



## Revision Schedule

### Dunfermline BRT/LRT Project November 2008 S101153

Rev	Date	Details	Contributions from	Reviewed by	Approved by
01	13 May 2008	Draft Report	Alex Bickett	Marwan AL-Azzawi Project Manager	Marwan AL-Azzawi Project Manager
02	23 July 2008	Final Draft Report	Alex Bickett & Geoffrey Cornelis	Marwan AL-Azzawi Project Manager	Marwan AL-Azzawi Project Manager
03	5 November 2008	Final Report (Rev A)	Alex Bickett, Geoffrey Cornelis & Sean Donnelly	Marwan AL-Azzawi Project Manager	Marwan AL-Azzawi Project Manager

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## **Appendix A – New Land Use Allocations**

## **Appendix B – Land-Take Envelope Plans**

## **Appendix C – LRT & BRT Capital Infrastructure Cost Estimates**

## EXECUTIVE SUMMARY

### E.1 Background

- E.1.1 SEStran (South East Scotland Transport Partnership) appointed Scott Wilson to carry out a high-level evaluation of potential options for a Bus Rapid Transport (BRT) system in the first instance, which could be upgraded in the longer term to Light Rail Transport (LRT) system, linking into the new crossing of the Forth Estuary in the Queensferry Area. The study area for this appraisal is the Dunfermline area, which includes Dunfermline and the surrounding Bridgehead, Inverkeithing, Rosyth including Rosyth Port and links across the Forth. This area falls within the "Queensferry" corridor, characterised by high volumes of commuter tidal flow between the Dunfermline area (and its hinterland) and Edinburgh. This report sets out the results obtained on the relative merits of both a new BRT and a new LRT system linking the area.

### E.2 New Land Use Developments & Potential Financial Contributions

- E.2.1 Before any analysis could be carried out, it was necessary to identify any proposed transport and land-use developments in the area which could influence any routes and cost estimates.
- E.2.2 Various development data was collated from relevant extracts of the Structure / Local Plans for the area supplied by officials in Fife Council (including the new Fife Structure Plan and the forthcoming Dunfermline & West Fife Local Plan). These helped to highlight the scale of proposed industrial, retail, business, residential and other developments that will be expected to generate additional transport demand in the future, which could enhance the demand for a new BRT / LRT system and also identify potential stops and interchanges for the new public transport services. The results of this work identified 61 plots for committed new housing sites, 20 plots for new industrial/commercial employment sites and 6 plots for new schools & colleges.
- E.2.3 Using the identified potential amounts and type of land available for development, along with historic information of developer contributions to transport infrastructure in the area, it was possible to estimate possible financial contributions from developers which can be used to offset the costs of implementing any BRT / LRT system. This gave a total value of developer contributions on developments adjacent or bordering the routes of the proposed BRT/LRT amounting to £65.2 million (at 2008 prices), depending on market conditions at the time of any agreements set with the private developers.

### E.3 BRT & LRT Options and their Capital Infrastructure Costs

- E.3.1 4 No. LRT sections and 7 No. BRT sections were identified, which can be connected together to make up a network of BRT and LRT systems. They are all technically feasible and hence, for the purposes of safeguarding land in Fife Council's Local Plan, their alignments can all be safeguarded for future development until a detailed evaluation is carried out to identify a preferred solution.
- E.3.2 Based on the LRT and BRT sections identified, a number of Land-Take Envelopes have been prepared to highlight the routes and land areas required. There are 55 plans in total

which are shown in Appendix B, along with a reference guide map showing the relevant plan to the corresponding section.

- E.3.3 Tables E.1 and E.2 summarise the estimates of the infrastructure capital costs for each identified section, for current prices and assumed opening year outturn values.

**Table E.1: Summary of LRT Section Costs**

LRT Sections	Cost Estimates	
	2008 Prices	2026 Prices
Section 1 – Dumferline West	£104.1m	£296.8m
Section 2 – A 823 Corridor	£41.7m	£118.9m
Section 3 – Disused Railway	£46.4m	£132.2m
Section 4a – Rosyth North	£35.5m	£101.2m
Section 4b – Rosyth Centre	£40.1m	£114.4m

**Table E.2: Summary of BRT Section Costs**

BRT Sections	Cost Estimates	
	2008 Prices	2016 Prices
Section 1 – Dumferline West	£47.8m	£76.1m
Section 2 – A 823 Corridor	£4.2m	£6.7m
Section 3 – Disused Railway	£18.6m	£29.6m
Section 4a – Rosyth North	£25m	£39.7m
Section 4b – Rosyth Centre	£18.5m	£29.5m
Section 5 – B980 / B981 Corridor	£31.7m	£50.4m
Section 6a – Sandpiper New Link	£9m	£14.3m
Section 6b – Aberdour Road Corridor	£2.1m	£3.4m
Section 7a – Halbeath East	£8.1m	£12.9m
Section 7b – Pylon Line New Link	£6.2m	£9.9m

- E.3.4 The total costs of the LRT network range between £649.1m to £662.3m (at 2026 prices), depending on whether Sections 1 to 4a or 1 to 4b are used. The total costs of the BRT network range between £205.6m to £229.7m (at 2016 prices), depending on whether Sections 4a, 6a and 7a are used or whether Sections 4b, 6b and 7b are used instead.

- E.3.5 In addition to the capital costs, an estimate due to risks and uncertainty was undertaken. A number of high-level risks were identified which are likely to apply to both the BRT and the LRT systems as they are common to both schemes. The analysis suggests the capital cost estimates should be increased by circa £20m (at 2008 prices) to allow for these key risks.

# 1 INTRODUCTION

## 1.1 Background

- 1.1.1 SEStran (South East Scotland Transport Partnership) appointed Scott Wilson to carry out a high-level evaluation of potential options for a Bus Rapid Transport (BRT) system in the first instance, which could be upgraded in the longer term to Light Rail Transport (LRT) system, linking into the new crossing of the Forth Estuary in the Queensferry Area.
- 1.1.2 The expansion of public transport should be strongly linked to land-use planning and the safeguarding future public transport corridors/alignments. The study should be sufficient to enable the reservation of land for future proposals in the forthcoming Dunfermline and West Fife Local Plan.
- 1.1.3 This report sets out the results obtained on the relative merits of both a new BRT and a new LRT system linking the area.

## 1.2 Overview of the Study Area

- 1.2.1 The study area for this appraisal, the Dunfermline area, is shown in Figure 1.1. This includes Dunfermline and the immediate surrounding Bridgehead area, Inverkeithing, Rosyth including Rosyth Port and links across the Forth.

*Figure 1.1: The Study Area*



- 1.2.2 This area falls within the “Queensferry” corridor, characterised by high volumes of commuter tidal flow between the Dunfermline area (and its hinterland) and Edinburgh. The Queensferry Corridor represents a strategic corridor where high volumes of modal shift are required, and the investment need to achieve this, in order to meet modal shift targets for this type of corridor.
- 1.2.3 Based on previous work<sup>1</sup>, it is felt that part of the solution for this corridor would be to provide a high quality bus rapid transit or light rail system - wholly or partly segregated from other traffic - that would serve Dunfermline city centre, the neighbouring employment and residential areas, and the relevant main interchanges and that could extend across the Forth to link up with public transport system(s) south of the Forth Estuary.
- 1.2.4 The objectives of this report include the following:
- identify existing and proposed land-use patterns within the study area that will influence the usage of a high quality public transport service;
  - develop options for BRT/LRT public transport options relevant routes and new infrastructure requirements; and
  - estimate preliminary capital costs as relevant for a STAG Part 2 Appraisal for both BRT and future possible LRT options, which will identify a land-take plan for reservation in the upcoming development of the West Fife Local Plan.

### 1.3 Structure of this Report

- 1.3.1 The overall structure of this report follows that set out for STAG Part 1 appraisal.

<i>Chapter 2</i>	A short analysis of the key issues identified in the stakeholder consultations.
<i>Chapter 3</i>	Summarises new land-use developments in the study area which are likely to be influencing factors on any proposed BRT/LRT system.
<i>Chapter 4</i>	Sets out the Options identified in the study.
<i>Chapter 5</i>	Summarises the cost outlay for the various sections of the identified BRT / LRT networks, including the estimates of risk and uncertainty.

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<sup>1</sup> SEStran Integrated Transport Corridors Study (SITCoS), Study prepared by Scott Wilson & MVA, 2005

## 2 KEY ISSUES TO CONSIDER

### 2.1 Introduction

2.1.1 Before any analysis could be carried out, it was necessary to identify any proposed transport and land-use developments in the area which could influence any routes and cost estimates. These were discussed and identified at the outset at a Project Inception Meeting held on 26 February 2008 at SEStran's offices. The meeting was held with a number of stakeholders to review the key issues in the study area, discuss land-use plans and identify committed transport schemes which could affect any BRT / LRT proposals. The meeting was facilitated by Scott Wilson and representatives from the following organisations attended:

- Scott Wilson;
- SEStran; and
- Fife Council.

2.1.2 This meeting was supplemented with a number of further targeted discussions with key stakeholders, including Network Rail, Transport Scotland, the consultants working on the Second Forth Crossing and the Planning Department (Development Services) at Fife Council. The discussions were used to gain inputs from stakeholders in terms of input to potential options/routes, highlighting potential problems, identifying opportunities/ideas for solutions and agreeing the criteria for route evaluation. This chapter summarises the key issues identified.

### 2.2 Summary of Key Issues

2.2.1 The following was identified from the stakeholder discussions:

- the options emerging from this study should consider BRT land-take in the first instance but the plan is eventually to upgrade to LRT in the long-term. Hence, we have sought, wherever possible, to set out routes and infrastructure amendments which can accommodate BRT systems but future-proof such proposals so they can be upgraded to full LRT at a future date. This has, by necessity, meant the cost estimates for the BRT options are somewhat higher than they would be without the need to future-proof for possible LRT upgrade. In addition, while we have tried as much as possible to identify BRT and LRT options which follow the same alignments, there could be slightly different options for BRT as opposed to LRT solutions where the BRT system can follow existing road sections in order to reduce costs;
- any LRT option should correspond to the plans for the Edinburgh Tram system. This suggests the clearance widths and heights of the LRT option, in addition to hilliness gradients and swept paths for bendiness, should correspond to the Edinburgh plans to allow any possible extensions into Fife. Therefore, we have applied the same clearances {known as the dynamic kinetic envelope (DKE)} for the LRT options as adopted as per the Edinburgh system. Given the need to maintain compatibility between BRT and LRT options, as per the above bullet points, the DKE for BRT options therefore follows similar clearances although there a less stringent height clearances required for BRT systems as opposed to LRT;

- the tie-in to the New Forth Crossing is important to maintain connectivity to Edinburgh and the surrounding Lothians. If the plans for the new bridge involve a multi-modal bridge with separate lanes for high-quality buses (e.g. BRT systems) and/or LRT services, then the DKE of the public transport lanes on the bridge should be sufficient to cover the DKE for the Edinburgh Tram system in order for there to be no physical constraints across the new bridge;
- there are proposals for a new Rosyth Bypass which ties in the major interchange at the A823(M). Fife Council supplied us with a copy of a STAG report and layout drawings showing the plans. These suggested there is a new bridge at Grange Road;
- at the meeting with Fife Council a number of disused railway lines and sidings were identified. However, our discussions with Network Rail have suggested that these might still be required for future plans by the freight operating companies and businesses with proposals to run freight services. Details of these potential operations were not available or it was not possible to supply them to us due to their commercial confidentiality;
- there are a number of Park-and-Ride / Choose locations in the area including the expansion of the P&R at Ferrytoll, Inverkeithing, Rosyth and Halbeith. The BRT / LRT options should connect these locations wherever possible; and
- there are a number of railway improvements planned in the area. These include the Charlston Chord as noted in the Structure Plan submitted last year which is proposed to improve rail movements / turning facilities. Discussions with Network Rail confirmed these should be safeguarded.

2.2.2 The above issues have been considered in the development of the options identified in this study. These options are described in Chapter 4, however before that we set out the identified land-use proposals in the area and their potential impact on passenger demands.



## 3 INTERACTION OF NEW LAND USE DEVELOPMENTS

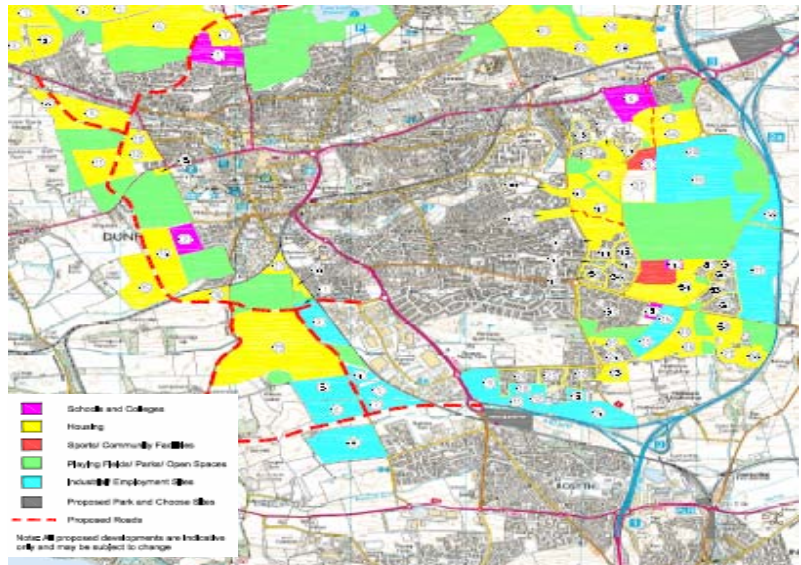
### 3.1 Introduction

3.1.1 It is important to identify proposed land-use patterns within the study area that could influence the usage of any potential high quality public transport service, including BRT & LRT systems. These new land-uses planned in the area are likely to generate additional demand for any new BRT / LRT system and hence developers could contribute to the capital costs of the proposals. This chapter summarises the findings of our collection of information on the new land-use plans and their potential financial contributions towards the plans for any BRT / LRT system.

### 3.2 New Land Use Developments

3.2.1 Various development data was collated from relevant extracts of the Structure / Local Plans for the area supplied by officials in Fife Council (including the new Fife Structure Plan and the forthcoming Dunfermline & West Fife Local Plan). This includes the masterplanning exercise for the planned development to the north and west of Dunfermline, being carried out by Willie Miller Urban Design Consultants. These helped to highlight the scale of proposed industrial, retail, business, residential and other developments that will be expected to generate additional transport demand in the future, which could enhance the demand for a new BRT / LRT system and also identify potential stops and interchanges for the new public transport services. A Land-Uses Baseline was established in order to assess the current planning development context, which was used to measure the impact of future options as part of the route evaluation. This was supplemented with key stakeholder consultations at Fife Council.

3.2.2 The results of this work identified 61 plots for committed new housing sites, 20 plots for new industrial/commercial employment sites and 6 plots for new schools & colleges. An overview is shown in the Figure (inset, right) and a more detailed plan with areas is shown in Appendix A.



3.2.3 It is important to note that the land-uses identified are based on draft planning allocations which are still under consideration. They are the best estimates available at the time of the analysis carried out in this study, but are subject to change arising from a review of candidate sites and representations to the Local Plan's *Issues & Options* and so are not finalised. They are, however, a good indication of the scale of potential demand for a new BRT/LRT system for the purposes of this high-level study.

3.2.4 The important land-uses are the new housing, commercial/employment developments and the schools & colleges. These will generate significant potential demand for any BRT / LRT system. Other land-uses include playing fields, parks and open spaces and hence are unlikely to generate/attract significant volumes of demand. In summary, the total areas for housing, commercial and education are shown below.

**Table 3.1: Summary of New Land-Use Areas**

New Developments	Number of plots	Average unit area (sq metres)	Total area (ha)
Housing	61	77,392	472.1
Industrial/Commercial Employment sites	20	99,189	198.4
Schools and Colleges	6	55,217	33.1

### 3.3 Potential Financial Contributions from the New Developments

3.3.1 Using the identified potential amounts and type of land available for development, along with historic information of developer contributions to transport infrastructure in the area, it is possible to estimate possible financial contributions from developers which can be used to offset the costs of implementing any BRT / LRT system.

3.3.2 The number of residential units was estimated based on medium density rates of 20 units per hectare, characterised by detached or semi-detached housing with small garden plots. The area for commercial development was estimated based on an assumed developed rate of 30% of the total land available for this type of land use development. These gave the following levels of dwellings for housing plots or gross floor areas (GFA) for commercial/employment sites.

**Table 3.2: Estimated Number of Dwellings for Housing Plots / Gross Floor Areas (GFAs) for new Commercial or Employment Sites**

	Total Area	Units/GFA (m <sup>2</sup> )
Housing	472.1 ha	9,442 units
Commercial/Industrial Development	198.4 ha	595,100m <sup>2</sup>

3.3.3 From our experience working with private developers in the SEStran's area, including the Fife Council area, it is not uncommon for private developers to contribute average values in the order of £4,700 per residential unit and £35 per square metre of commercial development (at 2008 prices). These are averages and depend on the size and type of homes and commercial/employment uses, however they serve as a good proxy for the high-level purposes of this study.

- 3.3.4 The new potential development area releases resources in terms of developer contributions. In a relatively tight housing market, it is likely that the developer will pass these costs onto the price of the development, in effect transferring this tax on 'producer surplus' as a cost onto the consumer (purchaser).
- 3.3.5 Multiplying these values for developer contributions by the above estimated number of housing dwellings and commercial/employment GFAs gives the following monetised values of developer contributions:
- Housing: £44.4 million (at 2008 prices); and
  - Commercial/Industrial development: £20.8 million (at 2008 prices).
- 3.3.6 The total value of developer contributions on developments adjacent or bordering the routes of the proposed BRT/LRT amount to £65.2 million (at 2008 prices). Clearly, these values will be dependent on market conditions at the time of any agreements set with the private developers, but they suggest there are some significant potential gains to be made to off set any capital costs for the new BRT / LRT system.

## 4 POTENTIAL BRT / LRT OPTIONS

### 4.1 Overview of the Process

- 4.1.1 An important component of the study was the integration of the proposed BRT / LRT system with the existing transport network (including other public transport facilities such as existing stations) and the surrounding land-uses. We undertook various site visits of the proposed route/alignments and prepared preliminary drawings showing possible alignments for any new BRT / LRT system in the area. This was supported with drawings showing the required cross section for typical BRT and LRT clearances.
- 4.1.2 Armed with this data and the issues identified from the site examinations and stakeholder consultations, we set out a range of possible options for discussion with the client group, and account was also taken of timeframes for the implementation of proposals. The dynamics of variations of any options (e.g. different alignments) was also considered and the options will be discussed with the client group.
- 4.1.3 To facilitate this, an 'Optioneering' Workshop was held with officials from SEStran and Fife Council on 13 March 2008 to flesh-out the identified potential solutions. This sort of workshop approach has the advantage of stakeholder involvement and ownership of any potential plans emerging.
- 4.1.4 The workshop was supported by a site walk-through with SEStran and Fife Council officials which also helped to refine the plans identified during the discussions in the workshop and relate them to actual conditions on the ground.
- 4.1.5 The outcome of the option development process was a reasonable number of broadly defined alternative proposals that were subjected to cost estimation described later in this report.
- 4.1.6 As part of the optioneering process we also considered the potential to enhance or strengthen integration with existing public transport facilities. This was considered important, as experience has shown that the new BRT/LRT options will need to ensure that all journeys by BRT/LRT are as straightforward as possible and integration between different other modes will help to achieve this aim. This 'seamless' approach helps to improve patronage, and the proposals should make the journey a more pleasant and less fraught experience. A series of simple measures which, if combined in a coherent fashion, can lead to significant improvements in the journey and positively contribute to modal shift. In this regards, accessibility and connectivity will therefore be important since any route alignment should link with current and planned stops/interchanges and areas of large employment, housing, retail and other land-uses (both existing and proposed).
- 4.1.7 To maintain high average running times, where appropriate, the alignment of the new BRT / LRT system was segregated from other modes of transport (and protected from traffic congestion) or integrated with other modes or a combination of the two. Proposed stops/interchanges were sited close to the potential users' to encourage usage and there was also consideration for Park-and-Ride / Choose interchanges.

- 4.1.8 The New Forth Crossing should connect to the southern section of this public transport corridor.

## 4.2 LRT Options

- 4.2.1 The identified sections of the LRT options are shown in Figure 4.1 at the end of this Chapter. The network is made up of individual sections identified in the analysis which can be connected together to make up a number of different total routes for the LRT system or service networks. These sections are labelled from Sections 1 to 4b inclusive, with differing alignments for some sections to represent different variations in the areas they traverse or how they tie into the next section (e.g. Sections 4a and 4b represent the same link but follow two different alignments).
- 4.2.2 There are a total of 4 sections for different alignments and configurations which make up variations of the LRT system (e.g. on-street versus off-line or segregated). They are all technically feasible and hence, for the purposes of safeguarding land in Fife Council's Local Plan, their alignments can all be safeguarded for future development until a detailed evaluation is carried out to identify a preferred solution (e.g. a STAG Part 2 Appraisal to sift through the various options and identify the preferred option to take forward to a detailed study).
- 4.2.3 The following is a brief description of each section, highlighting any constraints:

### *Section 1*

- There are three urban high-density villages bisected by this section;
- However, it is the most cost efficient because of fewer conflicts with urban facilities;
- There would be one stop for each urban village; and
- Could use the Council's existing roads depot as a new tram depot.

### *Section 2*

- Less attractive than option 1 due to lower level of population density;
- However, some sections follow the old railway line and tram route;
- As per Section 1, could use the Council's existing roads depot as a tram depot; and
- There would be stops at the City Centre, Dunfermline Station (Bothwell Gardens), Petreavie and Rosyth Station.

### *Section 3*

- Uses old railway lines and connects to potential urban village and Halbeath Park-and-Choose site; and
- There would be stops at the football ground, Queen Margaret Station, a new urban village and Halbeath Park-and-Choose site. However, if costs and engineering is uneconomical then this option could be curtailed to terminating at the new urban village.

### *Section 4a*

- This is dependant on the options for connecting the New Forth Crossing;
- Travels from Rosyth Station to the M90 Interchange; and
- There are no stops en route.

#### *Section 4b*

- If the New Forth Crossing connects at Ferrytoll then this section could be more suitable than Section 4a;
- The route travels along Castlelandhill Road (B981) and Queensferry Road;
- There would be stops at Admiralty Road [A985(T)] and Ferrytoll Park-and-Choose site; and
- There is a potential pinch-point on Castlelandhill Road, south of A985(T) which could mean closure to general traffic to accommodate the LRT.

4.2.4 BRT stops could have intermediate stops where the BRT is running along the LRT lines.

### **4.3 BRT Options**

4.3.1 The identified sections of the BRT alignments are shown in Figure 4.2 at the end of this Chapter. As with the LRT system proposals, there are different alignments and configurations which make up variations of the BRT system. However, there are more sections which run on-street, giving a total of 7 sections.

4.3.2 The following is a brief description of each section, again highlighting potential constraints:

#### *Section 1 – 4b*

- These are the same as identified for the LRT, however there could be additional stops if they were found to be desirable.

#### *Section 5*

- Due to prohibitively high costs and conflicts in rail, it is recommended this should be on-street but with bus priority which could include bus lanes; and
- There would be stops at Inverkeithing Station, Inverkeithing Town Centre, Ferrytoll Park-and-Choose site, Europark, Castle Road, Kings Road and terminus at Rosyth Station.

#### *Section 6a*

- Starts at the existing bridge crossing the A790 and travels along the B916. Then travels along a new link between Aberdour Road and Sandpiper Drive and a further new link between Sandpiper Drive and Greensbank Drive; and
- There would be stops at west of A790 and the eastern extension of the Tronheim Parkway.

#### *Section 6b*

- On road link following the existing Aberdour Road and Greenshank Drive, with two stops en route.

#### *Section 7a*

- On road link following the existing Greenshank Drive up to the rail level crossing, going around the site using the existing road; and
- The key constraint is at the rail level crossing.

### *Section 7b*

- Runs along the pylon line between Greensbank Drive to Lynburn Road; and
- It then follows a new link between Lynburn Road and Garrock Bank, or going around the site using the existing road.

## **4.4 Cross Sections**

- 4.4.1 The identified sections of the BRT and LRT options are a mixture of on-street and off-street (segregated) routes and hence we have identified suitable cross sections to show the width of the land-take required to accommodate the proposals.
- 4.4.2 Figure 4.3 shows the cross section requirements for a fully segregated BRT or LRT section with associated pedestrian and cycle footway. This could include pedestrian and cycle footways on both sides of the BRT / LRT envelope if required.
- 4.4.3 Figure 4.4 shows the land envelope requirements for a BRT or LRT cross section running next to an existing carriageway, with associated pedestrian and cycle footway. Unlike the fully segregated cross section, this can only accommodate a pedestrian and cycle footway on one side of the BRT / LRT envelope since the highway carriageway for other traffic would be on the other side of the BRT / LRT carriageway/trackway.
- 4.4.4 Figure 4.5 shows the cross section arrangements for a BRT or LRT running on-street with general traffic and other road users. Again, there could be associated a pedestrian and cycle footway.

## **4.5 Land Take Envelopes**

- 4.5.1 Based on the LRT and BRT sections identified, a number of Land-Take Envelopes have been prepared to identify the routes and land areas required. There are 55 plans in total and they are contained in Appendix B, along with a reference guide map which shows the relevant envelope plan for the corresponding section of the LRT / BRT route.

## 5 COST ESTIMATES

### 5.1 Background

- 5.1.1 The estimation of preliminary costs as relevant for a future STAG Part 2 Appraisal for both BRT and future possible LRT options are required. However, we believe that the cost analysis should take into account recent lessons learned from schemes in Scotland, especially the Edinburgh Tram and the Glasgow BRT system. Scott Wilson have been involved in both these schemes and have built up a series of cost rates used to derive the outturn costs of these schemes. Hence, we have used data from these two other studies to derive the cost estimates for the proposals set out in Chapter 4.
- 5.1.2 The scope of the preliminary costings work includes all construction elements but not those elements of specialist 'fit-out' and equipment installations (e.g. BRT vehicles, LRT rolling stock, shelters, ticket machines, etc). Having identified the various options available, we produced a cost plan for each alternative. In addition, we also estimated the costs of land-purchase based on rates collated during our work on Edinburgh Tram. The cost analysis contains sufficient detail to enable future costs estimates as the scheme moves towards a more detailed study and appraisal in a pro-active manner.

### 5.2 LRT Options Costs

- 5.3.1 Appendix C sets out the calculations of the capital infrastructure costs for the 4 No. LRT sections in Chapter 4 (see Figure 4.1). Table 5.1 summarises the costs of each section. We also set out the outturn costs inflated to reflect the assumed opening year of the LRT system, which in this case is assumed to be 2026.

**Table 5.1: Summary of LRT Section Costs**

LRT Sections	Cost Estimates	
	2008 Prices	2026 Prices
Section 1 – Dumferline West	£104.1m	£296.8m
Section 2 – A 823 Corridor	£41.7m	£118.9m
Section 3 – Disused Railway	£46.4m	£132.2m
Section 4a – Rosyth North	£35.5m	£101.2m
Section 4b – Rosyth Centre	£40.1m	£114.4m

- 5.3.2 The above costs include an allowance of Optimism Bias of 66% for *Non-Standard Civil Engineering* projects as per HM Treasury Guidance. As can be seen the costs of the sections range from £101.2m to £296.8m (at 2026 prices).
- 5.3.3 The total costs of the LRT network range between £649.1m to £662.3m (at 2026 prices), depending on whether Sections 1 to 4a or 1 to 4b are used.



## 5.3 BRT Options Costs

5.2.1 Appendix B sets out the calculations of the capital infrastructure costs for the 10 No. BRT sections identified shown in Figure 4.2 in Chapter 4. Table 5.2 summarises the costs of each section. These include an allowance of Optimism Bias of 44% for *Standard Civil Engineering* projects as per HM Treasury Guidance. In addition to showing costs at 2008 prices, the table also includes outturn costs inflated to 2016 prices to reflect the costs at the assumed opening year of the BRT system.

**Table 5.1: Summary of BRT Section Costs**

BRT Sections	Cost Estimates	
	2008 Prices	2016 Prices
Section 1 – Dumferline West	£47.8m	£76.1m
Section 2 – A 823 Corridor	£4.2m	£6.7m
Section 3 – Disused Railway	£18.6m	£29.6m
Section 4a – Rosyth North	£25m	£39.7m
Section 4b – Rosyth Centre	£18.5m	£29.5m
Section 5 – B980 / B981 Corridor	£31.7m	£50.4m
Section 6a – Sandpiper New Link	£9m	£14.3m
Section 6b – Aberdour Road Corridor	£2.1m	£3.4m
Section 7a – Halbeath East	£8.1m	£12.9m
Section 7b – Pylon Line New Link	£6.2m	£9.9m

5.2.2 As can be seen the costs of the sections range from £3.4m to £76.19m (at 2016 prices). The total costs of the BRT network range between £205.6m to £229.7m (at 2016 prices), depending on whether Sections 4a, 6a and 7a are used or whether Sections 4b, 6b and 7b are used instead.

## 5.4 Risk & Uncertainty Estimates

5.4.1 Another area of cost analysis carried out was in the identification of risks and uncertainty uplift values. Since the costings should be compatible to STAG Part 2, we believe this would provide added-value for any future development of the project, since STAG requires an estimate of “Risks & Uncertainty”. These risks can be monetised and added to the base capital costs to give a total budgetary cost which allows the comfort that potential risks have been considered, at least to a high-level of appraisal. To do this, we examined the risks identified during the cost analysis and identified the key areas of the cost estimation that was based on limited data due to the high-level nature of the appraisal. These key risks were related to the categories set out in the HM Treasury Guidance on Optimism Bias in cost analysis.

5.4.2 The risks identified were set out in a risk register with minimum and maximum potential costs estimates values against their likelihood of occurrence (based on the nature of the transport schemes being considered). Table 5.3 (overleaf) summarises the risks identified.

**Table 5.3: Summary of Risk Register**

Key Risks Identified	Potential cost Impacts		Likelihood
	Minimum Value	Maximum Value	
Ground Conditions (including mine workings)	£1m	£5m	High
Utilities (all types)	£5m	£15m	High
Land Prices	£1m	£10m	High
Construction Delays	£5m	£15m	Medium
Environmental Impacts	£1m	£10m	Low

5.4.3 Based on previous experience, we have assumed the probability of a high risk would be 0.75, the probability of a medium risk would be 0.5, and the probability of a low risk would be 0.15. The monetised costs of the identified risks in Table 5.3 were estimated using the @RISK Monte Carlo simulation computer package to derive estimates to be added to the base scheme costs. This estimated the mean value of the risks at £19.7m (at 2008 prices).

5.4.4 These risks are likely to apply to both the BRT and the LRT systems as they are common to both schemes. However, since the maximum and minimum values of the risks are based on total BRT / LRT schemes, they are only applicable to the whole options identified in Chapter 4 and not to individual sections/alignments which they make up. Hence, we would suggest the cost estimates in Tables 5.1 and 5.2 be increased by circa £20m (at 2008 prices) to allow for these identified key risks.

## 6 CONCLUSIONS

### 6.1 Background

6.1.1 SEStran (South East Scotland Transport Partnership) appointed Scott Wilson to carry out a high-level evaluation of potential options for a Bus Rapid Transport (BRT) system in the first instance, which could be upgraded in the longer term to Light Rail Transport (LRT) system, linking into the new crossing of the Forth Estuary in the Queensferry Area. The study area for this appraisal is the Dunfermline area, and includes Dunfermline and the immediate surrounding Bridgehead area, Inverkeithing, Rosyth including Rosyth Port and links across the Forth. This area falls within the “Queensferry” corridor, characterised by high volumes of commuter tidal flow between the Dunfermline area (and its hinterland) and Edinburgh.

### 6.2 New Land Use Developments & Potential Financial Contributions

6.2.1 Various development data was collated from relevant extracts of the Structure / Local Plans for the area supplied by officials in Fife Council (including the new Fife Structure Plan and the forthcoming Dunfermline & West Fife Local Plan). These helped to highlight the scale of proposed industrial, retail, business, residential and other developments that will be expected to generate additional transport demand in the future, which could enhance the demand for a new BRT / LRT system and also identify potential stops and interchanges for the new public transport services. The results of this work identified 61 plots for committed new housing sites, 20 plots for new industrial/commercial employment sites and 6 plots for new schools & colleges. Using the identified potential amounts and type of land available for development, along with historic information of developer contributions to transport infrastructure in the area, it was possible to estimate possible financial contributions from developers which can be used to offset the costs of implementing any BRT / LRT system. This gave the following monetised values of developer contributions:

- Housing: £44.4 million (at 2008 prices); and
- Commercial/Industrial development: £20.8 million (at 2008 prices).

6.2.2 The total value of developer contributions on developments adjacent or bordering the routes of the proposed BRT/LRT amount to £65.2 million (at 2008 prices), depending on market conditions at the time of any agreements set with the private developers.

### 6.3 BRT & LRT Options and their Costs

6.3.1 There were a total of 4 sections for different alignments and configurations identified for the LRT network and 7 sections for the BRT system. They are all technically feasible and hence, for the purposes of safeguarding land in Fife Council’s Local Plan, their alignments can all be safeguarded for future development until a detailed evaluation is carried out to identify a preferred solution.

6.3.2 The calculations of the capital infrastructure costs for the BRT sections identified range between £205.6m to £229.7m (at 2016 prices), depending on which Sections are used. Similarly, the costs of the LRT sections range from £649.1m to £662.3m (at 2026 prices).

6.3.3 In addition to the capital costs, an estimate due to risks and uncertainty was undertaken. A number of high-level risks were identified which are likely to apply to both the BRT and the LRT systems as they are common to both schemes. The analysis suggests the capital cost estimates should be increased by circa £20m (at 2008 prices) to allow for these key risks.