraisal, tests were undertaken using the Central Scotland Transport Model (CSTM12) developed for Transport Scotland in 2012. CSTM12 was designed to forecast the detailed benefits and impacts of current investment commitments such as the refinement of the Edinburgh to Glasgow Improvement Programme (EGIP) and the knock on consequences. Detailed representation of the network extends to Dundee and Perth with links to North Scotland towns and cities represented by external links. Although Oudenarde and Newburgh are included within CSTM12, the relevant zones are large and located on the edge of the modelled area. The CSTM12 was therefore deemed to be unsuitable for use in this study.

5.2 Appraisal tool development

5.2.1 A logit-based mode-choice spreadsheet was developed to predict patronage of a new rail station at either Newburgh or Oudenarde (but not both simultaneously). The spreadsheet tool is capable of predicting demand for a variety of service pattern stopping frequencies, by disaggregating the relevant movements into a discrete set of origin-destination pairs which are potentially served by either or both of the two new stations and the associated stopping patterns. The spreadsheet then compares the total demand and the time and money costs for car, existing public transport and the new improved public transport alternatives for each of these origin-destination (OD) movements. The passenger demand at the new station is further split into 'walk-in' and 'drive-to-station' demand segments.

5.2.2 The mode-choice components of the tool focus on the Travel to Work journey purpose (for which good robust travel pattern data exists from the 2001 and 2011 Census Datasets[14]), then uses observed relationships between the AM peak commuting demand and total annual station entries and exits for similar stations in Fife and Perth & Kinross to annualise these up to predicted annual station patronage estimates for each of the two new stations in each future modelled year. The same factor has been applied to both Newburgh and Oudenarde.

5.2.3 The travel demand is based on 2001 Census travel to Work/Education Output Area pattern (this is the most up-to-date publicly available dataset) for the relevant origin-destination journey pairs, scaled up to take account of the growth in the population of the various settlements over time.

[13] Including disbenefits to existing rail passengers from the additional stop

[14] Census 2001 travel to Work/Education data has been used in the model and is supplemented by Census 2011 population data at output area level

5.2.4 The mode choice is between car, bus, rail, walk-in and Park and Ride, using a logit-based mode choice process with competing bus services assumed to be as current with only walk-in and drive-in modes used to access the new stations (i.e the tool does not consider use of cycling or bus to access the new stations).

5.2.5 The tool takes account of projected population growth in the various settlements, but excludes any trip generation impacts of the new stations (ie the total travel demand between the various OD pairs is assumed to be the same in the Do Nothing and Do Something future-year scenarios). This simplifying assumption will have under-estimated potential demand for the new stations, particularly for any OD journey pairs where the new station provides a step-change in accessibility leading to residents changing leisure or work destinations/patterns, for example.

5.3 Modelling Assumptions

5.3.1 Appendix A summarises the assumptions and inputs used within the modelling tool.

Demand

5.3.2 As discussed previously in Chapter 3, there have been a number of variations to the Oudenarde development size and timescales. Following discussions with Perth and Kinross Council, the planning data was amended to ensure there were 500 new properties by 2017 and an assumed build out rate of 100 properties per year until 2028 (1,600 in total).

5.3.3 Assumed population growth in all other areas (including Newburgh) has been based on the appropriate National Records of Scotland (NRS) council level population forecasts. This 'average growth rate' approach does not take into account any localised developments which may impact on population growth, other than in Oudenarde. Specifically, this approach does not take into account the locational implications of the planned development at Perth Western Edge which may increase the drive-in catchment of a new station at Oudenarde. The impact of this simplification would require further analysis to determine its impact on the overall conclusions of this study.

Stopping Patterns at the New Stations

5.3.4 One train per hour was assumed to stop at either Newburgh or Oudenarde. These additional stops were assumed to be provided by existing ScotRail services between Edinburgh and Perth. Other rail services (eg services to Inverness) were assumed to travel through the new station without stopping.

5.3.5 This assumption is based on 11-12 services per day in each direction. It should be noted that the current Edinburgh – Perth timetable has a number of gaps in service which are currently filled by an Edinburgh – Inverness services. The inclusion of the additional existing passenger disbenefits incurred by using these longer-distance services to provide a genuine hourly service at the new station is discussed in Section 6.

5.3.6 It should be noted that Transport Scotland and Abellio's commitment to reducing journey times on the Highland Mainline may impact on the decision to stop these longer-distance services at the potential new station.

5.3.7 Additional detailed timetabling work would be required to identify the optimum service pattern which could be achieved.

Fares

5.3.8 Analysis of existing fares was used to determine the fare for Oudenarde and Newburgh. Fares are consistent for Oudenarde and Newburgh to all locations excluding Ladybank and Perth which have different fares for Oudenarde and Newburgh travellers. The fares were calculated based on a boarding fare of £1.50 and a £ per km value of £0.11 in the peak, and is consistent with fares between Ladybank and Perth, Gleneagles and Perth, and Invergowrie and Perth.

Disbenefits to Existing Rail Passengers

5.3.9 The additional stop was assumed to add an additional 3 minutes to the journey time of all existing rail passengers using the relevant Edinburgh-Perth rail services between Ladybank and Perth. This 3-minute per stop delay has been assumed based on discussions with Transport Scotland and Network Rail. Analysis of existing stopping patterns on similar routes indicates that the actual additional delays to these services may be less than this.

5.3.10 The number of through passengers experiencing this additional delay is based on the current patronage of the relevant Edinburgh-Perth movement, growthed up by the annual growth for inter-urban movements assumed in Network Rail's Route Utilisation Strategy[15]. No attempt has been made to predict the existing rail traveller responses to these increased journey-times.

[15] http://www.networkrail.co.uk/browse%20documents/rus%20documents/route%20utilisation%20strategies/rus%20generation%202/scotland/scottishrusbook.pdf

Year of opening

5.3.11 The modelling and associated benefit analysis has assumed a year of opening of 2020.

Car occupancy

5.3.12 The average car occupancy of Newburgh and Oudenarde/Bridge of Earn residents currently driving to their destination is assumed to be 1.2 occupants per car. This value is also used for the average occupancy of cars used to access the new station.

Car parking

5.3.13 The new station car parks are assumed to be free. Parking in Edinburgh is assumed to be £14.50 (daily rate at Waverley station) and £3 in Perth (daily rate at Perth station).

5.3.14 A 50% discount is applied to these parking charges, to represent the availability of free workplace parking for some motorists.

5.4 Appraisal Tool Outputs

5.4.1 Figure 6 shows the pattern of AM daily peak demand for the two stations (top 10 movements). The increase in demand associated with the growing Oudenarde development is evident in the 2020 v 2030 comparison. Movements to Perth dominate the origin-destination movements in the AM peak.

5.4.2 Figure 6 shows that the top 10 movements are largely local/short distance movements and Edinburgh movements are not in this Top 10 list. As discussed in Section 5.2.2, the trip pattern is driven by Census Travel to Work data and observed relationships between the AM peak commuting demand and total annual station entries and exits. While this approach will broadly achieve the correct number of boardings and alightings, it will tend to under-estimate differences between peak and off-peak trip patterns, such as increased numbers of long-distance leisure trips to Edinburgh and beyond.

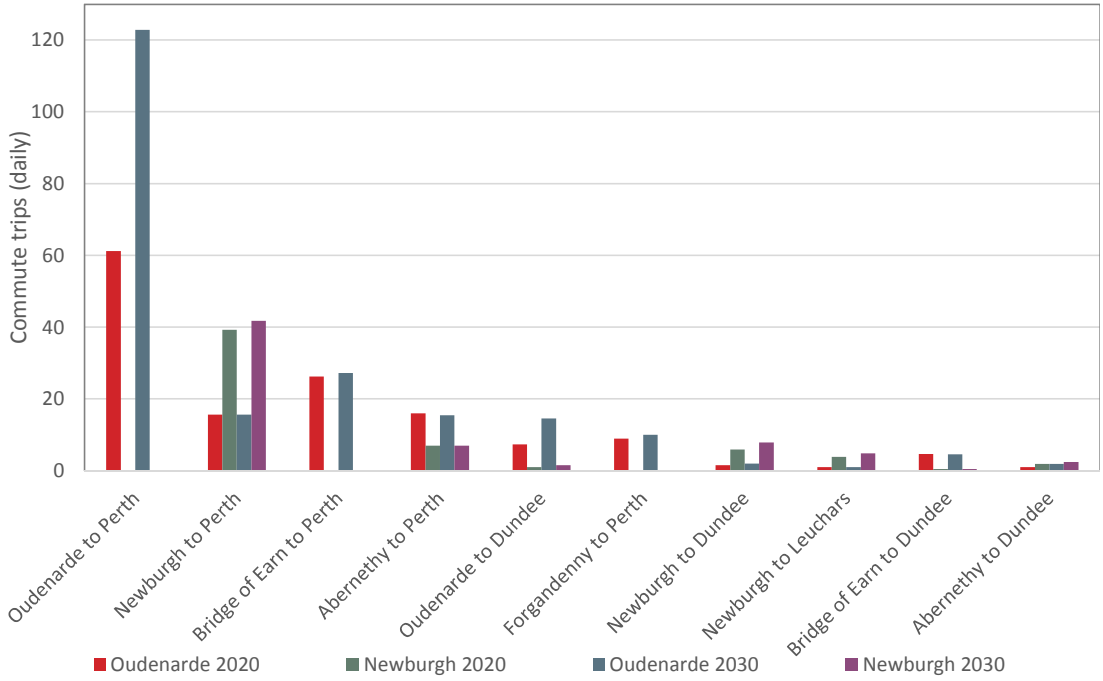


Figure 6. Pattern of AM Peak demand (Commute)

5.4.3 Oudenarde station is predicted to generate the higher patronage, particularly after the completion of the full Oudenarde development.

5.4.4 Table 9 presents the key outputs from the spreadsheet appraisal tool in terms of demand and benefits.

Table 10. Spreadsheet Appraisal Outputs

	OUDENARDE 2020	NEWBURGH 2020	OUDENARDE 2025	NEWBURGH 2025	OUDENARDE 2030	NEWBURGH 2030
Entries and Exits	191,799	83,091	247,146	87,957	286,158	93,373
Traveller benefits	£168,583	£295,812	£273,089	£339,337	£361,291	£370,336
Change in PT revenue	£292,015	£355,579	£286,004	£382,006	£332,418	£418,804
Total benefits	£399,198	£583,214	£492,813	£650,861	£611,571	£717,032

5.4.5 These results suggest that Oudenarde station would attract more demand than Newburgh, particularly as the additional housing at Oudenarde is completed, with approximately 286,000 station entries and exits per annum at Oudenarde by 2030, compared to around 93,000 per annum at Newburgh.

5.4.6 However, in all future years Newburgh station is predicted to generate more traveller benefits and more total benefits (ie including public transport revenues) than Oudenarde, though the gap in benefits between the two stations decreases over time, as patronage at Oudenarde increase.

5.4.7 The reason for this difference in the pattern between patronage and benefit is that the benefit per passenger is much higher for passengers using Newburgh than for those using Oudenarde The additional 8 – 12 minutes car journey time to Perth and Edinburgh for Newburgh residents compared to Oudenarde residents means that the new rail service provides more benefits to existing car users. Similarly, peak bus journey times between Newburgh and Perth are 10 – 20 minutes greater (with significantly lower service frequency) than Oudenarde to Perth movements compared to an eight minute difference between proposed rail journeys. In addition, because Oudenarde has better access to the motorway network and existing public transport services compared to Newburgh, the generalised cost saving for travellers switching to rail is significantly greater for Newburgh passengers compared to Oudenarde leading to a greater total traveller benefit, despite the lower number of passengers predicted to use the Newburgh station.

5.4.8 As a result, the approximate benefit per rail passenger in 2030 is predicted to be £1.26 per passenger for those using Oudenarde and £3.96 per passenger for those using Newburgh.

5.4.9 The relevant patterns of annual patronage, traveller benefit, change in PT revenue and total benefit are illustrated in the three figures below.

5.4.10 The figures show that although annual entries and exits at Oudenarde are significantly greater than Newburgh, the increase in net public transport revenue is greater for Newburgh station. This is due to a combination of differences in the relative bus and rail fares between the two settlements and the fact that much more of the demand at Newburgh is predicted to come from car than from bus, resulting in a significantly higher increase in the net PT revenue (76% of the Newburgh station users in 2030 are predicted to have switched from car, compared to just 37% of the predicted station demand at Oudenarde).

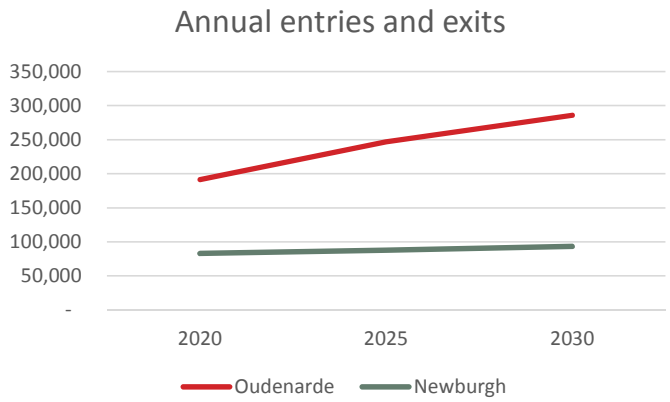


Figure 7. Annual entries and exits for Oudenarde and Newburgh stations

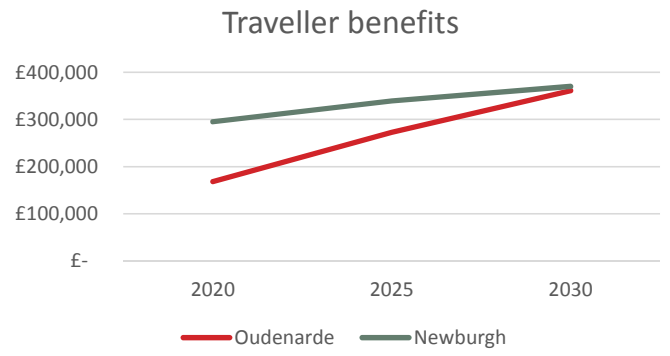


Figure 8. Traveller benefits for Oudenarde and Newburgh stations

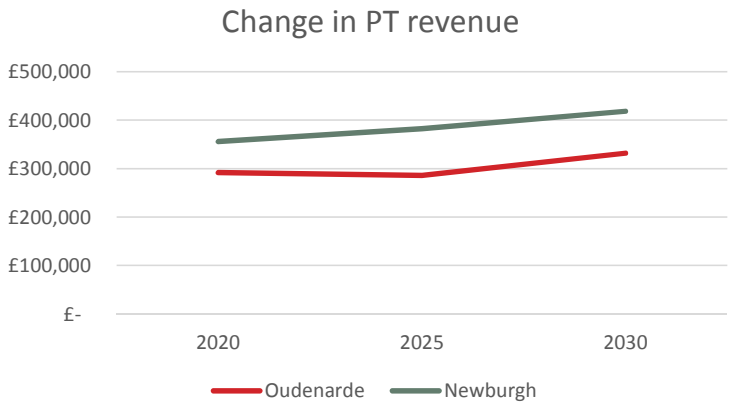


Figure 9. Change in public transport revenue for Oudenarde and Newburgh stations

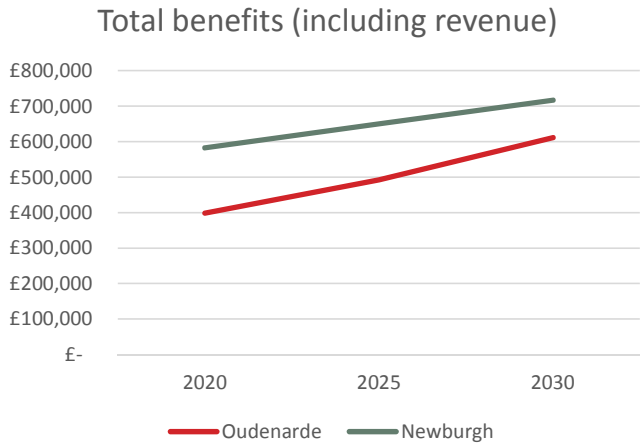


Figure 10. Traveller benefits for Oudenarde and Newburgh stations

5.4.11 Sensitivity analysis increasing the service frequency at the two new stations being tested here (using PDFH service interval penalties) suggest that the spreadsheet model is predicting annual demand which is broadly in line with the relative catchment populations for a number of similar stations in Scotland, including Aberdour, Ladybank, Laurencekirk and Stonehaven.

5.4.12 This 'sense check' comparison is summarised in Appendix B.

6. COST BENEFIT ANALYSIS

6.1 Costs

6.1.1 Outline operating and construction cost figures were presented in the Atkins 2005 Study[16] and have been adjusted based on inflation (to 2014) and discussions with the Client Group. As these stopping services are being tested on existing services no additional wages, leasing or fuel costs have been assumed. The costs incurred are presented in Table 11 with details of the optimism bias associated with the scheme identification phase for construction and operating costs.

6.1.2 Car parking costs have not been included for either station however the proposed Newburgh station is located within 150 metres of an existing 60+ car park which currently has a low level of utilisation. In addition the Oudenarde Masterplan currently has plans for an initial 50 space car park with room for a 250 space extension.

6.1.3 An outline signalling cost of £300,000 per station has been included, based on discussions with the Client Group.

6.1.4 No detailed costing of the stations or any of the associated infrastructure has been undertaken at this stage.

Table 11. Operating and construction costs per station

	OPERATING COST PER ANNUM (£000S, 2014 PRICES)	CONSTRUCTION COST (£000S, 2014 PRICES)	SOURCE/ COMMENTS
Optimism Bias	41%	66%	STAG
Track access charges	£19.6		Atkins 2005 report
Station maintenance	£9.9		Atkins 2005 report
Single platform station construction including signalling		£2,100.0	Atkins, Deltix report and stakeholder discussions
Total (inc Optimism Bias)	£41.5	£3,486.0	

Other Costs/Disbenefits

Increased Journey Time for Existing Rail Passengers and Other Timetable-related Impacts

6.1.5 As noted in the previous chapter, we have assumed that stopping trains at Newburgh and Oudenarde will add an additional three minutes to the journey time of passengers

[16] An appraisal of the viability of developing new rail station/rail halt facilities in Perth and Kinross, Atkins, 2005

travelling between Ladybank and Perth on these stopping trains. The resulting time disbenefits to existing users of the Ladybank to Perth section of the Edinburgh to Perth rail-line are included within the cost benefit analysis, using a MOIRA-based estimate of the average number of passengers on services which are assumed to make this additional stop[17].

6.1.6 Note that this disbenefit needs to be included, even if these three minutes can be regained by improvements elsewhere on the route, so that the new combined timetable still matches the current end-to-end journey times. This is because the Reference Case will include these journey time reductions, so that returning to the existing journey times as a result of the extra stop in the Do Something scenario still represents a disbenefit relative to the (new-improved) Reference Case.

6.1.7 However, if a) the existing (or improved) Reference Case includes slack time on the Ladybank to Perth section or elsewhere for some or all services in the Reference Case timetable (for example to facilitate passing manoeuvres or access to/from station platforms etc) and b) this slack does not contribute significantly to the overall reliability of the Reference Case timetable, then this simple 'additional 3-minute journey-time' assumption will be an over-estimate of this disbenefit to existing passengers.

6.1.8 We have not quantified any other timetable-related impacts of the new station. In particular, we have not quantified any of the following potential impacts:

- changes in patronage or revenue resulting from the increased journey time between Ladybank and Perth;
- changes in the time available to make bus or rail connections at Perth/Edinburgh as a result of the timetable changes; or
- changes to the overall reliability of the resulting timetable.

6.1.9 60-Year Cost Benefit Analysis

6.1.10 Interpolating and extrapolating between the four modelled years (2020, 2028, 2032 and 2050) and applying the relevant discounting to future-year costs and benefits provides an estimate of the present value of the 60-year costs and benefits of the two stations.

6.1.11 The relevant 60-year present value of the main costs and benefits (in 2014 prices) are summarised in Table 12 and Table 13 below.

[17] Existing user figures provided by Abellio/ATOC

Table 12. Newburgh Cost Benefit Analysis

60-year benefits	Newburgh		
PT Revenue		6.3	£M
User benefits		6.4	£M
Benefits to existing rail users		-3.1	£M
PVB	(a)	9.6	£M
PVC	(b)	3.4	£M
NPV	a-b	6.1	£M
BCR	a/b	2.8	

Table 13. Oudenarde Cost Benefit Analysis

60-year benefits	Oudenarde		
PT Revenue		4.8	£M
User benefits		5.3	£M
Benefits to existing rail users		-3.1	£M
PVB	(a)	6.9	£M
PVC	(b)	3.4	£M
NPV	a-b	3.5	£M
BCR	a/b	2	

6.1.12 These results suggest that both stations would generate more benefits than the costs assumed here, with a ratio of benefit to cost of 2 for Oudenarde and 2.8 for Newburgh. (See Section 5.4 for a detailed discussion of the relative benefits generated by the two stations).

6.1.13 As discussed in Section 5.3.5, this analysis and the associated disbenefits to existing passengers used the patronage on the Perth services to estimate these disbenefits (ie based on an assumption that additional timetabling would identify an hourly service pattern) provided just using Perth service (ie without needing to stop any Edinburgh-Inverness services at the new station). If the existing timetable was to be used, then a total of nine of the Edinburgh – Inverness services would be required to stop at Newburgh or Oudenarde to fill the various gaps in the current service pattern in each direction.

6.1.14 Our estimates suggest that the additional number of existing passengers on the long-distance would increase the average number of passengers affected by the extra journey time by around 33%.

6.1.15 A sensitivity test increasing the delays to existing passengers by this 33% factor gives a BCR of around 2.5 for Newburgh and 1.7 for Oudenarde.

6.1.16 A sensitivity test based on a 50% increase in scheme costs (capital and operating) showed a reduction in BCR for Newburgh and Oudenarde to 1.9 and 1.3 respectively, using the original existing passenger disbenefit estimates and to 1.3 and 0.9 for the 33% higher existing passenger disbenefit and 50% higher cost scenario.

6.1.17 These sensitivity tests suggest a range of BCR from 1.3-2.8 for Newburgh and 0.9 – 2.0 for Oudenarde.

6.1.18 This simplified Cost Benefit Analysis excludes:

- the environmental benefits associated with the modal shift from car to public transport;
- the social inclusion and local economic impact impacts from the improved access to services or employment for the Newburgh or Oudenarde residents; and
- the reduction in Government tax revenues due to the reduced fuel duty from former car users switching to rail and the loss of VAT as travellers spend more on (VAT-free) public transport

6.1.19 The models also exclude any trip generation impacts, eg from existing residents making more trips to the destinations served by rail and/or more-mobile residents being attracted into the station catchment areas by the new rail service.

6.1.20 The version of the station catchment spreadsheet tool developed and used here cannot be used to explicitly model the 2-station scenario (ie including both of the two new stations). However, it is possible to approximate this BCR by adding together the costs, benefits and disbenefits from the two 1-station scenarios and removing the double-counting of the predicted demand who could use either of two stations (approx 15% of the total predicted demand). This 'broad-brush' approximation suggests that the 2-station solution would perform less well than either of the single station scenarios, unless significant cost savings can be achieved (ie if the cost of providing both stations is significantly less than the sum of the two individual station costs). The two station scenario would also have additional timetabling and infrastructure implications which would require further reviewing.

7. SUMMARY

7.1.1 This feasibility study has provided an update to the various previous studies with a greater focus on the modelling and appraisal of options. Although the appraisal adopted here is consistent with the STAG principles, this study is a feasibility study and does not identify the existing problems and opportunities within Oudenarde and Newburgh, detailed costs or detailed timetabling. It will however serve to inform any subsequent STAG focusing on transport issues within this area.

7.1.2 This study has addressed one key question - is there a business case for stopping services at Oudenarde or Newburgh?

7.1.3 Although Oudenarde and Newburgh represent very different opportunities – Newburgh a small town with limited transport connections to Perth and Dundee and Oudenarde a large planned housing development adjacent to Bridge of Earn – they are bound by similar restrictions which have not been addressed as part of this study:

- Their position on a single track section of line restricting timetabling capabilities;
- Transport Scotland's commitment to reducing/maintaining long-distance journey times particularly in relation to the Highland Main Line Improvements;
- The operational impact of stopping services on this section of line; and
- The increase in line speed on the Ladybank to Hilton Junction.

7.1.4 These restrictions would need to be addressed before any decision is taken to provide an hourly service at a new station between Ladybank and Perth.

7.1.5 This study has looked at the introduction of an hourly stopping service on Edinburgh – Perth services with a three minute journey time increase for existing passengers. Although boarding and alighting levels are predicted to be considerably higher at Oudenarde, the much higher benefits per passenger for users of Newburgh station results in a greater total economic benefit for Newburgh station. Benefits per passenger for users of Newburgh station are greater due to the relative difference between existing and future generalised cost being greater for Newburgh users than Oudenarde. This is due to the less-attractive existing public transport and car journey times to/from Newburgh compared to Oudenarde.

7.1.6 The analysis suggests that the benefits would generally exceed the costs for each of the two stations, with cost benefit ratios ranging from 1.3 - 2.8 for Newburgh and 0.9 - 2 for Oudenarde.

7.1.7 The Business Case for both new rail stations outlined in this report would be further strengthened by the inclusion of a range of local economic and environmental benefits such as improved access to employment and other services and local air quality and climate change benefits from the reduced car traffic which have not been quantified here.

Appendix A – Modelling Assumptions

				Source or unit
Total Commuter station entries to AM Peak Hour			0.40	
Annualisation Factor from AM Peak Hour Commute 1-way to ORR Entries and Exits			3253	Analysis of observed data, TMfS and ORR
Base year for rail passenger growth			2013	
Number of hours in modelled period			2	
Minutes delay per stopping train			3	
Walk-speed			4.8	Kph
Miles _to_Km			1.61	
Proportion of commuters willing to P&R			50%	
Car Occupancy			1.2	
Lambda 'Spread Parameter' (Car vs PT)			0.032	
Lambda 'Spread Parameter' (Bus vs Rail)			0.064	
Parking charge at new station		£	-	
Parking charge in Edinburgh		£	14.50	Day rate at Waverley Station
Parking charge in Perth		£	3.00	Day rate at Perth Rail Station
RPI				
	2002		176.2	ONS
	2013		250.1	ONS
2013/2002			1.419	
Commuting days in a year			260	
Commuting trip adjustment factor			0.9	
Commuters per household			1.3	

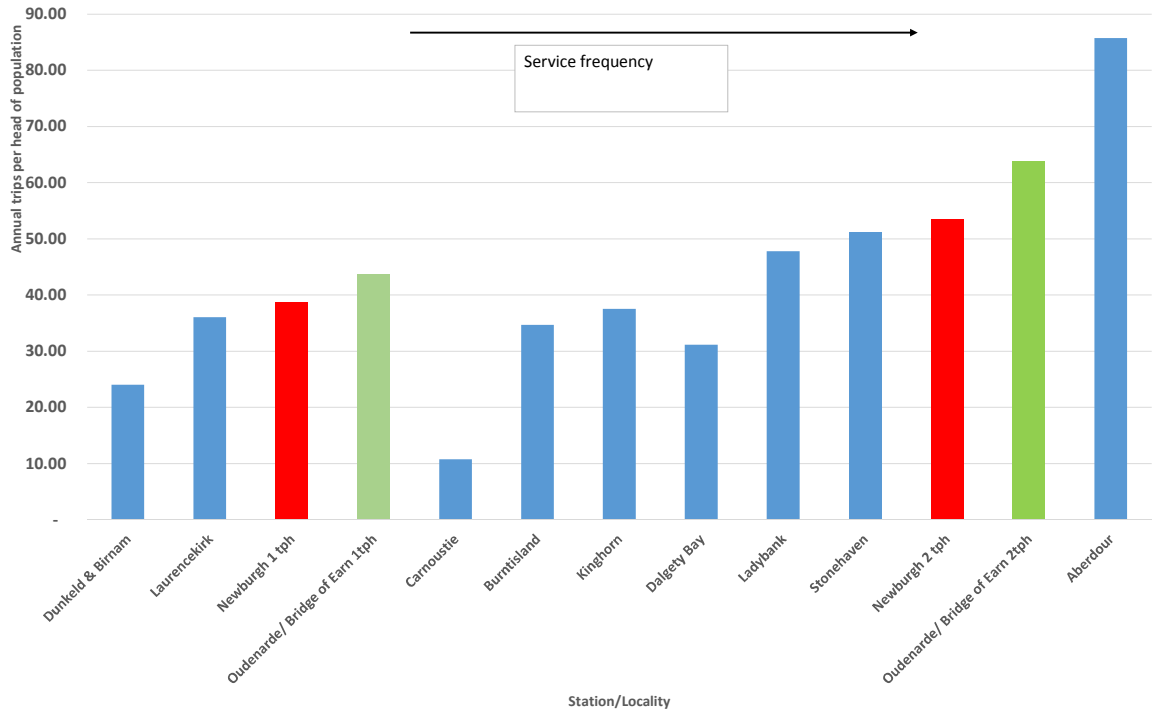
								Perceived VoT
2013 prices and values	Commuters		2030	Rail Passengers				2030
In-work Car Driver	0%	£	33.71	In-Work Rail Passenger	16.5%	£	39.81
Non-work Commuter	100%	£	10.09	Non-work Commuter	37.8%	£	10.09
Other non-work	0%	£	8.96	Other non-work	45.7%	£	8.96

Commuter	£	10.09	Average Rail passenger	£	14.48

Existing rail passenger growth	2.5% per annum	Scotland RUS - Inter-Urban Lower Growth Scenario

Appendix B - Comparison of the Model Predictions with the Observed Demand at Other Scottish Stations

	Population 2012 (NRS Locality)	2020 (growthed using NRS projections for Scotland, excl Oudenarde)	Trains per hour	2013-14 ORR	Growth to 2020	2020	Trips per person	City
Dunkeld & Birnam	1320	1379	1	27862	1.19	33,119	24.02	Perth
Laurencekirk	2920	3051	1	92470	1.19	109,918	36.03	Aberdeen
Newburgh 1 tph	2060	2152	1			83,091	38.61	Perth
Oudenarde/ Bridge of Earn 1tph	2790	4390	1			191,799	43.69	Edinburgh
Carnoustie	11430	11941	1.5	107758	1.19	128,090	10.73	Dundee
Burntisland	6370	6655	1.5	194210	1.19	230,855	34.69	Edinburgh
Kinghorn	2870	2998	1.5	94644	1.19	112,502	37.52	Edinburgh
Dalgety Bay	9810	10249	2	268420	1.19	319,067	31.13	Edinburgh
Ladybank	1530	1598	2	64238	1.19	76,359	47.77	Perth and Dundee
Stonehaven	11370	11879	2	510412	1.19	606,719	51.08	Aberdeen
Newburgh 2 tph	2060	2152	2			115,263	53.56	Perth
Oudenarde/ Bridge of Earn 2tph	2790	4390	2			279,977	63.78	Perth
Aberdour	1650	1724	2	124298	1.19	147,751	85.71	Edinburgh



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