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EDINBURGH TRAM NETWORK

STAG Report: **Line Two**

31 March 2004

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EDINBURGH TRAM LINE 2

STAG REPORT

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Edinburgh Tram Line Two
Executive Summary

Introduction
This STAG Report summarises the work that has been undertaken in developing the case for a Tram Line in West Edinburgh. Initially the case for a network of Tram Lines was established within the Integrated Transport Initiative for Edinburgh and South East Scotland, which was examined as part of a package aimed at addressing the congestion problems in Edinburgh. This together with the North Edinburgh Rapid Transit Solution Feasibility Study and the Edinburgh LRT Masterplan study confirmed the priority of developing a new high quality Tram in West Edinburgh. Subsequently FaberMaunsell and their sub-consultants have developed a Preferred Route and Operating System for the Edinburgh Tram Line Two. During this time the engineering feasibility, environmental impact and revenue/patronage forecasting has been undertaken for a variety of options seeking to provide a first class public transport system from the city centre to the western edge of the city.

This work has concluded that the introduction of a tram into West Edinburgh is consistent with the objectives of the City Council and will contribute to the realisation of the Vision for Edinburgh.

Planning Objectives
The Planning Objectives for this work were established from a review of the City of Edinburgh Council's own aims and objectives for transport contained within their Local Transport Strategy. The planning objectives have been used consistently throughout the process and are as follows:

- **To improve accessibility** – improvements, particularly for people without access to a car, on low incomes or whose mobility is impaired are fundamental to the achievement of both the social inclusion and economic development elements of the transport vision. Specific objectives are:
  - To improve access to the public transport network;
  - To improve access to employment opportunities: and
  - To support economic development.
- **To reduce pollution and environmental damage caused by traffic** – this is fundamental to the achievement of the environmental / sustainability aspiration and will contribute to the achievement of the safety element of the transport vision. Specific objectives are:
  - To increase the proportion of journeys made by public transport, walking and cycling;
  - To improve local air quality; and
  - To reduce emissions of greenhouse gases
- **To reduce traffic congestion** – this is fundamental to the achievement of economic development and environmental aims. Specifically the scheme should:
  - Reduce the number of private vehicle kilometres; and
  - Reduce traffic volumes and key routes.
- **To make the transport system safer and more secure for both users and non-users** – this is fundamental to the achievement of the safety and community elements of the vision and will contribute towards achieving the environmental and social inclusion elements. Specific objectives are to:
  - Reduce the number of road traffic accidents; and
  - Improve personal security when using the transport system.

Problems and Opportunities in West Edinburgh
Edinburgh's economic success as a growing region for employment and increasing population has led to many pressures arising in its transport networks. This together with increasing demands for new developments, particularly in the West Edinburgh area, will mean that this congestion is likely to increase further.

It has been estimated that traffic levels in Edinburgh will grow by 20% over the 20 years. Traffic delays, however, grow at a disproportionate rate and as a result the time lost in traffic due to congestion is expected to double. The most serious problems are expected in West Edinburgh, which has been shown to account for almost half of the additional congestion. There is a concern that the competitiveness and, thus, the dynamism of the Edinburgh and Lothian's economy will be reduced if the region's strengths are

not further developed and this would have a negative impact upon Scotland as a whole. Traffic congestion is causing problems for all road users through delays to commercial vehicles, private car and bus. Traffic congestion can impede effective business and discourage the location of new or expanding businesses in or near the city. As a consequence, congestion is harming the local economy and the environment.

Project History (Option Generating, Sifting, Development and AST1 work)
Development work on the ITI initially began in the late-1990s. This final strategy contains a Vision for Edinburgh and was submitted to the Scottish Executive in September 2002. This was approved in principle and therefore provided the initial justification for a package of schemes, together with congestion charging, as the way forward to tackle the problems expected to face the City. This package included a network of Tram Lines serving the North, West and South East of the City.

This network was explored further in the LRT Masterplan study undertaken by Arup, which confirmed that the Northern Loop should receive the highest priority followed by the Western and South-Eastern lines. In addition, the Feasibility Study for a North Edinburgh Rapid Transit Solution undertaken by Andersen examined the wide range of different technologies available in the Public Transport market before concluding that LRT or Tram based technology was the best solution for a network in Edinburgh.

These studies form the basis of the STAG Part 1 Appraisal and the Part 1 Appraisal Summary Tables are included in Appendix A to this main report.

The West Edinburgh Corridor
The starting point for FaberMaunsell's more detailed work was to choose a Preferred Route Corridor for the West Edinburgh Tram route (or Edinburgh Tram Line Two as it had become known). From a wide selection of options a "Central" corridor based largely on the previous CERT corridor was chosen using the following criteria:

- Engineering;
- Traffic and Transportation;
- Safety;
- Environment;
- Economy/Development;
- Accessibility; and
- Integration.

Throughout the course of this work consultation with third parties was undertaken and key issues were fed into the corridor selection process. In some areas it was difficult to identify the preferred route within the corridor so options were carried forward in key areas such as the city-centre, from Roseburn to Carrick Knowe, near Gogar roundabout and at the Airport.

Consultation
The Preferred Corridor together with the local options was then the subject of an extensive public consultation process. This informed major stakeholders and the residents of Edinburgh about the proposals and it provided the opportunity to comment in a variety of ways.

The results of the consultation show that there is broad support in Edinburgh for the tram proposals and preferences for each of the options presented was expressed. Further technical work and focussed consultation was undertaken to address specific issues arising from the consultation before the Preferred Route was determined.

Scheme Description
The Preferred Route begins at St Andrew Square before travelling along Princes Street and Shandwick Place to Haymarket. It then runs parallel to the main Edinburgh to Glasgow railway line, initially on the north side but crossing over the railway to run on the south side as far as the new Edinburgh Park Rail Station.

From this point it crosses the rail line once more and runs northwards through the Edinburgh Park and Gyle Shopping Centre. After crossing under the A8 to the east of Gogar roundabout, the Tram passes close to the new Royal Bank of Scotland Headquarters (albeit on the other side of the A8) before reaching the new Park and Ride site at Ingliston. At this point the line swings northwards to Edinburgh Airport where it will terminate.

A second Line (the Newbridge spur) will run between the Ingliston Park and Ride stop westwards towards Ratho Station and the new developments at Newbridge where it will terminate. The point of termination has been chosen to allow for future extension of the line. The Newbridge spur was introduced as a branch line, instead of a direct extension of the main route, as a result of the patronage estimates and planning difficulties arising from uncertainties regarding the future expansion of the Airport and its impact on Royal Highland Showground land.

The frequency of both the main line and the Newbridge Spur will see 6 trams running in each direction in each hour during the peak. Each tram will have a capacity of up to 300 passengers giving an overall capacity for the system of 1,800 passengers per hour in each direction. It is proposed that the Tram depot will be located at Gogar and there will be stops located at the following locations:

Main Line
St. Andrew Square
Princes Street
Shandwick Place
Haymarket
Murrayfield
Balgreen Road
Saughton Road North
South Gyle Access
Edinburgh Park Station
Edinburgh Park
The Gyle
Gogarburn
Ingliston Park & Ride
Airport

Newbridge Spur
Ingliston Park & Ride (interchange with the main line)
Ingliston West
Ratho Station
Newbridge South
Newbridge North

STAG Part 2 Appraisal
The Scottish Executive STAG appraisal guidelines have been used throughout the process. The notable issues arising from the Part 2 appraisal of the preferred Option are summarised below.

Environment
The assessment identifies a number of positive environmental benefits associated with Edinburgh Tram Line Two. It will have a minor positive impact on air quality with reductions in CO_2 emissions of 3% and 9% in 2011 and 2026 respectively. Accordingly, the planning objective of reducing the omissions of greenhouse gases is met.

In terms of local air quality, greater benefits are expected along Haymarket Terrace and Morrison Street. Other benefits are predicted along Saughton Road. The scheme is shown to have a beneficial impact on Oxides of Nitrogen and Particulate Matters and therefore the objective of improving local air quality is met overall.

Landscape and ecological benefits would occur along some segregated sections of the route where new planting would be undertaken. The tram would also have a number of negative impacts. The construction phase will result in short term-localised disruption to residents and businesses. Vegetation including trees will be lost in several locations including land behind Baird Drive and within the greenbelt. However, replacement planting is proposed in these areas.

The main impacts are associated with the presence of tram infrastructure within Edinburgh's World Heritage site and in the greenbelt. Negative heritage, landscape and visual impacts are predicted within these sensitive areas. Heritage impacts would also occur at Gogar and Huly Hill in Newbridge. Operational noise impacts would be negligible along much of the route but negative impacts are predicted at residential properties at Balbirnie Place, Baird Drive, and Ratho Station. A Design Manual has been produced and additional mitigation measures proposed to integrate the tram into the landscape and townscape. This will mitigate more localised impacts and, where appropriate, will enhance the local landscape structure.

The tram would also result in a loss of some high quality agricultural land and run through an area of importance for flood control south of Edinburgh Airport.

Safety
The personal security concerns of many individuals when using public transport will be dealt with through the design of mitigating facilities designed into the tram development. For example, Edinburgh Tram Line Two will have stops fitted with high quality lighting and closed circuit television. In addition it is possible to provide emergency help phones if necessary. Similarly, on board the modern tram it is possible to design a safe and secure environment. Thus it is fair to assume that Edinburgh Tram Line Two will provide a degree of improved security for potential patrons and system employees, meeting the improved security objective.

In terms of road user accidents it is not envisaged that there will be any significant change in the number of road accidents occurring during the early years of operation. The overall objective of improving road safety is not met in the later years of the scheme life. The reason for this is that the benefits of the scheme in relation to the economic life of the city lead to increased travel, much of it by car. As a result there is a net increase in car use and accidents. However, if the economic development effect was removed, for example through planning controls, there would be a reduction in road traffic and road traffic accidents. It is therefore the second order effect on the economy, rather than the scheme itself, which is leading to this outcome.

Economy
As required by STAG, this report includes consideration of the economic welfare impacts of the proposal (Transport Economic Efficiency, TEE). This appraisal provides a review of what users are willing to pay in order to use the tram line; the financial impact on private sector transport providers; and impacts arising from land use or other impacts of the tram line.

The benefits and costs of this tram project have been calculated over a 30-year period and are summarised below.

The Benefit Cost Ratio of the Preferred Route was calculated as 1.38. This means that the overall benefits of the scheme exceed the costs by 38% and therefore represents good value for money in economic terms

In addition, an assessment has been made of the economic activity and location impacts (EALIs), including quantification of the impacts in terms of employment gains and losses, as well as income / GDP. This has indicated that there will be a small net increase in the amount of residential, retail, office and industrial floorspace created as a result of the tram project but would have little discernable impact on property rental values in those sectors

Integration
The integration of the Tram with transport, land-use and wider policies has been reviewed within this report. In terms of transport integration the tram route will provide rail interchange opportunities at Waverley, Haymarket and the new station at Edinburgh Park. Bus interchange opportunities will also be possible at the Gyle Shopping Centre and at other locations.

The Finalised Edinburgh and Lothians Structure Plan 2015 makes clear that the delivery of a tram system is crucial for the successful delivery of the plan's development strategy. The Finalised Rural West Edinburgh Local Plan states that the routing of the Tram to Newbridge, and eventually beyond, is crucial to delivering a sustainable development solution in the Newbridge/Kirkliston/Ratho area.

The tram route will connect well with the Park and Ride facilities at Ingliston, ensuring that an alternative choice can be provided for motorists.

The Preferred route integrates well with land-use as it connects residential areas well with major employment, leisure and transport hubs thus contributing to sustainability and reducing the need to travel by public transport. In addition there is also greater scope for development opportunities resulting from the eventual routing of the tram route.

In terms of policy integration the tram is shown to contribute to wider Government policies on Disability, Health and Social Exclusion

Accessibility
The proposed tram line is expected to increase accessibility by public transport with key benefits realised by those who do not own a private car and by the socially disadvantaged. The higher reliability of tram, relative to bus, will particularly benefit these groups and will, in practice, increase accessibility of the public transport network. There are a number of socially deprived wards in and around the proposed route of the tram in which the tram will provide increased accessibility to employment opportunities.

In terms of access to local services it is considered, since the tram mainly runs off street, that it will have only minor adverse impacts on local accessibility.

Overall, the analysis demonstrates a general improvement in accessibility with some very significant benefits for certain movements. There are, however, some disbenefits, mainly as a result of reduced highway capacity in the city centre. In general, access to local services is improved as a result of the scheme and the more deprived areas within the corridor share in the benefits. Overall, the objective of improving accessibility is met.

Costs
The costs developed for this study include capital costs, operating costs and life cycle costs.

Capital cost estimates for Edinburgh Tram Line Two have been prepared using a combination of benchmarking, previous experience and engineering judgement.

The capital costs are estimated at £336.3M (including 31% optimism bias), based on 2Q 2003 prices. Costs have been derived from a comprehensive database compiled from analyses of costs for the infrastructure works of completed and proposed LRT schemes throughout the UK, currently advised prices from vehicle manufacturers and preliminary diversionary works estimates obtained from utilities companies. The resulting estimates take account of the prevailing factors influencing this particular scheme including location, relative complexity, environment and anticipated programme.

Operating costs, which include the cost of operating the system, maintenance and lifecycle costs, are expected to be around £5.7 million pounds per annum.

Summary of Cost-Benefit Appraisal

Present Value of Benefits (PVB)	£275 million
Present Value of Costs (PVC)	£199 million
Net Present Value (NPV)	£76 million
Benefit Cost Ratio (BCR)	1.38

Patronage and Revenue

The Tram is expected to carry around 5 million passengers in the opening years, which will grow to around 7 million passengers some 15 years later. The revenue expected from this level of demand will be £6 million in the early years, growing to over £8 million. These figures assume an allowance for fare evasion and a variety of ticket types.

Risk and Uncertainty

One of the critical success factors for Edinburgh Tram Line Two is the identification and mitigation of the risks inherent in a project of this nature. In order to manage risk in a structured manner, **tie** has appointed a full-time Risk Manager to develop and apply a framework of risk analysis and evaluation to assist in decision-making, and achieve the following prime objectives:

- Mitigate all identified risks to a 'medium' significance or less;
- Pass all identified risks to the best parties capable of managing the risk;
- Creation of a culture of risk awareness and management;
- Delivery within budget and on time;
- Provide a fully functioning operational service; and
- Obtain support from all key stakeholders.

tie has developed clear and active processes to identify and mitigate project risks in accordance with industry best practice. The **tie** Board takes ultimate responsibility for risk, with responsibility delegated to the Project Director.

Monitoring and Evaluation

There are five phases of the project which require consideration during the monitoring and evaluation process, namely:

- Scheme development;
- Infrastructure procurement;
- Construction;
- Testing and Commissioning; and
- Operations.

The STAG requirements for monitoring and evaluation are principally associated with the operational phase, following scheme implementation. However, it is also necessary to assess and re-appraise the project during phases prior to implementation.

tie has been, is, and will continue to take steps to validate and evaluate the scheme (both before and after implementation) and to monitor its performance in the operational phase.

Conclusions

The Integrated Transport Initiative was developed by **tie** to address the problems that currently exist, and those that are forecast to exist in the future, on Edinburgh's transport networks. It identified that failure to provide an effective solution would be detrimental to the vibrant and dynamic economy of both the city and the wider region.

At the heart of the solution identified was a network of tram routes serving the city. This was found to best meet the objectives identified in the Part 1 Appraisal process. These objectives have been used further to identify the Preferred Route for the West Edinburgh route or Edinburgh Tram Line Two. The appraisal has identified that this route from St Andrew Square to the Airport and via the branch line to Newbridge best meets the planning objectives in that:

- It enhances the accessibility of key areas within the city thereby improving access to employment and social opportunities, especially for those without private transport;
- Local air quality is expected to improve and greenhouse gas emissions reduce as a result of the introduction of the trams. This is a fundamental requirement of the environmental/sustainability aspiration of the city;
- Traffic congestion is reduced as illustrated by the economic benefits arising from the introduction of the scheme; and

- The tram itself will provide a safe and secure environment both on board and at the stops. There will be no increase in the number of accidents in 2009 as a result of the introduction of the tram.

It is therefore concluded that the introduction of the tram into west Edinburgh is consistent with the objectives of the City Council and will contribute well to the realisation of the Vision for Edinburgh.

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Disclaimer Notice

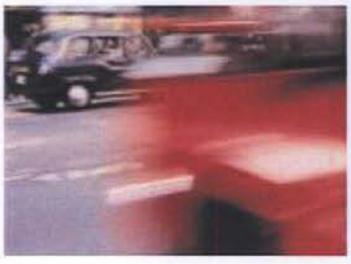
The contents of this report have been produced for **tie** for submission to the Scottish Executive and the City of Edinburgh Council. It should only be used in association with the development of the Edinburgh Tram Line Two project for **tie**.

The projections of demand and revenue contained within this document represent the author's current best estimates. While they are not precise forecasts, they do represent, a reasonable expectation for the future, based on the most credible information available as of the date of this report.

The estimates contained within this document do however rely on assumptions and judgements and which are influenced by external circumstances that can change quickly and could in certain circumstances affect the results.

It has been necessary to base much of this analysis on data collected by third parties. This has been independently checked whenever possible. However, **tie** and their advisors do not guarantee the accuracy of any third party data.

1 INTRODUCTION



1. Introduction

1.1. Background

1.1.1. The Integrated Transport Initiative

The City of Edinburgh Council (CEC) is examining ways of providing the city with the transport system necessary to promote and support a growing local economy and creates a healthy, safe and sustainable environment. In order to address the need for sustainable investment in transport in and around Edinburgh, CEC has developed the Integrated Transport Initiative for Edinburgh and South East Scotland (ITI). CEC is working in cooperation with other local authorities in South East Scotland to deliver this £1.5 billion strategy. Transport Initiatives Edinburgh Ltd **(tie)** has been established by CEC as a vehicle to deliver the ITI.

The ITI strategy includes road user charging and investment to create a high quality public transport system. As a key component of the strategy for public transport investment in Edinburgh, CEC is proposing to develop a network of modern Light Rapid Transit (LRT), or tram, routes. **tie** is currently promoting 3 urban tram lines, with further lines and extensions envisaged in the longer term. The three lines currently being developed are:

- Line 1 – Northern Loop, linking the City Centre with Granton and Leith;
- Line 2 - West from the City Centre to serve Edinburgh Park and the Airport; and
- Line 3 – From the City centre to South-Eastern Edinburgh.

Each line is being developed and approvals sought independently with a separate, but parallel, network study providing the over-arching framework for the development of the tram system in Edinburgh. On this basis, separate Scottish Transport Appraisal Guidance (STAG) appraisals and Parliamentary Bills are being submitted for each line. Accordingly, this report relates to the impacts of Line 2 only. A parallel report deals with the impacts of Line 1 and a full STAG report for Line 3 will be completed during 2004. FaberMaunsell was appointed in October 2002 to undertake all technical work associated with Edinburgh Tram Line 2.

It should be noted that proposals for a modern rapid transit system in Edinburgh have a long history. Since the closure of the Edinburgh tramway network in 1956 there have been a number of attempts to reinstate a tramway system. In 1987, a two-line 'light metro' was proposed, with a significant part of the North-South Metro route underground, but was not progressed beyond the design stage because of the high cost. In 1993, the Edinburgh Tram Company was formed by Forth Ports, which was keen to develop its redundant acres in Leith, Newhaven and Granton, by building a tramway from Haymarket to Newhaven via Princes Street. At the same time, the City of Edinburgh Rapid Transit (CERT) scheme was developed to provide a kerb-guided busway from near the Airport to the edge of the city centre. This scheme was developed as a Private Finance Initiative project and reached Preferred Bidder stage. However, it proved impossible to reach agreement on the funding arrangements on a basis that provided good value for money to the public sector. Although CERT has been abandoned, an award has been made by The Scottish Executive for the West of Edinburgh Busways Scheme (WEBS), which would incorporate two stretches of guideway from Edinburgh Park to Stenhouse.

The current proposal for LRT in North Edinburgh to link the Granton waterfront with the city centre resulted from a study commissioned by Waterfront Edinburgh Ltd. The Waterfront Edinburgh Study examined a wide variety of appropriate technologies such as Guided Bus, Conventional Bus and LRT. This study concluded that light rail (or tram) technology was most suited to meet the particular needs of Edinburgh.

CEC commissioned Arup in December 2001, to undertake the "Edinburgh LRT Masterplan Feasibility Study". This study was designed to identify a viable network of LRT routes and to provide sufficient data for the overall assessment and prioritisation of routes within the ITI. The study reported in January 2003 and confirmed that the three lines currently being progressed should be the highest priorities for development.

This study provided the basis for the Public Transport Fund bid for the further development of the tram routes. Arup's work also confirmed that light rail was the preferred solution for West Edinburgh. The study made the case for light rail, building on the benefits of the West Edinburgh Busway Scheme (WEBS). This has been further confirmed in the appraisal set out below.

1.1.2. Line 2: The Western Route

Edinburgh Tram Line 2 will run from Edinburgh City centre to Edinburgh Park, Edinburgh Airport and Newbridge. Extensions of Line 2 to Livingston and Queensferry are possible.

Tram Line 2 commences at St Andrews Square and will run on-street through the City Centre to Haymarket. This section of the route is shared with Tram Line 1. From Haymarket to Edinburgh Park the line will operate off-street, generally adjacent to the alignment of the main Edinburgh-Glasgow railway line,

passing through residential areas. The access points to Tram Line 2 will be limited on those sections of the route which run between rail embankment and housing.

Before leaving the railway alignment, Tram Line 2 will serve existing industrial areas at South Gyle and Sighthill. Tram Line 2 leaves the rail alignment to the west of the new Edinburgh Park heavy rail station and turns to the north, passing through the Edinburgh Park development. The Edinburgh Park and South Gyle sections of the route will serve a major concentration of office and industrial developments. A large amount of new office space is planned, particularly in the south of this area. This should both increase the potential usage of the tram and should also contribute to the attractiveness of existing and proposed developments in the area.

Edinburgh Tram Line Two will also serve Edinburgh Airport. The Airport is an important market and demands high quality connections to Edinburgh Park, the city centre and elsewhere in Edinburgh.

Due to operational constraints, the service from Ingliston to Newbridge will be operated as a separate branch line shuttle service, calling at the Royal Highland Showground, Ratho Station and terminating at Newbridge. There are a small number of businesses in the vicinity of the Royal Highland Showground, but these businesses produce negligible demand for Edinburgh Tram Line Two. However, a Royal Highland Showground station will cater for the large shows which take place approximately six times a year and which generate a large demand, mainly outside the peak demand periods for the other sections of Edinburgh Tram Line Two.

There are few land developments in the area between the Royal Highland Showground and Newbridge, although plans are in place for new office developments in the area of Ratho Station and there are a number of residential areas in the vicinity of Ratho Station, which will benefit from Edinburgh Tram Line Two.

There are a number of industrial units in Newbridge, but the nature of this area is projected to change and a number of high quality office developments, together with the Edinburgh Interchange, are planned.

1.2. STAG Appraisal

1.2.1. General

STAG is the official appraisal framework to aid transport planners and decision-makers in the development of transport policies, plans, programmes and projects in Scotland. It has been designed in the belief that good planning and consistent, comprehensive appraisal lead to good decision making in relation to transport policy and investment proposals.

The philosophy behind STAG is summarised in the guidance through the following 5 themes:

- **Objective-led** – all activities and decisions should arise from the established aims of the planning organisation with respect to transport and associated policy areas;
- **Open-minded** – the Guidance suggests working up possible projects or policies on the basis of defined objectives supported by a thorough understanding of the problems and opportunities in the area, rather than seeking to fit an existing proposal retrospectively to planning objectives:
- **Pragmatic** – work done should reflect the relative need for accuracy, the scale and expected impacts of proposals and their costs;
- **Auditable** – it must be possible to see clearly how planners have got from objectives to their final conclusion; and
- **Inclusive** – effective involvement of stakeholders is not presented as a chore but as a crucial required input to arriving at a final proposal, which meets, expectations and which can be delivered.

In this report we seek to show that the appraisal of Edinburgh Tram Line 2 has been undertaken fully in accordance with these themes.

STAG has two parts:

- Part 1 (AST1): initial appraisal and broad assessment of impacts, designed to decide whether a proposal should proceed, subject to meeting the planning objectives and fitting with relevant policies; and
- Part 2 (AST2): detailed appraisal against the Government's objectives.

STAG Part 1 appraisal of Edinburgh Tram Line 2 was undertaken during the Arup feasibility study. This study concluded that an LRT solution on the Western route is the preferred option and offers the greatest benefits. In addition, the scheme was considered to contribute to achieving local and national transport objectives. Further details of the STAG Part 1 appraisal are contained in Chapter 4.

The main focus of this report is on the STAG Part 2 appraisal. It contains a detailed assessment of Edinburgh Tram Line 2 against national and local objectives in order to confirm that the scheme, as currently developed, is both justified in its own right and is the preferred solution for the corridor. The appraisal takes full account of the recent release of STAG Version 1.0 (Scottish Executive, 2003).

While Edinburgh Tram Lines 1 and 2 have been developed independently by separate technical teams, a consistent basis for technical development, modelling and appraisal has been developed and agreed by the two teams. Furthermore, the appraisal of the shared route section between St Andrew's Square and Haymarket has been undertaken by the Line 1 technical team and has been adopted by the Line 2 team. This ensures that the STAG appraisal of the 2 lines is fully consistent.

1.2.2. Princes Street

Development of the scheme has, and is continuing, to ensure all relevant parties and stakeholders are signed up to the scheme design and principles therein. Arising from this, there have been material revisions to the scheme design along Princes Street within the timescale of the appraisal process.

The current design, which is reflected in the qualitative appraisal throughout this STAG report, assumes the removal of westbound traffic on Princes Street and a central public transport lane provided in both directions, with tram and bus sharing this lane. A second discontinuous lane is also provided in both directions to accommodate bus stopping and limited amounts of bus running. The discontinuations allow for tram stop, reduced length pedestrian crossings and improved pedestrian circulation space at key points.

The previous design retained the westbound traffic, with segregated tram running on central lanes and a bus lane in each direction, making five lanes in total. The resultant roadway width was greater than that currently occupied and resulted in the loss of a narrow strip of Princes Street Gardens to accommodate it. Whilst robust from a transport viewpoint, the townscape impact and the wider aspirations for Princes Street precluded this option. However, given the programme constraints, the transport modelling for the route remains based on the original five-lane solution and, therefore, all the quantitative analysis is on this basis (noise and air quality, transport economic efficiency and accessibility). Notwithstanding, the local transport effects along Princes Street have been reviewed on the basis of the revised configuration so as to ensure that the tram and bus run times are not unduly penalised.

1.3. Objectives And Structure Of This Report

This report sets out the findings of the STAG appraisal for Edinburgh Tram Line 2. It sets out the planning objectives for the scheme, describes the problems and opportunities that exist in West Edinburgh and then sets out the process of scheme development appraisal in detail.

After this introduction the report is laid out as follows:

- Chapter 2 – Planning objectives;
- Chapter 3 – Problems and opportunities in West Edinburgh;
- Chapter 4 – Project History – Option Generation, Development and AST1 Appraisal;
- Chapter 5 – The West Edinburgh Corridor;
- Chapter 6 – Consultation;
- Chapter 7 – Scheme Description;
- Chapter 8 – AST 2 appraisal;
- Chapter 9 – Risk and uncertainty;
- Chapter 10 – Monitoring and evaluation; and
- Chapter 11 – Conclusions.

This report is accompanied by 14 Appendices. These are bound separately in 5 volumes. The appendices are as follows:

- Appendix A - AST1 Tables;
- Appendix B - AST2 Tables;
- Appendix C - Environmental Worksheets;
- Appendix D - Preferred Route Scheme Drawings (bound separately);
- Appendix E - Consultation and Route Development Scheme Drawings (bound separately);
- Appendix F - Scheme Cost Report;
- Appendix G - Risk Matrix;
- Appendix H - Demand Modelling;
- Appendix I - Glossary of Terms;
- Appendix J - Bibliography;
- Appendix K - Preferred Route Corridor Report and Addendum (bound separately);
- Appendix L - Route Development Report Part A - Design Pause (bound separately);
- Appendix M - Route Development Report Part B – Route Finalisation (bound separately); and
- Appendix N - Literature Review.

2 PLANNING OBJECTIVES



2. Planning Objectives

2.1. Introduction

The aim of this chapter is to summarise national, regional and local policy objectives relevant to Edinburgh Tram Line 2, leading to the development of specific planning objectives for the project. Subsequent chapters of this report describe the contribution of the scheme in meeting these objectives. It is the starting point for demonstrating that the appraisal meets the requirements of being objective-led, open-minded and auditable.

2.2. National Policy

2.2.1. Introduction

The national policy framework for transport is set out in the White Paper, Travel Choices for Scotland (TSO, 1998); Scotland's Transport – Delivering Improvements (Scottish Executive, 2002); and more specifically in relation to planning and transport and in the National Planning Policy Guideline 17 (NPPG17). The over-arching transport and planning policy for Scotland is, therefore, highlighted in the three policy papers outlined below.

2.2.2. Transport White Paper – Travel Choices for Scotland

The July 1998 Transport White Paper sets out the overall aims of Government transport policy. These are to contribute to achieving:

- A strong economy;
- A clean environment; and
- An inclusive society.

The White Paper recognises that:

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

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

"Within and between different modes of transport, to promote genuine choice, so that each mode contributes its full potential and people can move easily between different modes;

"With environmental aims and policies, so that transport choices do not conflict with the achievement of environmental objectives;

"With land use planning at national, regional and local level, so that the two work together to reduce the need to travel and support more sustainable regional travel choices;

"With Government policies on education, health, economic growth and the objective of a fairer, more inclusive society."

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

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

In this context, the Government has established 5 key appraisal criteria for the assessment of transport schemes:

- Environment;
- Safety;
- Economy;
- Integration; and
- Accessibility and social inclusion.

STAG seeks to assess the impact of projects in relation to these criteria.

2.2.3. Scotland's Transport – Delivering Improvements

The Transport Delivery Report was published by the Scottish Executive in March 2002 and sets out the transport vision for Scotland. This document was subsequently updated with the progress report "Building Better Transport" in 2003. The Scottish Executive's vision directly addresses the challenge of tackling congestion in and around Scotland's major metropolitan areas, through modernising, improving and promoting public transport and encouraging more walking and cycling. The document outlines a number of key issues, which are recognised by the Scottish Executive, thus:

"delivering an efficient, safe transport system which meets the needs of all in society - individuals and businesses, car and public transport users, cyclists and pedestrians - without threatening our environment...tackling years of neglect by very substantially increasing investment in our transport infrastructure...delivering transport solutions which will work for the long term, but which extend choice and improve accessibility now.

Key priorities include tackling congestion in our urban areas by promoting attractive alternatives to the car, improving transport networks, delivering readily accessible and accurate information for transport users, and maintaining the affordable lifeline links so vital to the economic and social well-being of remote and rural areas.

A sustainable, effective, safe and integrated transport system lies at the heart of our economic development and underpins so much of our daily lives, whether through the journey to work, the distribution of goods and services, access to social and leisure facilities or simply visiting friends or relatives.

The projected growth in traffic is not sustainable in the long term and action is required now to prevent rising carbon dioxide emissions from road transport, localised air pollution (particularly nitrogen dioxide (NO_2) and particles) and social exclusion."

The document states that the Scottish Executive is committed to *"delivering a transport system for Scotland fit for the 21st century".*

2.2.4. Scottish Executive Partnership Agreement

This was a joint statement by Labour and Liberal Democrats of agreed policy initiatives and how these will be implemented. On transport, the Agreement states:

"The Scottish people and the Scottish economy need reliable, efficient transport. An effective transport system is central to a thriving economy and strong communities.

We will put in place an integrated transport system that gets goods to market quickly and efficiently, and gets people to work safely and on time.

We must connect the whole country and be connected to the rest of the world. Our aim is an accessible Scotland, with a modern, safe, efficient and sustainable transport system.

Our transport system should be sustainable, minimising impacts on our environment, particularly by greater use of public transport."

The Agreement lists a number of "high level commitments" including *"investing in a tram network in Edinburgh".*

2.2.5. National Planning Policy Guideline NPPG17 - Transport and Planning

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

On the whole, the guideline is primarily concerned with how new developments can support a sustainable transport system. It is noted that:

"Local authority support for bus services, passenger rail services or proposals for associated facilities should be consistent with the location policies in development plans. Such support could be conditional on careful planning of routes, timetables, and patterns of service".

Within NPPG17, land use planning is stated as an important tool in:

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

As stressed in NPPG17, the general hierarchy of priorities for individual travel accessibility to development should be walking, cycling, public transport and then private cars. NPPG17 suggests that access to employment and facilities across the wider urban area should be a prime consideration. Accessibility of new developments is an important issue, and one that has historically been difficult to measure definitively.

2.3. Regional Policy

CEC forms part of SESTRAN, the South East Scotland Transport Partnership. Transport between the city and the wider region is an important issue, as the high value property market increasingly pushes commuters out to the surrounding areas. The Transport Partnership has adopted a number of overall policy principles:

- Reduce dependence on the private car and minimise the need for travel especially by car for regional journeys within South East Scotland;
- Maximise public transport provision and achieve public transport integration and inter-modality;
- Promote and develop travel awareness and information, encourage walking/cycling, promote better health and fitness and encourage the use of public transport;
- Improve safety for all road and transport users;
- Reduce the environmental impacts of travel;
- Enhance community life and social inclusion, and
- Encourage the use of the most economic, effective, environmentally friendly and efficient modes for freight transport.

The draft Regional Transport Strategy (RTS) promotes a vision for a transport system that "provides all citizens of south east Scotland with a genuine choice of transport which fulfils their needs and provides travel opportunities for work and leisure on a sustainable basis". The draft RTS has the vision that people "should have the ability to move into and out of Edinburgh by a choice of modes of transport, with an increased use of public transport".

The RTS sets the target of reducing the proportion of single car commuting into Edinburgh by 10%, relative to 2001, by 2022. It notes that this "will only be possible if the appropriate improvements to public transport are implemented".

SESTRANS has a delivery target to implement a series of schemes listed in the RTS, including West Edinburgh tram.

2.4. Local Policy

2.4.1. Local Planning

The statutory development plan for Edinburgh is comprised of the Lothian Structure Plan (1994) and the local plans. CEC, together with West Lothian, Midlothian and East Lothian Councils are currently working together to prepare a new Structure Plan, which seeks to ensure that a sustainable future can be built in West Edinburgh and the wider area. This Plan is near to being finalised. It incorporates a development strategy based on Core Development Areas including two of direct relevance to Tram Line 2: Edinburgh Park/South Gyle/Sighthill and Newbridge/Kirkliston/Ralto, both of which are proposed for business land uses. The Structure Plan stresses the important of improving accessibility to these areas and West Edinburgh Tram is cited as a means of achieving this. The Structure Plan safeguards land for West Edinburgh Tram.

Key principles related to regeneration and social inclusion in line with general objectives include:

- Combating social exclusion by ensuring access between disadvantaged local communities and subsequent new employment opportunities;
- The need to ensure access to affordable transportation networks for all parts of the local community and particularly those in disadvantaged areas, such as West Edinburgh and West Lothian; and
- Support for controlled development and re-use of existing buildings and vacant, derelict and Brownfield sites where regeneration potential will be maximised.

The local and regional planning context is set within national guidance and particularly reflects priorities for sustainability and integration. The West Edinburgh Planning Framework (April 2003), prepared by the Scottish Executive, provides policy guidance on planning, development and growth in West Edinburgh. A key element is that adequate transport provision, in the form of a fixed rapid transit, is essential to enable any additional development in the area. The following statements from the West Edinburgh Planning Framework are particularly relevant:

> *"The Scottish Ministers regard West Edinburgh as a unique opportunity in Scotland to create an international business location, capable of attracting world class companies and headquarters opportunities".* (para 13)
>
> *"The national interest in West Edinburgh can therefore be defined as being the:*

- *Need to improve public transport accessibility to established development sites and reduce congestion;*
- *Realisation of opportunities for airport expansion and better surface access;*
- *Need to reinforce the strategic role of Edinburgh's Green Belt;*
- *Incorporation of sustainable development principles into planning and enhancement of environmental quality;*
- *Need to safeguard accessibility and a strategic reserve of land for the realisation of additional high quality economic development potential in the longer term (post 2020) served by a high quality transport system"* (para 15)
- *Public transport serves part of the area but is primarily bus-based, and subject to traffic congestion. The road and rail network is either at or near maximum operating capacity, or is poorly integrated. The anticipated improvements in the short-term are modest compared to the large amounts of committed development. This points to the need for an early and sustained step change in levels of transport investment to contain existing level of traffic congestion in line with national and local targets, safeguard accessibility and provide a long-term sustainable solution to existing transport problems. The promotion of a safer transport system and better[provision for walking and cycling are other important considerations".* (para 18)

Key policy objectives highlighted in the Framework include introducing tram networks and there is an overall presumption against new development until strategic public transport improvements are committed.

2.4.2. Local Transport Strategy 2001 – 2004

The Local Transport Strategy (LTS) produced by CEC sets the key framework for the City's transport strategy up to 2004. This strategy is in the process of being updated to cover the period 2004 – 2007. Within the context of the strategy, CEC has set out its policies and programmes, and has highlighted key issues and trends.

CEC has concerns over car use and car ownership in Edinburgh, both of which are growing. The growth in car use is a consequence of rising ownership levels and of changing land-use patterns: more out-of-town destinations, the decline of older industries in central parts of the city, as well as changes in expectations for personal mobility. In particular, traffic levels outside the city centre and in off-peak hours have grown, compared to stabilised levels at peak periods into the city centre. Walking and public transport still make up significant proportions of travel, while rail remains important for medium-long distance travel.

Lack of access to facilities and services are significant contributors to high levels of social exclusion. Particularly vulnerable are the elderly and disabled, as well as those with low incomes, children, women and parents with young children. To reduce social exclusion, CEC has identified good public transport, less traffic and lower speeds, better land use planning and transport integration, and accessible services as required.

CEC views congestion as affecting the economy in the city centre, but congestion is also seen to be affecting the outskirts of the city. The LTS stresses that all major centres of activity need to be accessible by public transport, foot and cycle. Future major travel generating development should be steered to areas that are well served by public transport, and local centres need to be supported by planning policies.

CEC's LTS has five key aims:

- To improve safety for all road users and transport users;
- To reduce the environmental impacts of travel;
- To support the local economy;
- To promote better health and fitness;
- To reduce social exclusion (to enhance social inclusion).

These aims reflect the five key government criteria for transport policy: Economy, Environment, Safety, Accessibility and Integration. To help meet their aims, CEC has adopted a number of objectives and targets for their transport strategy:

- To make it easier to live without the car, or use the car less;
- To reduce the amount of car use;
- To encourage and facilitate walking, cycling and public transport use;
- To reduce the adverse impacts of travel including road accidents, air pollution, noise and economic enhancement through environmental improvement;
- To enhance streets as 'civic spaces', where priority is given to people rather than cars;
- To improve the ability of people with low incomes or mobility impairments to use the transport system, especially public transport, as pedestrians or by bicycle; and
- To maintain the road network, and any other facilities for the movement of pedestrian, cyclists and bus users, to a standard suitable for safe and comfortable movement.

For a transport proposal to be successfully promoted in the City, it must be shown to contribute to meeting the objectives outlined above.

2.5. The Planning Objectives

At the outset of the development of the Edinburgh Tram Line 2 project, four principal planning objectives were developed:

- To improve accessibility;
- To reduce pollution and environmental damage caused by traffic;
- To reduce traffic congestion; and
- To make the transport system safer and more secure for both users and non users.

These objectives were originally defined when the ITI was developed. In line with the more detailed appraisal required as part of STAG2, it is appropriate to disaggregate these broad aims into more specific objectives. These are summarised below:

(i) **To improve accessibility**: Improvements, particularly for people without access to a car, on low incomes or whose mobility is impaired are fundamental to the achievement of both the social inclusion and economic development elements of the transport vision. Specific objectives are:

- To improve access to the public transport network;
- To improve access to employment opportunities; and
- To support economic development.

(ii) **To reduce pollution and environmental damage caused by traffic**: this is fundamental to the achievement of the environmental/sustainability aspiration and will contribute to the achievement and the safety element of the transport vision. Specific objectives are:

- To increase the proportion of journeys made by public transport, walking and cycling;
- To improve local air quality;
- To reduce emissions of greenhouse gases

(iii) **To reduce traffic congestion**: this is fundamental to the achievement of economic development and environmental aims. Specifically the scheme should:

- Reduce the number of private vehicle kilometres; and
- Reduce traffic volumes on key routes.

(iv) **To make the transport system safer and more secure for both users and non users**: this is fundamental to the achievement of the safety and community elements of the vision and will contribute to achieving the environmental and social inclusion elements. Specific objectives are to:

- Reduce the number of road traffic accidents; and
- Improve personal security when using the transport system.

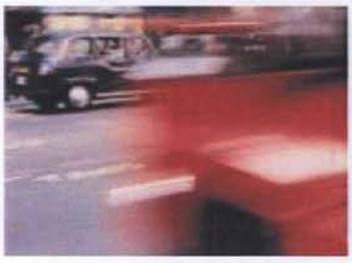
Table 2.1 maps these objectives against national, regional and local policy aims and demonstrates they are wholly consistent with these aims.

It is important to recognise that the success of the scheme in improving accessibility and supporting economic development will tend to counter-act the benefits under the other three objectives. Additional development stimulated by the project will lead to additional travel, some of which will be made by car. This will reduce the benefits under the remaining headings above. It is therefore important to distinguish between the primary benefits of the scheme and the results of consequent economic development. This issue is addressed further in Chapter 8.

Table 2.1 Planning Objectives and National, Regional and Local Policy

Planning Objective	National Policy	Regional Policy	Local Policy
Improve Accessibility • Improve access to public transport network. • Improve access to employment opportunities • Support economic development	Accessibility and social inclusion Strong economy through improving transport infrastructure and accessibility in West Edinburgh	Reduce dependence on car Encourage use of public transport Promote better health and fitness	Support the local economy Reduce social exclusion
Reduce Pollution and Environmental Damage • Increase proportion of journeys by public transport walking and cycling • Improve land air quality; • Reduce emissions of greenhouse gases	Environment Integration	Reduce dependence on car Encourage use of public transport Encourage walking/cycling Promote better health and fitness Reduce environmental impact of travel	Reduce the environmental impacts of travel Promote better health and fitness
Reduce Traffic Congestion • Reduce number of private vehicle kilometres • Reduce traffic volumes on key routes	Transport economic efficiency Environment	Reduce dependence on private car Reduce environmental impact of car	Reduce the environmental impacts of travel
Make the Transport System Safer for Users and Non-Users • Reduce number of road traffic accidents • Improve personal security when using the transport system	Safety	Improve safety for all road and transport users	Improve safety for all road and transport users

3 PROBLEMS AND OPPORTUNITIES IN WEST EDINBURGH



3. Problems and Opportunities in West Edinburgh

3.1. Introduction

This chapter considers relevant problems in West Edinburgh that could be mitigated through transport investment and highlights opportunities for improved public transport.

The chapter is laid out as follows:

- Section 3.2 considers the socio-demographic characteristics of the corridor;
- Section 3.3 describes current transport issues;
- Section 3.4 discusses environmental issues;
- Section 3.5 considers future development proposed in the corridor and its impacts; and
- Section 3.6 summarises the problems and opportunities in the corridor.

3.2. Socio-Demographic Profile Of West Edinburgh

3.2.1. General

Edinburgh and the Lothians is a dynamic Scottish region, experiencing growth across a range of socio-economic indicators. This is demonstrated by the fact that whilst only 15% of Scotland's population live in the area, the Lothians' GDP accounted for almost one fifth of Scotland's total in 1998, and 18% of Scottish jobs are in the area. This growth, however, presents many challenges.

3.2.2. Population

Lothian is one of Scotland's most densely populated regions, accounting for only 2% of Scotland's land area but 15% of its population. The baseline population for Lothian was 779,290 in 2002, and this is projected to increase to 802,350 in 2006 and 818,455 in 2011.

The baseline population for the City of Edinburgh was 448,080 in 2002, and this is projected to increase to 459,148 in 2006 and 464,579 in 2011. This increase is expected to occur largely through in-migration. In Edinburgh, over 90% of population growth is expected to be as a result of in-migration. Over this timescale the national population is expected to experience a small but steady decline.

The total population of the West Edinburgh area (defined as the area covered by the Edinburgh West Local Development Committee) was estimated to be some 80,684 people at the time of the 2001 Census, representing 18% of the total City population. Table 3.1 shows that the area has enjoyed significant population growth between 1991 and 2001, with 10 of the 14 wards within the corridor experiencing growth rates higher than for the City of Edinburgh as a whole.

The population and population density of individual wards falling within or adjoining the West Edinburgh corridor are also detailed in Table 3.1. This indicates that although the overall population size within each ward is similar, there is a noticeable difference between some wards in respect to the level of the density of population. Population levels in West Edinburgh wards are also shown in Figure 3.1 at the end of this Chapter.

Table 3.1 Population and Population Density (persons per ha)

Ward	Population	Area (Ha)	Population Density	Population Change 1991-2001 (%)
New Town	7,128	130	54.8	15.9
Dean	7,324	134	54.7	13.8
Tollcross	6,802	127	53.6	27.9
Fountainbridge	6,557	40	163.9	13.2
Dalry	8,024	91	88.2	31.7
Shandon	7,708	67	115.0	10.8
Moat	7,659	197	38.9	12.2
Stenhouse	8,099	211	38.4	2.5
Murrayfield	7,797	345	22.6	14.9
SE Corstorphine	7,942	178	44.6	2.1
NE Corstorphine	7,685	205	37.5	(1.7)
Sighthill	8,542	544	15.7	21.3
Gyle	8,704	308	28.3	22.4
Dalmeny & Kirkliston	7,808	7,533	1.0	1.6
City of Edinburgh	448,624	26,383	17.0	7.1

Source: 2001 Census

Dalmeny and Kirkliston, perhaps unsurprisingly, has the lowest population density of 1.0 person per hectare. In contrast, a number of more established inner city wards (i.e. Fountainbridge and Shandon) have particularly high density figures, reflecting the profile of high rise, tenement and flatted development in these localities. In general, as one travels westwards away from the City Centre the density of population tends to decrease reflecting the lower housing and other development densities.

It should be noted that as the average population density for the City of Edinburgh was estimated at 17.0 people per hectare at the time of the 2001 Census, all but two of the wards identified above (Dalmeny & Kirkliston and Sighthill) exceed this density.

Relatively high population densities represent a market opportunity for high frequency and high capacity public transport options. Growth in population over the last 10 years in the corridor indicates increasing market potential.

Table 3.2 shows the age distribution of the population in the corridor at a ward level.

Table 3.2 Age Distribution of Population

Ward	Population by Age (%)				
	0-15	16-24	25-44	45-59	60+
New Town	8.26	20.96	41.34	16.5	12.95
Dean	10.13	12.35	41.25	16.94	19.25
Tollcross	5.38	40.22	36.61	9.03	8.76
Fountainbridge	6.92	27.68	43.6	9.9	11.89
Dalry	8.46	25.2	46.7	9.86	9.78
Shandon	8.87	18.16	50.62	12.32	10.02
Moat	12.69	11.72	32.85	16.33	26.4
Stenhouse	17.02	7.71	27.9	16.67	30.69
Murrayfield	14.82	9.56	32.58	18.55	23.09
SE Corstorphine	18.35	9.21	30.13	17.85	24.43
NE Corstorphine	17.51	11.23	23.91	20.27	27.09
Sighthill	18.43	25.96	29.46	14.98	11.16
Gyle	17.99	8.45	31.8	18.77	23.49
Dalmeny & Kirkliston	21.46	8.9	29.59	21.86	18.18
City of Edinburgh	16.34	14.37	32.19	17.27	19.82

The table shows marked differences in population distribution and in particular the proportion of children and elderly people who are especially dependent on public transport. At one extreme Stenhouse ward has 48% of residents in these groups, while at the other Tollcross ward has only 14%. Relative to the City of Edinburgh as a whole the following wards have above average proportions of residents under 16 or over 60: Moat, Stenhouse, Murrayfield, South East Corstorphine, North East Corstophine, Gyle and Dalmeny & Kirlistin. Accordingly 50% of wards in the corridor have above average numbers of people in age groups which are particularly dependant on public transport.

In summary, the relatively dense and growing population in the corridor represents an opportunity for public transport. The high proportion of people, in half the corridor wards, in age groups particularly dependant on public transport represents both a problem if services are inadequate and a market opportunity for high quality services.

3.2.3. Car Ownership

Figure 3.2 show the proportion of non-car owning households in the West Edinburgh area. Overall 40.1% of households were in this category in 2001, very similar to the Edinburgh average of 39.5%. However, the proportions vary considerably between wards. In particular, the ward in the Southern part of the corridor have a much higher proportion of non-car owning households than those in the Northern part, making them far more dependant on public transport accessibility.

3.2.4. Employment

Edinburgh is the seat of Scotland's administrative power and is also the location of the country's financial, legal, medical, and insurance centre. It is also becoming more important for accommodating important nuclear and electronics research. Due to the historical significance of the City and its status as a World Heritage Site, tourism is one of its strongest industries.

A total of 219,228 people were in employment in Edinburgh in 2002, the majority of which are employed by the service sector. Edinburgh is the UK's largest financial centre outside London and the fourth largest in Europe. Claimant unemployment in Edinburgh stood at 2.2% in April 2002, which is well below the Scottish average of 4.0% (April 2002).

The local economy is very buoyant and well placed for future growth, reflecting the employment bias towards the service sector, particularly financial services. Forecasts show an overall increase between 2000-2015 of 34,500 jobs in Edinburgh (12%). Although the traditional sectors are projected to decline, the service sector is expected to increase by 53,500 jobs.

Indicators of the region's economic success include:

- Average disposable income in Edinburgh is amongst the highest in the UK (Henley Centre);
- GDP per capita in Edinburgh is 147% (Lothians 117%) of the UK average;
- Edinburgh is the city with the fastest growing economy in the UK (Cambridge Econometrics June 2000, August 2001);
- Edinburgh's world ranking as a conference venue rose from 22nd in 1996 to 12th in 2001 (ICCA);
- Output from the Lothians' financial services sector is predicted to expand by a quarter by 2008 (BSL 1999);
- Amongst Scottish local authority areas, average gross weekly earnings in Edinburgh are the second highest (New Earnings Survey 2000);
- Edinburgh's per capita spending on personal goods is 12% above the national average (CACI, Sept. 2000);
- Edinburgh is the UK's second largest overseas tourist destination after London; UK visitor bednights in Edinburgh have grown by 16% since 1996 (ONS).

However, traditional employment sectors (primary, manufacturing and construction) all continue to decline, although Midlothian is expected to experience continued growth in biotechnology industries.

Levels of unemployment in the West Edinburgh study area are displayed in Figure 3.3 at the end of this Chapter.

This shows a similar picture to the car ownership data above, with higher levels of unemployment in the southern part of the corridor. While unemployment is below the Scottish average in all wards it is clear that some are not fully sharing in the buoyancy of the City's economy. Improved accessibility would contribute to addressing this problem. Given the low levels of unemployment in Edinburgh, employers need staff to have the flexibility to seek a range of jobs if labour shortages are to be avoided, with a consequent impact on the development of the City's economy.

3.2.5. Social Grade

Table 3.3. shows the distribution of population by social grade (as defined in the register General's statistics) within the study area.

Table 3.3 Population by Social Grade

Ward	Social Grade (%)					
	AB	C1	C2	D	E	Total
New Town	43.54	35.59	4.25	8.60	8.01	100
Dean	46.73	34.46	3.96	6.79	8.07	100
Tollcross	23.21	36.18	6.54	20.15	13.92	100
Fountainbridge	25.66	36.56	6.22	17.48	14.09	100
Dairy	25.42	36.66	7.49	16.56	13.88	100
Shandon	29.89	39.75	8.15	12.61	9.60	100
Moat	14.10	32.62	10.95	17.71	24.61	100
Stenhouse	15.98	28.38	11.21	15.51	28.92	100
Murrayfield	48.51	34.75	3.48	4.78	8.49	100
SE Corstophine	24.35	35.87	10.87	13.73	15.18	100
NE Corstophine	37.29	30.99	7.44	8.32	15.96	100
Sighthill	11.50	26.97	18.05	24.46	19.03	100
Gyle	30.51	33.07	11.77	9.83	14.81	100
Dalmeny & Kirkliston	25.47	28.45	14.46	15.74	15.87	100
City of Edinburgh	27.23	31.91	9.35	14.28	17.23	100

This indicates below average numbers of people in the higher classifications A, B and C1 (managerial, professional and office workers) in Moat, Stenhouse, Sighthill and Dalmeny & Kirkliston wards.

3.2.6. Deprivation

The wards that fall within the West Edinburgh area are detailed in Table 3.4, below.

Table 3.4 Summary of Scottish Index of Multiple Deprivation at Ward Level

	SIMD Rank
Dean	1220
Murrayfield	1219
New Town	1205
Gyle	1170
SE Corstorphine	1153
NE Corstorphine	1144
Shandon	1068
Dalmeny/ Kirkliston	875
Fountainbridge	836
Tollcross	660
Moat	517
Sighthill	502
Dalry	432
Stenhouse	399

The Scottish Indices of Multiple Deprivation (SIMD) was examined to identify those, which rank poorly and therefore may benefit from better accessibility to jobs and services. Of the wards within the West Edinburgh study area, Stenhouse scores the lowest SIMD ranking of 399 and the lowest in terms of income. The SIMD ranking was also revealed to be low in Dalry, Sighthill, Moat, Tollcross and Fountainbridge. These trends of relative deprivation highlight the need to encourage greater levels of social inclusion. While these wards are not among the most deprived in Scotland, relative deprivation is important in the context of determining residents' ability to be social included in a generally prosperous city.

Figure 3.4 at the end of this Chapter shows SIMD patterns within the West Edinburgh area.

3.2.7. Education

Table 3.5 shows levels of educational attainment by ward.

Table 3.5 Educational Attainment by Ward

Ward	Qualifications (%)				
	None	Standard Grade SVQ 1 & 2	Higher Grade SVQ 3	HND, SVQ 4 & 5	Degree
New Town	7.07	7.42	22.79	5.25	57.48
Dean	8.27	9.87	15.71	6.66	59.49
Tollcross	11.75	8.9	31.37	6.58	41.39
Fountainbridge	12.71	10.46	25.69	8.03	43.11
Dairy	16.76	12.87	20.49	8.21	41.66
Shandon	12.55	15.63	20.07	8.96	42.8
Moat	33.99	25.73	15.76	6.75	17.77
Stenhouse	37.58	25.73	13.43	5.08	18.17
Murrayfield	9.7	11.88	14.64	5.96	57.83
SE Corstophine	21.72	29.5	19.74	6.51	22.53
NE Corstophine	19.84	20.31	20.34	6.06	33.46
Sighthill	29.42	26.54	24.66	5.27	14.1
Gyle	20.38	26.39	19.5	7.56	26.18
Dalmeny /Kirkliston	28.52	25.77	16.06	5.96	23.69
City of Edinburgh	22.89	19.94	18.64	6.04	32.48

It indicates that residents at Moat, Stenhouse, Sighthill and Dalmeny and Kirliston wards are more likely to have no formal qualifications than residents of Edinburgh as a whole. Not surprisingly they are also less likely than average to be educated to degree level. This is also true of South East Corstophine and Gyle residents. As the structure of Edinburgh's economy changes, high levels of educational attainment will be important to take advantage of the new employment opportunities being created. Those without qualifications will find themselves increasingly disadvantaged in the job market. It is therefore important that they find it easy to gain access to the widest possible range of those opportunities, that are available to them.

3.2.8. Overall Assessment of Problems and Opportunities

The discussion above has shown that the West Edinburgh corridor has a relatively high population density and a growing population, creating favourable conditions for high quality public transport.

Forty per cent of households do not have access to a car and are therefore dependant on public transport to gain access to employment shopping and leisure facilities. While this is similar to the Edinburgh average, low car ownership is concentrated in the Southern part of the corridor, South of the Glasgow-Edinburgh railway line. This area, particularly Moat, Stenhouse and Sighthill wards, also experiences high level of deprivation, low levels of educational attainment, relatively high unemployment and below average numbers of people in white collar occupations. This indicates that these areas are not fully sharing in the overall success of Edinburgh. The provision of high quality public transport would improve accessibility and assist in overcoming social exclusion and improved access to a wider range of employment opportunities.

3.3. Transport

3.3.1. Highway Network

The West Edinburgh area is served by three principal radial corridors:

- A8 Glasgow Road;
- A90 Queensferry Road; and
- A71 Calder Road/Gorgie Road.

These routes have experienced significant traffic growth over the past 20 years as shown below.

Table 3.6 Traffic Growth on Major Roads in West Edinburgh 1980-2000

Location	AM Peak Inbound	PM Peak Outbound	All Day
A90 at Edge of City	+40%	+41%	+62%
A8 at Edge of City	+25%	+42%	+35%

It should be noted that the M8 Extension opened during this period, removing significant volumes of traffic from the A8.

This growth is part of a more general trend of rapid traffic growth in Edinburgh and surrounding areas during recent years, including:

- A 10% rise in the number of private cars and light goods vehicles registered to Lothian residents, in the four years between 1996 and 2000;
- More new vehicle registrations in Edinburgh than in any other Scottish local authority (2000);
- A 7.5% increase in motor vehicle journeys on Lothian's motorways and A-class roads, in the four years from 1995 to 1999;
- A 72% increase in levels of daily commuting into Edinburgh, in the twenty years from 1981 to 2001;
- A steady increase in the amount of traffic on the City Bypass, with a daily average of more than 65,000 vehicles at Dreghorn;
- An 18% growth in traffic levels on the M8 motorway, in the three years between 1996 and 1999; and
- A 19% growth in traffic levels on the M9 motorway, in the three years between 1996 and 1999.

Work undertaken during the development of the West Edinburgh Planning Framework estimated that daily demand on the M8 Motorway east of Junction 1A was 86,500 vehicles compared to a capacity of 64,000.

The A8 Glasgow Road which runs through the centre of the West Edinburgh corridor is one of the key radial routes in Edinburgh. It serves a significant area of suburban Edinburgh and major land uses such as Edinburgh Airport, Edinburgh Park, The Gyle Centre and Murrayfield. It is a major route into the city from West Lothian and beyond. It feeds into the City of Edinburgh Bypass at Gogar and parallels the main Edinburgh to Glasgow railway to Haymarket. The A8 is also one of Edinburgh's Greenways, offering bus priorities through various traffic management measures and provision of dedicated roadspace.

Currently the volume of eastbound traffic on the A8 at the edge of the city centre (Haymarket Terrace) is around 1,600 vehicles in the peak hour. Average car occupancy on the A8 derived from monitoring surveys is around 1.3. This means that there are in excess of 2,000 people travelling into Edinburgh City Centre by car in the morning peak hour on Glasgow Road alone.

Car journey times along the corridor vary significantly between peak, inter-peak and off-peak periods. As would be expected there is increased congestion throughout the corridor in the peak periods, particularly around Gogar Roundabout and along Roseburn Terrace and West Coates approaching Haymarket. The main congestion hotspots are:

- **South Gyle Broadway** - from the Gogar Roundabout to the Gyle Roundabout is generally operating at capacity during the AM peak period.
- **Gogar Roundabout** – operates at capacity during the peak hours.
- **Gyle Roundabout** - junctions within Edinburgh Park & South Gyle Park are congested during the peak periods with significant delays. During the AM peak period queues along South Gyle Broadway back onto the A8 in both directions.
- **South Gyle Crescent** - delays during the PM peak period as traffic accessing South Gyle Broadway backs up.
- **Edinburgh Park** - congestion linked to the queuing experienced at the Gyle Roundabout.
- **Hermiston Gait Roundabout/Cultins Road** – heavy traffic flows during peak periods, queuing at the junction with the A71.
- **Railway Corridor (Bankhead Drive to Stenhouse Drive)** - queuing from Bankhead Avenue during peak periods. Congestion in the PM peak period along Broomhouse Drive.
- **Stenhouse/Stevenson** - queues during morning and evening peaks in excess of 500m back from the Stevenson Drive/Balgreen Road junction.
- **Balgreen Road/Westfield Road** - queues along Balgreen Road North and halfway along Stevenson Road during the AM peak.
- **Western Approach Road** - congestion occurring in the AM peak at the junction with Lothian Road, with traffic backing up beyond the Morrison Link.

Work carried out as part of the West Edinburgh Planning Framework suggests that committed development, together with increases in base traffic, could encourage a further 90,000 vehicles (2 way trips) per day into West Edinburgh. This is estimated to equate to a further 12,000 vehicles per hour during both the weekday AM and PM peaks, as outlined in Table 3.7.

As Table 3.7 indicates, key developments such as Edinburgh Park, Edinburgh Airport expansion and the Royal Bank of Scotland HQ will significantly contribute to increased traffic levels in West Edinburgh. The combined impact of these increases in traffic levels for the strategic and distributor road network will be very significant, as highlighted in Tables 3.8 and Table 3.9, below.

Table 3.7 Vehicle Trips Generated By Committed And Proposed New Development In West Edinburgh

	Development	Development Type	Development Related Vehicle Trips (2-way)		
			AM Peak	PM Peak	Daily Total
1.	Grampian Foods, Newbridge (TA)	Office — 56,670m^2	1230	912	7800
2.	Edinburgh Gate, Newbridge (TA)	Office — 74,322m^2	1663	1210	10450
3.	Edinburgh Exchange, Newbridge (TA)	Storage / Distribution16, 191m^2	70	65	533
4.	Edinburgh Airport (FM/JMP)	Airport Expansion	1735	1787	17350
5.	Royal Highland Showground (FM/JMP)	Mixed	371	319	N/A
6.	Proposed RBS HQ, at former Gogarburn Hospital (TA)	HQ — 57,500 m^2	1700	1655	12200
7.	Edinburgh Park (TA)	Business Park — 324,903 m^2	5500	5400	39650
8.	Sighthill / South Gyle (CEC/JMP)	Change to Office100,000 m^2	574	170	2700
9.	Newbridge 'Core Dev. Area' (CEC/ JMP)	Mixed	Negligible additional traffic flow		
Total			**12,843**	**11,518**	**90,683**

Source: West Edinburgh Planning Framework: Background Papers (2003)

Table 3.8 Implications of Traffic Growth on Operational Performance

Evaluation of Traffic Demands Link Name	Assessed Capacity	2001		2015	
		Demand Flow	RFC	Demand Flow	RFC
Rural Links (Annual average daily traffic)					
M8 — West of Junction 1a (M8 Extension)	64600	92685	1.43	115300	1.78
M8 — East of Junction 1a	61000	86470	1.42	107600	1.76
A8 — East of Newbridge Roundabout	47400	39675	0.84	49400	1.04
A8 — West of Gogar Roundabout	47100	44015	0.93	54800	1.16
Urban Links (peak hour traffic volumes)					
M9 — South of Newbridge Roundabout	4000	2831	0.71	3522	0.88
A8 — East of Maybury Junction	2100	2110	1.00	2625	1.25

Source: West Edinburgh Planning Framework: Background Papers (2003)

Table 3.9 Implications of Traffic Growth on Operational Performance of Key Junctions

Evaluation of Traffic Demands	Junction		Operational Performance	
Junction Name	Form	Type	2001	2015
M8 / A8 Newbridge	Grade Separate	Roundabout	At Capacity	Over Capacity
M8 / A720 Terminal Junction	Grade Separate	Roundabout	Below Capacity	At Capacity
A8 / Edinburgh Airport	Grade Separate	Roundabout	Below Capacity	Below Capacity
A8 / A720 Gogar	Grade Separate	Roundabout	At Capacity	Over Capacity
A8 / A902 Maybury	At grade	Traffic Signals	At Capacity	Over Capacity
A720 / A71 Calders	At grade	Traffic Signals	Over Capacity	Over Capacity
A90 / A902 — Barnton	At grade	Traffic Signals	Over Capacity	Over Capacity

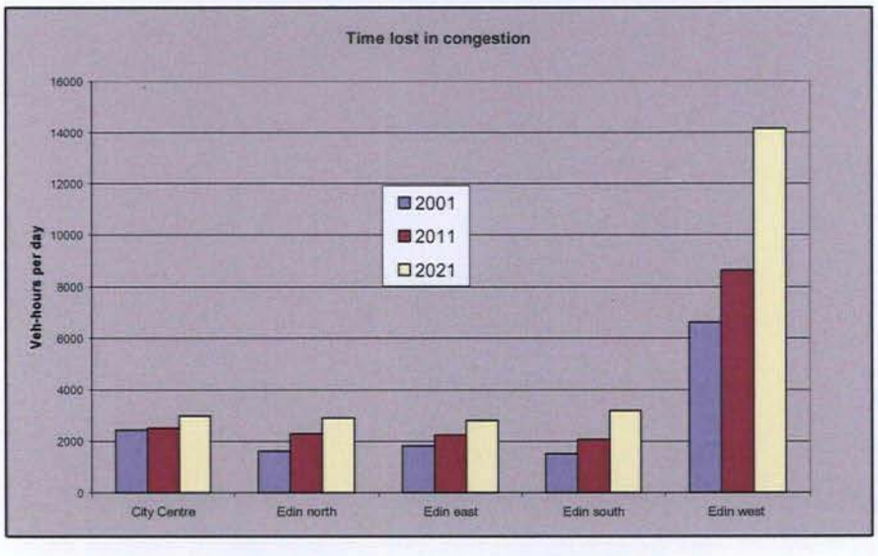
Source: West Edinburgh Planning Framework: Background Papers (2003)

As can be seen from Tables 3.8 and Table 3.9, it is anticipated that the many of the key road links and major junctions in West Edinburgh will operate above efficient operating capacity. As a result of further development, growth at Edinburgh Airport and a forecast 24% increase in background traffic there will be a significant increase in congestion by 2015.

The work undertaken as part of the West Edinburgh Planning Framework suggests that in order to contain existing levels of traffic, and achieve travel patterns comparable with sustainable development objectives, major improvements in public transport accessibility will be required.

The existing and forecast levels of traffic congestion in West Edinburgh are highlighted within the draft City of Edinburgh Local Transport Strategy. The LTS illustrates the time lost due to congestion across the local authority area. This data is reproduced below as Figure 3.5, which graphically illustrates that approximately 7000 hours are lost to existing congestion (2001) in West Edinburgh. This is comparable to the levels of congestion across the other four areas of the city combined.

Figure 3.5 Time Lost In Congestion, City Of Edinburgh, 2001-2021



Source: City of Edinburgh Draft Local Transport Strategy (2004-2007)

By the year 2021, time lost to travel congestion in West Edinburgh is forecast to have doubled to approximately 14000 hours, which is well in excess of the levels of congestion across the other four areas combined.

This demonstrates the need to reduce the number of vehicle kilometres on the highway network to reduce congestion, accidents and the environmental impacts of road traffic. It would also make walking and cycling more attractive.

3.3.2. Public Transport Network

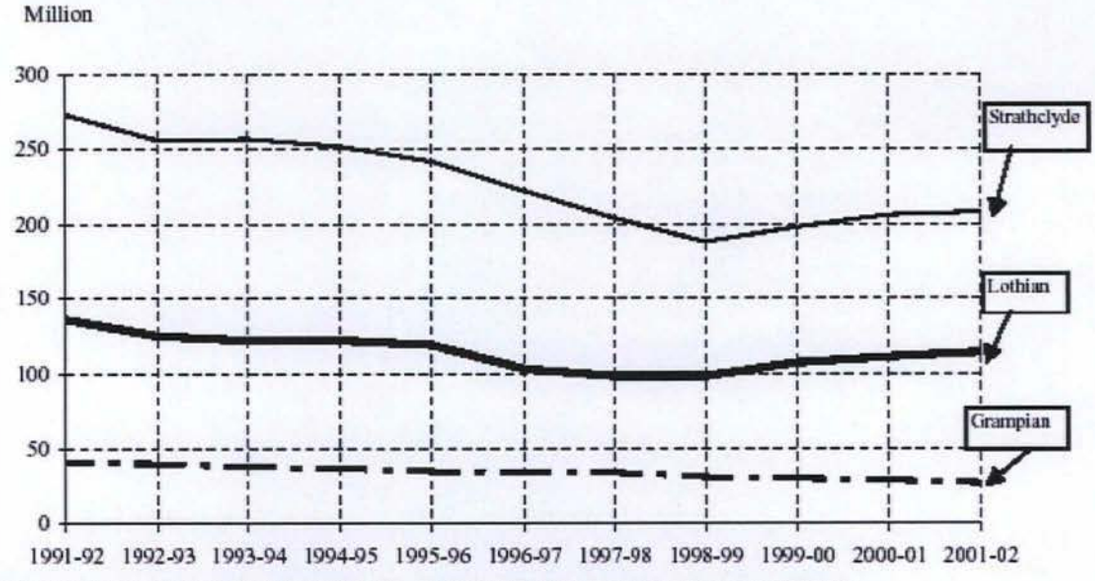
3.3.2.1 Bus Network

Within Edinburgh, public transport carries more than 100 million passenger journeys per year. The City is served by over 200 local bus services using over 800 buses which call at 2,000 stops. There are seven railway stations within the City area, and the rail network is important for medium and long distance travel to the city centre. However bus is the overwhelmingly dominant public transport mode used for local trips within Edinburgh. In 1999, over 18% of all trips made by Edinburgh residents were made by public transport (LTS), one of the highest rates of bus use per person in Britain. Public transport is therefore crucial in maintaining the accessibility and economy of the city centre.

Set against the backdrop of a UK and Scottish decline in bus passenger journeys per head between 1991-2001, the Lothian area has encountered a similar drop off in passenger journeys as indicated in Figure 3.6. Indeed, over the 20 years to 1991, commuting by bus in Edinburgh fell by 39% and the number of bus passengers fell from 171 million in 1981 to 135 million in 1992 (City Plan for Edinburgh, 1999).

However, since 1998-99, passenger journeys in Lothian have reversed this trend and have shown year-on-year rises up to 2001-02.

Figure 3.6: Estimated passenger journeys on local bus services



Source; Bus and Coach Statistics: 2001-02, Statistical Bulletin Transport Series Trn/2003/2

Bus surveys of outbound evening peak buses at Haymarket Terrace show over 2,000 passengers in the two-hour period from 1600 hours to 1800 hours. This corresponds to over 1.25 million two-way peak period passengers per annum.

Current bus services in West Edinburgh are operated largely by Lothian Buses. Existing services run predominantly on radial routes from the city centre. As many services cross the city centre, there are problems of congestion affecting journey times and reliability. The A8 and A71 are the principal bus corridors to the west. Possible interchange points are at Haymarket Station, Edinburgh Park, The Gyle shopping centre, Ingliston Showground and the Airport.

Nine services operate on the A71 corridor and five services on the A8 corridor. All of these services operate at frequencies of two to six buses per hour, seven days a week. A further route is served by a night bus only, and this route runs parallel to the A71 through Stenhouse, Saughton and South Gyle.

Both the A71 and A8 operate as Greenways. These are dedicated bus routes which improve bus travel, especially to and from the city centre, The Gyle, Edinburgh Park areas and the Airport, through various traffic management measures and provision of dedicated roadspace. Low floor buses are being introduced on many routes as the fleet is renewed. However, traffic congestion in the corridor is reaching the point where the effectiveness of the Greenways is being undermined, and this problem is likely to worsen in future as traffic volumes increase further. The West Edinburgh Planning Framework defines a key objective as being "the need to improve public transport accessibility to established development sites and reduce congestion".

The proposed WEBS has been developed as the logical next step in the development of public transport in the corridor. It comprises a series of bus priority measures at junctions, bus lanes on key lengths of the main radial corridor and a guideway section parallel to the main Edinburgh to Glasgow railway line. In total, the scheme includes 3 kilometres of guideway, 7 kilometres of bus lanes and more than 20 priority measures at junctions. WEBS will directly serve Edinburgh Park and The Gyle area and support further development at Edinburgh Park, South Gyle and Sighthill. It will provide interchange with the new railway station at Edinburgh Park and will enhance the public transport system for existing residential areas of South Gyle, Broomhouse, Carrickknowe and Saughton. While WEBS will lead to a significant improvement in the quality of the bus network in the short term, there is a significant risk that this could be undermined by increasing traffic congestion over time. This will make it more difficult to maintain a high level of priority for WEBS services, because the majority of the route will be on-street, especially given that buses have a smaller capacity than, for example, trams and more vehicles are therefore needed to provide a given capacity.

OK Just!.

3.3.2.2 Rail Network

Rail services have, to date, played only a limited role in serving the needs of the corridor. Until recently the only station within the corridor, outside the City Centre, was at South Gyle on the Fife line. This provides a useful railhead for medium to long distance trips to and from the area, but the service is not sufficiently frequent for it to contribute significantly to movements within the corridor.

Stations are located at Wester Hailes, Kingsknowe and Slateford on the southern edge of the corridor. These are served by an hourly stopping service from Edinburgh to Glasgow in Shotts. Its role in catering for the needs of the corridor is also limited.

The recently opened Edinburgh Park station on the Edinburgh-Glasgow line can be expected to play a similar role to South Gyle, but will generate a need for high quality local public transport as a feeder to the station.

In March 2002, the Scottish Executive identified the provision of a rail link to Edinburgh Airport as being a key priority. In March 2003, the Scottish Executive announced the preferred option for the Airport and committed funding for the further development work. This work will be incorporated into Private Bill submissions to obtain Parliamentary Powers for the construction and operation of the rail link.

The preferred option is a station beneath the terminal building, and a northwest-southeast railway tunnel under the runway, providing direct rail connection to Edinburgh and Fife and (among many other destinations) Aberdeen, Dundee, Glasgow, Inverness, Northeast England, and Stirling. The new route will provide a potential ten trains per hour connecting to the Airport.

The lodgement of the Bill and accompanying documentation is to be undertaken by 2005, with construction in 2006 with a view to opening the line by 2010.

This important project, being developed by **tie**, will improve public transport access to the airport from a wide area. It will offer faster journey times than other public transport between the airport and the city centre, albeit with worse accessibility within the central area than bus or tram services would provide. It may therefore abstract some demand potential from local public transport services. However this would be counter-acted by 3 factors which present opportunities for local public transport:

- Improved accessibility will support the further growth of the airport, attracting more trips from throughout its catchment area – not simply locations served by the rail link;
- The growth of the airport will result in increasing employment. In the absence of high quality local public transport a high proportion of work trips are likely to be car-based causing congestion and environmental problems. Residents from low income areas would also be disadvantaged in seeking work at the airport; and
- The airport station can be expected to develop as a railhead for the whole of West Edinburgh, imposing a need for improved public transport distributor services to Edinburgh Park and other locations in the corridor.

3.3.3. Mode Split

Table 3.7 shows mode split for the journey to work or education for wards in West Edinburgh, from the 2001 Census. The table show that a high proportion of residents in the city centre area wards walk to work, ranging from 29% in Dalry to 47% in Fountainbridge. Walking is also high in Sighthill, accounting for 35% of trips. This may indicate that residents are focussing on job opportunities within a limited area, possibly due to accessibility constraints. Bus accounts for over one-third of trips from Dalry, Shendon, Moat and Stenhouse wards, again demonstrating a strong base public transport demand on which to build and perhaps a lack of choice.

Table 3.7 Mode Split for Journey to Work or Education, 2001

Ward	Mode of Travel (%)									
	Car Driver or Motor-cyclist	Car Pass-enger	Bus	Train	Taxi	Cycle	Walk	Other	PT Users in Household	
									With Car	No Car
New Town	22.79	2.2	15.53	2.51	0.51	2.89	42.14	1.33	49.53.	50.47
Dean	30.81	3.72	16.43	2.26	0.56	2.98	34.41	1.19	54.74	45.26
Tollcross	12.77	2.28	23.92	1.81	0.36	5.01	47.19	0.54	29.47	70.53
Fountainbridge	20.98	2.53	28.2	1.45	0.25	6.14	34.87	0.54	33.68	66.32
Dalry	19.62	2.74	34.13	3.17	0.4	3.52	31.38	0.69	29.12	70.88
Shandon	30.87	4.03	39.26	1.48	0.15	4.65	15.23	0.67	40.78	59.22
Moat	33.36	4.83	40.66	0.71	0.51	2.19	13.86	0.53	45.95	54.05
Stenhouse	38.84	4.63	37.89	0.47	0.72	1.95	10.53	0.59	55.19	44.81
Murrayfield	38.7	4.34	22.34	2.72	0.3	2.95	19.41	1.21	68.23	31.77
SE Corstophine	45.74	5.75	28.26	0.33	0.73	1.87	11.83	0.49	73.14	26.86
NE Corstophine	25.55	5.03	25.02	0.53	0.35	1.99	12.9	1.01	80.6	19.4
Sighthill	26.58	4.15	22.39	1.04	0.52	1.2	35.12	0.54	48.64	51.36
Gyle	51.25	4.4	20.3	4.32	0.51	1.82	12.56	0.55	80.22	19.78
Dalmeny/Kirkliston	56.81	7.36	16.24	1.01	0.38	1.42	9.18	0.61	77.7	22.3
City of Einburgh	36.61	4.79	26.24	1.34	0.47	3.25	20.81	0.68	55.48	44.52

Source 2001 Census

3.3.4. Impact of Congestion Charging

Congestion charging is proposed as part of the ITI package of transport improvements covering the City of Edinburgh and south-east Scotland. The aim of the congestion-charging scheme, which is proposed to start in 2006, would be to impact directly on traffic levels and reduce congestion in and around Edinburgh. It is anticipated that the congestion charging proposals could deliver around £60 million net revenue annually, all of which will be used to fund integrated transport improvements.

Under the current proposals, congestion charging would involve the introduction of two charging cordons: one around the city centre to approximately the World Heritage Site boundary; and one inside the City Bypass. A proposed charge of £2.00 would be payable only once per day, regardless of how often one or both cordons are crossed in that day. The city centre cordon would operate Monday to Friday from 0700 hours to 1830 hours, and the outer cordon would operate Monday to Friday from 0700 hours to 1000 hours and from 1600 hours to 1830 hours. Emergency vehicles, motorcycles, local buses, licensed taxis, and vehicles used by disabled vehicles (blue badge) would be exempt.

The introduction of congestion charging is likely to assist in encouraging the uptake of public transport amongst those people who currently travel in and around Edinburgh by car. However, the public acceptability of the congestion charging proposals is likely to be heavily influenced by the quality of the public transport alternatives that would be available.

3.3.5. Summary of Problems and Opportunities

The success of Edinburgh's economy in recent years has led to rapid growth in travel demand by car. This is leading to rising levels of traffic congestion and delay to road users with associated impacts on the efficiency with which the transport network operates, emissions of pollutants and transport safety.

The existing and forecast levels of traffic congestion in West Edinburgh will require major improvements in public transport accessibility in order to maintain an operational and sustainable transport network, which contributes to the continuing economic success of the corridor.

Despite significant investment in bus priority measures, the bus network has not shared in the growth in travel demand and bus use has fallen significantly in the past 20 years. While there are some indications that bus use is now rising, this could be undermined by increasing traffic congestion, despite the investment in priority measures. This in turn, would reduce accessibility for those without access to a car, increasing social exclusion.

Heavy rail has a significant role to play in catering for longer distance trips to and from West Edinburgh but is not suited to playing a major role in meeting the demand for travel within the corridor. The new Edinburgh Park station and proposed Edinburgh Airport Rail Link are likely to increase the need for high quality local public transport within the corridor.

The proposed congestion charging scheme presents an opportunity to achieve modal transfer from car to high quality public transport alternatives. Indeed the public acceptability of the scheme may be affected by commitment to invest in public transport alternatives.

3.4. Environmental Problems

The relevant baseline environment conditions for each of the environmental sub-objectives are summarised in Chapter Eight of this report (with additional and supporting information presented in Appendix C). This Section on existing and potential problems therefore focuses on particular issues of significance for the environment in the vicinity of the West Edinburgh corridor.

In relation to STAG, the key environmental sub-objective which can be identified as an existing problem is city centre air quality. This has been specifically identified since air quality can be related to quantitative standards (air quality objectives) such that exceedences of these standards (or predicted future exceedences) would constitute environmental 'problems'. Air quality is also an issue, which receives public and media attention (it is therefore also a 'perceived problem'), particularly in terms of health implications, and one which is very clearly related to issues of city centre traffic growth and congestion in Edinburgh.

As a requirement of Part IV of the Environment Act 1995, local authorities have been required to complete a review and assessment of air quality to determine whether the air quality objectives are likely to be met, and where necessary designate Air Quality Management Areas (AQMAs). The review and assessment of the air quality report for Edinburgh recommended that a single AQMA be declared which centres on the New Town and links directly to the other locations in order that an integrated action plan can be prepared.

Edinburgh City Centre has been declared an AQMA on the basis that the nitrogen dioxide objectives for the annual and hourly mean are likely to be exceeded in 2005. Studies in Edinburgh have shown that 88% of nitrogen oxides come from road transport with the remaining 12% coming from domestic heating and Edinburgh Airport. This is likely to worsen in future as a result of the predicted growth in road traffic.

Road traffic clearly makes the principal contribution to air pollutant emissions in Edinburgh, and the measures included in the proposed CEC Action Plan for the AQMA are directly related to the cause of the problem. These are:

- Reducing the amount of traffic; and
- Easing traffic congestion.

These objectives are clearly relevant to the overall planning objectives for the proposed scheme, which are addressed in Chapter Two of this report.

Problems relating to other environmental sub-objectives are discussed in Chapter Eight. These include water quality in parts of the Gogar Burn (near the Airport) and areas prone to flood near Murrayfield and in the vicinity of Edinburgh Airport. Current ambient noise levels have been determined in residential areas including Baird Drive (which experiences noise from heavy rail and traffic).

In summary the key environmental problems are air quality and, to a lesser extent, noise. Both of these issues are associated with current volumes of road traffic and could be mitigated by traffic reductions.

3.5. Future Development

3.5.1. Opportunities for Future Development in West Edinburgh

Newbridge
Within Newbridge there are increasing potential development opportunities for a range of uses comprising offices, industrial and distribution activities. A number of development sites continue to be available in terms of both currently zoned and vacant land, and also the potential recycling of a number of existing facilities including the vacant former tyre plant, and potentially the release of Marshall's chicken factory. This area benefits from its existing accessibility to the motorway network and proximity to Edinburgh Airport.

Ratho Park
A new office development has recently been completed at Ratho Park, which is strategically situated on the A8, with access to both the motorway network and proximity to Edinburgh Airport. This extends to c2,787 sq m (30,000 sq ft) of high quality open-plan accommodation, and is currently vacant. It might be expected that further recycling of old or obsolete buildings to the rear of this industrial area will occur with greater pressure for development and occupation in the wider West Edinburgh and A8 corridor area.

Edinburgh Airport and Highland Showground
It is anticipated that the current growth trend in passenger numbers at Edinburgh Airport will continue for the foreseeable future. The recent White Paper on "The Future of Air Transport" forecast that demand at Edinburgh Airport would exceed 20m passengers pa by 2030. It identified the need for additional terminal capacity and a requirement for a second runway in around 2020. Given that in 2000, some 5.5m passengers used the Airport there will be substantial growth in airline-related facilities, support services, terminal facilities and in employment. For example, BAA Linton is believed to be interested in developing high quality warehousing for Edinburgh Airport which may initially total some 20,900 sq m (225,000 sq ft) of accommodation.

Gogarburn
The planned development at the former Gogarburn Hospital site for the Royal Bank of Scotland (RBoS) Group Headquarters has now commenced, and once completed is expected to accommodate a total of 4,650 staff on site. The headquarters will comprise 57,600 sq m (620,000 sq ft) of office accommodation and provide a range of other support facilities and amenities including leisure centre, crèche, training and conference facility, and other local amenities such as a shop and banking.

Edinburgh Park
The 58 hectare Edinburgh Park is already established as one of the top business parks in the UK, with 16 of the country's top performing companies located there, occupying over 100,000 sq m of office accommodation. There are currently around 7,000 employees on Edinburgh Park. The ongoing development programme spans a further 10 to 15 years with the latest development phase occupying the most prominent site to date, Lochside View, adjacent to the Gogar interchange and the Gyle shopping centre. Although the original master plan allowed for the creation of space for a further 8,000 people at the southern extension site, the revised plans could allow for up to 20,000. This will continue to act as the focus for prime office development in West Edinburgh for the foreseeable future.

However, a report in the Herald for 11th March 2004 suggested that "congestion, together with poor quality public transport, shortage of parking facilities and sheer lack of supporting infrastructure, was having a seriously depressing effect on take-up of space in the area".

Gyle Shopping Centre
The Gyle shopping centre is celebrating its tenth anniversary this year and is shortly due to progress its planned second phase of development, providing up to an additional 5,575 sq m (60,000 sq ft) of shopping mall retail space, in addition to the existing 27,870 sq m (300,000 sq ft). The new retail space will be predominantly occupied by the new Next flagship store due to open in late 2004.

Hermiston Gait
Although we understand that previous applications seeking to extend the Hermiston Gait Retail Park have so far been unsuccessful, the improved access provided by the Edinburgh Park rail station and interchange may improve the attractiveness and acceptability of further limited development in the future.

South Gyle and Sighthill
There is anticipated to be a continuation of site redevelopment in the South Gyle and Sighthill areas primarily as a result of redevelopment opportunities, which may come forward over time, whether in the form of industrial or commercial activity.

One particular opportunity exists at Sighthill Court/Calder Road where the Sighthill Campus of Napier University is thought to have been declared surplus to long term educational requirements and could therefore be sold for redevelopment, most likely for commercial, industrial or perhaps residential purposes.

Murrayfield Stadium and Surrounding Environs
The possible relocation of Hearts FC from Tynecastle Park to Murrayfield Stadium (for matches) and Riccarton Football Academy (for training and administrative functions), would release Tynecastle Park and the adjacent training pitch for redevelopment and enhance the usage of Murrayfield Stadium. Ensuring movement and access of spectators for these games can prove problematic at present and Corstorphine Road/Roseburn Terrace/West Coates are heavily congested on match days when bus services are at a standstill due to 'grid-lock'. For international rugby match days, an improved link between the Stadium and Edinburgh Airport would be a major boost to accessibility.

Further, the Scottish Rugby Union (SRU) and others have mooted proposals for the redevelopment of the area surrounding Murrayfield Stadium to the west and north, including the Murrayfield Ice Rink, for some time.

Westfield Road and Tynecastle Park
The area largely bounded by the Western Approach Road/Westfield Road to the North, Westfield Road and the railway embankment to the West, tenement residential property on Wheatfield Street and Tynecastle Park to the South, and McLeod Street/Russell Road to the East, offers one of the last remaining areas of 'lower value use' within relative proximity of, and to the West of, the City Centre. In the medium to longer term this area may gradually become available for redevelopment.

These current key 'fixes' of Tynecastle Park and the pharmaceutical plant on Westfield Road may in the longer term be relocated and their current sites become available for redevelopment. This would be likely to act as the catalyst for wider redevelopment in the area, including the existing adjacent bonded warehouse area on Westfield Road, the CEC's Roads Depot on McLeod Street, together with a variety of semi-warehousing, obsolete office/industrial accommodation, and bulk retail uses around the junction of Westfield Road and Westfield Avenue. These together may offer immense future development potential for higher value uses, located at the westernmost point of the Western Approach Road.

The current development of a major office block on Westfield Road is an illustration of the property market's awareness of this area's development potential, largely as a result of the area's accessibility – through the road network at present – and proximity to the City Centre. Higher value redevelopment of

land to the west of the City Centre has generally resulted in either residential or retail development. Therefore, depending upon the constraints of local plan policy, and indeed any area development framework, this might well represent the majority of any redevelopment, which occurs in this area. However, equally, should this area result in a mixed-use redevelopment with a significant business or office floorspace element, this will become new employment in what is currently a very 'tight' labour market. The availability of high quality public transport access may be critical to the acceptability of more intensive land uses in this area.

Haymarket

The area around Haymarket is well established in respect of residential and commercial use, and there are very few further identifiable development opportunities in the short-to-medium term, excluding any unforeseen wind-fall opportunity sites which may subsequently come forward.

The only real commercial properties within the West Edinburgh study area are those located at the Haymarket section from the railway station to Roseburn.

Recent development including Citypoint, modern high quality office accommodation at Haymarket Terrace, provides evidence of continuing interest and demand for development when sites come forward. For example, the planned redevelopment of the Donaldson's College for Deaf Children at West Coates, provides a significant and high profile development opportunity situated along one of the City's main arterial routes to and from the City Centre. Due to the importance of the building in terms of historical and heritage value, the site is perhaps most likely to be redeveloped for residential apartments.

There remains a prominent and significant major development opportunity site off Morrison Street, bounded to the East of Dalry Road. The site is at present earmarked for a range of development uses (i.e. residential, offices and hotel) within the adopted Central Edinburgh Local Plan (1997). The area also falls within an area of mixed activity where emphasis is placed upon the promotion of appropriate land uses which will contribute towards, and add to the character and vitality of, the surrounding local area. Part of the site that is formally allocated in the local plan has now been developed as a Travel Inn Lodge hotel, with the remainder currently being used as a temporary car park. To the South, recent housing development has been constructed along with a relatively new link road creating direct access from Morrison Street to the Western Approach Road.

The site occupies a former railway yard which is thought to still be in CEC ownership, and there are known to be railway tunnels at the northern most part of the site which may act as a constraint to future site development. Despite all this, the site has significant potential to enhance both the overall amenity and environment of the surrounding Haymarket area, in addition to contributing to the ongoing economic development of the City. Furthermore, with the site's close proximity to existing transportation interchange at Haymarket station (railway and bus) as well as accessibility to the Western Approach Road and other key arterial roads, there is significant potential for the creation of a high profile, gateway development at Morrison Street.

3.5.2. Impacts Of Future Development

The review of future development opportunities set out above demonstrates that there is very significant potential for development throughout the West Edinburgh Corridor.

In the absence of improved public transport it is likely to lead to a significant worsening of road traffic conditions in West Edinburgh as discussed above. Recent modelling work shows that, in a baseline scenario with the West Edinburgh Busway, total car traffic in the area covered by the transport model would increase by 19% in the AM peak hour between 2001 and 2011 and by 51% by 2026. This would result in significant increases in journey times. Some examples are shown in Table 3.8.

Table 3.8 Increase in AM Peak Journey Times

Route	2001 Time (Mins)	2011 Time (Mins)	2026 Time (Mins)
Sighthill-Haymarket	16.6	20.5	32.3
Gyle-Haymarket	22.4	27.7	43.3
Newbridge-Haymarket	28.4	38.7	62.2

These problems represent a significant opportunity for enhanced public transport in alleviating congestion and its associated environmental and safety impacts. In addition, the underlying growth in travel demand created by further development and increasing propensity to travel (itself driven by growing prosperity) provide increasing market potential for public transport.

3.6. Summary Of Problems And Opportunities

The analysis above has shown that there are significant opportunities for improved public transport in the corridor. It has a relatively high population density and a growing population. There are also major employment centres in the City Centre and at the western end of the corridor (Sighthill, Gyle, Edinburgh Park and Edinburgh Airport). There is considerable potential for further development in the corridor. This

provides opportunities for relatively balanced flows by direction at peak periods. Improved public transport would also play a role in distributing trips from major transport interchanges including the airport and rail stations at Edinburgh Park and Ride in the City Centre.

A high quality public transport system providing improved access and capable of attracting car users to switch mode, would also assist in resolving the following transport problems, highlighted above:

(i) Poor accessibility and social exclusion affecting the southern part of the corridor, particularly Moat, Stenhouse and Sighthill wards. It would improve access to the public transport network and wider employment opportunities;

(ii) Potential loss of economic growth to other areas as a result of access difficulties. This would reduce opportunities for residents of the more deprived wards in the corridor and there is a risk that development could relocate to areas which are more difficult to serve by public transport;

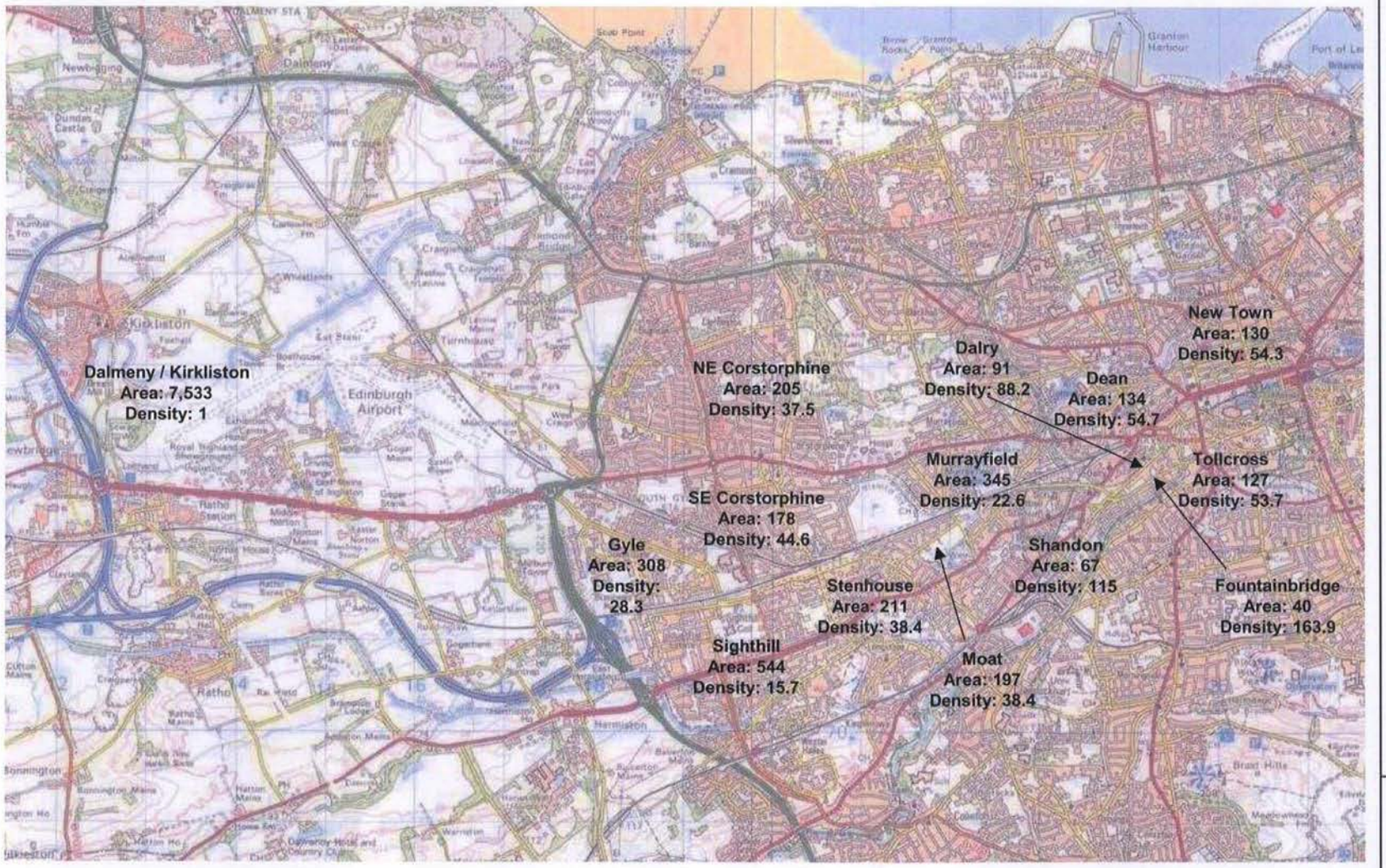
(iii) Increasing traffic congestion resulting from general traffic growth and additional development;

(iv) Poor air quality, especially in the City Centre, resulting mainly from road traffic. In the absence of a transfer to public transport this is likely to worsen as traffic volumes increase;

(v) Rising noise levels, again associated with road traffic; and

(vi) Additional road traffic accidents resulting from increasing traffic volumes.

Accordingly, improved public transport has the potential to contribute to achieving each of the planning objectives set out in Chapter 2.



Area: Hectares

Density: Person per Hectare

Figure 3.1

Population Density by Ward

FABER MAUNSELL
In association with: Roger Tym & PARTNERS

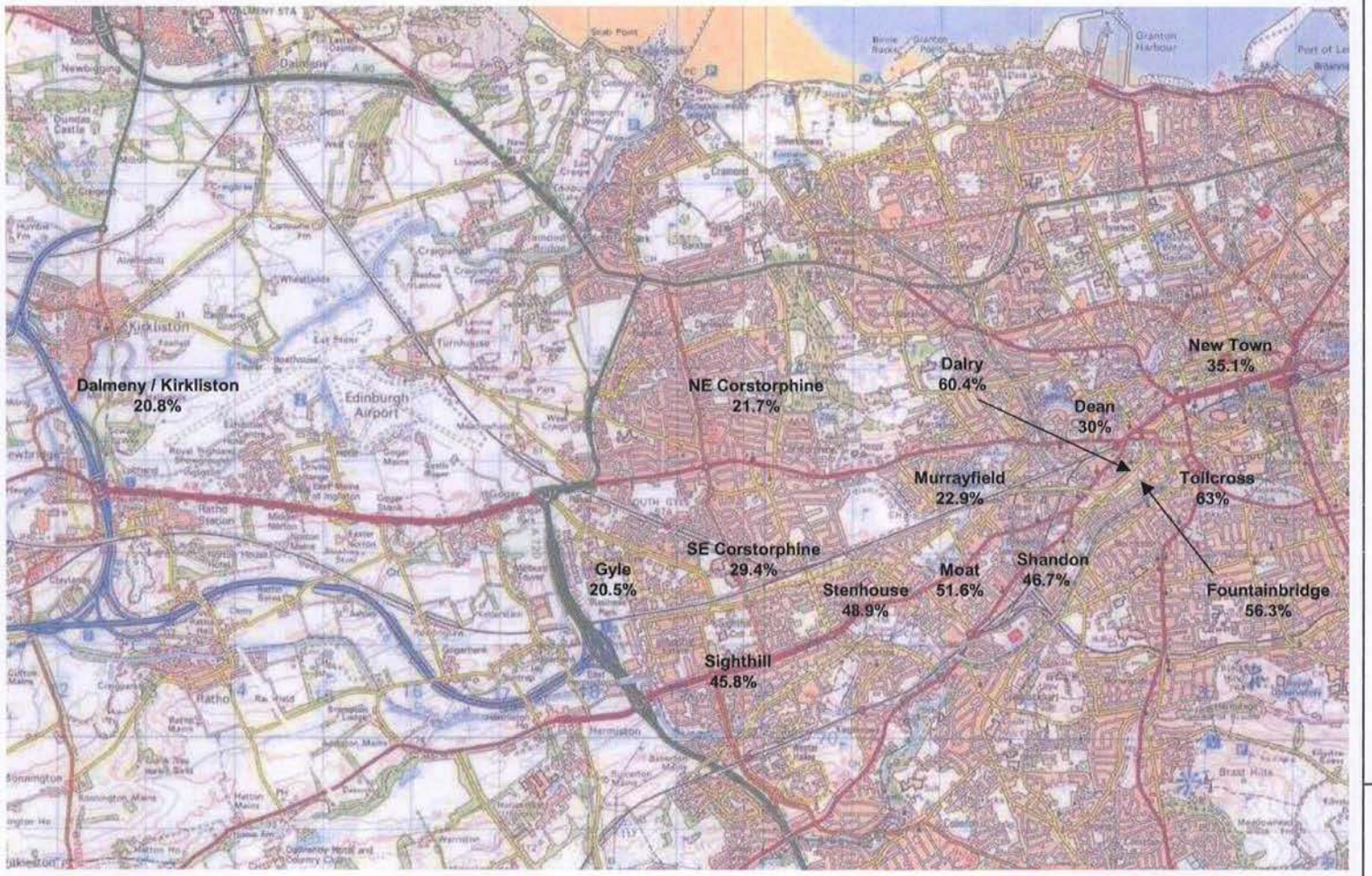


Figure 3.2

Households with no car

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In association with: Roger Tym & PARTNERS

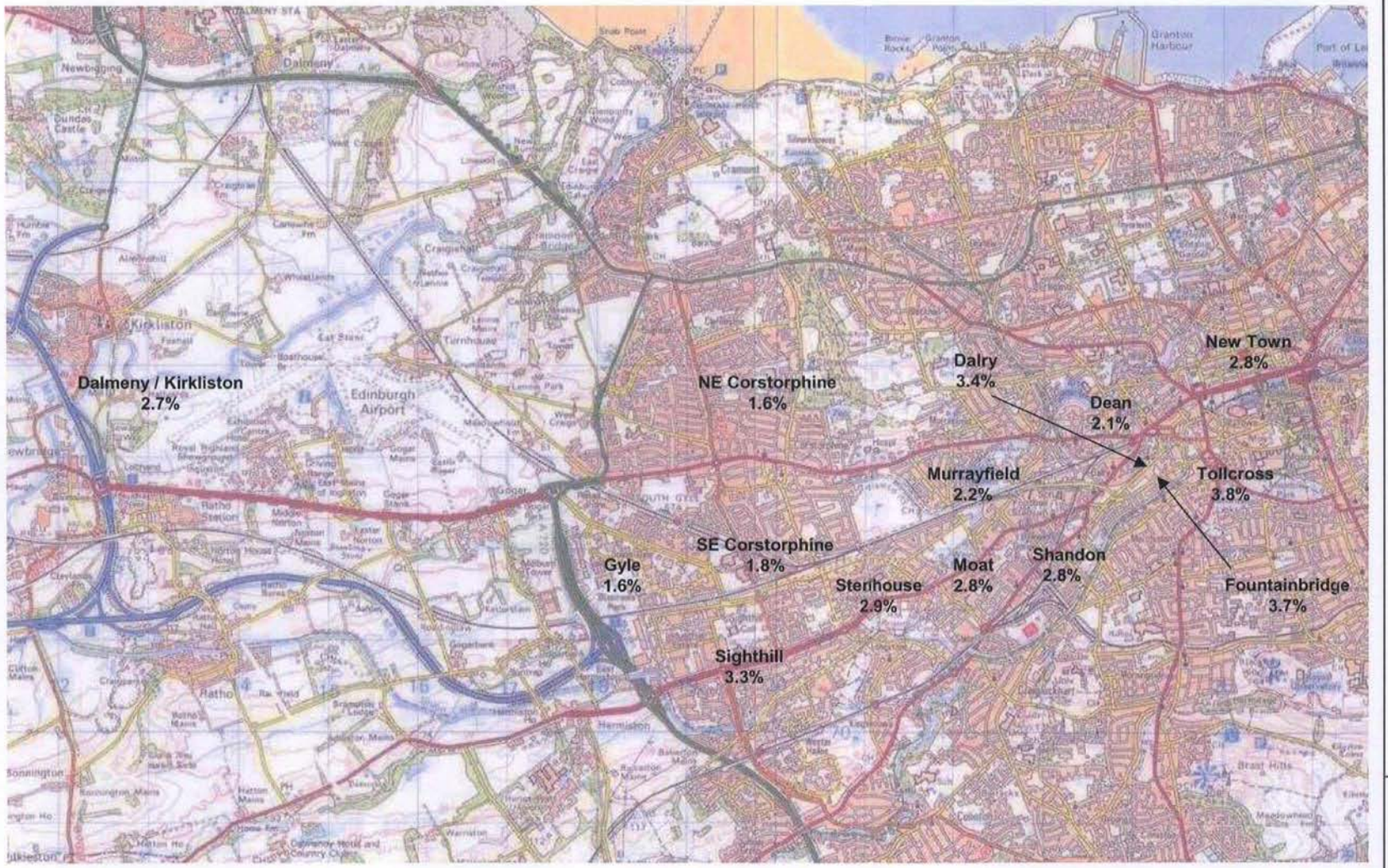
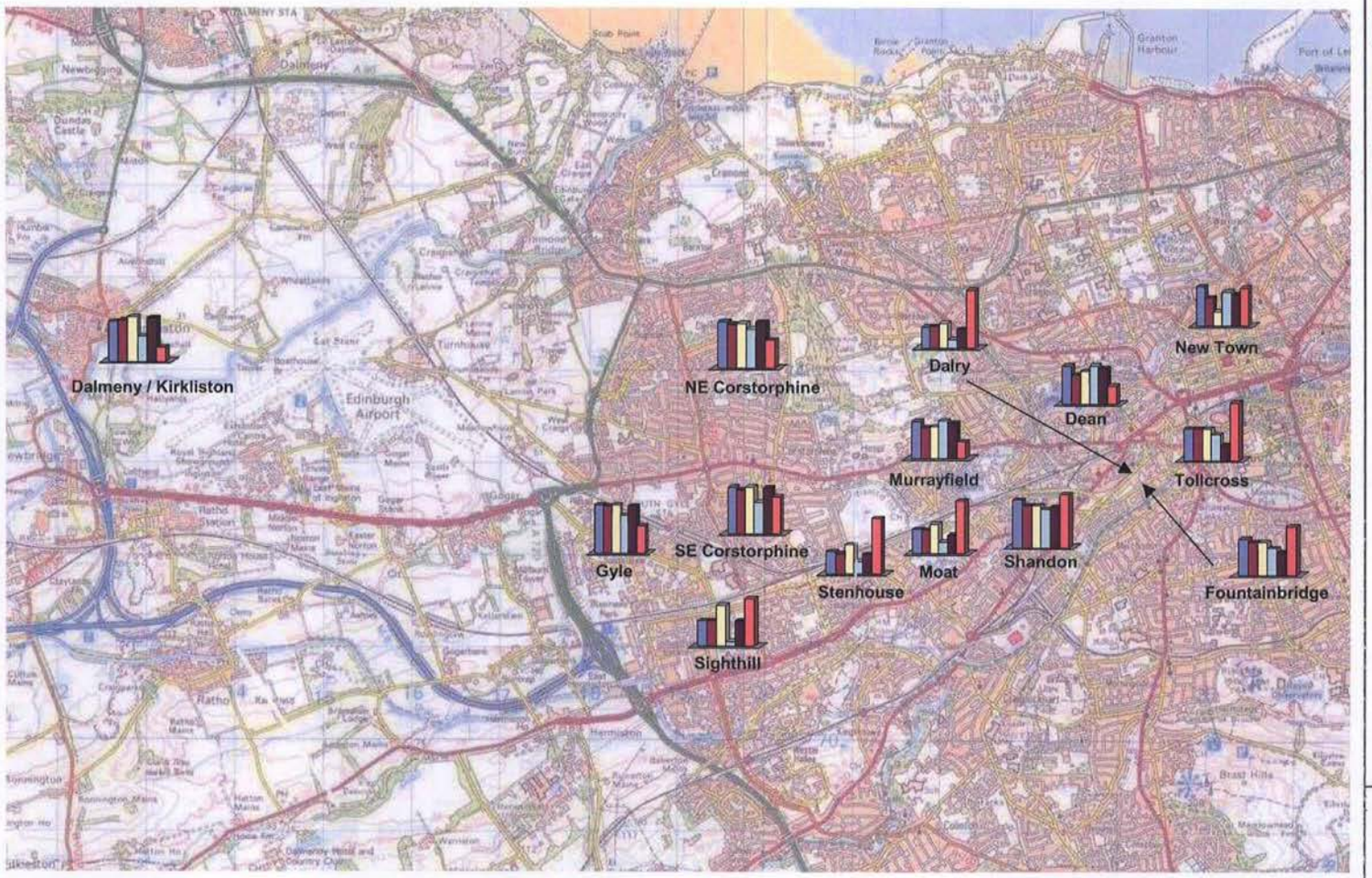


Figure 3.3

Unemployment Level by Ward

FABER MAUNSELL
In association with: Roger Tym & PARTNERS

EDINBURGH TRAM
LINE TWO
Environmental Statement



- SIMD ranking
- Income ranking
- Employment ranking
- Education ranking
- Health ranking
- Access ranking

Figure 3.4

Scottish Indices of Multiple Deprivation by Ward

FABER MAUNSELL
In association with: Roger Tym & PARTNERS

4 PROJECT HISTORY – OPTION GENERATING, SIFTING DEVELOPMENT AND AST1 APPRAISAL



4. Project History – Option Generating, Sifting, Development and AST1 Appraisal

4.1. Introduction

As noted in Chapter 1, the case for re-introducing trams or light rail to Edinburgh has been examined in a number of studies dating back to 1987. However, the current scheme was first developed and appraised in outline as part of the Integrated Transport Initiative for Edinburgh and South East Scotland. This was developed further during the Feasibility Study for a North Edinburgh Rapid Transit Solution and also by the Edinburgh LRT Masterplan Feasibility Study and the Prospectus for the West Edinburgh Tram. The key points arising from each piece of work are summarised below, demonstrating that a robust approach was adopted in selecting the tram solution.

4.2. Integrated Transport Initiative (Iti) For Edinburgh And South East Scotland

The ITI contains a Vision for Edinburgh and was submitted to the Scottish Executive in September 2002. This document summarises the options, which were examined as part of the appraisal process and assesses their performance against the Planning Objectives, which are set out in Chapter Two. The work was particularly concerned with assessing the justification for congestion charging and examining how it might be developed. However it was recognised that charging needed to be accompanied by investment in public transport and facilities for walking and cycling to provide improved alternatives to the private car.

As a result of this work **tie** recommended a single preferred congestion charging and investment package to take forward to the next stages of development of the ITI. Key features of this package included:

- Road user charging;
- A new tram network;
- Major improvements to bus service levels and quality;
- Rail network enhancements;
- Investment in public transport customer care;
- Park and ride investments;
- Increased spending on road maintenance;
- Providing a network of pedestrian routes;
- Improved cycle facilities; and
- A comprehensive range of traffic and environmental measures to enhance the City Centre environment.

The tram network identified in the ITI comprised the three lines currently being developed.

The Part 1 Appraisal Summary Tables (AST) arising from this work are reproduced in Appendix A. This indicates that the preferred package will meet the planning objectives.

The Preliminary Business Case indicated that it would be possible for the Preferred Package to achieve the following (costs at 2002 prices).

- North and West tram lines operational by 2009 (total capital cost £355M);
- South East tram operational by 2013 (capital cost £123M);
- A contribution to rail schemes in Edinburgh of £35M between 2008 and 20015;
- Another £140m available to fund a contribution towards rail or light rail outside the City boundary. This would come in two phases, £40M in 2014-2019, and £100M in 2022-2028;
- The orbital bus scheme linking South Gyle and the New Edinburgh Royal Infirmary completed in two phases, firstly £17M in 2006-2008, secondly £55M in 2015-2017;
- City Centre Enhancements undertaken between 2006 and 2015 at a total value of £40M;
- A total spend on public transport revenue projects averaging approximately £39M per annum; and
- Maintenance expenditure over the period of £188M over the life of the project, £6.9M per annum on average.

This report, and its subsequent endorsement by the Scottish Executive, formed the basis of establishing the justification for a network of high quality LRT routes in Edinburgh.

4.3. The Feasibility Study For A North Edinburgh Rapid Transit Solution

This feasibility study was undertaken by Andersen and reported in July 2001. Although the focus of the study was, as the title suggests, essentially into providing an enhanced public transport system for the North Edinburgh, work was undertaken which was relevant to the proposed Edinburgh network as a whole.

During the course of the study a range of transportation technologies were reviewed and their suitability considered.

Of the available technologies, *Traditional Bus, Monorail, Guideways, Magnetic Levitation (MAGLEV) and Peoplemovers* were discounted at an early stage for a variety of reasons. Monorails, Guideways and MAGLEV are generally more suited to end to end journeys along wholly segregated routes. They would not afford the same opportunities as other modes for future expansion into a broader Edinburgh network, which is one of the key objectives of that scheme. Traditional bus services would not promote the desired high quality segregated solution with the performance required to attract investors. Peoplemovers cannot provide the necessary capacity for the transport link.

The remaining technologies assessed in detail were broadly split between light rail and guided bus. Both systems are high quality and offer the potential to act as a catalyst for development. They also offer the flexibility for future expansion.

Of the guided bus options, the review concentrated on the tried and tested technology provided by kerb guidance, since it was essential that the technology can be delivered on time. Other systems such as electronic guidance have failed to perform in practice and could pose an unacceptable risk to the overall project. It was suggested that a review of developments in these technologies should be undertaken as the scheme develops, as they may with time gain greater acceptance and become proven in practice.

Overall it was concluded that for the North Edinburgh loop the light rail system should be adopted but that advanced Guided Bus developments should be monitored. The considerations that led to the selection of light rail as the preferred solution for North Edinburgh also apply to the West Edinburgh corridor.

Alternative light rail technology such as the LR55 was noted. However, it is recommended that the scheme be developed based on proven technologies. *Quality Bus* technology should be considered as a possible interim measure to meet the short-term transport demands of the development site, prior to the final solution being implemented.

These recommendations, together with ITI work undertaken as part of the preferred package, resulted in Light Rail (or Tram) technology being adopted for the Edinburgh network. This resulted in the LRT Masterplan Feasibility Study being commissioned by CEC in December 2001.

4.4. The Edinburgh LRT Masterplan Feasibility Study

This study was undertaken by Arup and reported to CEC in January 2003. Its objective was to identify a viable network of LRT routes which, in conjunction with other modes, would best meet LTS and other project objectives. It was also to provide sufficient data on LRT routes for use in overall assessment and prioritisation of schemes with the ITI.

The study looked at potential LRT corridors throughout Edinburgh as well as possible extensions beyond the city (the SESTRAN Extensions). It identified the main corridors of movement within Edinburgh, which have the potential to justify investment in high quality public transport. These are all radial to the City Centre and are as follows:

- Silverknowes;
- Newhaven/North Leith;
- Leith;
- Corstorphine/Murrayfield;
- South Gyle/Stenhouse;
- Moredan/The Inch; and
- Portobello.

Edinburgh Tram Line 2 would serve the Corstorphine/Myurrayfield and South Gyle/Stenhouse to city centre movements as well as providing other links to the city centre and within West Edinburgh. This analysis demonstrated that the West Edinburgh corridor should be a priority for investment. It also revisited the available technologies and, like the Andersen study, concluded that LRT (or Tram) was the appropriate choice for a city of Edinburgh's size.

This study recommended that the North Edinburgh Loop be accorded highest priority among the corridors tested and that the Masterplan should include both the West (Edinburgh Tram Line Two) and the South East (Edinburgh Tram Line Three) lines as high priority schemes.

The Part 1 Appraisal Summary Tables (AST) arising from this work are reproduced in Appendix A.

By the time that Arup's work was completed the West Edinburgh Busway scheme was committed. Accordingly Arup considered whether further investment in tram was worthwhile. They concluded that the tram would generate significant additional performance and reliability benefits and would lead to a significant further modal shift from car to public transport. While not part of this appraisal, Arup also highlighted the potential integration benefits of providing a network of tram routes. They also pointed out that the on-street bus priority measures that are a key feature of WEBS would remain after conversion of the guideway element to tram.

The order of implementation was not determined by technical issues or clear performance ranking. However, there was a strong case for considering the West Edinburgh Line next because of development pressure, the availability of alignments and traffic congestion. The study found that the three lines work well as a network, based on the core Haymarket-Princess Street alignment. This would achieve important economies, reducing the forecast capital cost from £528M to £466M, and improve the financial case for all lines.

There was found to be potential for further development of all three lines: inner area branches of the North Edinburgh Loop, including to Davidson's Mains, a branch off South East Edinburgh towards Liberton. However, a branch off the West Edinburgh line to Hermiston Gait was not recommended.

Extensions into the SESTRAN area were also found to be possible but the case for these required more detailed consideration. None of these is likely to be attractive as stand-alone schemes and all should be considered as extensions of Edinburgh core lines. Extensions of the West Edinburgh line to West Lothian (Broxburn/Livingston) and of the Southeast line to Dalkeith appeared to have the greatest potential, followed by Musselburgh via the Portobello/Joppa corridor, but this depended on the case for the latter which needs further investigation.

4.5. West Edinburgh Tram Propectus

In addition to the overall Masterplan Study, Arup prepared a document entitled "West Edinburgh Tram: Prospectus to Scottish Executive" in April 2002. This set out the arguments for building WEBS first and subsequently developing West Edinburgh Tram:

"The consideration of the short-term deliverable WEBS and a tram for the medium to long term would give a staged improvement in public transport provision in West /Edinburgh. The progression from a bus guideway to a tramway ultimately delivers a high quality reliable and attractive system…. whilst providing real benefits to the travelling public at the earliest opportunity".

This work showed that the benefits from tram were significantly greater than those of WEBS, but that the benefits of the latter were sufficient to cover the capital costs within 4 years.

Overall Arup concluded that there was a strong case for West Edinburgh tram as the second stage of development of public transport in the corridor. The prospectus was accepted by the Scottish Executive as the basis for offering PTF funding for the further development of the tram scheme.

4.6. Conclusions

When FaberMaunsell was appointed by **tie** in October 2002 the justification for a Tram route through the West of Edinburgh had been established. This justification was made through a series of different studies which have been summarised in this Chapter. AST1s were produced as part of the ITI submission and on this basis the Scottish Executive awarded the CEC £375M to cover the capital costs of the first two tram routes.

The case for Tram in Edinburgh had therefore been made in principle. Subsequent work undertaken by FaberMaunsell following their appointment was associated with looking at the corridor through West Edinburgh in more detail to determine the precise route alignment. This is summarised in the following Chapters of this report and is reported formally in the AST2s in Appendix B.

Notwithstanding this, it is necessary to demonstrate during the Part 2 Appraisal that tram is not only justified in its own right but it is the best public transport option for the corridor. In practice the only realistic alternative is a guided busway, for the reasons set out above. As WEBS is already being developed it was included in the baseline for this study. Accordingly the critical test is whether the tram option performs better than the baseline, or Do-Minimum, in the appraisal. The results of this appraisal are set out in detail in Chapter 8.

5 THE WEST EDINBURGH CORRIDOR



5. The West Edinburgh Corridor

5.1. Introduction

Once the case had been made in principle for Edinburgh Tram Line Two, the starting point for this, more detailed, stage of the work was to examine and select the Preferred Route Corridor through West Edinburgh.

During this phase of the study, over thirty route options were defined and three basic corridors identified as follows:

- North – along the A8;
- Central – a similar corridor to that used for the City of Edinburgh Rapid Transit generally following the heavy rail line from West Edinburgh to the city; and
- South – following the A71 and Western Approach Road.

Each corridor and option was subject to review as outlined in the sections below. This work was originally reported in the Preferred Route Corridor Report and Addendum (See Appendix K) and a summary of this work is contained below.

5.2. Methodology

At an early stage in the commission, the key team members undertook a general site inspection to view the constraints and opportunities for route alignment options, keeping the principle scheme objectives in mind. Confirmation walk-over visits followed to establish specific local route characteristics as possible alignments were considered in more detail.

In a workshop environment, a number of route options were developed using as a guiding principle "possible until proved impracticable". Subsequently these options were discussed with **tie** representatives taking into account previous work. As a result some adjustments were made and some new options were added.

A total of about 30 alignment options were drawn up with a very large number of combinations being possible from these. In some stretches of the route (for example from Newbridge to Gogar Roundabout) the options were similar but on slightly different alignments. Between Gogar Roundabout and the city centre there were distinctly different choices to be made between 'corridors' (for example a northerly corridor along the A8, a second 'central' corridor generally following the Edinburgh-Glasgow railway and previously developed CERT corridor, and a third southerly one following in part the A71). It was essential to reduce the options and combinations to a manageable number for onward analysis towards a preferred route.

The results of this sifting process are summarised in the Sections below. Further details can be found in the accompanying Preferred Route Corridor Report and Addendum.

5.3. Options Appraised

All 30 alignment options were appraised using the following criteria:

- Engineering;
- Traffic and Transportation;
- Safety;
- Environment;
- Economy/Development;
- Accessibility; and
- Integration.

The methods adopted for appraisal purposes were generally based on STAG although a number of adaptations and simplifications to the STAG approach were adopted. All impacts were based on professional judgement informed by previous experience of similar schemes. Impacts were described on a seven-point scale as indicated below:

	Negative	Positive
Major	---	+++
Moderate	--	++
Small	-	+
No Impact		0

The full scope of this appraisal and outline of methods used can be found within the Preferred Route Corridor Report and Addendum (see Appendix K).

Overall, the intention was to provide a relative comparison between options for the purpose of selecting a preferred route and therefore the results do not represent a definitive assessment of the impacts of the options. Results of this process are summarised in Table 5.1 below.

Table 5.1 – Options Progressed from Appraisal

Option Number	Extremities (East to West)	Progressed to AST2	Summary
1 (Part)	From Newbridge Roundabout to Airport terminal	x	Serves the Showground and provides a direct route. No access to Newbridge.
1b	From Highland Showground to Option3	✓	Avoids conflict with Airport expansion.
2 (Part)	From Newbridge roundabout to Airport terminal	✓	May lose demand from the Showground and does not serve Ratho development.
3 (Part)	From Gogar roundabout to Airport terminal	✓	Serves Airport well and potentially RBoS.
4 (Part)	From Gogar roundabout to Airport terminal	✓	Serves Airport well and potentially RBoS.
5	From Airport terminal to Gogar roundabout	x	Serves Airport well and potentially RBoS.
6	From Gogar roundabout to South Gyle access / Bankhead drive junction	✓	Serves Edinburgh Park well, plus existing demand, potential for interchange.
7	From Gogar roundabout to South Gyle access / Bankhead drive junction	x	Serves Edinburgh Park less well than 6, but existing demand better. Less potential for interchange and all on street.
8	From Corstorphine Road / Riverside Crescent to Gogar roundabout	x	Most direct route from the Airport but all on street and subject to congestion. Does not serve Edinburgh Park well.
9	From Broomhouse Road / Bankhead Drive junction to South Gyle Access / Bankhead Drive junction	✓	No major impact.
10	From Broomhouse Road / Bankhead Drive junction to South Gyle Access / Bankhead Drive junction	x	No major impact.
11	From Broomhouse Road / Bankhead Drive junction to South Gyle Access / Bankhead Drive junction	x	No major impact.
12	From Stenhouse Drive pedestrian bridge to Broomhouse Road / Bankhead Drive junction	✓	Segregated running allowing for a fast section of the journey but does not directly serve major patronage generators.
13	From Stenhouse Drive / Stenhouse Drive junction to Broomhouse Drive / Bankhead Drive junction	x	High patronage, very socially inclusive, but potential to lose demand from Newbridge and the Airport.
14	From Balgreen Road / Saughton Drive junction to Stenhouse Drive pedestrian bridge	✓	Segregated running allowing for a fast section of the journey but does not directly serve major patronage generators.
15	From Corstorphine Road / Saughton Drive junction to Balgreen Road / Saughton Drive junction	x	Leads to a congested area where delays likely through low density housing.
16 (Part)	From Roseburn Street / Roseburn Terrace junction to Balgreen Road / Saughton Drive junction	✓	Serves Murrayfield well. On street section likely to result in increased journey times hence this element has been dropped.
16b	On Baird Drive	x	As 16, but may increase journey times further. Additional residential property impact.
17	From Stenhouse Drive / Stenhouse Drive junction to Stenhouse Drive pedestrian bridge	x	No major impact.
18	From Riverside Crescent / Corstorphine Road junction to	x	Convoluted and slow path picking up little extra patronage.

	Balgreen Road / Saughton Drive junction		
19	From Roseburn Terrace / Roseburn Street junction to Riversdale Crescent / Corstorphine Road junction	x	A congested road section likely to incur delays regularly without adding to patronage significantly.
20	From Princess Street / Lothian Road junction to Stenhouse Drive / Stevenson Drive junction	x	Serves major areas of demand but likely to be slow speeds for much of its length.
21	From Haymarket Station to Roseburn Terrace / Roseburn Street junction	x	Potential for high patronage and links with Haymarket but slow journey times.
22	From Edinburgh Park to North side of A8 to Airport	x	Missed opportunity to link with Railway but segregated route might improve journey times.
23 (Part)	From South Gyle access / South Gyle Crescent roundabout to Gogar roundabout	✓	Does not serve Edinburgh Park well. Hence revised to go through Gyle Centre.
24	From Roseburn Street to Russell Road and connecting to Edinburgh Tram Line One	✓	No major impact.
25	On Roseburn Street / Roseburn Terrace junction	x	Delays at junction may increase journey times.
26	Gogar Roundabout	✓	At grade crossing may result in delays.
27	From Edinburgh Tram Line One to Roseburn Street	✓	Restricted access between lines 1 and 2. Network Rail impact.
28	Stevenson Road to CERT alignment.	x	Quicker than 16 but does not serve Murrayfield as well.
29	From Haymarket to West approach road	x	Serves major areas of demand but likely to be slow speeds for much of its length.
30	From Balgreen Road to Stenhouse Drive	✓	Segregated running allowing for a fast section of the journey but does not directly serve major patronage generators.
31	Western Extension Highland Showground to Newbridge	✓	Provides access across the Motorway to Newbridge.

5.4. Preferred Route Corridor

5.4.1. Background

5.4.1.1 Route

The preferred route corridor arising from this work and which was taken forward to public consultation is the central corridor, which broadly follows the alignment of CERT. A drawing folio showing the route options which were taken to public consultation, can be found in Appendix E. Further details of the option appraisal can be found in the accompanying Preferred Route Corridor Report and Addendum.

The Preferred Route Corridor can be described as follows:-

5.4.2. St Andrew Square to Roseburn

Edinburgh Tram Line Two services will run from St Andrew Square, along Princes Street, Shandwick Place to Haymarket and then onwards towards Roseburn.

5.4.3. Roseburn to Carrick Knowe

The preferred route corridor includes three sub-options along the length from Roseburn to Carrick Knowe:

- Option A – a route along the south of the railway embankment;
- Option B – a route along the north of the railway embankment; and
- Option C – a hybrid of Options A and B. This option is initially south of the railway between Russell Road and Balgreen Road and then crosses back to the north to utilise the reserve created for the CERT project.

5.4.4. WEBS / Edinburgh Park

From Carrick Knowe the preferred corridor assessment identified that the best route would be for the tram to supersede the WEBS guideway, which is to be formed in the grass reserve between the railway line and Stenhouse, Broomhouse, and Bankhead Drives respectively. Options 6, 9 and 12 form the alignment in this region. This decision was not challenged through either public or stakeholder consultation and was acceptable to the Client Group.

5.4.5. Gogar Junction

Following early consideration of a number of options at Gogar Roundabout, stakeholder and Client Group consultation defined two options for the preferred route:

- Option A – directly across the roundabout with signalisation providing priority for the tram (option 26);
- Option B – passing through the Gyle car park before crossing under Glasgow Road (the A8) east of Gogar Roundabout.

5.4.6. Gogar Burn

The alignment that was subsequently taken forward to public consultation was a hybrid of the previous options. The alignment ran parallel to the A8 as far as Gogar village, headed north then west to join the CERT route

5.4.7. Airport/Ingliston

The preferred route corridor identified a solution, which looped north to the Airport serving the Royal Highland Showground via an alignment either to the north or to the south (options 1 and 2).

5.4.8. Newbridge Spur

The western ends of two of the earlier options were ruled out due to difficulties crossing the motorway and the development of the Airport spur alignment. The preferred option within Newbridge presented for public consultation consists of a loop around the village. Starting from Ingliston Park and Ride, the route would cross Eastfield Road at-grade before reaching a stop at the Royal Highland Showground. The route would then pass the Showground along its southern boundary, beyond which a route via Ratho Station would be taken to reach Newbridge.

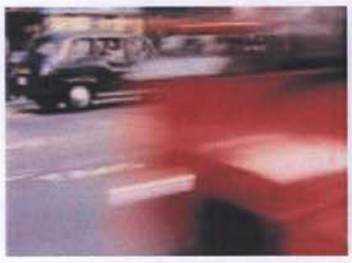
5.5. Summary

Following a STAG based appraisal process, the central corridor was shown to perform significantly better than the North and South corridors in six of the seven main categories and was therefore adopted as the preferred corridor. This, therefore was the corridor that was presented to the public at an extensive consultation process. During the consultation the public were asked to comment on sub-options of the corridor at:

- Princes Street/George Street;
- The Roseburn to Carrick Knowe section;
- Gogar Roundabout; and
- Near to the Airport.

The following Chapter will outline the findings from the Consultation process, which was used to appraise the preferred options, and depot sites.

6 CONSULTATION



6. Consultation

6.1. Introduction

Extensive consultation was undertaken in respect of Edinburgh Tram Line Two. **tie** appointed a specialist advisor, Weber Shandwick, to develop and implement an overall strategy for public relations and communications, including for example, the organisation, monitoring and reporting of a major public consultation exercise carried out covering both Edinburgh Tram Line One and Edinburgh Tram Line Two. In addition, there was wide-ranging consultation with the client group (**tie** and CEC) and with major stakeholders affected by one or both Lines. The consultations sought the views and comments on several route options presented by the advisors. This Chapter provides an overview of the consultation process and summarises the principle findings.

STAG sets out the requirements and the benefits of participation and consultation as well as providing details on scope and methods for this work. The strategy for participation and consultation was based upon the following attributes:

- It should be open so that those taking part understand the process and can see how their views are being taken into account;
- It should start as early as possible in the planning exercise and continue throughout to maximise ownership;
- It should involve stakeholders both in the identification of problems and the development of solutions; and
- It should provide feedback to contributors wherever possible.

6.2. Objectives

6.2.1. Consultation Objectives

The main objectives of the consultations were to inform stakeholders about the proposals, and to allow stakeholders to express their views on the proposals and therefore contribute to the assessment and preparation of final route designs. The consultation process also aimed to raise awareness, interest and understanding of the proposals amongst stakeholders, and build support where possible. In addition, the consultation process enabled any misconceptions and negative perceptions amongst stakeholders and the wider public to be addressed.

6.2.2. Consultation Process

The consultation process involved three key components, as outlined below.

- Client Consultation

There was continual consultation with the client group (**tie** and CEC) throughout the study. This included Steering Group consultations and monthly progress meetings with **tie**. Further meetings were held with CEC Transport and Planning divisions and the Scottish Executive as required.

- Stakeholder Consultation

"Stakeholders" were defined as a person or organisation that has an interest in the project proposals other than as a member of the public.

The stakeholder consultation undertaken for Edinburgh Tram Line Two involved a variety of methods and actions. In the first instance, the team reviewed the range of stakeholders and placed them into the following broad categories:

- Statutory;
- Council;
- Environmental;
- Heritage;
- Transport;
- Community;
- Business;
- Public Utility;
- Emergency Services;
- Disability; and
- A further category of 'technical' consultees was identified although this is strictly not a stakeholder category.

Extensive stakeholder consultations have been undertaken on an on-going basis during the development of the route corridor options. Stakeholders with whom consultations have been undertaken include the following:

- Network Rail;
- Historic Scotland / Edinburgh World Heritage Trust;
- Her Majesty's Railway Inspectorate;
- Scottish Rugby Union;
- City of Edinburgh Council (Murrayfield Flood Defence);
- Scottish Equitable;
- British Telecom;
- Edinburgh Park Management Limited / New Edinburgh Limited;
- The Gyle Management Company Ltd. / Drivers Jonas;
- Royal Bank of Scotland;
- New Ingliston Ltd.;
- BAA;
- Royal Highland Showground; and
- Edinburgh Gate.

A further list of consultees can be found in the Environmental Statement report, under separate cover.

The consultations aimed to inform stakeholders about the proposals and enabled stakeholders to express their views on the proposals. Feedback from the stakeholder consultations has assisted in generating and refining the route options.

- Public Consultation

Public consultations were undertaken during May and June 2003 and included consultations with political representatives, community organisations and the general public. The consultations involved a number of methods to achieve an inclusive approach along the length of the proposed tram corridor, and details of the exact methods employed are outlined in the Sections below.

6.3. Public Consultation Process

6.3.1. Methodology

A number of methods were used to raise awareness of the consultation and to involve the stakeholders and the wider public in the process, and these are summarised below:

- Media Launch

Media representatives were briefed at an official consultation launch.

- Leaflets

A leaflet was produced containing information on the proposals and the timetable for exhibitions and public meetings. The leaflet also included route maps and a self-completion questionnaire.

- Website

A dedicated website was set up and this included background information and the questionnaire, in addition to downloadable maps and documents and hyperlinks to other sites of interest. The website was promoted through the media.

- Freefone number

This was advertised in the local press, and was available to those who wished to request a consultation leaflet or further information on proposals and / or the consultation process.

- Consultation with Political Representatives and Community Organisations

MPs, MSPs and community council representatives were sent leaflets and a letter from **tie**'s Chief Executive. These stakeholders were invited to one of two events to discuss the proposals, and **tie** made representations or presentations at community council meetings, which were also open to the general public.

- Wider Stakeholder Consultation

A database of stakeholder organisations was compiled. These stakeholder organisations were sent leaflets with a covering letter from **tie**'s Chief Executive inviting comments, and key organisations were invited to one of two meetings.

- Exhibitions

A static exhibition was erected in the City Centre from 21 May 2003 to 25 June 2003 and was manned by staff from Weber Shandwick, Mott MacDonald and FaberMaunsell. In addition, a number of touring exhibitions were arranged at venues adjacent to the proposed tram route, and were also manned by staff from Weber Shandwick, Mott MacDonald and FaberMaunsell. The exhibitions provided detailed information on the proposals and an opportunity for the public to make comments. Comment books were available at all exhibitions and leaflets were distributed.

- Public Meetings

Public meetings were held at venues along the route. All public meetings and exhibitions were advertised in a prominent position (page 3) in the Evening News during the first week of the consultation. Radio advertising supported the public meetings, and additional publicity was achieved via press coverage at the consultation launch.

Members of the public could respond to the consultation in the following ways:

- Returning the pre-paid response slip from the leaflet or filling in the on-line response form;
- Writing to the Freepost address or by e-mail;
- Calling a Freefone number;
- Attending an exhibition or public meeting.

As noted earlier, the consultation strategy is to provide feedback to consultees where possible. This was achieved in a number of ways. Where questions were asked at the public exhibitions these were answered directly by the professional advisors present at the time. For some stakeholder consultees, several meetings were held to clarify issues, exchange views and report back changes to the scheme to accommodate concerns. Consultations with other groups began with meetings and a dialogue is expected to continue as the project progresses. Specific questions raised through correspondence and web-site enquiries have been answered in a similar manner.

6.3.2. Coverage and Response

The level of coverage and response rate to each stage of the consultation is described below.

- 107,000 leaflets were mailed directly to households and businesses in the vicinity of the tramlines.
- 9,100 leaflets were distributed to libraries, supermarkets, shopping centres and public buildings.
- 5,000 leaflets were distributed via exhibitions and public meetings.
- 450 leaflets were mailed directly to individuals on request.
- All businesses in the city centre, other major businesses, and third party groups were sent a leaflet, and additional leaflets were sent to city centre businesses on request.
- 676 people in total attended the public meetings (seven meetings); and a total of 67 people attended the wider stakeholder meetings.
- The website was the most popular means of information access, gaining between 30,000-50,000 hits per week.
- The overall number of responses received prior to the end of the consultation was 3,023. There were 74 duplications leaving the number of responses as **2,949**. These were distributed as follows:
- 1,929 of responses were received via the leaflet questionnaire;
- 481 responses were received through the online response form on the website;
- The remaining 539 were received by letter, email, phone, comment book, comment cards, and at exhibitions.

Further details relating to the consultation process can be found within Weber Shandwick's Consultation Report.

6.3.3. Main Findings

General

84% support the concept of the tram in Edinburgh

Recurring issues people commented on related to the route options, the design of the trams and pylons, expected noise levels, proximity to residential properties, disruption during construction and the environmental impact of the tram. The main issues raised are discussed in the following sections.

Edinburgh Tram Line Two

86% supported the route of Edinburgh Tram Line Two, and 14% did not support the route.

The main reasons given for supporting the Edinburgh Tram Line Two route were:

- Provides vital link to the Airport;
- Links with existing public transport;
- Will alleviate congestion in West Edinburgh;
- Provides good link to Gyle Centre, business parks, RBoS and Royal Highland Showground; and
- Will benefit the tourist industry.

The main objections to the Edinburgh Tram Line Two route were:

- Proximity to residential properties;
- Requirement for Compulsory Purchase Orders (CPOs) in some areas;
- No need to extend to tram to Newbridge (perception there would be few users in this area); and
- The route does not cover some heavily populated areas where likely tram users reside. For example Gorgie, Dalry and Corstorphine.

Tram stops

86% supported the proposed stops on Edinburgh Tram Line Two, whereas 14% had some objections to the stop locations.

The main reasons given for supporting the Edinburgh Tram Line Two stops were:

- They (the stops) are thought to be well placed; and
- Good balance between accessibility and speed.

The main objections to the Edinburgh Tram Line Two stops were:

- Too few stops; and
- Concern over increased parking at stops.
-

Route Options

Table 6.1, below, shows the support for each Edinburgh Tram Line Two route option.

Table 6.1 – Support for Edinburgh Tram Line Two Route Options

Option	Line 2 Section		
	Ingliston	Gogar	Roseburn/Carrick Knowe
Option A	40.8%	14.5%	13.2%
Option B	36.0%	76.8%	38.3%
Option C	-	-	27.3%
Don't Know	23.2%	8.8%	21.2%

There was no clear preference for the Ingliston options between Option A, the Royal Highland Showground route, and Option B, running east of the Showground. The most popular of the Gogar options was Option B, which avoids Gogar roundabout.

Option A, south of the railway line, was the least popular option for Roseburn/Carrick Knowe, however there was not an overwhelming majority for either Option B (north of the railway line) or Option C (a hybrid of options A and B). Local analysis showed that the majority (72%) of residents of Whitson Road and Stenhouse Avenue West, and of Baird Drive (63%), favoured Option C for Roseburn/Carrick Knowe.

The reasons given for the preference of one option over another were as follows:

Ingliston

The main reasons given for supporting Option A, the Royal Highland Showground route, were:

- Would be quicker and easier to construct than other options;
- Avoids disruption of re-routing the A8 that Option B would require;
- More direct route than other options;
- Better access to the Royal Highland Showground;
- Would not have a detrimental impact on private residential properties;
- Airport expansion unlikely to happen or feeling that it is not vital; and
- Allows Park and Ride facility.

The main reasons for supporting Option B, which runs east of the showground, were:

- Essential to have a stop at the Royal Highland Showground south;
- Serves South Gyle and North Gyle/Maybury area better than other options;
- Future expansion of the Airport should not be compromised;
- More likely to be approved by planners;
- Will result in the upgrade of the A8 which would be a good additional benefit; and
- Faster journey times between the Airport and the city are more important than beyond the Airport.

Gogar

The main reasons given for supporting Option A, which crosses the Gogar roundabout, were:

- If congestion gets worse on the roundabout car users might be encouraged to switch to the tram;
- Option B may result in more vandalism and teenage loitering near the current railway bridge; and
- Faster journey times are a priority – trams should have priority over traffic.

The main reasons given for supporting Option B, which avoids Gogar roundabout, were:

- Less disruption to traffic;
- Serves the Gyle better than other options; and
- Safer than having trams running on Gogar roundabout, and causes less congestion.

Roseburn/Carrick Knowe

The main reasons given for supporting Option A, which runs South of the railway line, were:

The main reasons given for supporting Option B, which runs North of the railway line, were:

- Better access to Murrayfield;
- Faster journey times;
- Keeps trams away from the roads – less impact on existing infrastructure;
- Best long-term solution;
- Safer for children as it is away from Balgreen Primary School;
- Will ease traffic congestion and parking problems in the Murrayfield area; and
- Keeps trams away from housing.

The main reasons given for supporting Option C, which is a hybrid of Options A and B, were:

- Has least effect on properties whilst providing good service to local area;
- Serves a number of potential users;
- Combines the best of both routes;
- More scenic;
- Does not encourage yet more development at Murrayfield; and
- Will not infringe on the green belt as much as other options.

6.4. Stakeholder Consultations

Extensive consultation has taken place with the Client Group and with major stakeholders, the key elements of which are summarised below. Further details can be found in specific comprehensive reports lodged by **tie**'s advisors.

Several of the consultants within the team were allocated categories of stakeholder with whom they would undertake consultation. This was generally arranged to take account of the consultant's discipline and role within the project team.

The consultations were undertaken by letter, telephone or meetings and often by a combination of these. The consultations were followed up by notes of meetings and issues raised were brought to the attention of the project team.

6.4.1. Client Group

The Client Group is the City of Edinburgh Council (CEC) Transport and Planning divisions and Transport Initiatives Edinburgh Limited (**tie**).

Regular meetings and communication with the client group has been undertaken. Meetings have included Steering Group consultations and monthly progress meetings with **tie**. Further meetings with CEC Transport and Planning divisions and the Scottish Executive on "as required" basis have been held.

6.4.2. Network Rail

Regular meetings have been held with Network Rail (NR) throughout the development of the project and generally, Network Rail approved of the principle of Edinburgh Tram Line Two. However, they raised a few concerns that will need to be addressed and are summarised here.

- Haymarket Station – independent consultants have been engaged by **tie** to consider development opportunities creating an interchange facility
- Haymarket Depot – Edinburgh Tram Line Two proposals will restrict access from Russell Road and Roseburn Street and affect diesel tanks at Roseburn St
- Bridge construction – at Russell Road and Balgreen Road 'disruptive' possession is necessary for an underbridge and 'rules of the route' for overbridge construction
- Immunisation issues - with the OHLE and tram corridor in close proximity definitive areas need to be agreed

6.4.3. Her Majesty's railway inspectorate

HMRI had been consulted on a regular basis, both through meetings to discuss the scheme as a whole and through e-mail exchanges to obtain their views on key design issues throughout the development of the project. The issues raised are summarised here.

- Bridge construction – at Russell Road and Balgreen Road. Requirement to improve vertical clearances to OHLE through restricted headroom structures, management of other road users and pedestrians in relation to tram and OHLE, impact on heavy rail above;
- Gogar Depot – feasibility of locating the main line depot adjacent to the Airport, beneath the flight path for the "crosswind" runway. Issues over electromagnetic compatibility, lighting, OHLE and buildings interface with safety flight envelope, ensuring no "credible" risk of collision between aircraft and depot;
- Derailment containment – on structures and other sections of elevated tramway, in locations parallel to heavy rail where heavy rail and tram are at differential levels;
- Paralleling Heavy Rail – derailment containment, "shielding" (ensuring no risk of tram or train driver confusion/misinterpretation of signals);
- Tram / road / pedestrian interface – issues over management of vehicle and pedestrian movements, sight lines, safe clearances;
- Immunisation issues – stray current control, electrical isolation from heavy rail; and
- Driver visibility for line-of-sight operation.

6.4.4. Historic Scotland/Edinburgh World Heritage

A series of meetings were held with Historic Scotland and the Edinburgh World Heritage Trust aimed at ensuring that the proposals for the section of tram line in the city centre were acceptable. These meetings have taken various formats from the presentation of information through to workshops. The main concerns of these groups related to the tram scheme fitting into the streetscape with minimum impact, with specific concern as to the impact of overhead power infrastructure, cables, fixings and supports. This consultation has been a significant factor in the identification of the preferred route corridor between St. Andrew Square and Haymarket, running along Princes Street and Shandwick Place. Additionally this consultation has fed into the development of the Design Manual which sets out the general specification which is to be applied to the development of the tram.

6.4.5. Murrayfield

6.4.5.1 Scottish Rugby Union (SRU)

The SRU expressed positive views for the introduction of the tram system. However, they indicated that tram movements will have an impact on crowds during major events at Murrayfield Stadium.

The SRU pointed out that tram movements would only affect crowds about a quarter of an hour before kick-off and half an hour after the match ends. There are approximately 14 major events annually.

If the SRU back pitches are required for the Edinburgh Tram Line Two route, any losses in land area would need to be recovered elsewhere. The pitches are liable to flooding. The SRU indicated that flood protection walls would be required if the back pitches were to be used for tram stabling.

6.4.5.2 CEC Murrayfield Flood Defence

CEC outlined that the north option would run over a flood retention area of approximately 300m in length. The tram route would need to be designed to ensure that flood capacity of this retention area is not reduced.

Cross sections of the tram in this area have been presented to CEC for consideration.

6.4.6. Edinburgh Park Limited / New Edinburgh Limited

The overall view from Edinburgh Park was positive. The representatives pointed out that it would be desirable for the tram to run as close to the adjacent highway as possible to allow for landscaping to be provided between the tram and Edinburgh Park buildings. The stop location in the middle of Edinburgh Park would be required to be of a high quality architecturally and in keeping with the surroundings.

6.4.6.1 Scottish Equitable

Generally, there was positive feedback from Scottish Equitable on the introduction of trams, as Edinburgh Park is currently lacking public transport. The bulk of Scottish Equitable is located in the south east of Scotland, so a link between Edinburgh Park and the Airport could be beneficial.

About 50% of their staff currently use public transport to get to work. Scottish Equitable mentioned that their only concern regarding the introduction of a tram system is the physical visual impact.

6.4.7. British Telecom (BT)

BT expressed positive views for the introduction of the tram as Edinburgh Park lacks public transport at present. The main concerns from BT were over the depth of construction and thus the likely impact on buried services, plus the visual impact of the tram on Edinburgh Park.

6.4.8. The Gyle Centre

Very positive views were expressed by the Gyle Management Company Ltd (GMC) as the tram stop at the Gyle Centre would facilitate access for both staff and customers.

The option which crosses South Gyle Broadway and passes through the Gyle Centre would have an impact on the Gyle car park, as the trams are currently proposed to run across the car park area. Although the stop location would be adjusted to minimise impacts on vehicle movements, it is clear that no option could completely avoid impacting parking provisions. Any options running through the Gyle Centre would also create traffic management issues in the vicinity.

The GMC pointed out that the Gyle Centre area is already very congested, and it may be preferable to reconfigure bus movements instead of trying to bring the tram to the current bus interchange. The Gyle Centre are already looking to reconfigure the public transport hub, and this could be structured to suit the introduction of the tram. The GMC would be very keen to work closely with the tram team to develop a mutually beneficial solution.

6.4.9. Gogar Burn

6.4.9.1 Royal Bank of Scotland (RBS)

RBoS welcomed the opportunity to be involved in the options appraisal stage. There were two issues of concern to RBoS: broad-brush route alignment issues and specific issues in relation to the bridge over A8. It was suggested that discussion should proceed on a high level between **tie** Board Chair and top bank officials, between Alex Macaulay and John Reade in relation to Network issues and at project level between site design engineers and Tram consultants.

6.4.10. Airport Area

6.4.10.1 New Ingliston Ltd

New Ingliston Ltd indicated that they are positive about a possible introduction of a tram in the west of Edinburgh.

6.4.10.2 BAA – Edinburgh Airport

In essence, BAA generally approved of the principle of Edinburgh Tram Line Two but had some specific concerns.

The proposed tram route running to and from Newbridge via the Airport raises a general concern over the interface between two-way tram movements, pedestrian movement between the Airport and trams and buses, and the general interaction of tram movements with the movements of road vehicles. Also, if a through-route for the tram is to be pursued, the alignment of the tram could affect the very likely future expansion of the terminal building and the ensuing rearrangement of the Airport forecourt.

BAA pointed out that terminal building expansion details are still being developed as part of their long term development strategy, therefore, a preferred route would possible not be finalised within the timescale of the preparation of the Parliamentary Bill for Edinburgh Tram Line Two. A Government White Paper detailing the preferred expansion option will only be published late 2003 / early 2004.

BAA's development plans have allowed for a terminus for the tram and indicated that FM's preference for a through-route would be difficult to accommodate. BAA mentioned that the likely future boundary between the Airport and the Royal Highland Showground would also rely on the White Paper.

BAA pointed out the difficulties that would arise if the OHLE was to foul the flight envelope. This issue has been allowed for in the subsequent appraisal of routing options. Further BAA indicated that any tram proposals should be consitent with, and not constrain, their future expansion plans .

6.4.10.3 Royal Highland Showground (RHASS)

The Showground receives 1.2 million visitors each year and the RHASS are keen to see the introduction of the tram scheme to help offset the loss of land and parking facilities (that are required for events) by transporting customers to and from the city centre. RHASS also noted that their preference is for the North option, however, they would like to see it moved further north to what is presently the central access along the car park, which they felt could form a boundary between the Airport and showground and a potential western access road for the Airport.

6.4.11. Newbridge

6.4.11.1 Edinburgh Gate

Edinburgh Gate is a development site in Newbridge, formerly Continental Tyres. Although the proposed tram route does not impact the development of new offices proposed on this site, which covers 61 acres of land next to the Newbridge bus interchange, a consultation session had been held.

A representative from Edinburgh Gate expressed positive support for the introduction of trams. It was felt that the route via Ratho station could serve the Edinburgh Gate development. It was also suggested that due to space restrictions in certain locations and the fact that the tram would have to run shared on street, a one-way system for the Newbridge loop could be considered.

6.4.12. Impacted Property Report

As part of the community and business consultation process, the advisors embarked on identifying residents and businesses that may be affected in some way by the preferred corridor. Once identified, each property was visited and consultation began with tenants and/or landowners. These visits and communication by other means, such as telephone or email, were registered in the 'Impacted Property Report'.

The major consequence from these consultations is concerted opposition by residents' groups in Baird Drive and Whitson Road to those options which would most closely affect their properties.

6.5. Focused Consultation

Following from the public consultation exercise there were a number of areas of the route which had not been fully defined or where additional alignment options or queries had arisen. These areas were subsequently subjected to a further round of consultation and engineering scrutiny to ensure that the route taken forward complied with the scheme requirements and objectives.

The sections which fell into this category are:

- Russell Road overbridge;
- Baird Drive;
- Depot;
- Gogarburn; and
- Newbridge.

Considering these in turn the following commentary outlines the issue, main constraints and findings of the further work undertaken.

6.5.1. Russell Road

Within the Public consultation there were three alignments between Roseburn and Carrick Knowe. It was identified that of these Options, A and C, which pass directly under the railway along Russell Road, both limit the scope for interface between tram lines one and two by only facilitating east / west movements. Option B, which stays to the north of the railway however, could facilitate a higher level of interface, with a link from Edinburgh Tram Line Two north to Granton being a possibility by implementing a full delta junction. The consultation alignment started with a moderate to steep grade down to street level before following Russell Road west. This gradient would make it very difficult to achieve a full delta between the two lines. As a result the possibility of amending the vertical alignment to incorporate a bridge over Russell road has been developed. This work is detailed in the *Route Development Report Part B – Route Finalisation*.

Consultation with CEC and the business owners has been undertaken with respect to this option. Although this increases the capital cost of the scheme and incurs a more direct impact on local business (requiring the purchase of the vehicle sales yard and office), it offers vastly enhanced operational benefits.

As a result the preferred alignment takes the tram over Russell Road, with a widened bridge which can support the relevant infrastructure for a full delta junction between the two lines.

6.5.2. Baird Drive

The public consultation exercise returned considerable concern about the high environmental impacts of an alignment along the railway embankment. The residents' main objections concern the visual intrusion, the noise generated, the disturbance during the construction period and the loss of vegetation (especially mature trees) on the Network Rail embankment. As a result **tie** directed the design team to develop an alternative vertical alignment which would introduce an engineered cutting to protect the residents from these tram impacts.

The development of this alternative was completed, with further consultation with Network Rail as part of ongoing monthly meetings, further discussions with HMRI and discussions with the residents themselves. Resident consultation consisted of both formal and informal meetings.

The design team developed three options for the Northern alignment in response to these concerns.

1. High Level alignment (as per the consultation alignment)
2. Alignment dropping to Baird Drive level before rising again to bridge over Balgreen Road
3. Alignment dropping to Baird Drive level to cross Balgreen Road at street level.

These three options are fully assessed in the *Route Development Report Part B – Route Finalisation*. The following table presents a summary of advantages and disadvantages.

Table 6.2 – Summary of Advantages and Disadvantages

Option	Advantages	Disadvantages
1	Grade separation with Balgreen Rd Tramway noise barrier also shields Baird Drive houses from NR noise. Final profile similar to existing profile Comfortable vertical alignment	Full height retaining wall required along entire length Bridge required over Balgreen Rd NR maintenance track to be switched to the south side Loss of mature vegetation on Railway embankment
2	Grade separation with Balgreen Rd Visual intrusion reduced in central portion Reduction in retaining wall and filling	Reduced comfort due to vertical alignment Bridge required over Balgreen Rd Loss of mature vegetation on Railway embankment
3	Saves cost of bridge over Balgreen Rd Visual intrusion reduced in central & western portions Retaining walls and fill volumes minimised	Reduced comfort due to vertical alignment At-grade crossing of Balgreen Rd Loss of mature vegetation on Railway embankment

Option 2 would only be beneficial to a limited number of Baird Drive dwellings. However, the constraints on engineering, cost and comfort more than outweigh the benefits. This option is therefore discarded.

Options 1 and 3 were put forward for further evaluation which resulted in Option 3 being favoured. Despite the fact that the tram will cross Balgreen Road at street level this safety risk is mitigated by the alignment and the fact that the tram speed will be reduced for it to serve the Balgreen stop. The major benefit of this option is that it enhances the potential mitigation options for the noise and visual impacts of the tram.

As a result of this work the Baird Drive alignment developed will cross the Water of Leith at a high level before dropping down to ground level to the south of the Baird Drive property boundary. This will require excavation of some of the embankment however cross sections shown in *Route Development Report Part*

B – Route Finalisation demonstrate that this can be achieved without encroaching on the railway support zone.

6.5.3. Depot

Prior to the Public Consultation two depot options were being considered: one located on the site of the present CEC cleansing depot on Russell Road and the other adjacent to the RHASS grounds (Newbridge).

With the development of the preferred alignment, to include Option B which stays to the north of the railway at Roseburn, the Russell Road option is not attractive. Indeed it would require a spur line to be constructed along the alignment of options A or C beneath Russell Road railway bridge solely for accessing the depot. Hence the option of a depot at Russell Road would be very expensive and operationally difficult.

Whilst the RHASS option remains viable, it is sub-optimal in operational terms being so near the end of the alignment. To develop a depot in this location would require an additional road crossing of the eastbound carriageway of the A8. Additionally the use of this site would constrain any ability to construct the route in stages (i.e. initially to the Airport followed by later construction of the Newbridge Spur).

As both of these locations had been shown to have significant constraints an alternative option was considered. This alternative option is adjacent to Gogar roundabout and has been developed in close consultation with CEC (Transport and Planning). An outline depot layout has been developed for the site and an indicative cross section drawn up. It is believed that this location provides the best option for Edinburgh Tram Line Two if developed in isolation (a separate study is investigating joint facilities for operation of all lines as a network). Full details of this site and its assessment compared with the earlier options is documented in the *'Edinburgh Tram Line Two – Depot Report'*.

6.5.4. Gogarburn

The preferred route presented to the public consultation took the tram line along the A8 to the Royal Bank of Scotland (RBoS) overbridge before striking north with a stop for RBoS employees. The alignment then turns west along the corridor which had previously been defined for the City of Edinburgh Rapid Transit (CERT). During the consultation period a number of additional environmental constraints came to light concerning archaeological remains which may be encountered in this area. As a result the design team were requested to reassess the alignment options in this area. This revision defined two route options for consideration:

Option A: To run parallel to the A8, within the north verge, through the RBoS access road,
Option B: To run parallel to the A8 as far as Gogar village, striking north then west to join the CERT route (a refinement of the consultation alignment).

Option A

The viability of option A depended entirely on being able to find a workable solution to negotiate the RBoS access road (which is elevated) and the entry / exit slips to this road (which are at-grade rising away from the surrounding ground level). Three designs were initially considered which were

- A1: To cross under the access road (using the space provided within the A8 overbridge structure) and ramp up to bridge over the access slips;
- A2: To cross the access road at-grade and the access slips via an overbridge; and
- A3: To cross under the access road (using the space provided within the A8 overbridge structure) and cross the access slips at-grade.

Analysis of these options showed that a solution could only be found by modifying the RBoS access road i.e. Option A3. Details of this analysis are contained in Annex 1 to this paper.

Option B: A8 / CERT hybrid

There were two possible solutions for an A8 corridor – CERT hybrid route. They both parallel the A8 between Gogar Roundabout and Gogar village, turning north then west to follow the CERT corridor to Ingliston Park and Ride. The options differ in that one passes Gogar village to the east (Option B1), and the other to the west passing between Gogar Church and Gogar Burn (Option B2).

Option B1 offers straightforward construction, negligible traffic impacts and minimal safety concerns, as there are only very minor highways interfaces and no interface with the RBoS access. By passing Gogar village to the east, this route also avoids the archaeological issues surrounding Gogar Church, the medieval village and the Scheduled Ancient Monument west of Gogar Burn. However, this option would fail to deliver in terms of accessibility and policy integration, as it would locate the tram stop at too great a distance from the RBoS access bridge, so pedestrian access would be impeded as would be the potential for interchange with buses.

Option B2, though more environmentally contentious, offers accessibility to the RBoS site comparable with the alternatives under Option A. It was appraised in comparison with Option A3 Details of the appraisals are included in '*Route Development Report Part B – Route Finalisation*'

From the work and consultation carried out, there is a clear indication that Option B should be the preferred route as it out-performs Option A in four of the seven criteria, and is equal in two of the remaining three. It is clearly less favourable in terms of environmental impact, however none of the options studied achieve negligible or positive environmental impacts.

6.5.5. Newbridge

At public consultation the alignment put forward included a single track loop through the village of Newbridge. No major objections were received to this route. However this alignment has been reviewed with respect to its ability to achieve the two objectives outlined for this Newbridge section:

1. The provision of access to the two key development sites;
2. Potential for future expansion of the tram west to Livingston or North to Kirkliston.

Key elements of this review included patronage studies and further stakeholder consultation. This work is reported in '*Route Development Report Part B – Route Finalisation*'.

The main consultation in development of this section was with CEC Planning and CEC Transport. Their directive has been that the route should serve both proposed development sites of Edinburgh Gate (former Continental Tyres plant) and the former Grampian Foods site.

The alignment went through a number of design iterations, including a double track and terminus at Old Liston Road, that each attempted to address the issues identified above. Also considered in more detail was how best to achieve a route between the Edinburgh Gate site and the former Grampian Foods site. The revised alignment which has been defined can be outlined as follows:
This option remains in broad terms as per the original alignment via Ratho Station and passing under the M8 / M9 link in Harvest Road. Beyond Harvest Road, the route differs from the consultation alignment in that it will continue as twin track into Newbridge. A stop will be provided at Newbridge South to serve Edinburgh Gate, after which the route will turn to the east to run adjacent to Old Liston Road, looping round Huly Hill on its eastern side before crossing the A89 to the Grampian Foods site. Here the route will terminate, with a stop at Newbridge North

This alignment gives a good linkage to the two development sites, providing stops to both the north and south of Newbridge village. Additionally, ending with a terminus with west facing track alignment on the north of the A89 gives excellent scope for further extension at a later date.

6.6 Final Route Proposals

The results of the public consultation have been taken into consideration to make the following refinements to the proposed routes.

6.6.1. Ingliston

The public consultation showed that neither of the two options was favoured over the other. BAA, which operates Edinburgh Airport, need to ensure passengers are served in the best possible way.

The proposals take into account BAA's concerns regarding a through route for the tram towards Newbridge. Proposals now terminate the main tram route at the Airport Terminal building, with any service to Newbridge being provided by a shuttle service from Ingliston.

6.6.2. Gogar

Option B, which avoids Gogar roundabout and is the most popular option, has been recommended as the final proposal. This minimises disruption at this busy roundabout and serves the Gyle Shopping Centre. Key stakeholders in the vicinity also support this option.

6.6.3. Roseburn / Carrick Knowe

tie is proposing Option B (north of the railway line), in line with the response to the public consultation. Further consultation has been carried out with local residents in this area, whose properties the tram will run in close proximity to. Various mitigation measures are proposed.

6.6.4. Airport Alignment

The alignment for this section of the route, between Ingliston Park and Ride and Newbridge, was developed through extensive consultations. The two key stakeholders were BAA and RHASS.

The study team initially developed several route options past the airport and showground to Newbridge. This considered both RHASS and BAA requirements, expansion plans and operations. The options provided a route past the airport and showground (a through route). The RHASS stated a clear preference for the option which passed to the north of the showground, whereas BAA preferred a spur (terminus) option as previously considered by the design team.

It was thus clear that a single preferred route could not be established prior to public consultation. It was agreed in consultation with **tie** and CEC to promote two loop options (through routes) through the Public Consultation process (see Route Development Report Part A – Design Pause in Appendix L), whilst retaining scope for the terminus option at the Airport.

Responses to the Public Consultation indicated no clear preference for either option from the public, however BAA's formal response strongly stated their objection to a loop option. RHASS formally responded that their preference is for a loop route on their northern boundary. As the preferences of the two key stakeholders were mutually exclusive, to progress this matter, a STAG-based appraisal of a loop (through-route) versus spur (terminus) to the Airport was undertaken. The STAG appraisal concluded that the route serving the airport should be a spur (terminus) rather than a loop (through route) for the following reasons:

A service terminating at the airport allows a premium fare to be charged to airport passengers, offering significant benefits to revenue potential.
The spur option minimises potential impact on the future expansion plans for the Airport
The spur option minimises disruption to both stakeholders during construction and operation.
Proposing Newbridge as a separate shuttle service allows for a "staged" construction, if it is necessary to delay the implementation of the Newbridge section.
Journey times for Newbridge passengers accessing the city is not expected to increase as a result of having to change trams, as their journey would by-pass the Airport.

Thus the preferred route alignment is a principal service terminating at the airport, connecting at Ingliston Park & Ride with a shuttle service to Newbridge.

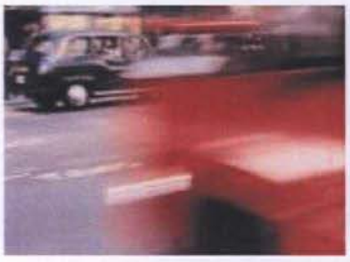
6.6 Conclusion

The consultation process has informed major stakeholders and the residents of Edinburgh about the proposals to introduce trams to Edinburgh, and it has provided the opportunity to comment in a variety of ways.

The results of the consultation show that there is broad support in Edinburgh for trams, and broad support for Edinburgh Tram Line Two. The main concerns are in relation to the impact trams will have on properties in close proximity to the route, and the requirement for CPOs in certain areas. Other concerns related to the disruption caused by the construction of the tram infrastructure, the environmental impact and destruction of local wildlife, and the impact of the tram on local traffic and parking.

There was further technical work undertaken which, together with the consultation outcomes, influenced the Final Route proposals.

7 SCHEME DESCRIPTION



7. Scheme Description

7.1. Introduction

The preceding Chapters have described the route corridor selection process, the consultation and the subsequent refinements to the route alignment. This Chapter now presents a description of the overall scheme which has emerged from this process.

The line of the route is to connect St Andrew Square to West Edinburgh terminating at Edinburgh Park, the Airport or Newbridge. Whilst the design aspiration is to run the tram as far west as possible it is essential that a robust business case be developed for the full route presented in the Parliamentary Bill. Ahead of the tram development the public transport provision in this corridor will be improved through the West Edinburgh Busways (WEBS) project. As WEBS and Edinburgh Tram Line Two share a common alignment in part, operation of the guideway section of WEBS will cease when tram construction starts.

The proposed Edinburgh Tram Line Two is 17.8km of double track tram. This comprises a main line extending from the St. Andrew Square to the Airport (some 13.6 km) and an additional spur line from the Park and Ride at Ingliston to Newbridge via Ratho Station (4.2 km). Within the city centre (St Andrew Square to Roseburn, much of the alignment will be on street. From Roseburn West the majority of the alignment is off street, until short lengths of street running are required to fit with the tight constraints at the Airport and Newbridge termini.

The route comprises 18 Stops, with fourteen on the main alignment to the Airport. The Newbridge spur will have five stops, with the most easterly of these being common to the Airport line, providing interface. Journey time has been estimated between St Andrew Sq and the Airport as thirty-two minutes and for the spur ten minutes. The frequency on each line is anticipated to be 6 trams per hour (headway of 10 minutes) during the peak periods.

7.2. Final Preferred Route Alignment

The following text outlines the preferred route which has emerged from the technical, operational and environmental assessment. This description follows the route alignment from St Andrew Square in the City centre, through Roseburn, Carrick Knowe, and Edinburgh Park to The Gyle. Passing Gogar Roundabout and the preferred Depot site the route continues west via Gogarburn to a Park and Ride facility at Ingliston before splitting. The main line continues to the Airport whilst the branch line goes to Newbridge. This route is shown in the plans contained in Appendix D.

7.2.1. St Andrew Square to Roseburn

A single track will be constructed around a loop consisting of St Andrew Sq West (South and North St David Street), Queen St, St Andrew Sq East (North and South St Andrew Street), and Princes Street. Being a one-way loop there will be two stops one serving eastbound and one west bound passengers.

From the junction of South St David Street and Princes Street the tram will continue east along Princes Street, as double track, on a specially developed Public transport route closed to all other traffic. There will be a single stop located between Frederick Street and Castle Street. At the West End the route will continue on a central alignment along Shandwick Place with a stop located centrally between Atholl Crescent and Coates Crescent. Continuing towards Haymarket a contraflow tram and bus facility will be implemented before the tram leaves the street along Haymarket Terrace. A stop is proposed at this location to interface with Haymarket heavy rail station.

West of this stop the alignment will make its way round Rosebery and Elgin House to run parallel to the heavy rail track alongside Balbirnie Place. It is at this location that a junction would be required to cater for Edinburgh Tram Line One if that was constructed.

7.2.2. Roseburn to Carrick Knowe

Edinburgh Tram Line Two would continue parallel to the railway line to bridge over Russell Road. From here the tram line would skirt round the northern boundary of the ScotRail depot. This will be generally at the level of the railway constructed above the existing embankment slope and will impact a number of Business properties to a greater or lesser degree. A stop is proposed immediately opposite the Murrayfield turnstyles which will service both the area and the stadium.

The tram will bridge over Roseburn Street and continue along the rail embankment past the Rugby stadium before crossing the back pitches on a viaduct with the provision of a siding to ensure operational flexibility to enable the tram to better service special events occurring at the stadium. From the viaduct the tram would bridge directly over the Water of Leith, continuing generally at the same level as the railway. To the west of the Water of Leith however the vertical alignment will begin to drop to the surrounding ground level. This will require amendments to the railway embankment and initial alignment development

has considered network rail constraints and requirements to ensure integrity is maintained. The intention of this vertical alignment is to enable the line to be dropped into an engineered cutting to shelter the residents of Baird Drive from visual and noise intrusion arising from the tram. The tram level would reach the ground level of the adjacent gardens and continue west to cross Balgreen Road at street level. Immediately to the West of Balgreen Road a stop will be provided before the alignment rises to follow the dedicated transport corridor along the south of Carrick Knowe Golf Course. At the west end of the golf course the tram would rise to bridge over the railway.

7.2.3. WEBS / Edinburgh Park

From Carrick Knowe the preferred corridor assessment identified that the best route would be for the tram to supersede the WEBS guideway which is to be formed in the grass reserve between the railway line and Stenhouse, Broomhouse, and Bankhead Drives respectively. This decision has been carried forward to the preferred route alignment.

At the eastern end the existing pedestrian access to the bridge over the railway will be amended to provide a tram crossing, and the building which houses the Air Training Corps will be relocated. There will be a stop located adjacent to the bridge which is proposed to carry the tram over Saughton Road North. This location provides access to housing north of the railway line via Saughton Road North. A similarly located stop adjacent to South Gyle access will provide access to the surrounding houses (north and south of the rail line) as well as businesses and the local tertiary educational establishments (Napier and Stevenson)

Where the proposed WEBS structure ends at South Gyle Access the tram will rise to bridge over the road before progressing west to Edinburgh Park Station. A stop located at this point provides for high quality interface for passengers between light and heavy rail.

The tram alignment will then turn north bridging over the heavy rail once again to then pass through Edinburgh Park on an alignment previously defined for the City of Edinburgh Rapid Transit (CERT - forerunner of WEBS). Within this alignment a stop is defined in a location central to the finalised development.

7.2.4. Gogar Junction

The tram alignment diverges from the CERT alignment when it reaches South Gyle Broadway. At this location it will cross the road at a new signalised crossing to enter the Shopping centre car park within which a stop will be located to provide both good access to the shopping centre and good public transport interchange with the bus network.

The Tram will then pass under the A8 with a new structure being constructed through the embankment leading to the proposed depot site.

7.2.5. Depot

A depot site has been identified between the Fife Rail Line and Gogar Roundabout. This utilises a small triangle of waste ground and some agricultural land at the edge of the greenbelt. An indicative layout of a potential depot has been generated to identify the ability to fit the depot. Key constraints for this have been ground levels to ensure that the facility (power supports and buildings) can be constructed without fouling the flight envelope from the adjacent runway, whilst minimising the visual impact at this gateway to Edinburgh.

7.2.6. Gogarburn

Progressing westward a key tram objective has been to service the Royal Bank of Scotland's new International headquarters at Gogarburn. The alignment achieves this by continuing parallel to the A8 to a new stop as close as possible to the approach embankment for the new Royal Bank bridge over the A8. From here it turns to strike north and rejoin the CERT alignment where it swings west again, across the burn. There are a number of environmental constraints in this area which have defined a very specific alignment, to minimise impact on expected archaeological remains, the setting of listed buildings and a scheduled ancient monument, along with the ecological issues along the burn itself.
To the west of Gogar burn there are a number of badger setts which impact the chosen line as it approaches the Ingliston Park and Ride site where the next stop is to be located.

7.2.7. Ingliston and Airport

Extensive consultation was carried out regarding the alignment between the Park and Ride and the Airport as well as to points further west. The alignment resulting from these discussions and various engineering studies has defined a route to the Airport with a separate line heading west.

The Airport line will turn north to cross the fields before running alongside the Gogar Burn, through a hotel car park and along Burnside Road to a stop immediately outside the terminal building where existing public transport facilities are located.

Travelling west the tram is to be on a separate line which will cross Eastfield road at a signalised intersection (which may be linked with the Park and Ride access/egress). It will then pass between the various parking facilities linked to the Airport. An additional stop would be located near to the eastern gates of the Royal Highland and Agricultural Society of Scotland (RHASS).

7.2.8. Newbridge

Leaving the Ingliston West stop the tram alignment will cross the eastbound carriageway of the A8 to then run along the central reserve. Once the tram has reached the west end of RHASS it will turn south crossing the westbound carriageway and striking across agricultural land to approach Ratho Station where the next stop will be located, adjacent to the heavy rail line at the top of Station Road.

The route then passes some private properties where the existing retaining wall at the foot of the gardens will require to be strengthened. The tram will then join Harvest Road and run on street to pass beneath the motorway into Newbridge itself. The route will then go through Newbridge industrial estate (on an off street) with a stop located near the existing bus stop serving the development site of Edinburgh Gate (previously Continental Tyres). The route then continues to the previous Grampian foods site in the verge of Old Linston Road (travelling counter clockwise round Huly Hill) before crossing the A89 to reach the final stop.

7.2.9. Summary

The preferred route alignment for Edinburgh Tram Line Two can be summarised as follows and is shown on drawings 30894/MMH/C108 and 30894/MMH/C119 contained in Appendix D.

The preferred route runs from St. Andrew Square through Haymarket to Roseburn. From Roseburn it continues off-street round the ScotRail depot past Murrayfield and along the back of Baird Drive in a false cutting (an area which is subject to further focused local consultation). Bridging over Balgreen Road the alignment continues along the north of the heavy rail corridor past Carrick Knowe golf course before bridging over the railway to join the WEBS alignment as far as Edinburgh Park station. A second major bridge of the railway will take the tram north where the alignment will follow the reserve identified for CERT through Edinburgh Park business park. North of Lochside Avenue the tram will then cross South Gyle Broadway at-grade into the Gyle Centre, where the external layout and facilities will need to be adjusted to accommodate a stop. The alignment proceeds beneath the Glasgow Road to the east of Gogar roundabout, turning west to Gogar Burn. West of Gogar Burn the tram will follow the CERT reservation to the proposed Park and Ride on Eastfield Road before turning north to terminate at the Airport. Additionally a spur line will extend from the Park and Ride through to Newbridge passing through Ratho Station and under the motorway at Harvest Road.

7.3. Technology

7.3.1. Vehicle

A range of potential vehicle types exist and have been examined in an earlier stage of scheme development. The work undertaken for the Edinburgh Loop showed that for the level and type of passenger service being targeted a mass transit system was required. Trams also satisfy a number of other criteria including environmental aspects, speed, safety , reliability and quality. Such qualities are believed to have been found to provide a more attractive form of public transport than others (to the extent of attracting additional passengers from private cars) and providing accessibility for all members of the community including the Mobility Impaired. These aspects are clearly in line with the Objectives of the City of Edinburgh Council.

There are three main categories of LRVs/trams currently available which are based upon the height of the tram floor relative to the running surface: *High Floor, Partial Low Floor and Low Floor.* These descriptions also reflect the evolution of tram design, although none of these categories are obsolete and each has its own relative merits which are set out below. All three of these types can be further classified as single or articulated. The articulated vehicles can be single-, double-, triple- or multiple-articulated. Both single and articulated trams can be operated as single units or assembled into pairs or trains according to the required capacity and stop facilities.

7.3.1.1 High Floor Trams

High floor trams are mainly suited for use in segregated corridors, in sub-urban areas, on disused heavy rail lines or on lines used commonly by trains and trams, where high speed is required. They require high boarding platforms, typically 850-1000mm and therefore on lines not ready equipped with high platforms the civils works required to accommodate these trams are usually more expensive than trams with lower floors.

The advantage of these vehicles come from their simple construction, high riding quality, speed (90-120km/h is attainable), easy equipment inspections, easy passenger accessibility and low purchasing costs.

If it is necessary to provide step wells for boarding the tram from low level tram stops this results in poor accessibility for mobility impaired travellers. These factors mean that high floor trans are not generally suited to the urban environment when high platforms cause physical obstacle and strong visual impact.

7.3.1.2 Partial Low Floor

These trams offer high and low floor sections with the principal aim of improving accessibility, especially for mobility impaired travellers. They are mainly suited suite for use in urban and sub-urban areas where high speed is also required. They provide good riding quality and can attain speeds up to 80-100km/h. The low floor sections usually make up approximately 50-70% of the floor area and are generally at the doors. Internal access to high floor sections of the tram must be negotiated by steps.

7.3.1.3 Continuous Low Floor Trams

These are the most modern available trams and provide the most accessible passenger vehicles, facilitating kerb boarding for users of all levels of mobility and age. These trams are mainly suited for use in urban environments where low visual impact is required. These vehicles offer fewer limitations on operations and can be easily customised internally to accommodate special requirements, for example, cycles and wheel chairs. Some are capable of negotiating very tight curves (radii 18m). On straight segregated track they can operate at speeds of 70-80km/h.

The disadvantage of low floor trams is that the on-board auxiliary equipment must be accommodated on the body roof. At present they are more expensive than the partly low floor types.

7.3.1.4 General LRV Specifications

Currently no particular light rail vehicle (LRV) or tram has been chosen for use on the Edinburgh system. However, it is understood that **tie** is seeking to implement a high quality low floor system. The following, therefore sets out to provide a guide on the range of vehicle characteristics currently available on the market and define an outline specification utilised for the engineering assessment and design.

Table 7.1 provides indicative characteristics of the Design Vehicle.

Table 7.1 – Design Vehicle

Parameter	Value	Comment
Vehicle Length	40m	Maximum
Platform Length	40m	
Vehicle Width	2.65m	Maximum
Vehicle Height	3.20m – 3.40m	Excluding pantograph
Floor Height	300 - 350mm	Low floor sections
Track Gauge	1435mm	Standard
Doorway Width	1200 – 1300mm	
Seating Capacity	65 – 80	
Standing Capacity	100 – 230 200 – 320	Normal Load 4/m^2 Max. Service Load 6/m^2
Line Voltage	750V D.C.	
Maximum Operating Speed	80 km/h	
Maximum Design Speed	85 km/h	
Minimum Horizontal Radius	25m 30m	Absolute Desirable
Minimum Vertical Radius	500m 1000m	Absolute Desirable
Expandable Vehicle	Yes	
Multiple Unit Operation	Yes	Only in event of breakdown / emergency
Bi-Directional	Yes	
Maximum Gradient	6.5 % 6 %	Absolute Desirable
Maximum Acceleration Rate	1.0 – 1.3 m/s^2	
Maximum Braking Rate	1.1 – 1.3 m/s^2 3.0 m/s^2	Service Emergency
Operational Acceleration / Braking	0.9 m/s^2	
Design Life	30 years	

A number of tram vehicles have been considered in the compilation of this set of assumptions including Ansaldo Transporti, Firema T68, the Alston Citadis tram and the Adtranz Incentro. Further it has been assumed that geometric design must comply fully with the requirements of Railway Safety Principles and Guidance 1996 published by HMSO.

7.4. Tram Infrastructure

7.4.1. Rails, Trackform and Surfacing

The nature of tramway support and surfacing is entirely dependent upon its environment. For on-street areas, the trackform must provide sufficient strength to support both traffic and tram loads together with appropriate stray current protection, and the surfacing must be appropriate for road vehicle traffic. Steel rails are embedded within a reinforced concrete trackslab, and encapsulated in a non-conductive material, with the final road surfacing laid to suit the rail level. The trackslab may also be designed to mitigate ground-borne noise and vibration. For off-street sections, the trackform can either comprise slab track (where the rails are directly fixed) or ballast (where the rails are supported on sleepers). Ballasted track provides the lower cost solution and is proposed where practicable for off-street sections of Edinburgh Tram Line Two. It is not proposed for areas where the visual impact of the tramway is high, where there is the risk of misuse of ballast material by members of the public (i.e. vandalism) or where the tramway horizontal alignment precludes its use. Slab track is proposed for these locations, and a variety of finishes such as grass track can be applied to slab track where required to minimise visual impacts.

The extent of surfacing works will cover:

- Surface finishes to reflect the location and the requirements of the Design Manual within the swept path.
- Opportunities outwith the swept path to provide betterment or to upgrade existing finishes.

7.4.2. Trackside Equipment

The provision of trackside equipment, required for the safe and efficient operation and maintenance of the tram system, will be designed to satisfy the requirements of the tram whilst ensuring that it is visual impact is minimised and in keeping with the surrounding environment. Trackside equipment will include:

- Power supply sub-stations – spaced along the route to minimise the numbers required whilst meeting the power requirements of the system;
- Overhead Line Equipment;
- Stop platforms and equipment rooms;
- Communications and signalling, including telephones and emergency help points;
- Track Control boxes;
- Signage and Lighting;
- Stop furniture – shelters and seating, ticket machines, CCTV, PA systems;
- Cycle Facilities; and
- Rubbish Collection / Disposal.

7.4.3. Cycle Facilities

Demand for cycle provisions on trams depends on the terrain, access to adjacent attractive areas and the general numbers of cyclists in the area. In Edinburgh much work has been done to promote cycling. The cycle routes appear popular and suggests that a large and local cycling population exists. Consequently, allowing cyclists to use Edinburgh Tram Line Two will provide added value to the existing cyclist facilities. Moreover, access into the suburbs by cycle could increase patronage.

There are a variety of reasons why cyclist provision on trams will attract patronage. Provision for cyclists trams is useful for longer routes or where the terrain is difficult, offering the possibility of breaking the journey, providing alternatives to other modes of travel. Many cyclists travelling on more secluded lines outside normal hours, also prefer to cycle at either end of their trip to offer them added security.

Much of the demand to integrate the tram with cyclists may be satisfied in alternative ways. The provision of secure cycle storage at tram stops would accommodate travellers who only require to cycle at one end of their journey and would remove the need to take bicycles on the tram. Similarly, provision of cycle hire facilities at selected tram stations (most probably major transport interchanges such as Waverley or Haymarket) also increases the systems flexibility; such schemes are common in European cities and are particularly attractive option for tourists wishing to use public transport but explore areas beyond the network.

Within Edinburgh Tram Line Two a section of new footpath and cycling is proposed to be added to new facilities being proposed as part of WEBS.

Practicalities

1. Vehicle

In the terms of statutory position on this issue, it is our understanding the HMRI have no objection to the inclusion of cycles on trams but consider the decision to be one for the operator. It remains the

responsibility of the operator to demonstrate to the Inspectorate that the cycle facilities can be implemented safely.

Allowing bicycles on trams may cause inconvenience to other passengers. Cycles can block access and be wet, dirty and oily. Loading cycles onto the tram has the potential to increase dwell times at stops and therefore overall journey times. This will be dependent upon actual numbers of bicycles on individual trams and in particular the number during peak periods. However, experience form other European systems suggest that actual numbers may not be large and careful design can accommodate cycles safely and efficiently.

Where systems employ conductors there would be a clear advantage in the ways which cycles could be managed. Regulations or Bye-Laws permitting cycle use must be clear, covering for example, permitted times of use, fares, placing and securing of cycles, the hierarchy of user priorities and where cyclists must give way to the mobility impaired (i.e. disabled and families). The penalties for misuse of the system must also be clear and enforceable.

One frequently raised concern regards the impact cycle inclusion has on safety during emergency stops since modern trams have powerful braking systems. The solution will be in the interior design of the vehicles, with the use of specified cycle bays for bikes next to the entrance with provision for restraint. Alternatively, cycles could be restricted to certain sections of the vehicle and cyclists require to stay with their bicycle for the journey to ensure they remain secure. As outlined above, the cycle proposals will require the approval of the HMRI.

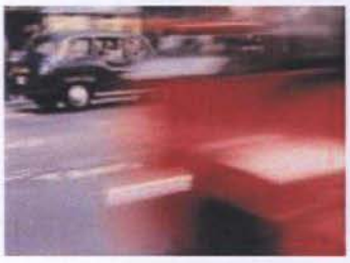
2. Platforms

There are a number of design issues relating to platforms as well as the trams themselves. Cyclists have the potential to cause a nuisance on platforms and around stops. The design should discourage riding of bikes onto or through the facilities. Again, this requires clear guidance, markings, signs and penalties for misuse. Where the vehicles will restrict access to particular tram doors, this will need to be indicated in a similar manner to disabled access.

3. Control of Demand

Various tools can be used either to help control the demand or to manage cycle accommodation. The hours of use can be restricted to off peak hours, or routes can be restricted to counter the direction of peak flow passenger traffic. Allowing bicycles on the tram is also a means of generating additional revenue during off-peak hours. The payment method and its level can be used to control the numbers of cycles on the tram. For example, some systems require cyclists to purchase travel permits in advance of using the tram. This indicates to the operator the likely demand allowing him to plan and manage operations. Monitoring the numbers of cycles, time of use, compliance with regulations, relative numbers of cyclists to wheelchairs, prams and pushchairs provide particularly useful information regarding the necessity and development of control procedures.

8 AST2 APPRAISAL



8. AST2 Appraisal

8.1. Introduction

A considerable body of work has been undertaken during the option sifting, AST1 and consultation processes. The output from these exercises has provided a clearly defined route alignment for the majority of the Edinburgh Tram Line Two corridor.

This Chapter provides a detailed appraisal of the preferred route options in terms of the Government's five objectives. It also demonstrates how the scheme meets the Planning Objectives set out in Chapter 2.

AST2 tables for the options appraised are contained within Appendix B. The Sections below focus in turn on each of the objectives of Environment; Safety; Economy; Transport Integration; Accessibility and Social Inclusion; and Cost to Government. Key assumptions relating to the detailed costings of each option are set out in Appendix F.

8.2. Environment

8.2.1. Approach to EIA and STAG Appraisal

The appraisal of Edinburgh Tram Line Two has been undertaken using the STAG 'project' level approach and is based on the results of Edinburgh Tram Line Two Environmental Statement (ES) which has been prepared as part of the Parliamentary Bill process. The approach to the ES was initially set out in the Edinburgh Tram Line Two Scoping Report (FaberMaunsell, 2003) and amended where necessary following comments received from statutory organisations. The table below identifies where the assessment varies from the recommended STAG methodology, and for cross referencing purposes, identifies the location of both the detailed assessment chapters of the ES and the relevant STAG Worksheets.

Table 8.1 Summary of Environmental Appraisal Chapters and Worksheets

STAG Topics	Chapter of ES	STAG Worksheet Number (see Appendix C)	Variations on STAG Recommendations
Noise and vibration	Chapter 13 Noise and Vibration	Worksheet N2	Vibration included in ES (no method is incorporated within STAG, nor in any STAG Worksheet)
Global air quality – carbon dioxide (CO_2)	Chapter 14 Air Quality	No Worksheet specified	No variation from STAG
Local air quality (PM_{10} and NO_2)	Chapter 14 Air Quality	Air Quality Worksheet for PM_{10} and NO_2	Detailed dispersion modelling undertaken rather than DMRB at the request of CEC. Due to number of links worksheets have been modified and presented as spreadsheets.
Water quality, drainage and flood defence	Chapter 10 Surface Water Quality. Chapter 7 contains information on effects on ground water, particularly from contamination.	Worksheet W1	No variation from STAG
Geology	Chapter 7 includes sections on geology.	Worksheet G1	No variation from STAG
Biodiversity	Chapter 9 Ecology and Nature	Worksheet B1 Baseline Information Worksheet B2 Impact Assessment	No variation from STAG
Landscape	Chapter 8	No worksheet specified in STAG although one has been prepared – Worksheet L1	No variation from STAG
Visual amenity	Chapter 8	No worksheet specified in STAG although one has been prepared – Worksheet VA1	No variation from STAG

STAG Topics	Chapter of ES	STAG Worksheet Number (see Appendix C)	Variations on STAG Recommendations
Agriculture and soils	Agricultural impacts are included in Chapter 6 Land Use, and soils are covered in Chapter 7 Geology, Soils and Contaminated Land	Worksheet AG1 Baseline Information Worksheet AG2 Assessment Score (Permanent and Temporary Impacts)	No variation from STAG
Cultural heritage	Chapter 11	Worksheet CH3 Baseline Information Worksheet CH4 Assessment Worksheet CH5 Assessment Score	No variation from STAG

In essence, the text contained within this STAG report is a summary of the results of the ES. However, the STAG Worksheets recommend that information is set out in a particular way and in some instances this differs from the manner in which it is presented in the ES. Irrespective of these differences the conclusions of the STAG Worksheets are identical to the conclusions of the ES.

Summaries of the appraisals for each of the topic headings are provided below. These summaries are supported by the following figures, which can be found at the end of this Chapter:

- Figure 8.1 to 8.10 Environmental Summary Plans
- Figure 8.11 Landscape Character
- Figure 8.12 Visual Envelope (During Operation)

8.2.2. Noise and Vibration

8.2.2.1 Approach

STAG recommends that the noise appraisal follows the approach set out in Guidance on Methods for Multi-Modal Studies (GOMMMS) section 4.3.27. The STAG appraisal considers operational noise only, and is based on both changes in traffic flows and the effects of introducing the tram system. The appraisal aims to estimate the change in the population annoyed by noise for a do-minimum strategy compared with the proposed option. The approach is to estimate the total number of people exposed to different noise levels and, using the annoyance response curve data provided in GOMMMS, calculate the change in the number of people likely to be 'annoyed'.

A different approach was used for the ES to calculate the impacts of the tram, as set out in Chapter 13 of the ES. The calculation method used was that recommended in the technical memorandum `Calculation of Railway Noise' (CoRN) 1995. The memorandum is used to determine noise from all guided transport systems where the guidance system is based on a dual running rail. The method consists of determining the reference noise level generated by an individual vehicle passage (defined as Sound Exposure Level, SEL in CoRN) and by then modifying these values to take account of factors such as distance, screening and number of vehicles.

Noise monitoring was undertaken at locations selected in consultation with CEC. Existing ambient noise sources were measured or calculated and compared with predicted noise levels likely to arise when Edinburgh Tram Line Two becomes operational. Relevant national legislation and local planning documents informed the assessment. Based on the results of the assessment mitigation measures were incorporated into the scheme design including noise barriers.

A method for assessing vibration is not included within either GOMMMS or STAG. Chapter 13 of the ES includes an assessment of the vibration effects that are predicted to result from the construction and operation of the tram. The impact of vibration on buildings and the risk of superficial damage was assessed according to BS7385: 1993. The likelihood of annoyance due to vibration and disturbance to occupiers was assessed according to the methodology of BS6472:1984 from which levels of vibration dose values were predicted.

8.2.2.2 Key Features

A number of sensitive properties and areas lie adjacent to the route. These include residential properties at Balbirnie Place, Baird Drive, Gogar and Ratho Station. There is also a school in Ratho Station. Noise monitoring was undertaken at each of these locations and others agreed with CEC. Between St Andrew Square and Haymarket the tram runs on-street where traffic noise dominates and ambient levels tend to be high during the daytime. On segregated sections ambient noise levels tend to be lower, although the route between Haymarket and Edinburgh Park Station (currently under construction) runs close or directly adjacent to a mainline railway. Ambient noise levels at Balbirnie Place and Baird Drive are dominated by the railway.

Vibration measurements were also undertaken at Roseburn Maltings, Baird Drive, Middle Norton, Edinburgh Park and Station Road in Ratho Station.

8.2.2.3 Summary of Impacts and Mitigation Measures

Construction Noise and Vibration and Mitigation

Construction noise varies considerably during any building project. Properties within 50 to 100m of such works can be disturbed. The character of construction noise varies during the project depending on the activities being undertaken. For tram routes, initial phases can involve road breaking, demolition work or earth moving followed by clearance and levelling. These activities can produce high levels of noise and vibration but would be of limited duration. Compaction and base laying can also be noisy but finishing phases of track construction and electrical installations tend to be low noise operations. Predicted construction noise is likely to exceed 80 LAeq,12hr Major negative short-term impacts are therefore predicted to occur at locations in close proximity to construction works including Balbirnie Place and Baird Drive.

Vibration is predicted to occur within 10m of works during construction and could result in Moderate adverse impacts for short periods, meaning that vibration may be perceptible but there would be no effect on the structure of properties.

As well as providing a calculation methodology, BS5228 also gives detailed advice on methods of minimising nuisance from construction noise. This can take the form of reduction at source, control of noise spread and in areas of very high noise levels, insulation at receptors. It should be a requirement of any construction contract for the contractors to comply with the recommendations in this standard in order to achieve specific noise limit criteria for each site. A code of construction practice or environmental management plan would be prepared by the contractor and this would include the following provisions at locations where noise is likely to be a problem:

- Sites would be surrounded with fencing or other barriers, where appropriate, and continuous running plant would be housed in acoustic enclosures.
- Use of electrical items of plant instead of diesel plant in especially sensitive locations.
- Exhaust silencing and plant muffling equipment would be maintained in good working order.
- Night time working would be kept to an absolute minimum and the normal working day would be used wherever possible.

In general, good public relations and extensive consultation with local authorities would be necessary to help to minimise the impact of construction work.

8.2.2.4 Operational Noise and Vibration and Mitigation

The STAG Worksheet summarises the number of people affected by change in noise and the number of these likely to be annoyed. The results suggest that the change in the number of people annoyed by traffic noise would be negligible. Similar results have been calculated for rail noise where an additional 4 people will be annoyed. However, an additional 76 people will experience an increase in noise of more than 3 dB(A) as a result of the introduction of the tram. It should be noted that there are large margins of error associated with an assessment of this nature.

The methods used in the ES to provide a more accurate prediction of changes in noise levels at specific locations. The assessment concludes that with mitigation in place impacts would be Moderate negative (an increase in noise of between 5 dB(A) and 9 dB(A)) at one location (Balbirnie Place) and Minor negative (an increase of between 2dB(A) and 4dB(A)) at several other locations including Baird Drive.

Mitigation of operational noise would take the form of an acoustic barrier located as close as possible to the tram track at selected locations. These locations are adjacent to housing at Balbirnie Place, Baird Drive, Hillwood Rise and Station Road at Ratho Station.

Vibration is predicted to be Neutral along much of the route. However, in a few locations where properties lie within 15m of the route e.g. Baird Drive. Additional vibration isolation measures would be considered at these properties, depending on the sensitivity of the buildings.

8.2.3. Global Air Quality – $C0_2$

8.2.3.1 Approach

The global air sub-objective in accordance with STAG has been undertaken using the DMRB Volume 11, Section 3, Part 1. This sub-objective was assessed by determining the impact on CO_2 emissions and using this gas as a proxy for all greenhouse gases. Both the impacts due to the change in road traffic flows and the CO_2 produced indirectly by the power consumption of the trams have been accounted for. CO_2 emissions for each link in the road network have been assessed. The assessment compares a existing baseline case based on current traffic flows with the opening year (2011) and the design year (2026) with and without the tram system.

8.2.3.2 Key Features

CO_2 emissions will be discussed in relation to the Government's target to reduce emissions nationally by 2010.

8.2.3.3 Summary of Impacts and Mitigation Measures

The impact of Edinburgh Tram Line Two on greenhouse gases has been assessed by predicting the effect on CO_2 emissions. The total CO_2 emissions for the whole study area are listed in the Table 8.2.

Table 8.2 The Impact of Edinburgh Tram Line Two on CO_2 Emissions

Year	CO_2 Emissions (Tonnes/year)
Existing Baseline (2001)	236300
Do-Minimum (2011)	245131
Line 2 (2011)	236792
Do-Minimum (2026)	284942
Line 2 (2026)	260030
	Percentage Differences
Line 2 (2011) as % of Existing Baseline (2001)	100%
Line 2 (2011) as % of Do-Minimum (2011)	97%
Line 2 (2026) as % of Existing Baseline (2001)	110%
Line 2 (2026) as % of Do-Minimum (2026)	91%

Table 8.2 indicates that Edinburgh Tram Line Two will have a minor positive impact, as defined by STAG, on air quality, with reductions in CO_2 emissions of 3% and 9% in 2011 and 2026, respectively. Accordingly the objective of reducing the emissions of greenhouse gases is met. It should be noted, however, that due to increased numbers of vehicles in the future years and only minor predicted improvements in vehicular CO_2 emissions, the implementation of Edinburgh Tram Line Two will result in a neutral impact relative to the Existing Baseline, whereas in 2026 the corresponding impact will be a 10% increase in emissions.

Mitigation measures would require improved energy efficiency for both road vehicles and the trams used.

8.2.4. Local Air Quality (NO_2 and PM10)

8.2.4.1 Approach

The local air quality sub-objective was assessed by determining concentrations of nitrogen dioxide (NO_2) and particulate matter smaller than 10 mm (PM10). Following consultations with CEC it was agreed that FaberMaunsell would undertake a detailed regional dispersion modelling appraisal of the effects from Edinburgh Tram Line Two. This type of appraisal is a more comprehensive assessment than the DMRB approach recommended in STAG and GOMMMS, but it has been undertaken in a manner which is compatible with STAG and GOMMMS requirements (i.e. the number of properties experiencing change in air quality within specified distance bands has been calculated). The AAQuIRE 6.1 regional air quality model was used to predict NO_2 and PM10 concentrations for an existing baseline (2001) and two future years (the opening year (2011) and design year (2026)). The opening and design year scenarios were both run for a Do-Minimum case and a Do-Something case.

8.2.4.2 Key Features

CEC has designated part of central Edinburgh as an Air Quality Management Area (AQMA) due to predicted exceedences in NO_2 levels. The AAQuIRE 6.1 model has been used to provide the detailed assessment required in such areas. The impacts have been considered based on traffic flows over an 18 hour day.

8.2.4.3 Summary of Impacts and Mitigation Measures

An estimate of the number of properties affected by Edinburgh Tram Line Two scheme was determined by predicting roadside concentrations for the two future year scenarios. Table 8.3 indicates the number of properties exposed to improvements and degradations in air quality.

Table 8.3 The Number of Properties Affected by the Edinburgh Tram Line Two Scheme

Year	Number of Properties		
	With an Improvement in Air Quality	With a Degradation in Air Quality	With Unchanged Air Quality
2011	175,893	101,315	1,226
2026	165,425	105,842	7,167

This Table demonstrates that there are a greater number of properties predicted to observe improvements in air quality than those showing a deterioration in air quality.

A more detailed indication of the impact of the Edinburgh Tram Line Two scheme is achieved by the calculation of the local air quality indices. These indices provide an assessment of the change in exposure to air quality over the whole study area. This assessment combines the change in roadside concentrations with the number of properties affected. A negative value indicates that the scheme is predicted to have a beneficial impact on air quality; a positive value indicates a detrimental impact. Table 8.4 summarises the impacts.

Table 8.4 Air Quality Indices for Edinburgh Tram Line Two Scheme

Year	NO_2 Index	PM_{10} Index
2011	-47,669	-11,334
2026	-39,193	-17,780

These indices predict that the scheme will lead to a moderate positive impact on local air quality in both 2011 and 2026. This impact was due to a reduction in vehicle kilometres, especially in the more populated areas of the City. The 2011 NO_2 index is equivalent to 47,669 properties seeing a reduction in NO_2 concentrations of 1 µg/m3. Overall, the objective of improving local air quality is met.

The greatest benefits are found along Haymarket Terrace and Morrison Street. Lesser disbenefits were predicted along Saughton Road and Queensferry Road.

Mitigation measures include the increased usage of the trams and other modes of public transport. Further improvements could be made by restricting road traffic through the City or by encouraging the use of non-polluting vehicles.

8.2.5. Water Quality, Drainage and Flood Defence

8.2.5.1 Approach

The assessment of impacts on the water environment is concerned with the effects of the development on the quality and hydrology of surface and ground waters. A baseline desk study of the surface water environment along the route incorporated the river classifications from the Scottish Environment Protection Agency (SEPA) for water bodies within 500m of the proposed route. Classifications reflect the status of the watercourse in terms of chemical, biological, aesthetic quality and toxicity assessment.

Information on flooding and land drainage, as well as known contaminated sites within the area of the proposed route was provided by CEC and from consulting historical Ordnance Survey plans held at the National Library of Scotland to ascertain former land uses along the route. In addition, information on geology and groundwater was collected from maps published by the British Geological Survey (BGS). Where available, site investigation records were also consulted.

Based upon the approach set out in Chapters 7 and 10 of the ES the effect on the water environment has been assessed by predicting the changes that would be caused by the construction and operation of Edinburgh Tram Line Two.

8.2.5.2 Key Features

There are three main watercourses in the vicinity of Edinburgh Tram Line Two that could potentially be affected by the scheme. These are: the River Almond, the Gogar Burn and the Water of Leith.

Approximately 100m to the West of the western terminus of the route (near the M9/A8 junctions) at Newbridge the River Almond flows in a northerly direction. The Gogar Burn is a tributary of the River Almond and, after passing beneath the A8, it flows northward to the Airport boundary, where it flows westwards before entering a culvert near the Airport terminal building to pass beneath the runway and into the River Almond.

The Gogar Burn is known to cause flooding in areas to the south of the Airport and surrounds and an Area of Importance for Flood Control has been defined in this location. A section of the route for the scheme between the Airport and Ingliston Park and Ride stops would run close to the burn. New crossings of the Gogar Burn would be required close to the Gogarburn and Edinburgh Park stops. In addition, a number of smaller un-named water courses or ditches in the vicinity of the Area of Importance for Flood Control would be crossed.

Under SEPA's River Classification scheme in 2001 stretches of the Gogar Burn have been assessed as Class B (Fair), with the stretch close to the Airport assessed as Class C (Poor). East of the Gogar Roundabout the route runs alongside the recently created Loch Ross, formed by widening the Gogar Burn at this point to create a water feature within Edinburgh Park.

Progressing eastwards the route would then continue alongside the existing heavy rail corridor. A new crossing of the Water of Leith would be required immediately west of the Murrayfield Rugby Ground. The practice pitches here are also designated as Areas of Importance for Flood Control. The Water of Leith is Class B (Fair) at this location and in recent times the river has caused severe flooding of the Rugby Ground and the surrounding area.

Underlying bedrock generally comprises rocks of moderate to weak permeability and hydrogeological conditions are similar throughout the proposed route. Bedrock is fractured or potentially fractured and does not have a high permeability, or other formations of variable permeability. Although these formations seldom produce large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers. Shallow groundwater may be present within superficial deposits both within sand and gravel deposits and overlying the low permeability clays.

There are no official records regarding groundwater abstractions in Scotland and the presence of abstraction points is therefore not known along the route. Groundwater flow is generally not known although shallow groundwater flow is likely to be towards local watercourses. Groundwater quality is likely to vary depending on potential sources of pollution in the area. Groundwater Source Protections Zones do not yet exist in Scotland and although there are two Nitrate Vulnerable Zones in Scotland, the nearest one is in Fife.

Areas of contaminated ground are present along the Edinburgh Tram Line Two route. Main issues included disused railway land around Ratho, Baird Drive, Roseburn and Haymarket, as well as areas of made ground close to the Gogar Burn near Castle Gogar (a possible former landfill for demolition material). Further information on contaminated land is provided below in Agriculture and Soils.

8.2.5.3 Summary of Impacts and Mitigation Measures

Worksheet W1 covering Water Quality, Drainage and Flood Defence has been drafted and is included in Appendix C.

The construction of Edinburgh Tram Line Two would involve works, such as bridge construction and temporary disturbance, which would have a direct temporary impact on the channel and banks of the Water of Leith and the Gogar Burn. It would also be necessary to construct a culvert over a minor unnamed watercourse, which is a tributary of the Gogar Burn. There would also be a number of land-based activities associated with the construction works, which could potentially have an impact on surface waters in the vicinity.

Proposed mitigation would comprise the following:

- Construction activities would take place in accordance with all relevant legislation, codes of practice and Pollution Prevention Guidelines for protection of ground and surface water, with submission of an environmental method statement to SEPA.
- Temporary site drainage and/or treatment (e.g. settlement lagoons) would be put in place to manage site run-off and accidental spills of fuel, etc., during construction
- Identification of potential risks from possible contaminated land that would be disturbed by the proposed development.
- Temporary and permanent works would be designed to minimise disruption to water courses and loss of flood plains.
- The route drainage system would be designed to avoid pollution of watercourses and groundwater during operation though installation of interceptors, settlement tanks, etc.

The potential impacts to surface water, associated with the construction of Edinburgh Tram Line Two, would be minor and would be largely due to the temporary works associated with the construction of two new crossings of the Water of Leith and the Gogar Burn.

Assuming effective mitigation, in general the permanent impacts during operation of Edinburgh Tram Line Two would be neutral to minor, however an overall rating of moderate has resulted from the assessment. This is due to there being uncertainty at this stage as to whether or not the possible impact of Edinburgh Tram Line Two crossing the Area of Importance for Flood Control associated with the Gogar Burn could be entirely mitigated.

Further assessments during the detailed design stage would establish the required mitigation in detail. Mitigation could involve the provision of adequate compensatory floodwater storage volume equal to that taken up by the placement of the embankment and Edinburgh Tram Line Two infrastructure in the Area of Importance for Flood Control.

Assuming that adequate and well designed drainage is put in place that would collect and/or treat any contaminated run off and/or spills and that an effective management system and training is implemented to prevent inappropriate disposal or spills, potential impacts to groundwater from the proposed scheme would be Neutral.

Appropriate risk assessment of potential risks from contamination would be necessary to inform the site environmental management planning and development of appropriate mitigation measures for contaminated land risks. With these mitigation measures in place this would ensure that contact between potential contaminants and any identified receptors is minimised and the risk reduced to acceptable levels. The overall impact is assessed as being Minor.

8.2.6. Geology

8.2.6.1 Approach

Baseline geological information was obtained by means of a desk study combined with a walkover survey to visually inspect the route corridor. No fieldwork was carried out to confirm the findings of the desk study.

Geological information was determined from geological maps published by the British Geological Survey (BGS). In addition, where available, borehole records held in the BGS library were consulted. Information on the presence of geological SSSIs and Regionally Important Geological Sites (RIGS) was sought from SNH.

SEPA was also consulted regarding holders of Waste Management Licences and existing and former waste management sites in the route corridor. The waste management implications of removing and disposing of areas of potentially contaminated soil within the Limits of Deviation (LODs) and Limits of Land to be Acquired or Used (LLAUs) have been considered. Local Plans and BGS maps were consulted to determine the presence of active or potential mineral resources underlying or close to the Edinburgh Tram Line Two route.

The significance of potential impacts on geology that may be affected by the development is based on assessment criteria as detailed in the ES Chapter 7. The main issues for impacts on geology include damage to areas designated for their geological interest or zones where the development may affect active or potential mineral extraction activities and potential sterilisation of mineral reserves. In addition, issues associated with waste management of potentially contaminated soils have been assessed.Key Features

Superficial geological deposits comprise mainly glacial till overlain in places with mounds of glacio-fluvial sands and gravels, lacustrine deposits associated with various former lochs and weak alluvial soils near the Gogar Burn and the Water of Leith. There are pockets of made ground in places. Superficial deposits are generally more than 10 metres thick.

A major fault, the Middleton Hall Fault, is recorded to outcrop through the centre of Newbridge, running west to east, extending towards Edinburgh, down throwing the strata to the north. To the south of the fault line the Lower Oil Shale Group, which is similar in stratification to the Upper Oil Shale Group, is recorded to outcrop at rockhead. These are both of Carboniferous age.

The village of Ratho Station, located to the east of Newbridge lies upon a Quartz Dolerite intrusion. A further Quartz Dolerite intrusion is present at Maybury, to the north of the Gogar Roundabout. The intrusions comprise a black, fine-grained igneous rock, which is locally known as 'whin' which has historically been quarried at a number of sites in the Newbridge area.

Based on initial screening of historical information and assessment of previous industrial activities, a number of potentially contaminated sites have been identified within 500 metres of the Edinburgh Tram Line Two route corridor and in areas that may be used for depots, etc.

Consultation with SNH indicates that there would be no geological SSSIs or RIGS within or adjacent to Edinburgh Tram Line Two. However, the Castle Rock SSSI (Edinburgh Castle) is close to the route at Princes Street, albeit on the far side of the main railway line west from Waverley Station.

Local Plans do not indicate any active or proposed mineral extraction activities within or close to the route. However, an active whinstone quarry (Hillwood Quarry) is present approximately 100 metres south of the proposed route near Ratho Station. There is no evidence of undermining under any part of the route.

There are no licensed or formally licensed waste management sites actually within the LODs or LLAUs although a number of sites with waste management licences (mainly scrap yards, etc. have been identified near the route). However, there is an area near Gogar that is likely to have been used as a landfill for demolition waste prior to introduction of the current waste management-licensing regime.

Waste management issues would be associated with areas of potentially contaminated land within the route and from which material may need to be disposed of during construction of Edinburgh Tram Line Two and associated infrastructure. In addition, fly-tipped waste deposited on certain areas of the LODs and LLAUs would have to be disposed of during construction of the scheme. A number of sites where non-hazardous waste may be present were identified.

Summary of Impacts and Mitigation Measures

No impacts on designated geological sites such as SSSIs and RIGS are predicted from the construction and operation of Edinburgh Tram Line Two. In addition, no impacts on active or mineral resources are predicted. Both of these impacts have therefore been assessed as Neutral.

Issues relating to contaminated land have been addressed in the Water, Drainage & Flood Defence and Agriculture & Soils sections.

During construction there will be the requirement to dispose of material from within the route as required by the detailed design. It is possible that some of this waste material would come from areas that are potentially contaminated. Particular issues would include known areas of made ground such as railway embankments, former railway or industrial and the area of former landfill at Gogar, in addition to fly-tipped waste.

In general, waste material is likely to comprise Inert and Non-Hazardous waste, although there is the possibility of encountering material that could be classed as Hazardous Waste, for example drums of chemicals or paint, etc. Appropriate handling and disposal of this waste would be required. Measures will be put in place to ensure that as much of the excavated material as possible generated through construction is re-used on other areas of the development.

In addition, construction activities themselves would generate waste. Most of this would be Inert Waste, however, Hazardous Waste including waste oils, solvents, etc., may also be generated. These wastes would have to be disposed of in accordance with the appropriate Waste Regulations and Duty of Care in order to avoid impacts on the environment. As part of the Environmental Management Plan for construction sites, waste minimisation measures would be put in place. The impact from waste during construction is assessed as Minor.

Waste would also be generated during operation of the scheme. This would be handled and disposed of according to current Waste Management legislation. The impact from waste management issues is therefore assessed as Minor.

Worksheet G1 in Appendix C summarises the impacts on Geology.

8.2.7. Biodiversity

8.2.7.1 Approach

The approach to the ES and STAG appraisal, including the evaluation of specific taxonomic groups, including plants, birds and mammals follows that contained within the Guidelines for Ecological Impact Assessment: Amended Pilot, November 2002 published by IEEM. However, due note and reference has also been made to: DMRB Vol 11 Environmental Assessment – Section 3, Part 4 Ecology and Nature Conservation and GOMMMS specifically Section 4.10 'The Biodiversity sub-objective'.

Survey methodology complies with that published in the Guidelines for Baseline Ecological Assessment, 1995 published by the Institute of Environmental Assessment (now the Institute of Environmental Management and Assessment). In the first instance, a desk study and an extended Phase 1 survey, based on the methodology outlined by the Nature Conservancy Council in A Handbook for Phase 1 Habitat Survey, 1990 was carried out. Further species-specific survey work was subsequently carried out.

8.2.7.2 Key Features

Worksheet B1 provides a summary of baseline ecological conditions including designated sites, habitats of interest and protected species.

No national or international nature conservation designations are in place along the proposed tram route. However, within the 2km corridor of the proposed tram route there are two national designated areas, Castle Rock SSSI and Calton Hill SSSI.

Non-statutory designated areas along the route include Roseburn Railway Urban Wildlife Site (UWS), Water of Leith UWS, Gogar Burn Site of Interest for Nature Conservation (SINC) and UWS. In addition, Carrick Knowe Golf Course is a Neighbourhood Nature Area (NNA).

Through consultation with various consultees including the Lothian Wildlife Information Centre, a total of eight notable flora species were identified in the 2km wide route corridor. However, of these species none are encountered along the actual route of the tram.

Protected mammal species known to be present within the route study area include badgers, bats and otters.