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EDINBURGH TRAM NETWORK

# Preliminary Financial Case - Update: Line One

September 2004



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tie Limited

Line One Preliminary Financial Case - Update

September 2004

**Document Status**

This document has been prepared at the request of the Private Bills Unit to provide the Committee of MSPs considering the Bill for Tram Line One with an updated position relative to the equivalent version submitted in December 2003.

This document should be regarded as a working draft document as significant aspects of the business case are subject to continuing work and will be further developed in the Outline Business Case anticipated in summer 2005. This will be followed by a Formal Business Case in 2006 prior to financial commitment, all subject to the Bill receiving Royal Assent

Prepared by tie Limited and Grant Thornton on behalf of  
the City of Edinburgh Council

# Contents

<b>1</b>	<b>Executive Summary</b>	<b>8</b>
1.1	Introduction	8
1.2	Risks	10
1.3	Key Procurement Issues	10
1.4	Programme Risk	11
1.5	Service Integration	12
1.6	Results of Financial Model	12
<b>2</b>	<b>Introduction and Background</b>	<b>16</b>
2.1	Introduction	16
2.2	Description of tie/City of Edinburgh Council Relationship	16
2.3	Outline of Previous Work	16
2.4	Description of Project Development	18
2.5	Summary of tie Advisors roles and functions and Working Groups	19
2.6	Summary	20
<b>3</b>	<b>The Need for Tram</b>	<b>21</b>
3.1	Tram in Edinburgh	21
3.2	Development of the Current Tram Proposals for Line One	27
3.3	Parliamentary Process	28
3.4	The Justification for Tram: The Structure Plan	29
3.5	Overall Policy Context	31
3.6	National Policy	31
3.7	Development Plan	31
3.8	Regional and Local Transport Policy	32

3.9	Specific Tram Benefits	33
3.10	North Edinburgh	36
3.11	Population of North Edinburgh	37
3.12	Transport Problems in North Edinburgh	37
3.13	Why not other public transport modes instead of tram?	37
3.14	Conclusions	39
<b>4</b>	<b>Summary of STAG Appraisal</b>	<b>41</b>
4.1	Introduction	41
4.2	STAG 2	41
4.3	Scheme Description	41
4.4	STAG Appraisal	42
4.5	Cost to Government	43
<b>5</b>	<b>Risk</b>	<b>44</b>
5.1	Introduction	44
5.2	Approach to the Identification and Mitigation of Risk	48
5.3	Key Risks	51
5.4	HM Treasury Green Book	55
5.5	Conclusions	56
<b>6</b>	<b>Procurement Options</b>	<b>58</b>
6.1	Procurement Issues	58
6.2	Evaluation Features	59
6.3	Operator	60
6.4	Infrastructure	66
6.5	Information Exchange with the Council and SE	72
6.6	Conclusions	73

<b>7</b>	<b>Funding Options</b>	<b>74</b>
7.1	Assessment of Public and Private Funding Options	74
7.2	Funding Sources	75
7.3	Additional Considerations	78
7.4	Value for Money Analysis	80
7.5	Funding Strategy	82
7.6	Conclusions	85
<b>8</b>	<b>Cost &amp; Revenue Development</b>	<b>86</b>
8.1	Capital and Operating Costs	86
8.2	Methodology used by Technical Advisors to project Farebox Revenue	87
8.3	Value Engineering and Cost Optimisation	90
<b>9</b>	<b>Financial Model Assumptions</b>	<b>92</b>
9.1	Summary of Assumptions in Financial Model	92
9.2	Model Inflows and Outflows	93
9.3	Taxation treatment in financial models	94
<b>10</b>	<b>Financial Model Output</b>	<b>97</b>
10.1	Introduction	97
10.2	Funding Model	97
10.3	NPV Analysis	99
10.4	Sensitivity Analysis	100
10.5	Sources and Applications of Funding and Affordability	100

## Glossary

CEKT	Central Edinburgh Rapid Transport
CETM	Central Edinburgh Traffic Management
CSTM	Central Scotland Transport Model
DBM	Design Build and Maintain
DBOM	Design Build Operate and Maintain
DTI	Department for Transport
DPOF	Development Partnering and Operating Franchise
EIB	European Investment Bank
GDP	Gross Domestic Product
IRR	Internal Rate of Return
Infracore	Infrastructure and Equipment Company
ITI	Integrated Transport Initiative
KPI	Key Performance Indicator
LB	Lothian Buses
LEI	Local Economic Impact
LIBOR	London Interbank Offered Rate
LRT	Light Rapid Transit
LUTI	Land-use/ Transport interaction
MAWG	Modelling Appraisal and Working Group
MLA	Minimum Liquid Asset
NAO	National Audit Office
NPV	Net Present Value

Edinburgh Tram Line One - 2004 Preliminary Financial Case - Update  
September 2004

OBC	Outline Business Case
OHLE	Overhead Line Electrification
OJEU	Official Journal of the European Union
OPEX	Operating Expenditure
PII	Private Finance Initiative
P&M	Plant & Machinery
PPP	Public Private Partnerships
PUK	Partnerships UK
RPI	Retail Price Index
SE	Scottish Executive
SEEL	Scottish Enterprise Edinburgh and Lothian
SEERAD	Scottish Executive Environment and Rural Affairs Department
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
SPC	Special Purpose Company
STAG	Scottish Transport Appraisal Guidance
the Council	City of Edinburgh Council
tie	tie Limited
TRAM	Traffic Restraint Analysis Model
TUBA	Transport User Benefit Appraisal
VAI	Vision Achievement Incentive
VAT	Value Added Tax
VFM	Value for Money
VTM	Variable Trip Matrix
WEL	Waterfront Edinburgh Limited

# 1 Executive Summary

## 1.1 Introduction

The purpose of this updated version of the Preliminary Financial Case is to report on progress that has been made, since the submission of the Preliminary Financial Case in December 2003, in the development of options to procure and finance Line One of the proposed Edinburgh Tram Network. This document incorporates and updates the information in the December 2003 version. Future actions described in this document reflect the need to set out a forward plan of action and do not imply any presumption about Parliament's wishes.

tie is progressing the technical and financial analysis of Lines One, Two and Three of the proposed Edinburgh Tram Network on behalf of the City of Edinburgh Council (the Council). It should be noted that this is not an application for funding support from the Scottish Executive (SE) at this stage. No contractual commitment to the construction of the tram line has yet been made. Further development work is required to finalise the technical solution for the Line and consequently the revenue and cost assumptions which have been factored into the financial model contained within this Preliminary Financial Case. A formal application for SE funding support will be submitted prior to the commencement of the tendering process for the contract to install the infrastructure for the Line in the form of an Outline Business Case (OBC). The present estimate of the timescale for this is summer 2005.

It should also be noted that this document is a financial analysis of the project. The Scottish Transport Appraisal Guidance (STAG 2) analysis is contained within a separate document prepared by Mott MacDonald. This Preliminary Financial Case has been informed by the work undertaken by Mott MacDonald in preparing an updated version of the STAG 2 document.

This document also describes:

- the need for a tram system in Edinburgh;
- the basis for the selected procurement approach;
- tie's proactive approach to transport service integration;
- the extensive and rigorous project risk management procedures in place (including those mitigating cost creep); and
- the impact of alternative financial structures.

tie has also assessed the National Audit Office (NAO) report into light rail schemes and Audit Scotland's recently reported findings in relation to Holyrood and believes that the principal recommendations have been embedded in the procurement and project management approach to the tram project.



### Description of the Line One Project

The proposed Edinburgh Tram Network is a primary component of the Council's Local Transport Strategy, contributing to the easing of congestion, improved transport links to support economic development and social policy objectives.

The preferred corridor is the "loop" project that includes a connecting line between Leith and Granton creating a circular network linking with the City Centre, Princes Street and Haymarket. The proposal includes significant street running along Princes Street and Leith Walk, together with a former railway alignment between the City Centre and Granton, and a new alignment along the riverside section. The proposal is for a double track tramway featuring extensive priorities along the route.

The Line will pass the new bus station adjacent to St Andrew Square as well as a number of other potential development sites in the northern area.

The overall route length is 15.5km with stops at 22 locations. Stop spacing varies along the route with an average spacing of around 700m outside the City Centre.

The demand for the tram has been derived through a detailed modelling process. This has forecast the patronage to be 9.41 million in 2011, rising to 12.97 million by 2026.

The revenues and the capital, lifecycle and operating costs have been developed through a rigorous process and benchmarked by the technical consultants between Lines One and Two and against other UK projects. These will be subject to further refinement prior to financial commitment.

### Summary of Costs and Revenues

Description		Line One (£)*
Capital Costs	Base Cost	219,320,000
	Contingency	23,730,000
<b>Specified Capital Cost</b>		<b>243,050,000</b>
	Optimism Bias	31,100,000
	<b>Total</b>	<b>274,150,000</b>
<b>Lifecycle Costs</b>	Total	<b>44,624,636</b>
<b>Operating Costs</b>	Per Annum	<b>6,287,000</b>
<b>Revenue</b>	2011	<b>6,567,434</b>
	2026	<b>9,564,397</b>

\*All prices at Q2 2003, undiscounted

The capital and lifecycle costs quoted above, with the exception of the Optimism Bias are derived from the STAG 2 analysis conducted by Mott MacDonald. The treatment of Optimism Bias is addressed in section 5.4.

The configuration of the Line is essentially the same as that identified in the Waterfront Feasibility Study in 2001 and the T1 Preliminary Business Case submitted in September 2002.

The benefits of the project against the Planning Objectives are set out in the STAG2 document. Line One will improve accessibility to employment, education, shopping and leisure destinations, particularly for the socially deprived, including those without access to a car. To the extent to which the scheme provides changes in modal share, it will contribute to sustainable travel and less congestion (more public transport trips and less car trips). The electric trams will not produce exhaust emissions.

The tram system will provide a safe and secure means for travel as well as a safe local environment.

The tram will provide social benefits in terms of enhanced liveability on streets and accessibility to mobility-impaired and deprived groups in the population.

### **1.2 Risks**

tie has adopted a rigorous approach to risk management. This has identified a comprehensive package of risks surrounding the development of the project and has resulted in a comprehensive mitigation strategy. The risk documentation is subject to regular Board review and updating in order to manage proactively the identified risks. This document sets out in detail at Section 5 how risk is being managed.

An incremental Optimism Bias factor of 14.2%, over and above the defined contingency as specified by tie's consultants, has been applied to base capital costs and 10% to works duration using HM Treasury methodology in examining the funding options. The Optimism Bias factors have reduced since the submission of the Preliminary Financial Case in December 2003 due to a number of factors that have changed in the intervening period. The revised lower factor now represents an increase to the Specified Capital Costs of £31 million and a prolongation of the construction period by 4 months compared to the base case provided by tie's technical advisors. The contingency costs advised to tie by their technical advisors are based on their detailed evaluation of the underlying costs and the remaining project risk. tie operate rigorous risk management procedures, which have supported the development of the project scope and costs. For the purposes of the assessment of the required funding the costs do not include the Optimism Bias element which is designed to accommodate more general contingent risk based on non-project specific factors.

### **1.3 Key Procurement Issues**

A decision was taken in early 2003 on risk management grounds to separate the operator and system procurement processes. tie has appointed Transdev under the terms of the DPOF Agreement, to work in partnership on the development of the system which formally commenced on 28 June 2004. For reasons which are fully explained in this document, the current proposal is that the system procurement model adopted will focus on an Infrastructure and Integrator Consortium Option with separate but interfaced procurements of the system infrastructure and tram vehicles, ultimately leading to novation of the vehicle contract into a single consortium responsible for all elements of infrastructure. This is a complex issue which will be subject to further evaluation.

Given the level of uncertainties at this stage about costs and available funding on a project of this complexity and scale, tie is recommending the adoption of a phased approach to the procurement, construction and operation of the tram system. Prior to the formal tendering for the system, there is a need to define the configuration of the first phase ("Phase 1") of the system, bearing in mind the development of the Line Two proposals and overall network and affordability matters. The preferred procurement option facilitates such an approach as follows:

- planning for anticipated initial packages of detailed design and advance works (principally land acquisition and utility diversion works);
- Phase 1 configuration within affordability limits;
- the procurement of the tram vehicles incorporating an option on sufficient vehicles to serve the full system, but structured to allow for sequential purchase in line with the requirements of each phase; and
- the main infrastructure contract procurement scope covering the entire system.

The main infrastructure contract procurement scope will be structured to require:

- a firm, fixed price bid, potentially privately financed, for Phase 1;
- a detailed breakdown of all cost inputs to the bid so as to provide indicative pricing which would be used to build up a fixed price bid for subsequent phases on an open book/partnering basis in line with available funds; and
- a firm, fixed price bid, potentially privately financed, for Phase 2 and any subsequent phases.

The approach facilitates the option of retaining the same infrastructure provider through the subsequent phases on the basis of the initial procurement (subject to continuing affordability and VFM) which assists system integration. The approach also achieves a number of other objectives, notably:

- ensures that affordability is achieved and minimises initial capital investment;
- creates a partnering approach to construction procurement over subsequent phases, rather than an "all or nothing" contract for a single project; and
- mitigates the risk that procurement is implemented and unaffordable tenders are received (a problem common to most other UK system procurements) requiring the tendered system scope to be retrospectively curtailed.

This represents tie's recommended approach based on information available now and which is assessed to be reliable. A number of key factors are undergoing further refinement, as described below. This process will continue through to formal tendering and financial close.

It is currently anticipated that the final procurement model will result in substantially all construction risk being transferred to the private sector and that revenue risk will be substantially retained by the public sector parties to the contractual arrangements. These criteria will be refined as procurement negotiations proceed.

#### **1.4 Programme Risk**

The project timetable continues to be driven toward an operational system in 2009, in line with the Council's published programme. The optimum risk management approach would involve expenditure prior to the date for Royal Assent to this Bill (anticipated end December 2005) and this is a critical matter requiring further analysis and detailed discussion with the SE. It is necessary to adopt this form of planning assumption in order to define properly the programme,

but it is not intended to imply any presumption about Parliament's wishes. In the event that such expenditure is facilitated, the risk of abortive cost will be fully appraised before actual spending is committed; in the event that no, or only limited, such expenditure may be financed prior to Royal Assent, the implications for programme will require to be evaluated.

### 1.5 Service Integration

Effective integration is key to patronage stability and growth as well as to delivery of wider social policy aspirations. Uniquely in the UK, tie has instigated a programme of involvement of the tram operator and bus companies and will develop in due course a similar dialogue with other transport operators.

The main bus operator in the Edinburgh bus market is Lothian Buses plc (LB), owned by the Council (91%), which delivers approximately 80% of bus services in the City, with the balance primarily serviced by First Group. This market structure offers an exceptional opportunity to achieve effective integration, subject always to full compliance with competition law. tie has established a detailed process to maximise this opportunity for the benefit of customers, including:

- in the period to March 2004, tie worked with the Council and LB to design a framework for achieving sustainable integration of LB services with those of the tram;
- the process of selecting the tram operator had a specific requirement that the aspiring operators demonstrate that they would be able to deliver effective integration. Transdev have now accepted this obligation;
- Transdev have noted and agreed with the objectives and direction of the framework developed with the Council and LB; detailed dialogue is now underway;
- a holding company wholly-owned by the Council -- Transport Edinburgh Limited (TEL) -- has been incorporated to oversee and drive progress;
- a joint-venture financial framework involving Transdev and LB will be developed to provide balanced financial incentives for the main integration parties; and
- a draft action plan governing the next stages of the integration dialogue is targeted for commencement in September 2004, including effective integration with other operators.

The Office of Fair Trading has been notified of the proposed approach.

### 1.6 Results of Financial Model

It is considered that the optimum procurement and funding structure will involve the establishment of a separate private sector owned entity to construct and maintain the infrastructure and equipment (Infraco), with another private sector entity acting as Operator. For planning purposes, the project is assumed to have a 30 year operational life post construction, however, the equipment is anticipated to have a residual life beyond this period the value of which will be reflected in the initial and subsequent Infraco contracts.

tie will continue to work with its public sector stakeholders and private sector partners to design the optimum procurement and funding approach for the infrastructure and equipment during the period in which Parliament considers the Private Bill and subsequently, if Royal Assent is given, through to conclusion of contractual negotiations. The proposals embodied in this Preliminary Financial Case represent the current best estimate of the outcome of that process.

The financial projections have been developed with extensive input from experienced advisors:

- capital costs have been prepared by tie's technical advisors; Lines One and Two have been benchmarked against each other and the system has been benchmarked against other systems' actual costs. Apart from the downwards adjustment to Optimism Bias the capital costs reflected in this Preliminary Financial Case are largely the same as those in the December 2003 version, since no material matters have come to light since December 2003 which would cause them to require change. They represent a substantial increase over the original feasibility estimates which were developed in detail in 2001;
- revenue projections are based on patronage numbers drawn from a public transport model, which although complex has been independently assessed as fit for purpose; and
- operating costs are now based on the costs estimated by Transdev in developing the DPOF Agreement, and supersede those initially estimated by the technical advisors.

Accordingly, the financial projections and risk assessments are as firmly based as is possible at this stage in the procurement process.

In assessing affordability, two key assumptions have been made:

1. that there will be no indexation or further SE funding than the £375m grant which was conditionally proposed by the SE in March 2003; and
2. that the system must have a reasonable expectation of making an operating cash flow surplus over its life, avoiding the need for future subsidy from public sector sources.

At this stage of the project's development, certain variables are subject to refinement and change. On the operational and expenditure side these include:

- capital cost estimates – which will be developed further through detailed design work, advice from Transdev and then market-tested through the formal procurement process; and
- patronage and revenue projections – which will evolve to optimise the system performance with input from Transdev and most critically from the establishment of service integration plans.

On the funding side the issues under evaluation include cash flow from property development gains, developer contributions and additional commercial income that can be driven from the trams' operations.

tie has appraised these key issues and assessed the funding which has reasonable visibility and can be delivered for the scheme. This has been done both for the individual lines and for a network of Lines One and Two. In the context of this document, which is prepared in support of Line One, it is tie's conclusion that:

- a. there is a reasonable basis for taking forward the procurement of Line One as a standalone project, given the funding which is reasonably visible;
- b. when a network of Lines One and Two is assessed, it becomes more difficult to be fully confident about the adequacy of available funding and accordingly there is a need for further detailed evaluation of the system scope, including the basis for extending Line Two beyond the Airport in the initial Phase 1 system construction, in these circumstances, a clearer view of the economic development assumptions in the

Newbridge area would be valuable and the work required to develop a robust business case for the extension to Newbridge should continue; and

- c. the procurement of the system should be continued according to the programme timetable which will deliver an operating system in 2009. The procurement should be executed on a phased basis which ensures the construction always remains within funding which can be regarded as reasonably assured.

The models illustrate three options for consideration by the Council and SE as ways in which to fund Line One. Their impact can be illustrated by way of a Net Present Value analysis which is set out in Section 10. The principal reason for the differential between the NPV's is driven by the timing of the cashflows in the respective models.

- an Up-front Grant funding route would offer the lowest NPV, but this route does require significant resources to be available from public funds during the construction period, 2006 to 2009;
- a Full PFI solution requires greater cash but spreads the burden over the contract period and subject to analysis would probably offer a better risk transfer solution to the public sector; and
- a Partial PFI/Hybrid option can be put forward to balance the available public sector funding support with the consequent implications for the NPV. Risk transfer under the Hybrid should be broadly similar to that achieved under a Full PFI.

An analysis has been undertaken of a number of sources of funding for the project, essentially the infrastructure contract, both public and private. Discussions have also been held with potential funders regarding the parameters of the funding for the infrastructure and equipment contract which would be acceptable. A commercial funding solution would utilise a mix of equity and commercial debt funding through a PFI/PPP style contract. A bond solution may be more effective but this will largely be dependent on rates pertaining at the time of financial close and will be a decision for the infrastructure and equipment provider.

The format and timing of public sector funding input to the project therefore remains under consideration. It is likely to prove financially attractive to lease the tram vehicles and possibly elements of the infrastructure, which will defer the cash flow. This is a complex matter, including taxation advantages for both the project and its financial partners and has not been assessed in detail at this point. The current financial appraisals do not involve leasing options and in this regard tie have modelled the conservative case for the vehicle procurement.

The estimates supporting the assessment of affordability reflect the "grant-funded" case whereby the majority of public sector funding is provided during construction. This does not specifically take account of the requirement to finance the excess capital cost above the grant support in a scenario where a network of Lines One and Two is to be constructed. There are a number of variables to take account of in such a calculation -- the extent and debt service cost of funding for land acquisition and utility diversion; the value of leasing arrangements; the timing of cash inflows from operations; and more fundamentally whether a PFI model would be deployed -- accordingly, this feature can only meaningfully be assessed when the precise funding route is better developed. This matter is under evaluation and will be concluded upon in the OBC.

This document does not therefore conclude on the preferred funding structure, but recommends that this be the subject of further detailed analysis with the SE, taking account of the recently published HM Treasury guidance on deployment of PFI in major capital projects.

It will also be necessary for the SE and the Council to agree on the relative balance of financial risk and underwriting. In summary, the assumptions in the financial models are:

- the SE will be committing to provide either a sum up to £375m in capital funding or a stream of availability payments, which will be passed through the Council to the design, construction and implementation partners;
- further dialogue will be required on funding the early stage capital expenditure above that supported by the grant drawdown if a network is to be constructed; and
- the Council will require to underwrite the contractual payments to the operator. This is assumed to be financed out of operational tram revenues, net of operating costs but augmented by other third party sources of income related to the tram's operations such as property gains and advertising income. In addition, the Council will require to meet lifecycle replenishment capital costs out of operational revenues.

Further discussion on these arrangements will take place between the Council and the SE.

Taking Line One in isolation from any wider network consideration, the SE has proposed a funding contribution to progress the project. However, t1e is progressing concurrently Lines One and Two and as a consequence the available SE funding has to be allocated between these. This has been done on the split of the base capital costs for each line, with Line One including the costs of the shared section. Excluding the impact of Optimism Bias, over and above the priced contingency, this would result in a funding requirement in addition to the proposed SE Grant of £33 million in 2003 prices based on the Up-Front Grant funded solution. Additional sources of funding are being pursued by t1e as set out in Section 7 of this document. The Line is projected to achieve an operating surplus over the modelled project life, and t1e is pursuing funding from property development and commercial income. In addition, the means of improving revenues through marketing activity are under examination. Revenues and costs will be refined during the DPOF process and the infrastructure contract definition and t1e will be seeking to maximise the benefits arising from revenues and commercial income sources while minimising cost creep. The OBC seeking formal funding support will identify the totality of the funding requirement for the Line and how this is to be satisfied.

## 2 Introduction and Background

### 2.1 Introduction

The Edinburgh Tram project has been under development in different forms for a number of years. The background chronology is described in this section while the underlying rationale for the project is detailed in Section 3.

### 2.2 Description of tie/City of Edinburgh Council Relationship

The Council established tie as a wholly-owned company with the role of project procurement and implementation. tie was set up in 2002 with its own staff and a majority of private sector Board members and the remit to develop the Integrated Transport Initiative (ITI) and to take forward the development of the three tram line projects. The Council retains the transport strategy function and once agreed projects move to the detailed development and procurement stage, tie takes responsibility for these. tie and the Council have set up a liaison structure to discuss and monitor progress on projects.

### 2.3 Outline of Previous Work

Line One was originally proposed by Waterfront Edinburgh Limited (WEL) as a rapid transport project to link the Waterfront development area with the City Centre. WEL, together with a number of other interested parties (both public and private sector), commissioned a feasibility study to assess the viability of the project. A team led by the Andersen Infrastructure group (which subsequently transferred to Grant Thornton), Mott MacDonald and Steer Davies Gleave undertook this commission.

The remit for that report was to consider the feasibility of a rapid transport project linking the Waterfront development site in North Edinburgh and the City Centre with a view to submitting a bid for Preparation Pool support from the SE Public Transport Fund. Following discussions with Forth Ports plc, the remit expanded to consider the feasibility of a North Edinburgh Loop. WEL formed a Steering Group which included representatives of Scottish Enterprise Edinburgh and Lothians (SEEL), Telford College, Scottish Gas, local businesses and the Council to oversee progress of the study. The report identified that, having regard to STAG 1 appraisal criteria, a feasible project existed which met the objectives of the Steering Group and the Local Transport Strategy. The report identified the costs involved in taking such a project through the STAG 2 appraisal process.

A number of route options were considered in evaluating the delivery of an optimum project. It became apparent that the best-fit route alignment should utilise the former railway corridor running from Crewe Toll to Roseburn. This offered segregated running for a significant element of the project and avoided many of the "pinch points" which exist in the North Edinburgh area.



Three options were considered:

- an alignment from Granton Square, through the Waterfront site and then via the disused railway line to Haymarket station;
- a continuation of the first option on-street to St Andrew Square; and
- a North Edinburgh Loop from Granton Square to Haymarket and then St Andrew Square, to Leith via Leith Walk and on to Ocean Terminal then along the foreshore to Granton Square.

The Steering Group and the advisory team reviewed the available vehicle technologies; the outcome of the analysis reduced the viable options to a Guided Bus or Light Rail vehicle. It was clear from the consultation process undertaken as part of the feasibility study that a Guided Bus was not perceived as being capable of achieving the modal shift from cars that could be achieved by a light rail project. A Guided Bus solution was also regarded as offering segregation for only a limited element of the route. For the majority of the route length such an option would effectively be no different to the standard bus services operating in the City. The Steering Group felt that this option, whilst worthy of examination in terms of the patronage and cost implications, did not fit with either its objectives nor those of the Council as expressed in the Local Transport Strategy. Having undertaken the patronage and cost analysis a guided bus option for the Loop made only a small surplus at the operating level and it was therefore not a recommendation of the report that such a project be pursued, notwithstanding the cheaper capital cost.

For the light rail solution, patronage and cost analysis ruled out the Haymarket-only link. The St Andrews Square option did cover its operating costs from revenue, albeit marginally. However, the most attractive option from a financial and cost benefit perspective was the Loop project.

The preferred light rail option, the Loop project, was subjected to a STAG 1 appraisal. The appraisal demonstrated that the Loop project fitted well with each of the Government's five appraisal criteria and contributed to meeting the objectives of the Edinburgh Local Transport Strategy. The project was ranked second in the project appraisal conducted for the Local Transport Strategy; the top-ranked project being an Edinburgh wide Light Rail System.

The Steering Group considered that the Preferred Option identified in the report offered the City of Edinburgh an excellent opportunity to enhance the prospects of effective economic regeneration of the North of the City through development of an integrated, rapid transport solution. The project fitted the objectives of the Local Transport Strategy and offered the potential to create an integrated transport network for the City. A Light Rail Project operating on the Loop also secured positive endorsement from the consultation process.

The conclusion of the STAG 1 Appraisal and Feasibility Study was that a project which formed what became known as the North Edinburgh Loop was the most viable and economically attractive option. The Feasibility Study was submitted to the Council in July 2001, and formed the principal element of the City's application to the Scottish Executive for development funding support in August of that year. Support to develop Line One was granted by the Scottish Executive and tie was given the role of taking the project forward.

The principal benefits of a tram system over other modes were seen as:

- a greater capacity than buses -- up to 300 passengers per vehicle;
- a greater effect on persuading people to use public transport -- research from the Croydon Tramlink indicated a 'modal shift' of 18%;
- reliability and speed;
- a greater benefit to the environment in terms of emissions and noise; and
- greater accessibility for mobility-impaired people.

#### **2.4 Description of Project Development**

Grant Thornton were appointed in October 2002 to advise on the Preliminary Financial Cases for Lines One and Two and reflect the latest market information available to the technical advisors. A number of workstreams have been undertaken to develop the Preliminary Financial Case.

Grant Thornton were appointed by tie with the following remit:

- (1) to develop a robust Preliminary Financial Case in respect of Tram Lines One and Two (North and West Edinburgh);
- (2) develop and support tie/the Council in the Parliamentary Submission of the Private Bills for the two tram projects; and
- (3) support the Council during the Parliamentary Inquiry.

The purpose of this updated Preliminary Financial Case, is to examine the following:

- (1) the risks inherent in the project and to identify with tie how to mitigate these risks;
- (2) to identify a means by which to procure the project which offers the optimum solution and mitigate the risks and pitfalls of other procurement exercises;
- (3) the costs and revenue projections for the Line as prepared by tie's technical advisors within the financial model for the project; and
- (4) to consider the optimal funding structure based upon the analysis conducted above.

A key element has been to work with tie, Transdev and the technical advisors for both Lines One and Two to ensure robustness of revenue and costs across the two lines. The objective here has been to ensure that all relevant revenues, capital and operating costs are included and that they are constructed on a similar basis. The costs contained within the financial models informing the Preliminary Financial Case have been subjected to cross-checking by tie, Transdev and the technical teams. Changes in costs since the original concept studies were developed have been identified and a rationale established for these movements by the technical teams. Similarly cost changes during the development of the project have been fully analysed and documented.

A second key workstream has been to analyse the impact of risk on the project. The resource and analysis to identify and mitigate risk has steadily increased as the project has progressed along its development lifecycle. Early workshops resulting in risk identification and mitigation strategies have been augmented by tie's ongoing risk management process and the appointment of a dedicated Risk Manager. There has also been considerable discussion, including with the SE, around the methodology with which to apply the latest version of HM Treasury Green Book guidance. An agreed basis for the application of this guidance has been established for the purposes of the Preliminary Financial Case. This will be kept under review and revisited in the OBC. Risk and the Green Book Optimism Bias treatment are considered in Section 5 below.

Analysis of the optimum procurement route for the Edinburgh tram network has also been undertaken in conjunction with representatives of tie, DLA, Mott MacDonald, Faber Maunsell and Partnerships UK. Due to the difficulties experienced on many other projects in the UK it was regarded as appropriate to consider alternative procurement models which would better achieve the objectives of tie, the Council and the SE. This involved an analysis of the issues which have arisen on other projects and the procurement structures utilised, focussing particularly on risk assessment and an assessment of market appetite for risk transfer. A list of key criteria were agreed for the tram network and a number of procurement options were scored against these criteria. The outcome of this analysis is set out in Section 6 below.

Following on from the work of the Procurement Group an analysis was undertaken of the potential funding options by Grant Thornton. It is recognised that a potential mix of public and private sources of funding may be required to deliver the project. The funding options considered are set out in Section 7 below. Sections 8 to 10 reflect the current status of the project financial evaluation.

## **2.5 Summary of tie Advisors roles and functions and Working Groups**

In order to develop the STAG 2 analysis and the Preliminary Financial Case tie has established its own internal project management team and an advisory group working on a number of key elements of the project. The advisory team is as follows:

Technical and Environmental	Mott MacDonald, supported by Babbie, Steer Davies Gleave, Brian Hannaby & Associates, Gillespies, ERM, Terra Quest and McLean Hazel
Financial	Grant Thornton
Operator Advice	Transdev
Transport Modelling	MVA and DSC
Legal	DLA, Bircham Dyson Bell and Dundas & Wilson
Procurement and PFI	Partnerships UK
PR & Communications	Weber Shandwick

tie has also established a number of coordinated groups to manage the process of development of the Tram Lines.

Representatives of tie and relevant advisors sit on these groups and they report monthly, ultimately to the tie Board and the Council. The following sub-groups have been established:

- **Environment and Design** - To ensure a common approach to the overall environmental appraisal and to provide a forum to resolve individual critical environmental issues;
- **Health & Safety** - To ensure that all related aspects of safety are co-ordinated between tie, the Council and the technical advisors;
- **Planning** - To ensure a consistent approach to planning and urban design issues and identify and address the policy context and all material considerations for the Edinburgh Tram in full consultation with the Planning Authority. To identify and address the implications of the tram route on private property interests;
- **Procurement** - To ensure the development of a procurement strategy which enables the Tram Lines to achieve royal assent and be procured in the shortest possible time, with the minimum risk to successful operation;
- **Public Relations & Communications** - To ensure a consistent approach to the management of all PR and Communications;
- **Risk** - To ensure alignment of, and a consistent approach to, the management of risk.
- **Third Party Consultation** - To ensure a consistent approach and where necessary the development of an appropriate strategy for dealing with third party interests, which could have a significant impact on the Tram Lines;
- **Traffic Management & Streetscape** - To ensure a consistent approach to traffic and streetscape issues, including orders, particularly in the light of other developments (e.g. Central Edinburgh Traffic Management (CETM)) and to ensure a co-ordinated and sustained liaison with the Council; and
- **Transport, Modelling and Appraisal** - To ensure a common approach to transport modelling and appraisal based on existing information. To ensure a common and practical strategy and implementation of the updating and enhancement of relevant traffic models.

## 2.6 Summary

The development of the Preliminary Financial Case reflects the considerable work done over a number of years to define the project. It identifies the issues and risks which have affected the deliverability of other light rail projects in the UK and ways in which these can be mitigated in the delivery of this project. This has been achieved through a cohesive team approach which has led to an innovative procurement structure which tie and its advisors believe will assist in the delivery of the project.

The sections which follow set out the recent evolution of key areas - Risk Management, Procurement Strategy and Funding Options. The concluding sections set out the current status of the overall financial evaluation.

## 3 The Need for Tram

### 3.1 Tram in Edinburgh

#### 3.1.1 The Need for Tram

A tram system is seen as essential for Scotland's Capital for many reasons. It will enable new development and continued growth of existing development in a sustainable way. Without it, growing traffic congestion and lack of access to development sites will curb future growth and threaten the economic prosperity of the City. Only by permitting continued development will we support the City's economy and help it expand further which is not only good for Edinburgh, but for the region and the country. Tram provides a high quality, high capacity, frequent, reliable and fast public transport system that has environmental benefits over traditional public transport modes. Combine these facts with its positive image with the public and this adds up to the tram having the ability to be an attractive alternative to the private car and to be an effective quality public transport system which can facilitate economic growth in Edinburgh and the wider region. Finally tram currently enjoys a relatively high level of political support thus the funding case for such proposals is strengthened. If tie and the Council want to achieve a step change in travel behaviour that is the key to being able to sustain new development and thus meet the objectives of the Edinburgh and the Lothians Structure Plan they must provide a step change in public transport provision. A tram system can achieve this.

#### 3.1.2 The Modern Tram System

A twenty-first century tram bears little resemblance to its Victorian antecedent. Today's tram provides the ambience and comfort of a modern well-designed train with the ability to run on road as well as off road. Their benefits include their capacity, speed, regularity, reliability, flexibility, safety, comfort, accessibility as well as environmental benefits. A modern tram system is designed from the outset to be aesthetically pleasing, both outside and in, giving a positive image to a City and a positive image of public transport. This design concept often involves a "wall-to-wall" element to ensure the tram is fully integrated into the urban fabric by including major public realm works as part of the provision of the transport system.

Five new tram systems have been built in the UK in the last twelve years, with even more rapid developments in France and the USA. Tramways offer a relatively fast and reliable service providing the comfort of a high quality modern transport system, but with much more versatility than trains. Trams can negotiate sharper curves and steeper gradients and can accelerate and stop much faster. They can run on fully segregated alignments (including former railways), in the median of roads, in conventional streets and in pedestrianised areas. In paved areas the rails are laid flush with the road surface, eliminating potential severance problems as could be created by

the physical barriers introduced with some alternative transport options such as guided bus. These act to cause severance by stopping people crossing the route and hence reduce local accessibility and amenity in accessing facilities and services on opposite sides of the route. Tramways require a track along the whole of the route and all but a very few systems are electrified using a single overhead wire to supply traction current to the tram. This means that the tram creates no pollution at the point of use and noise levels are low, the motors being virtually silent.

The tram has the ability to carry large numbers of people through its vehicle capacity combined with the frequency of service provided. This leads to a "turn up and go" ability with tram that does not tend to exist with train and at the same time provides a higher quality service, and the perception of a higher quality service, than that of a traditional bus. Thus a far greater flexibility and quality is offered to the travelling public.

### **3.1.3 History of Tram in Edinburgh**

Edinburgh operated a tram system in the early part of the 20<sup>th</sup> century. Prior to this however a cable car network operated. This was operated by a cable running along the centre of the two tracks, that pulled the vehicle from a central point. This cable car operation became the basis for Edinburgh's early tram system as electric traction was added to the original network and the cable car vehicles were remodelled to become tramcars.

The tram system started operating in Edinburgh on 21 June 1922. This network comprised 28 routes covering 47.25 miles across the City. It connected the City centre with Granton; Leith; Corstorphine; Cornely Bank; Stanhouse; Slateford; Colinton; Fairmilehead; Liberton; Portobello; Joppa and Musselburgh. The tram network across the City therefore was extensive. The penetration it achieved meant the opening up of the suburban areas of Edinburgh making them directly accessible from the centre as well as other areas of the City. The trams were single unit doubledeck cars and were serviced by any one of the City's 5 tram depots, of which Leith was the biggest with the ability to accommodate 146 cars. The trams were decommissioned in phases from December 1952 to November 1956.

This original tram system operated at a time when travel habits and needs were fundamentally different from those of today. The majority of those travelling on the early tram system would not be car owners or have access to a car, their trips would be primarily local trips and the main trip pattern was of short distance, frequently made journeys. For instance, the culture of the 1920s and 30s was one where a worker would often travel home at lunchtime for the midday meal and then return to work in the afternoon. The requirements and objectives of this early tram system were quite different from the requirements and objectives for this proposal for tram in Edinburgh.

The tram was decommissioned in Edinburgh for exactly the same reason it was removed from many other towns and cities across the country. The level of funding required to modernise it after a lack of investment in the system over the war period was compounded by the fact that the system itself had never been installed as a brand new facility having been remodelled from cable car, meaning major investment was needed. Further to this, over the operating period of tram when the network remained static, Edinburgh had expanded considerably particularly in the inter-war period as well as the years following. This meant tram no longer served the travel needs of the City's population as effectively as it once had and to rectify, again would require significant investment in expanding the network. All these factors were apparent at a time when

the bus was beginning to establish itself as a major travel mode with trams increasingly being seen as causing congestion and perceived as outdated. The cost implications of modernisation of an already remodelled transport system along with the perception that the tram should make way for change, ultimately led to the scrapping of the tram.

### 3.1.4 The Need for Tram Now

Edinburgh currently has a thriving economy with sufficient diversity to see the City not suffer the recent national economic downturn. It is this success which ensures continued growth and with it the demand to intensify development. The main areas of planned new development are in North Edinburgh and the Waterfront, the City centre, the south-east wedge and the west of the City and highlight Edinburgh's perennial problem of how to accommodate growth and expansion whilst situated between greenbelt and the sea. There are three options of how cater to for this:

- a) intensification of development within the City with emphasis on brownfield land;
- b) to encroach into the greenbelt; or
- c) to leapfrog the greenbelt.

If this continuing growth is to be served, development areas must be accessed in a sustainable way as both intensification within the City and development beyond the greenbelt will lead to increases in traffic and congestion in the absence of significant investment in public transport options. Not achieving this will lead to increased congestion and ultimately a downturn in the economy as expansion ceases, new investors opt for other more accessible locations and existing businesses locate elsewhere.

For Edinburgh and its hinterland to continue to thrive, further development must be permitted but without creating additional congestion and the negative impacts this brings with it such as unreliability of access for employees, goods and services to facilitate those developments. Tram has the ability to serve existing and new areas in a sustainable way ensuring accessibility by an efficient and reliable travel mode capable of moving large numbers of people.

Tram in itself however, will not operate to reduce congestion significantly, but will enable further development by preventing the further growth in congestion which would otherwise occur as a result of new or intensification of development. Without such a system, it is unlikely much of the development expansion proposed could be permitted with the ultimate consequence of economic growth being stifled and structure plan objectives not being met. Only through real integration of land use planning and transport policy can further economic growth be achieved in Edinburgh and tram enabling sustainable development will be fundamental to this. The impact of a strong local economy in terms of creating more demand to travel is also borne out by transport and travel statistics.

Recent transport trends, regardless of mode, clearly show an increased demand for travel. This translates to both the desire to make more trips and the trend for longer trips. In 1985/86 Scots drove on average about 5 miles a day per head, in 2000 they drove about 10 miles. At the same

time more people are opting to drive for even relatively short trips – 32% of people who commute less than 1 km to work travel by car or van. These trends ultimately result in more traffic on the road network and increasing congestion in built-up areas. This fact is reinforced by modelling work carried out for the Council through tie. This modelling showed that traffic levels would increase by 39% between 2001 and 2021, and perhaps more significantly, congestion is forecast to nearly triple by 2021.

Following a significant decline in public transport use since the 1960s, the current trend is showing a slow reversal of this. Local bus services carried 445 million passenger journeys across Scotland in 2002-03, up almost 8% since 1998-99. The position in Edinburgh is even more encouraging than the national picture. Patronage on LB has grown from 82 million passengers carried in 1998 to 99 million in 2003 representing an increase of just over 20% in 5 years. The projection for 2004 is to see over 100 million passengers carried (102 million forecast). Whilst these figures are encouraging, when viewed in the context of Edinburgh's rising demand for transport, much remains to be done to reduce the growth in car traffic and associated congestion. Moreover, even good quality bus services like Edinburgh's have a poor record of attracting motorists out of their cars. Forecasts of tram patronage is just over 7 million in year of opening (2009) and nearly doubling to just under 14 million passengers in the 20 year time horizon (2038).

For part of its route, tram will be in direct competition with a number of existing bus routes. The STAG appraisal for tram considered this and predicted the impact Line One is likely to have on existing bus services. This work concluded that most impact will be experienced on Leith Walk where 22 services will be removed, a further 7 services would be removed from Crewe Road and 3 from Inverleith Road. The STAG appraisal however, goes on to conclude that the reduction in bus passenger capacity on these services will be broadly offset by the capacity supplied by Line One, for instance, on Leith Walk the reduction of 1,540 passenger places per hour will be offset by 2,000 per hour provided by the tram.

This contrasts with trams, which have an increased ability to attract passengers from their private cars. A survey carried out in 14 European cities researching the effectiveness of light rail on modal split, showed that on average 11% of the new passengers formerly travelled by car. Within this it should be recognised that there can be significant variances on this average, for instance a 1999 study on Sheffield Supertram found that of the 3,071 people interviewed, 22% formerly made the journey by car. The ability of bus to attract car users is considered to be relatively low, for example, the transfer was found to be minor for Birmingham and Leeds bus studies at 2-3%.

Tram has a greater carrying capacity than the bus. Although bus services remain, and will continue to be a major and important component of Edinburgh's public transport system, a tram system is necessary to supplement bus services by providing an efficient and effective complementary alternative with the capacity to meet Edinburgh's growing transport needs in the foreseeable future. No-one should dispute the strides made by Edinburgh to support the



provision of the bus network, but tram comes to the fore when the number and frequency of buses required to meet travel demand either puts a serious strain on the City's road network or causes severe congestion at specific points on the network and at specific times. Significantly more passengers can be comfortably accommodated by an integrated bus and tram system.

The capacity of a tram operating in the Edinburgh system will be 230 passengers at normal loading and 320 at maximum loading. This assumes a 40m tram length as currently proposed. This compares to between 71 and 83 people for a doubledecker bus in Edinburgh, with the 71 passenger carrying capacity being for the most modern doubledecker vehicles.

The modern tram is also faster than some of its public transport counterparts. Trams normally tend to have a higher average speed than the bus. In a segregated environment the tram will travel on average 7 km/hr faster than travelling on street and even in mixed traffic trams are about 4 km/hr faster than buses. Part of this increased speed is gained by the fact that tram tends to have fewer stops compared with bus and a quicker loading time due to a system of pre-buying tickets. This latter element will only partly contribute to the difference between tram and bus, as although LB do not have an on-street pre-buy ticket system at present, just under half of their passengers have a pre-paid pass. LB also propose to install 30 on-street ticket machines in central Edinburgh in the near future hence further contributing to quicker loading times for bus. The fewer number of stops however, will mean a slightly reduced accessibility to the system than for bus due to increased walking distances between stops, (average distance between stops in Edinburgh will be 700m which will give a walking distance of 350m if the destination is midway between tram stops. 350m equates to the distance between Princes Street and Queen Street). This factor however, must be balanced against the quicker speeds, reduced journey times and improved reliability tram offers compared to bus.

Modern tram, unlike its predecessor, is fully accessible and so easy to use for people with mobility difficulties, parents with pushchairs or even those carrying large amounts of shopping. The tram system operating in Edinburgh in the early part of the 20<sup>th</sup> century involved a high step onto the vehicle from street level. This would make it difficult for people with disabilities to use these vehicles with any confidence or comfort. The modern tram however is designed to be fully accessible. An at grade access from the tramstop into the vehicle means ease of access for both disabled people and parents with buggies/pushchairs. This at-grade access at each tram stop will be 300mm above the road surface and will have ramped access. For the majority of stops, the boarding area will be an extension to the existing footway. An added benefit of this is quicker loading times thus contributing to a fast and reliable travel mode.

Light rail vehicles such as tram use little energy because of the low track to steel wheel friction. Energy can also be conserved by the use of a flywheel or by returning electricity to the power line through the process of regenerative braking. It is therefore a relatively efficient system. It is acknowledged however, that whilst there are no emissions at the point of use and hence benefits for City centre air quality, the production of electricity in this country involves the burning of fossil fuels which will have a wider impact.

The modern tram has the advantage of being relatively quiet, compared to the modern bus. The main areas where noise may be an issue with a tram system are where tight radii are encountered,

gradients are steeper or where ambient noise levels are extremely low due to lack of any kind of traffic at present. An example of such a situation would be the disused Roseburn Railway corridor. Both design features and mitigation measures can be put in place to minimise the impact of any increase in noise levels due to the introduction of a tram system.

Within our City environment space is a prime constraint. Edinburgh City centre is a World Heritage Site and as such the street layout cannot be altered in any significant way. This means existing street patterns set out centuries ago when motorised vehicles were not a factor for consideration, now have to cope with movement by vehicle, on bike and on foot. The current levels of activity mean this is becoming increasingly untenable on some City centre streets hence the increase in congestion predicted. The tram has a valuable contribution to make here in that it requires less space than buses and does not preclude other modes of vehicles from using its running space. For example the proposed Edinburgh tram at 2.65m wide will require a width of 5.9m for two way running. The equivalent figure for buses ranges from 6.0-8.0m depending on the width of the vehicle.

As part of its TFI, the Council is continuing to invest more in bus priority, bus related infrastructure and measures to improve interchange between bus services as well as other modes of transport, and plans to do so even more extensively, should congestion charging be introduced in 2006. A number of bus service improvements are planned for implementation from late 2004 for a 3 year period funded through the SE's City Growth monies. This will involve £900,000 of new or improved bus service covering Edinburgh and its neighbouring authority areas. Further to this the Council is preparing a bid for bus service improvements under the Bus Route Development Fund for predominantly City service improvements. Buses will not therefore be neglected in the run up to, and when tram is implemented; improvements to stops, bus lanes, interchanges, information and services, will continue to be made. To provide the maximum benefit to the travelling public of the transport improvements proposed, buses and tram will be fully integrated. Work is being undertaken from the early stages of development of the tram project to ensure this is achieved.

The Edinburgh Tram (Line One) Bill is seeking to obtain the powers to build a tram line connecting North Edinburgh with the City centre. The Council however is also seeking powers for Line Two connecting the City centre and West Edinburgh and will, in the near future, be seeking powers to construct a third line to the south-east of the City. Whilst it is fully acknowledged that Line One will contribute significantly to the Council's economic, transport and social inclusion agendas, the implementation of an interconnecting network of lines across the City will provide far greater benefits for the City than one line on its own. A network of tram lines will not only provide enhanced accessibility linking different areas of the City, it will offer cost savings and economies through provision of common sections of route, shared depot provision and spare rolling stock. Similarly fixed overheads can be shared and overall greater value for money is achieved as well as the very tangible benefit of improved accessibility and integration for travelling around the City.

The above clearly sets out the benefits that such a modern tram system can offer to a thriving City and why Edinburgh needs a tram system. The overall rising demand for travel which is currently leading to predictions of increasing traffic and congestion levels is founded on the fact

that Edinburgh has a strong and growing economy. In reality this means existing employers are expanding and new employers are seeking to locate here leading to increased demand for a vast array of other developments to support the growing population such as housing, retail and leisure facilities. A tram network can serve both existing developments and permit further development by ensuring a means of sustainable access through providing fast, attractive and frequent public transport. Tram therefore is vital for Edinburgh if it wants to continue to expand its economy and in turn, help drive the regional and national economies.

Without a tram system economic growth will be constrained or significantly higher congestion levels will be experienced. This scenario in effect, means the objectives of the structure plan will not be delivered as these are reliant on the implementation of a package of transport measures of which tram is a cornerstone. As a result the structure plan would need to be reviewed to accept reduced economic growth for Edinburgh and the surrounding region and a strategy to manage the implications of this economic downturn put in place.

Tram therefore is vital if Edinburgh is to offer a high quality of life to those living and working in the City, to ensure delivery of the structure plan objectives and to enable continued economic prosperity for the City and region.

### **3.2 Development of the Current Tram Proposals for Line One**

Proposals for tram in Edinburgh have developed over a number of years. During the late 1980s the then Lothian Regional Council was instrumental in developing the Metro project. This involved a combination of on-street tram, underground sections and utilisation of disused railway lines. A unit was set up to progress this work within the Council which carried out the design and consultation for the scheme. This consultation resulted in significant numbers of objections being received. The Parliamentary process at that time required a local MP to introduce the Bill to Parliament, however due to the scale of objections, this stage was never reached. Further to this, there was no real prospect of securing funding for the project from the Scottish Office. The project was therefore postponed mid 1990.

During the mid 1990s the Central Edinburgh Rapid Transport (CERT) initiative was developed. This sought to provide a rapid transport solution along a potentially high patronage corridor from the west of the City into the centre and included the provision of park and ride sites at Ingliston and Hermiston, Edinburgh Park Station and a cycleway. This scheme was both affordable and deliverable. Difficulties with route options had been resolved by finding an alternative route and an issue with land for Ingliston Park and Ride was similarly resolved by an alternative site being secured for this purpose.

However the procurement process of packaging a number of elements together and progressing through a PFI arrangement led to the collapse of this scheme when the preferred bidder backed out on concluding the project could not be delivered for the cost which had previously been submitted. It is worth noting that some of the elements which made up the CERT scheme have been delivered with the remaining few to come on line in the short term. For instance Edinburgh Park station has been built and is now operational, Hermiston and Ingliston park and ride sites are scheduled for completion Spring 2005 and the West Edinburgh Busway (WEBS) and associated cycleway are to be complete by October 2004. In the intervening months since the bids for CERT had been submitted LBhad registered Service 22 which ran parallel to the proposed route and it is this route which will become the route for the WEBS initiative.

The Council in producing its Local Transport Strategy in 2000 commissioned Atkins to carry out a project appraisal study for what would become the basis of the Integrated Transport Initiative. This exercise concluded a LRT network for the City to be the highest ranked option in terms of value for money and achieving transport objectives. At the same time, a rapid transport feasibility study for North Edinburgh was commissioned by Waterfront Edinburgh Limited (WEL) and a number of local businesses which were interested in the establishment of a rapid transport scheme with the objective of establishing how effective a rapid transport link between Granton, and Leith and the City centre would be.

The driver for the study was the developer led view that higher quality transport than bus was required in order to facilitate development with a real feeling that there was a need for tram because of its image of much enhanced public transport. The steering group for this comprised WEL, the Council, Forth Ports and local businesses. The study, which reported in July 2001, considered two other route options and concluded that the most viable project would be a tram loop from the City centre to Leith travelling onto Granton and back to the centre. This study led to the preparation of a bid for Preparation Pool support under the 2002/03 Public Transport Fund for the first phase of an integrated rapid transport system for Edinburgh. This work was carried out at the same time as the CERT project was running into difficulties and simultaneously with work by NETCo, a private tram promotion company pushing for a similar north Edinburgh tram loop. A tripartite steering group comprising NETCo, the Council and the local enterprise company commissioned a study to evaluate the NETCo proposals. This concluded that the overall objectives were not achieved and hence this scheme progressed no further.

Considerable time and effort had been invested in promoting the CERT initiative and whilst it was largely viewed as a failed project technology with little political support, the original driver of a potentially high patronage public transport corridor remained. In order to address this the West Edinburgh Bus Scheme (WEBS) was developed which involves partial guided bus along with segregated and on-street running. This infrastructure can be converted into tram at a future date. The funding of the project through the Scottish Executive's Public Transport Fund meant the difficulties resulting in the collapse of the CERT scheme were eliminated as the reliance on a PFI arrangement was removed.

A Council commissioned study carried out by Arups included as part of it a bid to secure money to carry out this conversion of WEBS to tram. The study's main objective however was to identify a City wide LRT network in view of the LTS appraisal finding that this would be most effective in achieving transport objectives. This study reported early 2003 identifying a network with a north Edinburgh Tram route ranked first, a west route coming second and a south-east tram route being the third best performing alignment. It is this network which is currently being taken forward.

### **3.3 Parliamentary Process**

On 22 December 2003, the Edinburgh Tram (Line One) Bill was introduced in the Scottish Parliament by the Council, as Promoter. The objective of the Bill is to authorise the construction and operation of Line One which will form a 'northern loop' connecting Leith and

the City centre. This line will operate on a segregated alignment from Granton Square through the Waterfront major development area and along the alignment of the disused Roseburn railway line to Haymarket. It will then run on-street, but with priority over other traffic, from Haymarket to St Andrew Square via Waverley and then onto Leith via Leith Walk. A segregated alignment would be provided through Leith Port followed by a mixture of street running and segregated alignment back to Granton Square.

The route will consist of 15.5km of double track infrastructure, the only exception to this being St Andrews Square which will provide a 520m single track loop. 58% of the line will be off street with 22 tram stops proposed. Modelling work forecasts a total route time of 40.5 minutes which assumes an average speed of 23.3 km/h with a frequency of 8 trams per hour. The equivalent time for the same journey by bus is 52 minutes, involves 3 changes of bus and includes 15 minutes walking time as there is no bus between Ravelston Dykes and Roseburn. For comparison of journey times on sections of the tram line, Granton Square to the City centre takes 25 minutes by bus. This will be reduced to 17 minutes by tram. Similarly the bus journey from Caroline Park to St Andrew Square takes 29 minutes but will take 17 minutes by tram.

The principle operational objective of the tram line is to minimise journey time and in order to do this, successful integration with other road users is critical. In reality this means providing segregation along the route wherever possible and certainly where congestion is likely, giving maximum priority for tram at junctions and ensuring a high standard of horizontal alignment to minimise speed restrictions. The route as proposed meets many of these objectives as demonstrated by achieving 58% segregation and utilising features such as the former railway corridor between Crewe Toll and Roseburn thus avoiding a number of "pinch-points" in the North Edinburgh area. Work has been carried out to ensure the satisfactory solution to the operation of trams, buses and pedestrian facilities on a significant number of locations throughout the City to ensure the network can cope with a northern tram loop.

Seamless integration between public transport modes will be fundamental to achieving the vision of the Local Transport Strategy of a transport system accessible to and serving all. This means ensuring integration of bus and tram services. To ensure this the DPOF Agreement put in place with Transdev requires full integration between public transport modes to be achieved. In reality this means Transdev must work with the incumbent public transport providers (bus and heavy rail) to produce a transport integration plan.

Part of the parliamentary process involved a period for formal objections which closed on 29 March 2004. This exercise led to 196 formal objections to the scheme. The nature of the objections covered a wide range of subjects and included the views that it would be better to invest in buses; buses would adversely suffer from tram operation; not flexible and will exacerbate traffic congestion; tram does not go where people want to go with no clear evidence of patronage, it is premature in light of a number of other transport projects and the alternatives have not been adequately tested. These, and other issues are discussed in this section.

### **3.4 The Justification for Tram: The Structure Plan**

The Council has a well developed vision for transport over the next 20 years. This vision is founded on the integration of land use planning and transport and recognises the importance of

transport for the city's economy. This vision is reflected in the Edinburgh and the Lothians Structure Plan 2015 ("structure plan") which states at the outset "*Edinburgh and the Lothians will continue to prosper as the capital's City-region and will remain the economic development hub of East Central Scotland*".

The structure plan forms part of the statutory development plan and some considerable weight should be attached to its provisions because they have been subjected to public scrutiny and, ultimately, approved by the Scottish Ministers.

The current structure plan was approved by Scottish Ministers on 17 June 2004. This plan rolls forward and develops the strategic aims of the previous plan to develop both east-west and north-south light rapid transit routes within Edinburgh. Although funding was uncertain, that plan required the safeguarding of routes, and the location of depots and park and ride sites. The link between the objectives of the strategy and the transport package put forward is clearly set out as stated within the structure: "*For the development strategy to go ahead, it is essential that the key transport proposals be delivered.*"

A key strategic aim of the current structure plan is to integrate land use and transport. The plan recognises that there will be continuing pressures for development in Edinburgh and the Lothians as a result of its strong and growing economy. It also recognises that further major Green Belt release would be prejudicial to the stability and endurance of the Green Belt, although the strategy allows for limited Green Belt release to achieve housing targets and a better distribution of land for economic development. By relating those releases to transport corridors, it will also help attain a more sustainable pattern of development.

The plan's strategy directs development to 15 'core development areas' where infrastructure capacity exists or where new infrastructure would be cost effective. In Edinburgh these are the City Centre, Waterfront Edinburgh, Edinburgh Park, / South Gyle/Sighthill and Newbridge/Kirkliston/Ratho, two of which will be served by Line One. Most of the demand for development land will centre on housing and business and it is envisaged that each of the core development areas will contribute to these strategic requirements in different ways. The current structure plan goes on to state "*However, limited development opportunities mean that the strategy will encourage major new economic development outwith Edinburgh City centre. In order for this to take place in a way which is consistent with the structure plan's key aims, major investment in public transport, walking and cycling will be needed. In particular a tram system in the Edinburgh area is essential.*"

The plan's strategic housing allocations include an allocation of 1,700 units at Waterfront Edinburgh. This is set within the context of an overall housing requirement of 5,000 dwellings per annum across Edinburgh and the Lothians structure plan area. The plan states that housing sites identified in local plans "*should support sustainable transport objectives by having a good level of access by public transport.*"

Edinburgh has been and is predicted to continue to experience rapid economic growth. There is a direct relationship between economic growth and pressure for development. The structure

plan directs future development to the core development areas. If this development strategy is to succeed, it is essential that these areas benefit from appropriate and adequate transport links. The plan states *"The construction of a tram system in Edinburgh is crucial to the success of the development strategy. When combined with high quality interchanges, the tram system will enable public transport journeys to several of the core development areas to be made much more easily from within Edinburgh itself and from much of the Lothians. A strategic network of tram routes has been identified."* Line One is part of that strategic network of three tram lines.

### 3.5 Overall Policy Context

Policy support for the tram project is extensive and can be drawn from the following sources:

### 3.6 National Policy

National planning policy is shaped by the National Planning Framework –commits the SE to the development of the Edinburgh Tram – and also, more specifically, by SPP1. This document supports the integrated planning of land-use and transport as exemplified by the Edinburgh and the Lothians Structure Plan. For example, in Paragraph 20 it states that *"Integration of land use and transport is essential to the economy of Scotland."*

National transport policy is set out in the White Paper "Scotland's Transport Future." This sets out the overall aim of promoting economic growth, social inclusion, health and protection of our environment through a safe, integrated, effective and efficient transport system. It sees the principal challenges in achieving this being changing attitudes to transport choices, stabilising road traffic volumes at 2001 levels by 2021, facilitating the development of new transport links and delivering value for money. Linked to this is maximising opportunities presented by the rapid pace of technological change and ensuring the right governance arrangements are in place to deliver.

In terms of delivering the vision, the White Paper specifically states *"We (SE) are supporting City of Edinburgh Council's proposals to introduce a modern tram network to Edinburgh, to tackle congestion and link communities with areas of economic growth. Trams will provide fast, efficient, mass transport and provide a real alternative to travel by private car."*

The national policy framework is set out in **National Planning Policy Guidance 17**, (NPPG 17). NPPG 17 is under review by the SE and the new draft policy states that *"Strategic land use plans should be co-ordinated with Regional and Local Transport Strategies, relate the settlement strategy to the capacity of the strategic transport network, and identify where economic growth or regeneration requires additional transport infrastructure."* The Line One proposal meets this requirement by meeting the transport demands arising from new development in North Edinburgh, particularly the Waterfront development.

### 3.7 Development Plan

The statutory development plan for Edinburgh comprises the structure plan and various local plans. The most important source of regional policy is the structure plan for Edinburgh and the Lothians, as discussed above. It centres on a land-use and transportation strategy together with a set of policies which co-ordinate sustainable public and private investment with the protection

of the environment. It therefore provides the basis for all decisions regarding future development in Edinburgh and the Lothians.

The route of Line One runs through three different adopted local plan areas -- Central Edinburgh, North East Edinburgh and North West Edinburgh. In addition, the North West area is now covered by the draft West Edinburgh Local Plan. **The Central Edinburgh Local Plan** which was adopted in 1997, protects routes for the possible construction of a light rapid transit system. This route protection is also included in the **North East Edinburgh Local Plan**. This Local Plan was adopted in 1998 with an alteration to the plan being adopted in 2004. Routes are similarly protected in the North West Edinburgh Local Plan, adopted in 1992, where the local plan allocation safeguarded land for possible future highways or light rail proposals. The Draft West Edinburgh Local Plan published for consultation in 2001 also reserved land for public transport proposals including the LRT north-south route.

The local plans are supported by supplementary guidance in the form of site specific master plans which have the principal objective of providing a vision and development framework to ensure unique opportunities in relation to each site is maximised in accordance with the planning system. These master plans include provision for transport infrastructure required to facilitate development. An example of master planning is the Waterfront Granton Master Plan which identifies a need for a strategic link between the City centre and the Waterfront in North Edinburgh. The Leith Docks Development Framework is also in the course of preparation. Additional supplementary planning guidance on detailed design for the tram is also in the course of preparation in the form of a Tram Design Manual.

### **3.8 Regional and Local Transport Policy**

In terms of transport, SESTRAN, a body of the 10 local authorities covering the south east of Scotland have produced and agreed a **Regional Transport Strategy**. One of the aspirations of this Regional Transport Strategy is *"a desire to see high quality, reasonably-priced bus, and rail and tram links from the region into Edinburgh and within the City itself."*

The vision of the Council's **Local Transport Strategy** is as follows:

*"Edinburgh aspires to be a City with a transport system that is accessible to all and serves all. Edinburgh's transport system should contribute to better health, safety and quality of life.... The transport system should support a strong, sustainable local economy."*

The document includes the following policy: - "The Council will work with partners and external agencies to introduce a tram system to serve the City of Edinburgh."

National transport policy as set out in the White Paper is non-statutory. However, it does provide the direction for content of both the Regional Transport Strategy (RTS) and the Local Transport Strategy. Both these documents are non-statutory at the present time although the White Paper proposes the RTS should become statutory when new regional transport bodies are in place. The Development Plan, having undergone rigorous public scrutiny and secured the approval of Scottish Ministers, is statutory. The structure plan provides the broad framework



for local plans, which contain more detailed and site-specific policies. Local plans are required by law to conform to the structure plan.

### 3.9 Specific Tram Benefits

Although Edinburgh's economic success brings many benefits to both the City and the wider region, it also creates problems, such as traffic congestion. There are a range of objectives of the tram that should either support the benefits or address the problems. These are detailed below:

**Land Use Planning:** One of the most significant benefit relates to the contribution of the tram to bring about effective integration of land use and transport planning, as set out in the structure plan. By providing a tram system to serve and connect the Core Development Areas (CDA) across the City, such as the Waterfront area of North Edinburgh, the need for car dependence to access employment, residential and retail areas should be minimised. A tram system will ensure that there is effective, high quality public transport linking the City's strategic development and regeneration sites. For example, Line One will provide high quality, fast and reliable public transport connections between the City centre and the Waterfront Granton development. Without a tram system, it is likely that major developments will be less likely to succeed and where they do, will contribute significantly more to City wide congestion as a direct result of the failure to integrate land use and transport policies. Such developments will also be likely to be diverted to less sustainable locations in the greenbelt and elsewhere with less potential for effective transport integration. The importance of tram to permit continued development of North Edinburgh is demonstrated by the proposed redevelopment of the Leith Docks site. This will not take place without a tram system to serve the area.

**Traffic Congestion:** Tram, rather than directly reducing existing congestion, will operate primarily to permit further development without aggravating additional congestion. The tram system has the potential to reduce traffic congestion by encouraging drivers to use the tram instead of their car. As other tram schemes in the UK have shown, there is greater potential for modal shift from car to tram than to buses, or guided buses, particularly if the tram is in operation before the development comes online and travel patterns have already been established. Modal shift from car is a key objective of the Local and Regional Transport Strategies because it will help to relieve the problems of traffic congestion that are experienced in the City and the wider region. The analysis carried out by Mott MacDonald on Line One, following standard STAG methodology showed that this line would provide a relatively high level of benefit for non users of the tram, more so than for users. An explanation for this is that the modelling work predicts severe congestion by 2026 and any reduction in congestion caused by modal shift, however small, could result in a small benefit to a large number of people travelling. In reality this means that as some car users switch to tram, capacity is released on the road network which cuts journey times for remaining car drivers. In addition, faster journeys for remaining bus users, as well as for those switching from slower bus to faster tram provide overall benefits. Thus the de-congestion benefits are predicted to be cumulatively significant.

Forecast tram patronage is around 9.5 million passengers in 2011 which would grow to just under 14 million by 2026. It is recognised however, that some bus journeys to and from the City centre or which pass through the City centre will be adversely affected by the reduction in

highway capacity. It is hoped that this can be counteracted by bus priority schemes to mitigate these problems.

**Environment** -- The Council has a statutory responsibility under the Environment Act 1995 to work to comply with the national air quality objectives. Air quality monitoring is carried out periodically and, for the seven pollutants the Council is required to monitor, one was found to be unlikely to meet its objective. Consequently, the Council declared an Air Quality Management Area in December 2000 covering parts of the City centre area on the basis that the nitrogen dioxides objectives are likely to be exceeded in 2005. Vehicles within the City have been shown to account for up to 88% of emissions of nitrogen oxides. The Council is currently implementing its Air Quality Action Plan (AQAP) in relation to nitrogen dioxide pollution. Trams will contribute to the objectives of the AQAP by providing a large number of journeys through the City centre so improving mobility and accessibility but without adding to current levels of nitrogen dioxide as trams have zero emissions at point of use.

Trams can also be much quieter than buses providing a higher quality environment for those living, working and travelling in the area. Given the Council's lack of direct control over the types and age of buses travelling through the City centre, and its inability to direct bus operators to either retrofit older buses with cleaner fuels/engines, or to buy new alternatively-fuelled buses, the Council's direct influence over the specifications of the tram will allow it to make a much more significant contribution to air quality enhancement, compared with bus. The Council is currently working to establish the most effective means of reducing emissions from buses. Once this work has been finalised, the Council will seek to secure funding to ensure the appropriate technology can be applied to the City's bus fleet in co-operation with the bus operators.

**Social inclusion** - This can be facilitated by better public transport, which allows improved access to jobs and services for those without access to a car. Although Line One will not serve anywhere not currently served by bus, and will have greater spacing between stops than bus has, it will significantly reduce public transport journey times and greatly enhance the reliability of trips from the north of the City to employment centres (Gyle, Edinburgh Park, Gogarburn, the Airport and Newbridge) in the west, as well as journeys across the north of the City. For those living close to a stop, this will provide a significant benefit although for those living between stops walk time will be increased compared to the bus. This will be partially offset by the level of frequency and reliability tram offers compared to the bus. In terms of journey time savings for example, (comparing scheduled bus journey times with those scheduled for the tram, and taking into account waiting times), it is predicted to provide the following journey time savings: Roseburn Corridor /Pilton to Ocean Terminal /Leith 10+ minutes; access times to Granton development area will be improved by 10 or more minutes from most of Edinburgh; access time to Haymarket from Granton and Leith improved by 5 or more minutes. The tram therefore improves accessibility for many in travelling to employment, education and leisure opportunities.

**Integration** -- The introduction of tram will provide an opportunity to significantly improve integration between transport modes. The major advantage here is that integration can be planned before the start of services; this is much more effective than trying to achieve integration between already established services. The tram operator designate is required to work

with bus operators to ensure integration between the modes. The interchange at Haymarket and close proximity to Waverley Station means integration with heavy rail will be good. These interlinking services, along with the proposed frequency of the service, means tram will afford easier access to employment and service areas. The integration of the bus, rail and tram network will mean considerable improvement for the travelling public. This could lead to demand for additional feeder services to the main network thus further benefits in terms of both integration and inclusion.

**Accessibility** - Trams are accessible to people with mobility impairments as access to vehicles and at stops will be fully accessible. In comparison, a little more than half of the LB fleet has low floor access at present although LB are required under the Disability Discrimination Act to have all their vehicles as fully compliant low floor vehicles by 2014. If current levels of LB fleet replacement are maintained, all their vehicles will be fully accessible within six years. Even on low floor buses however these buses, access for people with mobility impairments cannot be guaranteed due to inconsiderate or illegal parking of other vehicles at bus stops, and/or poor driver discipline, such that the bus does not reach the kerb. Trams will always have access to stops and every tram will have level boarding. For people with mobility impairments who live close to tram stops, the tram will therefore represent a major improvement in the provision of accessible public transport. The greater distance between stops will reduce accessibility for some although the guaranteed level access once at the stop will provide a benefit over the current situation of accessing buses.

**Economic regeneration** - In parts of North Edinburgh, regeneration is a key priority. Tram enables the development of brownfield sites by providing sustainable transport connections to areas either currently poorly served by public transport or experiencing congestion, particularly at peak times. This therefore can significantly contribute to City regeneration. For example, without Line One it is unlikely the largescale redevelopment of Leith Docks could go ahead bringing with it high quality living, leisure and employment opportunities. In addition to opening up brownfield land for redevelopment and despite the difficulty in quantifying, it is probable that the tram will have a positive impact on the image of the area and hence help to stimulate further inward investment. For certain employers whose workforces may be more than usually reliant on public transport access, the tram may act as a catalyst to encourage them to locate in areas that they would have previously discounted. In addition, by contributing to reducing growth in congestion, tram will be assisting with maintaining the economic viability of North Edinburgh.

**Streetscape** - Linked to economic regeneration is the image of a City conveyed by its streetscape. In spite of its historical importance, parts of Edinburgh's urban environment are of much poorer quality than is desirable. Experience in France has shown that investment in trams has been used as a mechanism to improve streetscape and environmental amenity in general, bringing both economic and social benefits. In recognition of this important role of tram, a Tram Urban Design Manual has been, and is continuing to be developed by the Council.

**Reliability** - Trams are more reliable than buses for two main reasons: firstly, they tend to benefit from greater segregation from general traffic and are thus protected from the vagaries of traffic congestion; and, secondly, they generally utilise off-vehicle ticket sales with multi-door

boarding, rather than only the driver selling tickets, which reduces dwell time and the variability of dwell time at stops compared with bus. It is theoretically possible that bus operation could be modified to produce the same level of reliability. However, the Council cannot require bus operators in the City to change their ticket sales and boarding methods, hence the much greater reliability of trams compared with buses.

Higher levels of segregation also permit trams to attain much higher average speeds than buses. Line One would have an average speed around the whole route of 23.3 km/h. Buses in standard urban operating conditions average around 14 km/h. It is these features which mean that tram cannot be matched by the current bus network since it makes more stops over a similar distance route, has longer boarding times due to ticket payment onboard and validation of passes, as well as lack of level access on a proportion of the bus fleet and is often subject to the delays caused by mixed traffic on-street running.

### **3.10 North Edinburgh**

#### **3.10.1 Socio-economic Characteristics of North Edinburgh**

Despite a worldwide economic slowdown, Edinburgh's economy has weathered the national and international downturn favourably. Research published in 2001 suggests that Edinburgh will have the fastest growing economy of any major UK City over the period 1999 - 2005, reflecting the importance of the service sector, in particular, financial services. Unemployment is very low, at around 2% and is expected to remain very low in the period to 2015.

However, there are still areas of Edinburgh, which experience higher levels of unemployment. The key concentrations of unemployment can be found generally in North Edinburgh, in pockets in Leith and, more widespread, in areas of Granton, Pilton and Muirhouse.

North Edinburgh has a history of social deprivation and exclusion. A 1999 study highlighted the general social and economic characteristics of particular importance:

- This area has larger household sizes than the City and also national averages. High proportions of these are large households with children and elderly;
- This area has a younger population than Edinburgh as a whole;
- The majority live in rented, council accommodation;
- 66% of people do not have access to a car. This compares with 40% of Edinburgh residents with no access to a car and 35% in Scotland overall;
- The majority is employed in the service and skilled trade sectors;
- A significant proportion, estimated to be three times the Scottish average, travel to work by bus; and
- The cost of travel is a low factor when considering barriers to ideal jobs.

Employment patterns were shown to reflect transport links. It was suggested that work patterns would continue to be affected by accessibility by bus and foot. The main growth areas were viewed to be service sector employment in the City centre, the Gyle and Edinburgh Park. Better

public transport links to the latter two locations in particular are required to enable access to opportunities.

These findings were reinforced by a further study carried out in 2000 which highlighted the reliance of these communities on public transport and the inadequacy of current connections to areas of employment both in Leith and in the west of the City. It should also be noted that, whilst studies have concentrated on the north of Edinburgh, similar issues are also apparent in other areas, including Leith, where despite recent regeneration, social deprivation and exclusions remains a problem.

**3.11 Population of North Edinburgh**

Edinburgh's population is set to grow from 453,000 to 465,000 between 2001 and 2011. High densities are found in various areas including Leith Walk and into Leith, Newhaven and north-west Edinburgh, in particular, Granton, Pilton and Muirhouse. These areas, and particularly, Granton and Leith Docks, are subject to major development plans, including residential developments. It is therefore essential to ensure that they are adequately served by public transport, not only to enhance accessibility but to ensure that a potential workforce can access jobs.

66% of households in North Edinburgh do not have access to a car. Thus there is a strong correlation between areas of high population density, income and deprivation and those without access to a car.

**3.12 Transport Problems in North Edinburgh**

Currently, there are gaps in the public transport system, which contribute to the lack of social inclusion. Other than LB services 21, 24 and 32, there are few direct services to destinations in the west of the City, a situation that could be significantly improved through a tram interchange at Haymarket. In addition, there are congestion issues, especially from east to west across north Edinburgh, where orbital bus services have to cross major arterials; and in other places where physical constraints do not permit the provision of bus priority. This can make bus journeys across the area slow, particularly at peak times. A trip from Crewe Toll to the Gyle by bus is scheduled to take 30 minutes at peak times (but may well take longer, depending on traffic); with segregated running for almost the entire trip, the same journey by tram would take about 25 minutes, including a 5 minute wait at the interchange point at Haymarket. Because of greater levels of segregation from and priority over general traffic, trams will in general offer greater levels of reliability than buses and consequently reduced waiting times.

From the above, it can be seen that Tram Line One will contribute to addressing a number of issues specific to North Edinburgh. It will enhance social inclusion by improving accessibility to jobs, social and health care facilities in an area with pockets of relatively high social deprivation and low car ownership. This in turn increases travel options and opportunities and thus contributes to a higher quality of life for those living and working in North Edinburgh.

**3.13 Why not other public transport modes instead of tram?**

Other than rail, tram is the most expensive public transport option. There are however good reasons for selecting tram rather than other options such as enhanced bus priority or guided bus.

The WEL study carried out on Line One, known at that time as the Waterfront Transit project, considered various modes of public transport that could be used on the route and compared in detail tram and guided bus. The study appraised traditional bus, monorail, guideways, magnetic levitation (MAGLEV) and people movers as well as guided bus and light rapid transit. All but LRT and guided bus were deemed not to meet project aims and objectives for a number of reasons. These included: lack of capacity; inability to integrate in a historic City centre; high maintenance costs; and lack of flexibility for future extensions. In terms of comparison of guided bus and LRT, the former is less expensive to implement but generates less patronage and hence less revenue than tram. Guided bus tends to be less accessible and have a lower level of comfort due to irregularity of road surface, it tends to be perceived as a normal bus by the public and has increased air quality and noise impacts than tram due to generally being diesel powered.

Guided bus is essentially a bus that can run on normal road or on a special concrete guideway. On this "track" it is steered by automatic guidewheels that engage with the side of the guideway. It has enjoyed some success in Leeds and in Bradford in the UK, and overseas in Essen and Adelaide, and offers the advantages, compared with tram, of being cheaper to build and more flexible in its implementation and operation, since it can run on normal road when there is no guideway available. Nonetheless it has a number of disadvantages compared with tram, the most significant of which are listed below:

- where there are high flows, its operating costs per passenger are higher than for tram because more vehicles are required to carry the same flow. An articulated guided bus will carry around 120 passengers and a tram around twice as many. This is a significant factor for Line One, given the high flows that are predicted from the redevelopment of the Granton and Leith areas which are predicted to contribute around one third of the demand for Line One;
- because it is more akin to a normal bus, it is unlikely that it will be given as much priority as a tram in street running situations. This can be explained by the fact that the tram is viewed as a different entity to the bus and therefore commands more support for priority at the expense of other traffic than the bus both in terms of public and political support. If it is given less priority it will be slower and, perhaps more importantly, more unreliable than a tram;
- it is difficult to install guideway where there are frequent crossings of the guideway by other traffic, since it has raised kerbs – it cannot be flush like a tram track and hence cannot easily be integrated into an environment with significant pedestrian activity;
- again, because it is more akin to a normal bus, guided bus has a less favourable image than tram, it tends to be noisier, and more polluting when diesel powered and offers a poorer quality of ride as a result of the condition of the road surface. The tram which runs on tracks, provided they are modern, offers a higher level of ride comfort. Careful design can to some extent overcome these problems, as shown by the (non-guided) *Zuidtangent* busway running from Schiphol Airport to Haarlem in the Netherlands, but the perception of tram will normally be better than that of guided bus;
- many of the areas the route will pass through, such as Haymarket, Princes Street and Leith Walk have high levels of pedestrian activity thus the guideways themselves would then operate to cause severance for pedestrians crossing these main routes. Without the guideways however, the system operates as a normal bus therefore not providing the

potential modal shift benefits of tram. The West Edinburgh Busway System (WEBS) currently being implemented which will link West Edinburgh to the City centre has a section of guided busway. This section however is located at the western extremity of the route where pedestrian/street activity is extremely low and hence severance issues are slight. The facility will ensure a reliable and fast journey time over this section before changing to on-street running closer to the City centre. The WEBS system has been built with the capability of conversion to use by tram in the future and will become part of the Line Two route;

- the modelling results from the Feasibility Study for the North Edinburgh Rapid Transit study predicted that almost twice as many people per year would use a tram on the Line One route compared with guided bus; and that the tram would return an operating surplus of just around £5 million per year compared to a very small surplus for the guided bus. The North Edinburgh study considered the effectiveness of a guided bus system and concluded that whilst quality bus technology should be considered as a possible interim measure to meet short-term transport demands, a light rail system for the North Edinburgh Loop should be adopted with monitoring of developments in advanced guided bus technology, therefore guided bus technology was not found to be a suitable long term solution for mass public transport. The work by Arups to take forward LRT proposals for the City concluded that a network of lines would achieve important economies, reduce the forecast capital cost and improve the financial case for all lines therefore, the maximum benefit for the City will be gleaned from the provision of a network of tram lines; and
- Guided bus, unlike tram has relatively few applications worldwide and therefore does not have the "tried and tested" technology of tram. For kerb guided buses there are only 9 systems worldwide, 5 of these are in the UK of which the maximum length of guideway is 2.5 km. These systems are a mix of guideway and on-street running. There are 8 new guided systems worldwide. This involves the entire route being guided. None of these are in the UK. In comparison there are around 400 light rail systems in the world.

### 3.14 Conclusions

Edinburgh has a clear need for a tram system. The need for such a system has been identified in national, regional and local policy for a number of years. Indeed, it has been specifically identified as a delivery objective for a range of organisations from the SE downwards.

Edinburgh operated a popular and extensive tram network during the first half of the 20<sup>th</sup> century. This early form of mass transit was removed to make way for the progress offered by the lower maintenance and more flexible bus. Travel patterns and lifestyles have changed dramatically over the intervening half century since tram last operated in the City and today's society presents new challenges in meeting travel demand to and within Edinburgh. More people require to travel further on a daily basis to access employment, leisure and other services. The numbers involved mean that on some corridors in the City buses will not be able to provide for the level of demand.

The level of development resulting from Edinburgh's strong and growing economy, in effect, means the City is a victim of its own success. The prosperity of the City leads to pressure for new development in both new and existing development areas. The main areas identified for new development in Edinburgh are firstly, the North of the City which, due to its geography of being bounded by the Firth of Forth means limited access opportunities and intensification of

congestion on the existing access routes to this area. A second area of significant demand for development is around the greenbelt particularly to the west of the City where extensive new development is planned. If the objectives of the structure plan for the capital's City-region to remain the economic hub of East Central Scotland are to be met then further development must be permitted. This can only be achieved if the transport package set out in the plan, including a tram system, is delivered thus enabling continued growth in a sustainable way without contributing to increased congestion.

The decades since the removal of Edinburgh's original tram system has seen not only travel demand change, but tram technology dramatically move on also. Modern trams are fast, reliable, fully accessible and are capable of carrying greater numbers of people in a less environmentally damaging way than the bus. This new tram represents a step change in transport provision and greatly improves the image of public transport.

A tram system will address many of the current problems of the transport network and, in doing so, will contribute to wider economic, environmental and social inclusion agenda across Edinburgh and, particularly, in North Edinburgh where pressure for brownfield development is considerable. Most importantly, the provision of tram will form a major step in ensuring integration between land use planning and transport decision-making and thus supporting the structure plan's strategy, as well as meeting wider objectives for increased prosperity and quality of life in Edinburgh.



## 4 Summary of STAG Appraisal

### 4.1 Introduction

This section summarises the key conclusions arising from the STAG 2 analysis undertaken by Mott MacDonald in respect of Line One. The remainder of this section is drawn from the executive summary of the Mott MacDonald STAG 2 document.

### 4.2 STAG 2

The Council is examining ways of providing the City with the transport infrastructure necessary to promote and support a growing local economy and creates a healthy, safe and sustainable environment.

As a key component of the strategy of public transport investment in Edinburgh, the Council is proposing to develop a network of modern trams. The tram system is being developed in stages and will focus on the major City transport corridors.

The STAG appraisal has been undertaken by Mott MacDonald on Line One, the Northern Loop, linking the City Centre with Granton, Newhaven and Leith, passing through the Waterfront development area and then along the line of the former Roseburn railway corridor to Haymarket. This line is expected to facilitate a number of positive benefits for the area, including economic regeneration and improved accessibility.

### 4.3 Scheme Description

#### Route

The preferred route comprises:

- 15.5 km of Double Track infrastructure (single track at St Andrews Square);
- 58% off street; and
- 22 proposed stop locations.

Wherever possible a segregated alignment has been proposed (where the tram operates on dedicated tramway or tramroad) such that the system can maintain speed, frequency and reliability of service without interference to and from other traffic. The alignment is effectively double track, clockwise and anti-clockwise running, throughout its length, with the exception of the one way loop at St. Andrew Square (approximately 520m long).

### Tram Specification

It is assumed that the trams will be semi-low floor or total low floor vehicles. This implies a floor height of between 300 and 400mm. This type of vehicle has been adopted in order to ensure that the alignment characteristics will cater for most currently available rolling stock.

### Construction

The construction of Line One is programmed to commence in mid 2006 with an estimated construction period of 36 months.

One of the early activities required for construction is the diversion of Public Utilities from beneath the tramway. This has, historically been undertaken, either as an advanced works contract or as part of the main works contract. Generally the inclusion of this phase within the main contract provides a reduction in programme due to the ability to coordinate efficiently within the main contract. The 36-month construction period is based upon the utilities diversions being undertaken as advance works ahead of the main infrastructure contract.

### Capital Costs

Capital costs are estimated at £243m including specified contingency (or £274m including Optimism Bias), set at a base point of Quarter 2 2003. The reduction in capital costs (including Optimism Bias) from £287million in the December 2003 Preliminary Financial Case is due to the mitigation of the Optimism Bias factor as explained in Section 5. 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.

### Operations

The single overarching objective from the operational viewpoint is to minimise journey times, so as to maximise the attractiveness of the service and minimise operating costs and rolling stock resources. The key is to achieve free flow wherever possible so that the running speed is the maximum safe speed for any particular type of environment.

The transport model forecasts a total time of 40.5 minutes around the loop, excluding any layover time allowance, equivalent to an average journey speed of 23.3 km/h. The anticipated frequency will be 8 trams per hour (i.e. a headway of 7½ minutes).

#### 4.4 STAG Appraisal

Mott MacDonald have undertaken a STAG 2 appraisal of Line One examining the key issues of:

- Environment;
- Safety;
- Economy;
- Integration; and

- Accessibility and Social Inclusion.

The matters arising from their analysis are set out in detail in the STAG 2 report.

**4.5 Cost to Government**

As part of the STAG appraisal Mott MacDonald have undertaken an economic analysis of the project based on its revenues and costs.

The cost to government sets out the net cost of a proposal from the public sector's point of view, which can then be compared with the overall benefits of the scheme covering all five of the main objectives (environment, safety, economy, integration and accessibility). The economic impact of Line One is presented in the table below, which summarises the monetised benefits of the scheme in terms of safety and economy and then compares with the cost to government. The Present Value of Costs (PVC) to Government is some £195.5m; this compares with the Present Value Benefit (PVB) of £235.9m, producing an NPV of £40.4m and a Benefit Cost Ratio (BCR) of 1.21. On this basis, the scheme represents good value for money. Sensitivities around this Central Case demonstrate the robustness of the case for Line One; coupled with the benefits to the non-monetary objectives, a strong case for Line One has been made.

Present Value of Benefits (PVB)	£236 million
Present Value of Costs (PVC)	£196 million
Net Present Value (NPV)	£40 million
Benefit Cost Ratio (BCR)	1.21

The information, particularly the NPV, is analysed in a different manner to the financial basis in the rest of this Preliminary Financial Case and the two should not be confused.

## 5 Risk

### 5.1 Introduction

Appropriate risk transfer is fundamental to achieving value for money for the tram system. Risks should be transferred to the parties best placed to manage them and can be used as an incentive to the private sector to ensure that the Council's primary objectives for the project are met. This outsourcing of risk and its management would leave the Council/tie to concentrate on its core functions.

Risk is a significant factor in all major capital projects and a key element of this Preliminary Financial Case has been to examine the risks inherent in the project, identifying how to mitigate these to achieve greater certainty in cost and time estimates. Since the December 2003 Preliminary Financial Case there has been considerable further development in the mitigation and quantification of risk. As the project has progressed through its development lifecycle there has been an increasing sophistication in the tie approach to the assessment and management of risk. Examples of the tie Board's increasing risk management focus are set out chronologically below.

**July 2001 - WEL Feasibility Study for a North Edinburgh Rapid Transit Solution** - As part of the feasibility study the risks associated with the project were identified, categorised and the impact assessed in a structured process for the first time. Andersen, Steer Davies Gleave and Mort MacDonald published their "Feasibility Study for a North Edinburgh Rapid Transit Solution" in July 2001. This report identified the following areas of risk that continue to be relevant to the present day scheme. The majority of the risks identified related to scheme development and construction activities, as shown below.

Impact	Risk Area	
Capital Expenditure	Utility Diversions	On-Street Interface
	Procurement Strategy	Technical Issues -- Stray Current
	Land Acquisition	Level of service: Frequency
	Planning Requirements	Depot location, scale and function
	Frontage Access/ Trade Access	Route Length - % on or off street
	Environmental Issues	

Impact	Risk Area	
	Network Rail Interface	Fleet Costs
	Road User Charging	HMRI and other Approvals
Operating Expenditure	Procurement Strategy	Level of Service: Frequency
	Level of service: Staffing/ Security	Maintenance/ Lifecycle Costs
	Road User Charging	Depot location, scale and function
	Revenue Protection	Route Length - % on or off street
	Consultation	Ticketing
Revenue	Patronage/ Revenue Forecasts	Revenue Protection
	Procurement Strategy	Competition -- Bus
	Level of service: Staffing/ Security	
Programme	Utility Diversions	Network Rail Interface
	Land Acquisition	Consultation
	Planning Requirements	HMRI and other Approvals
	Frontager Access/ Trade Access	

May 2002 - tie established as a 100% subsidiary of City of Edinburgh Council - tie was officially established with corporate governance that set out levels of authority, roles and responsibilities. Core to its corporate governance was project and risk management processes as part of the delivery of the Tram Lines. tie will continue to ensure that the appropriate governance controls are applied to the stages of the development of the tram system. tie have identified the principles of an emerging procurement strategy with details of the consequential planning and design, procurement and construction activities that will effectively de-risk the main infrastructure contract.

September 2002 - Edinburgh LRT Masterplan Feasibility Study published on behalf of the Council - Arup Transport Planning published it's report on the feasibility of the North Edinburgh Loop (Line One), and West (Line Two) and South East (Line Three) lines highlighting the strong case for individual lines and potential improvements and economies through a tram network. The report stressed key risk aspects including revenue impacted from

journey times, need for service diversion to mitigate risk of disruption of tram operators/utility providers and consideration of this as advance works to the main works, and need for greater understanding in extent of and scope of potential transfer of revenue risk to private sector partners.

**December 2002 - Appointment of Technical, Legal and Financial Advisors to develop the STAG 2 appraisal and support the Parliamentary Bill process** - Part of the advisors' brief for the project was the detailed identification, quantification and mitigation of risks associated with the Tram Lines. This built on previous studies undertaken. Additionally the assessments of risk as part of the STAG 2 and the parliamentary process fed into tie's ongoing risk management processes.

**April 2003-Publication of revised HM Treasury Green Book Appraisal** -HM Treasury officially launched the revised Green Book. This set out a number of major changes as to the assessment and quantification of risk for major capital projects. As a result of the revised guidance tie reviewed its risk assessments to ensure that they interpreted guidance accurately. This was done in consultation with the SE.

**June 2003 -Appointment of Risk Manager** - In recognition of the importance of effective risk management tie appointed a Risk Manager. tie defined the roles and responsibilities of the Risk Manager such that it required an individual with a deep understanding of risk management processes, techniques and analytics.

**December 2003 – Preliminary Financial Case** – Grant Thomson reported the rationale for Operator procurement options and financial analysis of each Line. The report introduced tie's processes for the management of risk including the specific project risks and mitigations identified.

**April 2004 - Publication of NAO report on 'Improving Public Transport in England through Light Rail'** - This report is a timely and comprehensive overview of the successes and failures experienced in similar schemes elsewhere in the UK in recent years. Although the report is mainly focussed on the role and responsibilities of the Department for Transport (DfT) it contains useful guidance for tie and the Council. The principal lessons learned from previous projects is reported as follows.

- proactive approach to risk identification, analysis and mitigation - NAO identified a number of barriers to the successful future development of light rail systems in the UK and highlighted the issues which need to be addressed to overcome these, which included the poor financial performance of existing schemes leading to higher risk-driven cost of new schemes, and recommended the adoption of better 'risk-sharing' and 'new' procurement contract structures that enhance private sector involvement. As a consequence, the NAO made a number of specific recommendations to the DfT, which included the following procurement related issues:
  - seek better standardisation in design of systems, vehicles and methods of construction using experience from existing systems and partnering with promoters of other new schemes;
  - Seek ways of managing risk and reducing the costs of utility diversion including questioning the need for specific diversion; and

- identify the most cost-effective procurement methods and contract structures as a means of controlling cost.

This report contained a number of recommendations on the appraisal, development and implementation of light rail schemes. Prior to the NAO report, tie had reviewed and benchmarked existing light rail schemes as part of the development of its risk management strategy. On the publication of the report tie reviewed its current procurement and delivery strategy and concluded that its overall approach was in line with the NAO recommendations. tie's paper was reported to the full Council and published on 18th May 2004.

**May 2004-Appointment of Transdev** - As part of the development of the procurement strategy it became clear that better value could be obtained by having separate operating and infrastructure contracts. Although separate, the operator and infrastructure contracts still have to interface to ensure that the design of the tram line is optimised in terms of system operations and integration. In order to manage the risk of a sub-optimal system tie developed a procurement strategy to secure the early involvement of the operator. Transdev are providing tram operational expertise to ensure that the design and development of the infrastructure is as efficient as possible.

**June 2004-Publication of Audit Scotland report on 'Management of the Holyrood Building Project'** - This report highlighted a number of lessons learned for major capital projects. tie have reviewed this report and undertaken an assessment of the lessons learned against the current procurement and delivery strategy. As a result of this review tie refined some areas of its procurement and delivery strategy.

**July 2004 - Publication of DfT Procedures for Dealing with Optimism Bias in Transport Planning** - Subsequent to the publication of the revised HM Treasury Green Book launched in April 2003 the DfT issued specific guidance on the application of Optimism Bias. tie's treatment of Optimism Bias is discussed in Section 5.4.

The above examples illustrates how tie continues to develop the scheme with appropriate risk management, has applied external guidance, used industry expertise and built on lessons learned on other projects. The overarching framework of risk analysis and evaluation supports ongoing management and decision making and takes account of the following prime objectives:

- mitigate all identified risks to a 'medium' significance or less;
- pass all identified risks to the parties best capable of managing the risk;
- a culture of risk awareness (not risk averse) and management be created;
- delivery within budget and on time;
- provide a fully functioning operational service; and
- obtain support from all key stakeholders.

tie has appointed experienced advisors covering parliamentary, legal, financial, technical, operational, environmental, public relations and communications, land and property, insurance, project management and specialist procurement advisors to realise a successful project. In addition to these advisors, tie is seeking to substantially mitigate risk through the ongoing involvement of Transdev.

Optimal risk transfer dictates that risk is allocated to the party best able to manage that risk. This in turn requires the terms of any contract to be negotiated in order to achieve the optimal risk spread amongst the participants in the project. A key element in determining how best to manage and mitigate the risk has been the evaluation of the appropriate procurement route and the conclusion of this analysis which is set out in Section 6, is to separate the Operator and Infrastructure and equipment supply contracts. The consequence of adopting this approach will be to allocate the appropriate risks to the Operator contract and similarly the appropriate risks to the Infrastructure and equipment supply contract. This separation is believed to offer a fundamentally more attractive commercial package to bidders for the respective contracts and should, as a consequence, deliver a better value for money solution to tie and the Council. tie and the Council will retain certain risks, notably a large proportion of revenue risk.

In developing this Preliminary Financial Case, tie and its advisors have considered the implications of the Green Book Guidance as issued by HM Treasury and have discussed the application of this guidance to the Line One project with PUK and the SE. Further detail on how this has been applied and its impact on the financial models is set out below.

In addition a number of sensitivities have been run within the financial modelling exercise, designed to simulate certain key financial risks, principally variations in inflation and interest rates. These sensitivities are designed to test the overall financial robustness of the project, and to give an indication of impact of key project risks on the financial structure proposed. The results of this exercise are set out in Section 10.

## **5.2 Approach to the Identification and Mitigation of Risk**

tie has adopted a structured approach to identifying, assessing and controlling risks that have emerged during the course of the design development. tie has ensured the use of defined processes to manage risk and adopted industry recognised methods to identify, classify, categorise, prioritise and measure progress, as outlined below.

### **5.2.1 Risk Identification**

tie and its advisors have identified project risks through workshops, strategic reviews, experience of other UK tram projects and recording of risks throughout the development process. These risks have been recorded on a register which has been further developed from checklists contained in the following published industry guidance.

- RAMP: Risk Analysis and Management for Projects;
- CIRIA: Funders Report: developing a risk communication tool (RiskCom); and
- HM Treasury Review of Large Public Procurement in the UK.

### **5.2.2 Timing of Risks**

In order to review timing, the risks have been categorised in order to identify the risk level of each of the following five stages of the project and to ensure risks are reviewed and mitigated for each stage of the project:

- Planning -- STAG2 Appraisal, Preliminary Financial Case preparation;
- Application for Powers -- Private Bill preparation;
- Procurement -- Operator and Infrastructure/Equipment supply contracts;
- Construction; and



- Operation.

### 5.2.3 Categorisation

tie and its advisors consider that they have identified all significant potential risks to the project, and identify the need for ongoing effort to identify and manage project risks. These risks were categorised into the following groups in accordance with HM Treasury guidance:

- Procurement;
- Project Specific;
- Client Specific;
- Environment; and
- External Influences.

### 5.2.4 Risk Impacts

Each of the project risks have been assessed against the following principal impacts:

- Capital Costs;
- Operating Costs;
- Revenue;
- Programme;
- Quality;
- Functionality; and
- Approvability.

Of these areas, capital costs, operating costs, revenue and works duration (programme) have been shown to lie within Optimism Bias considerations. Two strategies have been adopted to quantify the impact of risk, in accordance with Green Book guidance. The first, has been to calculate the Optimism Bias to be applied to Capital Costs and Works Duration. The second, has been to appraise the risks associated with operating costs and revenue through sensitivity analysis.

### 5.2.5 Risk Significance

The significance of each risk has been classified by means of a 5-point (Australia/New Zealand) system for combining likelihood and impact of each risk. The scoring was conducted on the basis of an allocation of a numerical weight ranking from 1 to 5, with 1 ranking low and 5 ranking high. The numerical allocation for likelihood and impact were multiplied to generate a ranking of that particular risk's overall importance to the project. These risks were allocated to the categories above and risk was then "scored" by tie and its technical and financial advisors in order to assess both their likelihood and impact on the project. This has been assessed for each risk prior to mitigation and following mitigation in order to rank and prioritise activity.

The following definitions of likelihood have been consistently adopted.

Level	Likelihood
1	Remote
2	Unusual
3	Possible
4	Probable
5	Expected

The following definitions of severity have been consistently adopted.

Level	Impact	Capex / Lifecycle (£)	Opex/ Revenue (£ per annum)	Programme
1	Insignificant	Up to £25k	Up to £25k	Up to 1 week
2	Minor	>£25k to £100k	>£25k to £100k	>1 week to 2 weeks
3	Moderate	>£100k to £500k	>£100k to £500k	>2 weeks to 1 month
4	Significant	>£500k to £1m	>£500k to £1m	>1 month to 3 months
5	Major	>£1m	>£1m	>3 months

When combined the likelihood and severity of the risks have been evaluated and prioritised as follows.

Significance	Range
Negligible Risk	>=0 <4
Low Risk	>=4 <8
Medium Risk	>=8 <12
High Risk	>=12 <16
Very High Risk	>=16

**5.2.6 Mitigation Factors**

The extent to which risks have been mitigated is assessed and measured by a mitigation factor, that is, 0.0 means that risks in a project risk area are not mitigated and 1.0 means all the risks in a project risk area are fully mitigated.

**5.2.7 Mitigation**

Responsibilities were allocated amongst tie, various Working Groups and advisors for each risk and, in particular, to develop a risk mitigation strategy. The risk mitigation strategy sets out an understanding of the risk identified, the actions to be taken to minimise the impact of the risk, by whom and to an agreed timescale. Furthermore, the list of risks was reviewed to identify the "critical path" risks, being either fundamental in principle, or time critical to the success of the project. These risks have been managed by tie to ensure risks are addressed in an ongoing positive manner. It is intended that the risk register will be updated regularly as the project progresses, and will be a utilised by tie as a live risk management tool.

**5.3 Key Risks**

Ita has developed clear and active processes to prevent and mitigate project risks in accordance with industry best practice.

**5.3.1 Risks Identified To Date**

The work undertaken on risk to date follows industry best practice on identifying and quantifying risks. The risks to the scheme can be allocated to the following four principal risk categories (excluding Termination Risk), using contemporary classifications.

- **Development Risk** : design and development, scheme approvals and procurement of all scheme components, and activities to be concluded prior to commencement of construction;
- **Construction Risk** : advance works including utility diversion, main infrastructure construction, project management and commissioning related risks
- **Performance Risk** : standards and defects related risks occurring post-construction; and
- **Operation Risk** : repair and replacement risks impacting the scheme during operation of the system (outwith DPOF Operator risks).

Ita has identified the following key risk areas to the infrastructure components.

Development Risk	Construction Risk	Performance Risk	Operation Risk
Failure to acquire land	Incorrect cost estimates	Latent defects to infrastructure	Legislative/regulatory change
Delays in obtaining planning permissions	Incorrect time estimates	Performance of sub-contractors	Changes in taxation
Cost and delays due to utility diversions	Unforeseen ground / site conditions	Default by sub-contractors	Changes in VAT
Poor contractual interface with vehicle suppliers and system integrators	Unforeseen ground / site conditions under existing buildings/structures	Industrial action	Incorrect estimate of maintenance costs
Failure to design to brief	Delay in gaining access to the sites	Failure of system integration	Incorrect estimate of lifecycle costs
Continuing design development	Responsibility for maintaining on-site security	Failure to meet performance standards	Residual value reduced
Delays in advance works	Responsibility for maintaining site safety	Incorrect choice of tram vehicles	
Changes in design required by the Operator	Third party claims	Availability of tram infrastructure	
Changes in design	Compensation events	Relief Events	
	Delay events	Force Majeure	

Development Risk	Construction Risk	Performance Risk	Operation Risk
required by the Council/tie  Failure to build to design	Force Majeure  Termination  Legislative/regulatory change  Changes in taxation  Changes in VAT  Contractor default  Poor project management  Contractor / Sub-contractor industrial action  Protestor action  Changes in inflation during construction  Incorrect time and cost for commissioning new tram	Termination  Failure to upgrade to new technology resulting in obsolescence	

**5.3.2 Capital Costs - Third Party Costs**

tie anticipates that the following elements of capital expenditure have associated risks, which are largely dictated by third parties, and may significantly impact the final outturn cost of the scheme. It is considered that these risks have been significantly mitigated through the considerable amount of work undertaken to date by tie's technical and land and property advisors to generate the robust costs and contingencies allowed.

- utility diversion costs;
- land costs associated with acquisition, temporary disruption during construction and compensation;
- vehicle costs;
- Network Rail costs for immunisation of equipment, possessions, compensation costs to train operating companies, information supply, liaison and development of agreement;
- unforeseen ground conditions for currently accessible and inaccessible areas; and
- Council/tie instructed change.

The main risks that have been analysed are those related to third parties. Of these the majority relate to development and construction risks. As the design, procurement of components, and

construction of the tram takes place over the first three years of the project the majority of risks that are inherent in the development and construction process occur over the first three years of the contract for both a full and phased system.

### 5.3.3 Operating Costs

Sensitivity tests were undertaken to examine the importance of various parameters (vehicle performance, signal optimisation, boarding and alighting arrangements, stop design, etc) on the overall operating cost performance. Tests were also undertaken to assess the effect of rationalisation of existing bus services within the network along competing corridors, the impact of changes in speed on bus operations and the resource implications.

### 5.3.4 Revenue

The LUTI model development included a detailed model calibration and validation stage. In addition an independent review of the model was undertaken by a group led by Professor Roger Vickerman, Director for Centre for European, Regional and Transport Economics. For the initial congestion charging study it reported that "our overall assessment is that they have erred on the conservative side".

Following the development of the model, a Modelling and Appraisal Working Group was established to review modelling related issues as and when they arose, and draw on the collective experience of the working group members as well as the wider modelling expertise within the associated consultancies. The Working Group members were drawn from the LUTI model development team, tie and the appointed project consultant teams (MVA, Steer Davies and Gleave, Mott MacDonald, Babcic, Faber Maunsell and Halcrow). Where issues were identified, they were quickly addressed and modifications incorporated within the modelling suite. A series of technical notes reported on the issues and their resolution as they arose.

A series of sensitivity tests were undertaken to evaluate the sensitivity of the demand forecasting results in response to small changes in scheme alignments, planning scenarios, growth rates, parameter values, park and ride, etc.

The model is at the cutting edge of the 'art' of transport modelling and is capable of modelling the interaction between many factors influencing travel choice that were not previously taken into account. Although it does not simulate all movements, it provides forecasts across a range of scenario tests that are both consistent and indicative of the level of change. The increase in the number of independent variables taken into consideration increases the overall level of confidence associated with the central model forecast although the number of variables associated with a statistical range of confidence is increased (Monte-Carlo type risk analysis).

Appropriate allowances have been set aside for ramp down of early years of operation, potential fare evasion and concession discounts. Transdev have already conducted an initial 'high level' review of revenue to confirm that estimates are of the correct order. tie anticipates that areas will be identified that will require detailed analysis leading to further improvements of the robustness of estimates.

### 5.3.5 Life Cycle Costs

The project lifecycle has been assumed to be 30 years. Estimates provided, by tie's technical advisors, for lifecycle costs have been carried out in parallel, and through detailed consultation between individual lines. The resulting methodology for developing the estimates has utilised the

combined previous experience (including knowledge of commercial rates for supply of maintenance services), which covers the development of practically every modern tram scheme built in the UK.

This approach follows industry best practice, and is the most appropriate method of defining costs. In each case, a conservative approach was adopted to defining lifecycle intervals and costs, thereby limiting the risk of the actual costs exceeding estimates, and providing a "built-in" contingency.

The above process demonstrates that a thorough, methodical approach has been applied to the generation of lifecycle costs. The consistency of approach between tie's individual line consultants, together with the combined knowledge of both teams regarding existing UK tram schemes, ensures that there is a high level of confidence in the robustness of the estimates.

### **5.3.6 Programme - Delays**

tie have identified a number of key areas where there are significant risks of delays to project programme, as follows.

- public utility diversions;
- Network Rail;
- objections;
- change of Transport Minister;
- Parliamentary time with other Bills under consideration;
- lack of market appetite in the scheme;
- weak communications between tie and the SE;
- bidder fatigue during negotiation; and
- competing projects cause increased construction periods.

As the construction of the tram takes place over the first three years of the project, the majority of risks that are inherent in the development and construction process occur over the first three years of the contract.

### **5.3.7 Key Risk Mitigation Underway**

tie will continue to apply significant efforts to identify, analyse, categorise and implement planned mitigation for each risk.

All of the risks identified have been discussed in detail between tie and their advisors, and are each subject to a risk mitigation strategy to minimise, where possible, their likelihood and severity of impact on project delivery and operation.

tie is seeking to substantially further mitigate risk through the involvement of Transdev since June 2004 in all the planned phases of project development.

In the 'short' term, tie's immediate focus will be to mitigate the risks associated with the development of this Preliminary Financial Case to ensure funding issues do not delay scheme delivery; working to resolve issues raised by the objectors to the scheme; the preparation of evidence for submission to Parliament; and the involvement of Transdev in reviews of the current design of the proposed system.

In the 'medium' term, tie's focus will be the mitigation of risks associated with the potential market for the construction of the tram system. tie is undertaking market sounding with potential Infraco consortia members; the procurement of designers to commence detailed design of the system; engaging with Network Rail and Public Utility providers; and commence Infraco and Vehicle procurements.

In the 'long' term, tie's focus will be related to the commencement of Public Utility diversions; effecting a Contract with Infraco and implementation of integration of services with bus operators.

#### **5.4 HM Treasury Green Book**

The Green Book sets out the HM Treasury guidance on how to evaluate projects and the risks inherent in developing these projects. The Green Book has recently been revised and the methodology contained within it is still subject to development and testing to understand fully its impact. For the purposes of this Preliminary Financial Case there are two key issues to consider:

- Optimism Bias-This provides a methodology to determine what level of additional cost and programme delay should be applied to a project given its particular stage of development. A project in its early stages of development is inherently less certain, in terms of its cost envelope, than one which is close to contract signature. The Optimism Bias adjustment allows a theoretical factor to be applied to the capital costs of a project to reflect this and the costs involved in mitigating the impact of this. Standard factors are given dependent upon the nature of the project based on analysis of previous projects. The Green Book does not propose any Optimism Bias adjustments at present to cover operating costs, lifecycle costs or revenue.
- Amendment of the discount rate - Prior to the revision of the Green Book all capital projects were discounted at a rate of 6% plus RPI. This however has been superseded in that projects are now discounted at 3.5% plus RPI to establish the NPV of the project.

##### **5.4.1 Optimism Bias Applied**

The risk assessment undertaken by tie has taken as a starting point the fact that the project falls within the Green Book definition of a Standard Civil Engineering Project, due to the number of other UK projects that have been developed, and as a consequence the maximum Optimism Bias adjustment per the Green Book to capital costs and works duration is 44% and 20% respectively. In determining the appropriate level of Optimism Bias to apply to this project account has to be taken of the rigorous capital costing methodology employed by tie's technical advisors, that is, determining the cost based on a detailed engineering analysis of the alignment and utilising the out-turn costs of a number of recent tram projects. As noted in this section the capital and operating costs have been subject to a cross-checking process between the Line One and Line Two technical advisors and subject to benchmarking by them against other light rail projects. It is therefore considered by tie and its advisors that the Specified Capital Costs (including identified contingency) have been developed based on the latest available market knowledge.

##### **5.4.2 Recent DfT Guidance**

DfT has published its guidance "*Procedures for Dealing with Optimism Bias in Transport Planning*" in July 2004. This guidance builds on previous studies reported by Mott

MacDonald, on behalf of HM Treasury, with recommended Optimism Bias adjustments. The guidance identifies the following four categories for the causes of Optimism Bias:

- **Technical causes:** imperfect information such as unavailability of data, new or unproven technology; scope changes such as changes in relation to speed, road width, routing, safety and environmental norms; and management issues such as inappropriate calculation approach, procurement issues and risk sharing;
- **Psychological causes:** the tendency for humans and organisations to favour optimism; and appraisal of optimism impact;
- **Economic causes:** construction companies and consultants having interest in advancing projects; and
- **Political-institutional causes:** interests, power and institutions; and actors may deliberately lie in order to see their projects or interest realised.

The project has now been in detailed development for some three years. As a consequence of the stage it has reached, the analysis, cross-checking, review of lessons learned on other schemes and benchmarking of cost estimates, together with the amount of mitigation that has been carried out across the range of risk areas identified above, it is considered appropriate to use lower factors of 25% for Capital Cost Optimism Bias and 10% Works Duration Optimism Bias. It should be noted that this compares to a capital cost contingency of 10.8% identified by Mott MacDonald for Line One. The difference between this figure and the Optimism Bias Capital Cost adjustment of 25% adds a theoretical £31million of capital cost to the project costs in 2003 Q2 prices at this stage.

The levels of Optimism Bias, since the submission of the December 2003 Preliminary Financial Case, have reduced from 31% to 25% and 15% to 10% for Capital Cost and Works Duration respectively. This has been achieved through a deeper understanding and quantification of risk together with mitigation actions that have already been applied. As the project develops in terms of specification and design the overall level of Optimism Bias should reduce further towards the level of contingency calculated by tie's technical advisors.

### 5.5 Conclusions

tie and their advisors have implemented a rigorous approach to the quantification and management of risk which has evolved both in terms of sophistication and the resource applied. tie have sought to apply lessons learned from published reviews of major projects and tram schemes in the UK.

tie's risk management process has identified a comprehensive package of risks surrounding the development of the project and initiated a related mitigation strategy. The risk documentation is subject to regular review and updating in order to manage proactively the identified risks.

In assuming the funding structural options an incremental Optimism Bias factor of 14.2% has been applied to base capital costs and 10% to works duration using HM Treasury methodology. This represents an increase in Specified Capital Costs of £31 million and a prolongation of the construction period by 4 months compared to the base case provided by tie's advisors. The contingency costs included above have been advised to tie by their technical advisors, based on their detailed evaluation of the underlying costs and the remaining project risk. For the purposes of the assessment of the required funding the costs do not include the element captured within



Edinburgh Tram Line One - 2004 Preliminary Financial Case - Update  
September 2004

the Optimism Bias concept which is designed to accommodate more general contingent risk based on non-project specific factors.

## 6 Procurement Options

### 6.1 Procurement Issues

The purpose of this section is to outline the further work that tie has undertaken in the development of procurement strategy since the submission of the Preliminary Financial Case in December 2003. The analysis that has been undertaken has been based primarily on assessment of the experience of procuring similar projects elsewhere in the UK.

In recognition of the importance of the procurement approach to the success of the project, tie established a Procurement Group as part of the overall stream of work to consider how best to achieve the procurement of the tram network. The remit of this group is to analyse the issues which have arisen in other light rail projects and to determine the optimum route for the procurement of the light rail network for Edinburgh. The group contained representatives of tie, the Council, Mott MacDonald and Faber Maunsell (the technical advisors for Lines One and Two), DLA, Grant Thornton and PUK.

Over the past ten years, numerous public transport infrastructure projects have been developed across the world through an approach that in some measure involves the introduction of the private sector in a risk bearing capacity. In airports, ports and roads, it has been possible to develop relatively straightforward funding models where a concession company takes responsibility for the design, build, financing and operation of the project, in return for the right to the real or shadow revenue streams generated by the enhanced infrastructure. In urban and inter-urban rail and transit systems, while a number of projects have indeed been developed, their funding structures have generally been significantly more complex.

This complexity follows from a number of features commonly associated with light rail and other transit projects. A summary of the issues which have arisen on other projects is set out below:

**Revenue generation-** Light rail projects do not, generally, generate sufficient revenue from the farebox to meet both the capital and operating costs associated with the project. The public sector therefore maintains a major role, contributing all or substantially all of the capital costs either by way of up-front capital grant or through a long term service related payment. Over-optimistic projections of farebox receipts have been the cause of difficulties on projects seeking full transfer of this risk to the operator.

**Social benefit and system quality -** The public sector has a real interest in ensuring that, in design and operation, the project meets its wider social agenda as well as the necessary commercial requirements of the system operator and funders. This has resulted in tension in projects as to control over design and specification and affordability.

**Integration-** Much of the benefit of a public transport service is only generated through integration with the other parts of the transport system, be that bus, heavy rail or car. This has significant impact on the way the project can be structured, with the design and operation of the system constrained, and the revenue collection ability of the project under inevitable influence from the alternative modes of transport. Additionally, there is conflict between the practicality of integrated transport and UK Competition Law requirements. Equally, direct competition from other public transport modes has damaged the ability of light rail schemes to attract and sustain patronage, particularly during the start-up period.

**Risk Transfer-** Previous UK projects have pursued risk transfer to the private sector as an objective without necessarily focussing on the detailed commercial implications of what that means. As a consequence some projects have suffered from overly aggressive risk transfer proposals resulting in substantial risk premia, unsuccessful negotiations, inappropriate funding structures, poor value for money and consequentially commercial structures which are not robust.

**Procurement models-** A variety of procurement models have been utilised for light rail projects within the UK with varying degrees of success. While many projects have progressed relatively smoothly some projects have suffered from factors such as inadequate early development with resultant affordability issues, system integration technical problems, insufficient early involvement of an operator/contractor, lack of foresight regarding future extensions and unwanted procurement delays. tie has reviewed its advisors' recommendations as to lessons to be taken from the UK experience on the issues outlined above and also sought information from other current UK schemes in order to seek to avoid some of these pitfalls. To that end the tie team have visited the project teams for Leeds, Nottingham, South Hampshire, Croydon and Docklands light rail schemes, as well as projects overseas. This has provided additional useful insight into the optimal scheme management route for the development of the proposed light rail network.

A number of recurring themes arose from these other projects. These can be summarised as:

- failure to recognise that the banking market appetite for certain light rail project risks has evaporated;
- over-optimistic revenue projections causing difficulties for the Special Purpose Company (SPC) and funders;
- poor project development leading to significant cost escalation;
- timescale delays during procurement and construction;
- aggressive competition from other transport modes;
- loss of integration potential; and
- inflexible procurement routes and poorly analysed risk transfer implications.

In the analysis and development of its procurement route tie has sought to address each of these issues.

## **6.2 Evaluation Features**

Given the issues identified above the Procurement Group sought to identify a means of mitigating the procurement risks which have arisen on other projects. A procurement strategy evaluation exercise was undertaken against an agreed set of evaluation criteria and measures.

The key elements in the criteria were as follows:

- fit with the Local Transport Strategy: this assessed key issues such as integration, social inclusion, economic growth and congestion reduction;
- cost and affordability: project costs, sources of funding and risk transfer;
- deliverability: this assessed timescale, third party issues, fit within the City environment, funding issues for the private sector and practicality;
- incremental network: this was concerned with how best to deliver the extensions to the network within procurement law constraints;
- effective competition: this assessed the ability of bidders to participate in the procurement exercise and the maximisation of bidder commitment; and
- bidder configuration: this was focussed on the achievement of a strong technical solution and the sourcing of a strong operator.

### 6.3 Operator

Through the procurement process tie has sought to enhance the delivery of the Edinburgh tram system by combining best practice with lessons learned from other related projects in the UK and abroad. The outcome of this work led to the shaping of the procurement route with a balanced approach to risk transfer, and active mitigation of specific areas that have proven problematic in other projects.

In direct response to the application of best practice the Board of tie, in consultation with the Council and the SE, determined in Spring 2003 that the early involvement of the tram operator was an innovative and critical element of project risk management. The principal reasons are:

- separation of the operator and system construction contracts achieves high quality risk disaggregation and consequent benefits to contract pricing
- early involvement of the operator allows tie to use their knowledge in the design and construction phases and ensures two things:
  1. the Operator is fully bought-in to the design once operational and eliminates the risk of redefinition being introduced with attendant cost implications; and
  2. the Operator's knowledge will assist in keeping costs of construction down during the negotiation of the construction contracts.
- early involvement also facilitates proper planning of an integrated service network, especially with bus operations
- the DPOF Agreement allows for pain and gain sharing around target costs and revenues, providing further financial risk management

Following a rigorous procurement process and detailed negotiations, which is described below, the DPOF Agreement was signed with Transdev on 14 May 2004. The contract structure adopted by tie is now under active assessment by a number of English authorities as a means to resolve some of their execution problems. The recent NAO report pointed strongly to early operator involvement as a means of improving the execution of tram procurement and achieving a stable and affordable system.

It is tie's primary objective that this process will forge the basis for a strong and mutually beneficial long-term partnering relationship with Transdev for the operation of the Edinburgh Tram Network. It is considered that this relationship will assist in the promotion of integration between the different transport modes within the City, assist in developing and delivering the optimal project for Edinburgh, and also assist in managing costs and bringing first hand experience to revenue projections in order to deliver a robust project and avoid unnecessary cost creep.

### **6.3.1 Operator procurement approach**

Following the issue of a Prior Information Notice, initial meetings were conducted with the following respondents in May 2003. It should be noted that these informal discussions did not form any part of the evaluation process to select the preferred partner, rather they were used to assess market appetite for such early operator involvement, to test private sector views on a number of key issues and to assist in scoping out the role of the DPOF partner:

- Alstom;
- First Group;
- HTM Consultancy;
- Keolis;
- Serco; and
- Transdev.

These meetings covered a set agenda of the following topics:

- bus-tram integration;
- remuneration;
- operations;
- infrastructure/ equipment provision;
- risk allocation; and
- timing/ resourcing issues.

The main conclusions flowing from these discussions were the market's enthusiasm for tie's procurement proposals, and a willingness of the operators to get involved at the outset of the process in order to avoid some of the pitfalls of other recent projects. Further detail as to the outcomes of the discussions are set out below and were used to inform the scope and shape of the procurement.

#### **Bus Tram Integration**

Generally the operators were comfortable with the framework outlined by tie for the development of a services integration plan which would form a key element in the assessment of bids received and the eventual selection of the preferred partner. A strong recognition of the importance of successful integration was evident.

#### **Remuneration**

An outline of the proposed payment mechanisms was shared with the operators setting out the milestone basis during the initial phases and a "pain/ gain" sharing mechanism based on target

costs and revenues during mobilisation and operations. No major issues regarding the proposals were noted.

### Operations

The question of fares policy and the operator's degree of control over these has a major impact on their attitude to revenue risk. The Council policy has yet to be developed in relation to tram fares, however a substantial degree of control will remain with the public sector which detracts from a full revenue transfer as noted above.

In terms of operating franchise length, the operators had varying ideas as to their preferred initial contract period, renewal opportunities and break points. The preferred option of the Procurement Group, endorsed by the tie Board, is an initial 15 year contract, with an option for tie to extend the contract for a further 5 years (this complies with current applicable EU legislation).

### Infrastructure/ Equipment Provision

The main feature of discussions held in relation to infrastructure and equipment provision surrounded the ability and willingness, or otherwise, of an operator to couple the provision of maintenance as an element of the operating contract, or the infrastructure and equipment supply contract. Various parties had opposing views. The preferred option of the Procurement Group was to proceed on the basis that infrastructure maintenance best fits with the infrastructure provider. This aspect remains under detailed development as part of the infrastructure procurement.

### Risk Allocation

In relation to risk sharing, it was apparent that although operators have contemplated and in some cases accepted revenue transfer elsewhere, this was not necessarily considered an optimum solution for either the public or the private sector. Factors such as control over fare setting, control over integration, and the required risk premium in light of the lack of confidence in patronage modelling all detract from full farebox revenue transfer at the outset. Particular concern over revenue risk transfer during the initial operational ramp up period of two to three years was also highlighted.

### Timing/ Resourcing Issues

tie highlighted their requirement for a compact focused team during the development phases, with involvement of senior individuals who have live tram operating experience. Long-term commitment to the Edinburgh project was also highlighted as key, with a focus on the continuity of the senior team who will lead the actual management and operations of the project throughout the process. The operators were made aware of the importance of the team proposed in tie's overall evaluation of bids when received.

### Prequalification Process

Following an OJEU notice issued by tie on 11 June 2003, six potential bidders submitted pre-qualification questionnaires. The six bidders were:

- First Group;
- HTM;
- Keolis Via GTI UK limited in association with Parsons Brinkerhoff;
- National Express;
- Serco; and
- Transdev.

The pre-qualification questionnaire included a series of technical questions designed to elicit the demonstrated experience and capability of candidates in providing these services. It also contained a series of financial questions developed to allow an assessment of the financial and economic standing of each of the candidates in relation to the DPOF approach. Candidates were also asked to return signed bid conditions, dealing with rules of tendering.

Following the evaluation process, tie invited four bidders (First, Keolis, Serco and Transdev) to respond to the Invitation to Negotiate issued on 25 September 2003. Bid submissions from the four parties were received on 18 November 2003. Following bid clarifications and negotiations, tie selected Transdev as it's preferred partner.

The DPOF approach is designed to permit flexibility for incremental development, construction and delivery of the three line core network and its planned expansion. The DPOF approach covers four distinct Edinburgh Tram Network Project Phases creating a framework with an equitable balance between responsibilities and rewards. An outline of the activities associated with each Project Phase is given below. It should be noted that tie has the ability to terminate the DPOF Agreement prior to Phase D

#### **Development (Project Phase A)**

During this Project Phase, the Operator would be engaged with tie and its advisors to deploy its operational and commercial expertise to complete development of tie's requirements for the system infrastructure.

#### **Infrastructure, Equipment and Vehicle Procurement (Project Phase B)**

This Phase will be concerned with preparation for infrastructure, vehicle and equipment procurement (following Royal Assent to the enabling legislation) for the three core network lines.

#### **Design, Build and Commissioning (Project Phases C1 and C2)**

After award of a contract for infrastructure, vehicle and equipment delivery, it is envisaged that the Operator would be a member of tie's project management team. The Operator would undertake system mobilisation during this Phase in order to prepare for full operation and complete arrangements on service integration.

#### **Operations (Project Phase D)**

During Project Phase D, the Operator would run Line One, accepting further core network incrementally. The Operator would continue Project Phases A, B and C development

partnering functions, as required by tie, in relation to further Lines and expansion beyond the core network.

### 6.3.2 DPOF Risk Transfer Issues

Two issues were seen as key to the DPOF contract development process.

#### Operation and Performance Risk

The Operator will ultimately be in day to day control of project performance and hence the quality of service provided to the public. However, the foundations for the project development lie with tie and its advisors. One of the main factors involved in bringing on an Operator during the early phases of the project is to inject their perspective to the development of the network, and hence to facilitate the evolution of the optimal delivery platform for the tram project, within affordability limits. It is anticipated by tie and the Procurement Group that this approach, which has been endorsed by the Council and supported by operators interviewed at the PIN stage, should allow the delivery of the project to meet both the Council and tie requirements.

To address issues of performance during the operating phase of the contract, the DPOF Agreement has been structured to incorporate a Payment Mechanism which tie believes offers the Operator an appropriate risk/reward share. tie's proposed payment mechanism is set out below, however in summary, the Operator will be penalised under a KPI regime for not delivering service to the required specification, whilst being incentivised to minimise costs and maximise revenue to take advantage of the proposed pain/gain sharing mechanism. The final strand of the payment mechanism, namely the Vision Achievement Incentive, is a longer term goal for the Operator to aspire to. This will only be payable in circumstances where the tram project's financial performance exceeds expectations, and where the quality of service delivery also exceeds a pre-agreed challenging target level.

#### Pricing and Revenue Risk

A key element of retained risk for the public sector surrounds the actual revenue and costs of the project. One of the factors influencing the decision to proceed with the DPOF arrangement and separate infrastructure procurement was the underperformance of a number of the full PFI/PPP structures where 100% farebox risk has been transferred to the private sector. In particular, due to the lack of confidence in patronage modelling, the revenue stream associated with such projects can be heavily discounted in agreeing a final price, and attracts a significant risk premium in terms of funding margins.

In order to achieve the benefits associated with the DPOF structure, full revenue and operating cost risk will not be transferred to the private sector. Rather a degree of control over the public sector's exposure to operating costs and revenues has been built into the DPOF approach via the development of a pain/gain sharing mechanism.

This regime, which compares actual costs and revenues with pre-agreed targets, has the joint benefit of incentivising the operator to minimise costs, and maximise revenue, whilst limiting the public sector's risk.

The success of the pain/gain sharing mechanism will be driven not only by the outturn performance of the project in terms of actual costs and revenues, but also the agreement of



appropriate targets. In order to introduce a control mechanism to target cost setting the four short listed bidders were requested to submit their costing assumptions for each cost element of the project. These assumptions were used to create a costing framework or template, to be refined by discussion with tie and the successful Operator over the development phases as the detail of the Line is crystallised. This information will be used in the OBC which contains a formal funding request and which will be submitted following the development of project specification with Transdev. Revenue targets will also be developed during the early phases of the DPOF and fixed prior to Transdev's confirmed status as system operator. In the instance where agreement surrounding target setting cannot be achieved between tie and Transdev, tie have a termination right to step out of the contract. It is envisaged that the target costs will be reviewed and reset on a three yearly basis.

### **6.3.3 Payment Mechanism**

tie's proposed payment mechanism over the four Phases is summarised below. This was subject to the responses received from the bidders and negotiation with them prior to selection of the DPOF partner. To facilitate this the bidders were requested to supply details as to their assumptions and breakdown of costing data as an integral part of their bids.

During Project Phases A to C1 the four bidders were invited to supply capped fee estimates, based on the scope of work set out in the output specification. Payments for these phases will be made on a quarterly basis with the fee based on the cost of the Operator's expert personnel. A retention of 25% will be remitted upon the completion of each individual phase.

During mobilisation, Phase C2, Transdev will be paid on the basis of a pain / gain sharing arrangement around agreed target costs for the phase. These target costs will be developed and agreed prior to completion of Phase B.

tie's proposed Payment Mechanism during Project Phase D comprises the following discrete elements:

- Operating Costs and Profit Element;
- Performance Regime;
- Pain/Gain Share Mechanism; and
- Vision Achievement Incentive.

Each element is described in turn:

#### **Operating Costs and Profit Element**

The Operator will be paid preset operating costs and a fixed profit element monthly on the basis of the target operating costs and a fixed profit element. The annual target operating costs will be agreed with the Operator prior to completion of Phase B, and the profit elements were bid as one of the ITN submission requirements.

#### **Performance Regime**

This is the day-to-day mechanism through which tie will monitor and incentivise the Operator to deliver the high quality tram project that is envisaged for Edinburgh.

tie has selected seven weighted KPIs, which it considers as most important to ensure the effective operation of the tram system and a service quality responsive to the Council's aspirations.

#### **Pain/Gain Share Mechanism**

This is the key element of the mechanism which achieves mutuality of interest in the financial performance of the Line. The intention of this mechanism is to offer the Operator and tie the opportunity to share in savings on operating costs generated from operating the system more efficiently and in the generation of any additional revenues above targets. The mechanism also offers the Operator an element of protection against downside revenue risk and cost escalation.

The comparison of target and actual costs and revenues, and the ensuing payment to or from the Operator will be performed by tie semi-annually. It is proposed that the targets are reviewed during the course of the contract on a three yearly cycle and if necessary reset by agreement between tie and the Operator.

#### **Vision Achievement Incentive (VAI)**

The principle underlying this would be to reward the Operator for the added value created in the tram system through sustained high quality performance as measured under the KPI regime and a greater than forecast surplus of revenues over costs, having taken account of the pain/gain share mechanism.

### **6.4 Infrastructure**

The Procurement Group also considered alternative structures for the procurement of 'infrastructure', 'tram vehicle' and 'system integration' elements of tram system.

The Procurement Group's collective experience of procurement was used to assess options over a number of detailed working meetings. This experience is now supplemented by Transdev.

The aims of the Procurement Group are to assess the alternatives and identify the preferred route for procurement which could form the basis for market discussions. It is intended these conclusions will be tested with the market through a PIN process as the next stage.

The Procurement Group undertook the assessment of options through ranking against eight key criteria comprising the following.

**Risk** -- in broad sense: who takes the risk of infrastructure failing to work, costing more to construct and taking longer to construct? This type of risk can be transferred to an infrastructure partner under certain procurement options, but always at a price. As a general rule, the aim is therefore to transfer risk to those best placed to manage. Considerations in deciding upon the Procurement Group's view of risk included:

- tie's own resources and expertise;
- timetable implications; and
- areas where tie may wish to maintain control for other reasons.

**Cost Certainty** – how important is it to have a degree of cost certainty on costs ahead of committing to contract. Considerations included:

- source of funding: how much certainty is required in advance on amounts?
- defining scope: degree of certainty is important in planning scope of different phases of infrastructure.

**Control** – are there areas of the infrastructure over which tie or the Council need greater control – for commercial or other reasons (e.g. policy and planning)? Considerations included:

- the fact that greater control will generally reduce the opportunity for risk transfer.

**Flexibility of contract** – how important is it to be able to change scope – add or subtract substantial elements? Considerations included:

- generally, greater flexibility will reduce cost certainty;
- flexibility may also reduce the scope for risk transfer; and
- degree of flexibility may be constrained by procurement rules.

**Flexibility of financing** – how important is it to keep all financing options open e.g. 'conventional' (up front or milestone payment by tie), private finance raised by Infracore (PFI or PFI hybrid) or others (leasing)? Considerations included:

- VFM – does opportunity for private finance allow for greater risk transfer and potentially better VFM; and
- profile of funding availability.

**Demonstrable VFM** – any selected option clearly must be capable of delivering VFM, but also to be able to demonstrate that the approach is likely to deliver. Considerations included:

- value of competition for largest cost elements of infrastructure; and
- possible requirement for benchmarking and competitive sub-contract tendering.

**Market interest** – is a procurement option likely to prove attractive to the main private sector providers in the market? This is linked to VFM since it determines the likely strength of any competition. Considerations included:

- familiarity of procurement route;
- balance of risks that the private sector are asked to take;
- clarity on project and funding and political support; and
- market view of tie's own competence and expertise as a procuring authority.

**Deliverability** – what is the degree of confidence that the chosen procurement route will be effective? Considerations included:

- novelty of chosen option; and
- potential bidders' levels of comfort with selected option.

Following discussion by the Procurement Group a broad assessment of the relative importance and influence of the key criteria was agreed.

#### 6.4.1 Importance of Criteria

The Procurement Group views of the relative importance of the key criteria were as follows.

1. **Risk** – The general view, given tie's own resources and experience (essentially a procuring body, rather than a major project management organisation) and the scale and complexity of the tram infrastructure scheme, was that tie should be seeking to transfer a significant majority of the major project risks to a private sector partner(s). In particular, keys risks to be transferred (at an appropriate price) should include the majority of construction risks (cost and delays) and the risk that system works (including integration). However, the Procurement Group also agreed that there was a willingness to retain elements of risk as an acceptable trade-off in order to:
  - a. retain control over certain key elements (see below); and
  - b. keep broadly within the overall timetable.
2. **Cost Certainty** – The Procurement Group's view was that a degree of cost certainty was important. Whilst this was not an immediate requirement, it would be a priority ahead of signing the infrastructure contract (covering the bulk of construction).
3. **Control** – The Procurement Group considered that there are at least three, and possibly four areas, over which the advantages of tie retaining a degree of control outweighed the possible erosion of risk transfer. These areas are:
  - a. **Choice of vehicles:** Given the considerable consolidation within the tram supply market, allowing for a market response *inclusive* of tram supply will severely reduce the number of infrastructure tenderers and could compromise final selection, pricing and risk transfer. For this reason, the Procurement Group agreed that there was strong case for tie to separately develop a tram supply, commissioning, maintenance and spare parts supply contract. Key would be the timing of such a contract and arrangements to migrate into the main infrastructure contract.
  - b. **Design:** Given the particular sensitivity of sections of the line within the World Heritage centre and the known concerns of the Council's planning authority, the Procurement Group agreed that there was merit in considering a preliminary package of targeted design work ahead of the letting of any main infrastructure contract. The aim would be to assist with the development of designs that are likely to satisfy planning requirements, reducing risk and wasted design work and speeding up the overall timetable. Key will be determining an appropriate level of work that will prove attractive to potential bidders, without distorting overall costs, and without delaying the letting of a main infrastructure contract.
  - c. **Utility diversion:** This is a time consuming and high risk element of the project. If tie were able to gain a greater level of certainty on requirements, this

could assist both in achieving the timetable and in reducing risk for the main infrastructure contractor (with impact on deliverability and cost).

- d. **System integration:** Given the importance of systems integration, and similarly limited market, the Procurement Group considered that tie may wish to have greater control and visibility over this aspect of any consortium. Whether this required a separate initial contract (as with vehicles) is more open to question, given the importance of transferring this risk to bidders.
4. **Flexibility of contract** – The Procurement Group recognised the trade-offs between cost certainty and risk transfer and flexibility. Nevertheless, it was agreed that the preferred procurement option, as a minimum should be potentially capable of delivering the system through a series of stages, via a single initial procurement. Defining the first, and most certain initial tranche would be essential (and would need to fit the affordability constraints) but as the most effective means of handling future integration issues, tie should have the *option* of retaining the same private sector partner for subsequent tranches, and system expansion, subject to VFM.
5. **Flexibility of financing** – The view was that it was important to maintain all financing options at this stage, in particular the option of private finance, via PFI or a PFI hybrid, given the potential for greater risk transfer and VFM, and the potential issues in relation to the profile of funding available from the SE.
6. **Demonstrable VFM** – The Procurement Group agreed on the importance, given the high profile and scale of project, in the context both of SE VFM and local authority best value obligations. Ideally, this could most clearly be demonstrated via a transparent and strong competition for the main contract. This in turn would require the Procurement Group to be satisfied on likely market interest and deliverability.
7. **Market interest** – The Procurement Group view endorsed the importance of market soundings to test options with private sector bidders.
8. **Deliverability** – The Procurement Group agreed that the tie preferred option needed to build on best practice and lessons learned from other projects without introducing unnecessary novelty. Again the views of potential bidders through market testing would be key.

#### 6.4.2 Procurement Options Available

Having agreed on the relative importance of the key criteria, the Procurement Group identified potential procurement options for further analysis.

1. **Full Consortium Option** - Under this option, tie would conduct one procurement exercise and the successful consortium would deliver all design, infrastructure works, and tram vehicles. The consortium would also be responsible for systems integration. The form of contract could be based on a PFI/PPP model.
2. **Infrastructure and Integrator Consortium Option** - Under this option, tie would conduct two procurement exercises. The first would be for the procurement of design, infrastructure works and systems integration. The second would be for the

procurement of tram vehicles. Ultimately, the contract for tram vehicles would be novated to the infrastructure provider as part of the design, infrastructure and systems integration package of works. The form of contract could be based on a PFI/PPP model.

3. **Infrastructure Consortium Option** - Under this option, tie would conduct three procurement exercises. The first would be for the procurement of design and infrastructure works. The second would be for the procurement of tram vehicles. The third would be for the procurement of a systems integrator. Ultimately, the contract for tram vehicles and the contract for a systems integrator would be novated to the infrastructure provider as part of the design and infrastructure package of works. The form of contract could be based on a PFI/PPP model.
4. **"Arranged" Joint Venture Option** - Under this option, tie would conduct separate procurement exercises to appoint an infrastructure provider, a systems integrator and a tram vehicles supplier. These parties would then be required by tie to form a joint venture which would be responsible for the delivery of the project. These parties could each provide risk-bearing equity.
5. **Infrastructure Development Partner Option** - Under this option, tie would conduct one procurement exercise to appoint a private sector partner who would, under tie instruction, either procure contracts or be instructed to enter into contracts in relation to any advance works, the infrastructure works, system integration, design and the procurement of tram vehicles.
6. **Traditional Procurement Option** - Under this option, tie itself would conduct separate procurement exercises in relation to design, infrastructure works, system integration and tram vehicles. tie would remain in contract with each of these parties. Various types of contract could be used such as the Institute of Civil Engineers or Engineering and Construction Contract conditions.

The options cover the extremes of the risk spectrum with option 1 (Full Consortia) which maximises risk transfer to a minimum risk transfer at option 6 (Traditional Procurement). tie will review the details of risk allocation within the OBC for the preferred procurement option as part of the assessment of VFM against a public sector comparator (PSC) as envisaged by option 6.

#### 6.4.3 Appraisal of Options

The six options identified by the Group, have been tested against the parameters established through the key criteria:

1. **Full Consortia Option** - This potentially provides for maximum risk transfer, cost certainty and flexibility of financing. However, tie would lose control of the key areas highlighted as important (vehicles, design, utility diversion and system integration). Also certain doubts about market appetite (even with separate operator contract) impacting on deliverability and VFM (especially given NAO observations on approach as used on previous schemes). Fit elements of match with parameters

2. **Infrastructure and Integrator Consortium Option** – This potentially provides for maximum risk transfer (assuming successful novation of vehicle contract and transfer of designs), cost certainty and flexibility of financing. It would allow tie to retain control of choice of vehicle (and to take the advice of Transdev) and to advance design work for sensitive sections of the lines. However, tie would not control the choice of system integrator. The opportunity for advance design and utility diversion work should increase market appeal and addresses certain NAO observations, but market consultations are required to confirm this. Fit: potentially very good match with parameters.
3. **Infrastructure Consortium Option** – As Option 2. However, given the importance of system integration to delivery, tie choice of system integrator potentially erodes risk transfer possible in main contract. Fit: potentially good match with parameters.
4. **'Arranged' Joint Venture Option** – This would create flexibility on scope. But a JV with equity puts a limit on possible risk transfer, increasing cost uncertainty. PFI financing would not be possible. The route is also untested in the light rail sector, raising doubts over market appetite, deliverability and VFM. Fit: poor match with parameters.
5. **Infrastructure Development Partner Option** – This would provide a great deal of control and maximum flexibility. However, much reduced risk transfer and no certainty of costs up front. It would be more difficult to demonstrate VFM (due to loss of competition) and PFI financing would not be possible. Fit: elements of good fit, but significant elements of poor fit.
6. **Traditional Procurement Option** – This is similar to Option 5 in terms of maximum control for tie and maximum flexibility (but implies significant project management capability requirement). Minimal risk transfer, minimal cost certainty, and not suitable for PFI. Fit: elements of good fit, but significant elements of poor fit.

A summary of the Procurement Group's view of the options fit with the key criteria is shown below.

Key Criteria	Options					
	1	2	3	4	5	6
Risk	√	√√	?	X	X	X
Cost Certainty	√√	√√	√	X	X	X
Control	X	√√	√	√	√	√
Flexibility of Contract	√	√	√	√√	√√	√√
Flexibility of Financing	√	√	√	X	X	X
Demonstrable VIM	?	√	√	X	X	?
Market Interest*	?	√	?	?	√	√
Deliverability*	?	√	?	?	√	√

\* To be discussed with market

Key: √√ = Very good fit

√ = Good fit

X = Poor fit

? = Uncertain – may need to be tested

On the basis of a comparison with the Group's assessment of the relative importance of the key criteria, the emerging current preferred procurement strategy is **Option 2: Infrastructure and Integrator Consortia (Infraco)**. The emerging preferred procurement strategy will be discussed extensively by tie with the Council, the SE and the DPOF partner, Transdev. In addition, targeted market testing will take place with a selection of constructors and funders in due course.

### 6.5 Information Exchange with the Council and SE

A series of briefing sessions have been held by representatives of the Procurement Group and tie with both the Council and the SE in order to keep both of these parties fully abreast of the project developments and tie decision points. These briefings have covered various issues including the following key areas:

- procurement approach to explain and explore the Procurement Group's analysis of the DPOF approach and recommendations to the Board;



- details of the commercial implications of the DPOF approach, including issues of risk transfer and payment mechanism; and
- a review of residual public sector risks associated with the DPOF approach and how tie and the Council intend to mitigate these risks.

### **6.6 Conclusions**

In developing the procurement approach outlined above tie has sought to take cognisance of the issues which have befallen other light rail projects particularly the risk allocation issues. tie has created a procurement strategy which facilitates the achievement of the Council's objectives of social inclusion and bus/tram integration through the early involvement of an operator. This approach will also aid in the overall project development and aid buy-in from the operator. Transdev staff now form an integral part of the tie team and are assisting in the scoping of the project. In assessing the appropriate structure for procurement of the infrastructure tie has suggested a route which will facilitate phased development of the project and minimise integration issues.

## 7 Funding Options

### 7.1 Assessment of Public and Private Funding Options

The purpose of this section is to examine the sources of funds and financial structures which can be used to finance the tram project. The analysis of funding options has been informed by an assessment of the problems encountered by other projects in the UK and the work undertaken by the Procurement Group as set out in the previous section.

In order to progress the development of this case, discussions have been held with major project finance banks to ascertain the issues they face in funding such projects. The funders' views on risk, particularly the aversion to revenue risk transfer, are therefore very pertinent. These discussions have confirmed the interest of funders in participating in structuring appropriate funding models to meet the needs of the project.

Light rail projects typically require a significant element of public support in respect of their capital costs if they are to be commercially viable; farebox revenue is generally not sufficient to deliver the income streams required to support the levels of debt service necessary to construct and operate the project. The questions then are:

- what level of public sector support is required for the project to ensure its financial stability; and
- how best to provide this support to the project, whether by capital grant or through a service payment tied to project performance.

The answer to the first question flows from the financial modelling and will reflect the extent and reliability of alternative funding sources available; the second question will partly be answered by risk assessment and partly by an assessment of SE spending commitments, applying the latest HM Treasury guidance on VFM.

Conventional public sector procurement would suggest an Up-Front Grant while a PFI/PPP solution requires a payment for services tied to the delivery of a functioning light rail system. There is a 'Partial PPP' option between these two whereby an element of the public sector contribution could be by way of milestone payments against construction completion with the balance through a PFI/PPP structure. Further variations involve separate procurement and funding of land acquisition and/or utility diversion; and leasing of vehicles and certain infrastructure. The key is to ensure that sufficient private sector capital remains at risk relative to performance of the system, to retain the key discipline that PFI provides.

This Preliminary Financial Case considers three possible options for public sector support;

- Up-front capital grant to fund capital costs;
- Full PFI/PPP structure (Fully commercial funding); and
- Partial PFI/"Hybrid" (Specified costs paid for outwith theSPC).

The funding requirements of each of the options have been modelled and the results are detailed in Section 10

Finally, the balance of funding and financial underwriting between the SE and the Council will require to be agreed. This has a critical influence on the affordability of the project, as is demonstrated below.

## **7.2 Funding Sources**

The principal sources of funding for the tram system are:

1. SE grant;
2. Operating surplus;
3. Private sector; and
4. Others including the Council.

This section sets out the basis for the inclusion of funding from these sources and highlights additional opportunities which are under examination.

### **7.2.1 SE grant**

This funding is based on the award announced in April 2003 by the Minister that:

The £375 Million grant "will secure at least the completion by 2009 of the "north Edinburgh loop" (Line One), the first tram line for the City in almost 50 years."

For the purposes of this Preliminary Financial Case, it is assumed that the grant will in principle be available to fund a system of Line One and Two or potentially an alternative configuration, subject always to a "robust business case" being available for the preferred configuration.

### **7.2.2 Operating surplus**

The surplus will require to be financially linked to the funding structure for the infrastructure contract. This interface will be addressed in the preparation of the OBC containing the application for funding support from the SE.

### **7.2.3 Private Sector**

tie has examined a wide range of potential private sector sources. In this section we do not address funding of a debt nature, such as that embedded within a SPC, since any such funding requires full repayment (with a return) and therefore creates no net additional funding for the project. In this context, equity funding is similarly disregarded. These sources are of course fundamental to the funding of a PFI structure, and are addressed in Section 7.5 below. The focus here is on absolute receipts or income for the project.

### Property development related funding sources

It is widely recognised that the introduction of a tram or light rail network has a positive effect on the value of property in near proximity to the routes. tie has examined how best to exploit this feature and develop additional funding for the tram project. Colliers CRE were engaged to provide professional support. The steps have been as follows:

#### a) Council-owned Development Sites

Colliers CRE have assessed the potential in the Council land holdings along Lines One and Two. The potential of many sites has been assessed as either too small and / or too difficult to extract but a number have been identified for further development activity. The sites have widely differing characteristics and potential. The potential value is very subjective, but an early assessment is that this portfolio could directly or indirectly contribute up to £5.0m million to tram funding in 2004 prices, with £2m accruing on Line One and £3m on Line Two. The cash would be realised partly before and partly after tram construction. Realising this value will be partly dependent on a joint venture arrangement with EDI (an arms length Council owned company with significant development expertise). The key principles are:

- EDI and tie collaborate on achieving planning permission for site development through normal planning procedures,
- once achieved, the Council contribute the land holdings to tie at market value, mandated by an option agreement entered into by the Council and tie. The consideration is additional share capital in tie to be owned by the Council;
- tie then contribute this land to a company established by EDI to execute development. tie therefore receives cash or other consideration for the land which is available for tram project funding; and
- the company develops the land and sells on to the private sector. After a developer return to EDI, incremental profits are shared, potentially providing additional cash for project funding.

It is anticipated that further sites will be identified and developed jointly with EDI under these arrangements. This overall approach has been endorsed by the Council.

#### b) Existing Section 75 negotiations

These have been handled by the Council planning officials under normal process and have yielded land contributions to the value of £13.6million in 2003 prices, split £8.8m to Line One and £4.8m to Line Two.

#### c) Developer contributions

A proposal is before the Council setting out how this mechanism could operate following a consultation on the subject. The policy offers an attractive long-term cash-flow from all future development related to the tram route above a specific size. Developers are given clarity in advance of submitting applications as to the level of contribution required, rather than subject to more ad hoc negotiations. Cashflow generated would require to be hypothecated to the tram project and possibly shared to a limited extent with public realm activity.

**d) Specific large-scale development**

The policy consultation specifically provides for "large-scale" developments to be subject to specific negotiation relevant to the circumstances of each site.

There are a number of key locations around the tram routes which, because of their scale, demand specific attention. Negotiations conducted to date have produced contributions which are reflected in the Section 75 number above. Further examination of these opportunities is continuing.

**e) Small-scale development**

The potential for small-scale property development around tram stops will be examined once the planning guidelines are settled. This would incorporate retail and vending facilities and would be focussed on the major transport interchanges and stops. Further work is anticipated on opportunities during 2004 and 2005.

**Commercial Income**

There are two broad potential sources of incremental commercial income:

- advertising; and
- marketing driven revenues.

**In-tram, tram stop and exterior advertising**

In total, the system will have up to 31 vehicles carrying up to 220-300 people per tram (depending on final specification decisions) with total expected passenger journeys initially of approximately 15m per annum. The captive nature of the audience and the lack of distraction make in-tram advertising attractive. tie has taken advice to assess how much space might be of potential value, while maintaining consistency with the objectives for tram décor quality and assessed how much revenue this might produce. The operator contract which has been negotiated under the DPOF structure leaves control over the development of these sources of income under the control of tie and accordingly all revenues less direct costs of delivery will flow to the tram project.

The value of tram stops as advertising media varies depending on location and passenger volume but again holds significant potential. There are important planning and legal aspects to address but these should not prevent progress.

The market for exterior vehicle advertising, either in panel form or "wraparound", is also well-developed. This will also require to respect design and image constraints.

**Marketing driven revenues**

The revenue projections in the model are based on transport usage patterns and availability rather than the subject of specific targeted marketing in favour of tram patronage. tie anticipates

the appointment of marketing management to develop and drive incremental revenues. In addition to Edinburgh public patronage, this would also focus on the tourist potential, both normal usage and tourist-trip specific and the use of the tram, perhaps in conjunction with Park and Ride facilities and feeder buses, for major events at Edinburgh's three main sports arenas, festival events etc.

#### **7.2.4 Other possible sources**

##### **The Case for Edinburgh**

The Council has submitted a comprehensive case to the SE highlighting the investment required to sustain and grow Edinburgh's economy for the benefit of the Scottish economy as a whole. This includes transport and specifically the tram project. Discussions with the SE are at an early stage and no allowance has been made for funding from this source.

##### **Project related revenues – not reflected in the projections**

- ticket non-payment penalty;
- fare increases by bus operators driving tram revenues ahead of those modelled – the evidence is that revenues for the tram are relatively understated relative to recent fare changes; and
- uplift in car parking revenues due to tram implementation arising from changes in the transport modelling, notably use of car parking for short rather than long stay.

These issues require further detailed assessment before they can be regarded as reasonably visible sources of income.

##### **Capital cost and funding items**

- residual value of system – this matter is under discussion with the SE within an assessment of current HM Treasury guidance. Currently, no residual value is allowed for although, given the long life nature of the assets and the life cycle maintenance plans, this is a particularly prudent assumption;
- extension of operating period – as for residual value treatment; and
- proceeds of disposal of Council-owned assets and investments – with the exception of land sites related to the tram project, the Council have no plans to generate cash-flow from such disposals for the specific purpose of funding the tram project.

##### **Congestion charging cash flows**

The 2002 ITI Preliminary Business Case assumed congestion charging cash flows would be available for the tram project. It has since been determined that it would be imprudent to continue that assumption in the context of this document. It remains open to the Council to review their utilisation of congestion charging cash flows should it proceed, however at this stage no assumption of availability is made in addressing the funding of Lines One and Two.

#### **7.3 Additional Considerations**

There are two issues which affect the financial position of Line One which warrant more detailed appraisal.

### 7.3.1 Congestion Charging

In assessing Line One in the congestion charging context, the impact of adding the tram into a scenario where congestion charging has already been introduced was assessed. The addition of the tram produced no discernible impact on the overall scheme patronage and revenues. This was primarily due to the Line One use of greenways for improving the bus speed and therefore less congestion had minimal impact on the benefits attributable to public transport users. Additionally the bulk of the patronage on Line One was not crossing the corridor and therefore not affected by the inclusion of congestion charging.

### 7.3.2 Service integration

It is widely recognised that effective integration is key to patronage stability and growth as well as to delivery of wider social policy aspirations. The NAO Report highlighted the need to complement and integrate the tram and bus routes to enhance the delivery of benefit to passengers and the wider stakeholders. tie has instigated a detailed programme of involvement of the tram operator and bus companies and will develop in due course a similar dialogue with other transport operators.

The STAG 2 estimates and financial projections contain initial assumptions about possible integration decisions but these will now be subject to a rigorous examination by tie, Transdev and other transport operators.

The main bus operator in the Edinburgh bus market is LB, owned by the Council (91%) and neighbouring local authorities (9%). LB delivers approximately 80% of bus services in the City, with the balance primarily delivered by First Group. This market structure offers an exceptional opportunity to achieve effective integration. tie has established the approach described below to capitalise on the opportunity:

- in the period to March 2004, tie worked with the Council and LB to design a framework for achieving sustainable integration of LB services with those of the Tram;
- the process of selecting the tram operator had a specific requirement that the bidders demonstrate that they would be able to deliver effective integration;
- in May 2004, Transdev were selected as preferred operator and they have now been fully appraised of the framework developed with LB. Initial meetings have taken place to commence the development of detailed integration plans;
- a holding company wholly-owned by the Council – Transport Edinburgh Limited (TEL) – has been incorporated to oversee and drive progress. Subject to Council approval, the board of TEL will comprise a balance of other key players – LB and Transdev, the Council, tie and independent directors. An operating group of transport professionals, reporting to this Board, will be established in due course to examine and develop detailed operational proposals;
- tie considers that integration will work best within a corporate structure which gives both bus and tram operators a meaningful financial stake in the success of the integration plans. Accordingly, a joint-venture framework is under development;
- the requirements of competition law are being taken fully into account and tie has established communication with the OFT, together with detailed legal analysis, to ensure that these aspects are handled properly. It is anticipated that the proposals which do emerge will be subject to formal approval by the competition authorities; and

- tie intends to engage with First Group in early course in their role as second main bus operator and as the Scotrail franchisee. Engagement with other transport operators will follow.

A primary driver of the DPOF process was to ensure that this integration dialogue was given the best chance of success, including a lengthy period of consideration before the first tram is operational. It should be recognised that these plans are at an early stage and will continue to evolve up to the point of commissioning, since the underlying market is dynamic not static. However, tie believes that an excellent start has been made and that the opportunity to have highly-effective, stable and sustainable service integration has every chance of being seized.

A draft action plan to drive forward the dialogue on these matters is under preparation targeted for commencement in September 2004.

#### **7.4 Value for Money Analysis**

The preferred procurement strategy for the infrastructure contract being the Infracore, could potentially be adopted either conventionally or through a PFI structure (retaining this flexibility was one of the key criteria used to decide upon the preferred option). The choice between the two types of procurement route should depend upon a broad assessment of value for money, which in turn is a function of the characteristics of the project, and in particular, the associated range of risks.

##### **7.4.1 Benefits of PFI**

HM Treasury's publication 'PFI: Meeting the Investment Challenge' (July 2003) provides a comprehensive overview of the experience of PFI to date, and sets out the type of projects that are likely to benefit from a PFI approach. In general these will be 'major and complex capital projects' with ongoing maintenance requirements, where the private sector 'can offer project management skills, more innovative design and risk management expertise that can bring substantial benefits'. These benefits include a much greater likelihood of on-time and on-budget delivery and a whole life approach to costing which ensures the long term maintenance of service standards.

Conversely, PFI is unlikely to deliver value for money in areas where 'the transaction costs of pursuing PFI are disproportionate compared to the value of the project or where fast paced technological change make it difficult to establish requirements in the long term'. The Treasury document goes on to suggest that such areas include IT, and projects with capital values below £20m.

##### **7.4.2 New Draft Guidance on VFM**

The 2003 publication also described the outline of a new approach to the assessment of value for money in the light of the new Green Book, and responding to the views in particular of the NAO (who have criticised the use of the previous Public Sector Comparator as a single pass/fail test, driven by spurious accuracy). The new approach is designed to take account of a broader range of indicators at different stages throughout the procurement process, and emphasises the importance of market feedback and quality of competition.



The new approach is described in greater detail in HM Treasury's recently published Draft Value for Money Assessment Guidance. The new guidance sets out a three stage process.

- a new test of the potential value for money of procurement options when overall investment decisions are made;
- an early economic appraisal of an individual project at the OBC stage (replacing the previous Public Sector Comparator); and
- a final test at the procurement stage to evaluate the competitive interest in a project and the capacity of the market to deliver it effectively.

Procuring public sector authorities should be seeking to apply the guidelines in circumstances where the potential benefits of a PFI approach create a prima facie case for its consideration. These include:

- a major capital investment programme, requiring effective management of risks associated with construction and delivery;
- the private sector has the expertise to deliver and there is good reason to think it will offer value for money;
- the structure of the service is appropriate, allowing the public sector to define its needs as service outputs;
- the nature of the assets and services identified as part of the PFI scheme are capable of being costed on a whole life, long-term basis;
- the value of the project is sufficiently large to ensure that procurement costs are not disproportionate;
- the technology and other aspects of the sector are stable, and not susceptible to fast paced change;
- planning horizons are long-term, with assets intended to be used over long periods into the future; and
- there are robust incentives on the private sector to perform.

Stage 1 in the new guidance is aimed primarily at assessing the potential suitability of PFI as a procurement route for a programme of investment. The guidelines as whole are however equally applicable to 'a large unique project' which exhibits the range of characteristics listed above, so creating a prima facie case for PFI.

Where the initial assessment has established a case for PFI for the project type, Stage 2 is designed to verify that PFI continues to provide potential benefits for the particular project. The test incorporates both qualitative and quantitative elements. The key qualitative factors relate to:

- viability: assessment of whether the services may need to be provided by directly by the public sector, and whether the services can be adequately captured in a contract-based approach;
- desirability: assessment of the relative benefits of different procurement routes, such as incentives and risk transfer of PFI versus lower public sector borrowing costs; and
- achievability: assessment of likely market interest, and public sector client capability.

Quantitative factors potentially include, where there is a suitable evidence base, an assessment of

estimated capital and operating costs, adjusted for risk (through a generic spreadsheet) as well as affordability. However, 'if the result of the qualitative case for proceeding with either PFI or conventional is strong, the outcome of the quantitative case will be less important'.

Stage 3 is designed to apply once a project is into the formal procurement phases i.e. post OBC. It involves a series of ongoing 'checks' on value for money, in particular focusing on the quality of the competition, and the successful transfer of appropriate risk.

#### **7.4.3 Application to the Tram Scheme**

The proposed tram network is not part of a planned programme of investment. However, it is clearly 'a large, unique project' which prima facie exhibits the range of characteristics which suggest that a PFI approach is capable of delivering value for money. Delivery to time and to budget will also be very important, and in risk management terms, the project involves 'the purchase of significant capital asset, where the risks of cost and time overruns are likely to be significant'.

In terms of market interest and the likelihood of creating a strong competition, the recommended procurement option has been designed in part to reflect the lessons learned from the experience of PFI on previous schemes. The separation of the operator contract through the DPOF Agreement reflects the difficulty, in value for money terms, of attempting to transfer full revenue risk to a PFI-type consortium. Similarly, the proposed packages of initial work are focussed on those aspects of the overall scheme that have proved difficult for the private sector to price (with the intention of avoiding a potential premium pricing of some of those risks).

Whilst further, formal market testing will be an important element of the proposed next phase of work, the initial assessment is that a PFI structure as part of the preferred procurement option for the Infraco contract would be likely to attract significant market interest. This would facilitate appropriate risk transfer and enhance the prospect of delivery of the project to time and budget. The overall current assessment is therefore that the Partial PFI option does merit serious consideration and does have the potential to deliver VFM. The OBC will examine this option in detail taking into consideration the risk transfer process and the potential benefits arising from this. A Partial PFI option also has the benefit of creating a performance and incentive regime for the Infraco to ensure the quality of the infrastructure is maintained throughout the contract period.

#### **7.5 Funding Strategy**

In looking at the appropriate funding strategy for the infrastructure and equipment supply contract for Line One three options have been modelled:

- Full PFI/PPP option.
- Partial PFI/Hybrid solution of part SE grant and part private sector funding through a SPC; and
- Up-Front Capital Grant from the SE;

For the purposes of the private sector funding of the Infraco the prudent option is to use a mixture of equity, subordinated debt and senior debt. The proportion of equity and subordinated debt to senior debt has been split in the normal market ratio 10:90. A senior debt solution has been modelled as this offers the greatest degree of flexibility albeit with a cost implication; this is therefore regarded as a conservative structure. No benefit has been included

that might arise from an EIB route or a bond structure. A bond financing option while possible is more likely to be used as a refinancing option once the construction period is over. The contract with the Infraco should be structured in a way to capture a share of any refinancing benefit. This funding strategy represents a conservative approach based on current market practice and reflects current market conditions for infrastructure projects.

Private sector funding for a project of this nature will be channelled through a company. Normally this is a SPC which has the sole aim of delivering the project and which will ring-fence the project risks within that company.

### Equity

Typically commercially funded project finance deals involve an element of risk capital in the SPC. In the context of large infrastructure and equipment supply contracts this is normally in the region of 8%-10% of the total project cost. This is risk capital and as a result it attracts a higher return than senior debt funding. The providers of this element of the funding will be the contractor and other parties to the infrastructure and equipment supply contract possibly with the assistance of third party equity funds. The funding is normally structured by way of a minimal amount of pure equity capital with the balance through a more tax efficient subordinated debt line. The equity capital will receive its return through a dividend payment as and when the resources are available within the SPC to pay these. Interest payments on subordinated debt can normally be made during the project life subject to the requirements of the senior debt providers.

### Bond Finance

This has been used on a number of infrastructure projects and can have advantages over a bank debt option. The general principles of bond finance are that the borrower would receive a lump sum on issue of the bond and would require to pay an interest charge (either fixed or variable) over the bond period. At the maturity of the bond, which may be 20 to 30 years, the borrower would require to repay the principal amount. The funder would typically require security against the bond repayments over the term of the bond.

Bond finance would require fixed repayments over the bond term, although some bonds are linked to RPI. The total liability which would be payable would be known and therefore would allow the borrower to incorporate these fixed payments in its budgeting process. The ultimate price paid for bond finance will also be dependent on the borrower's credit rating which requires an assessment by a rating agency such as Standard & Poors or Moodys of the underlying credit. The more creditworthy the lower the interest rate on the bond. Credit enhancement options are available for bond packages by utilising the services of monoline insurers to "wrap" the bond issue. Effectively these large financial institutions put their balance sheets behind the bond for a fee. This makes the bond issue more attractive to bond purchasers.

Pricing for bonds is based on a reference gilt which reflects the maturity of the bond. The margin applied over the base cost of funds will be a reflection of the perceived credit risk of the bond which tends to be lower than the margins applied to project finance debt in a range 65-85bps. With long gilt yields at around 5.0% this offers an advantage over project finance debt where the base cost of funds would be around 5.1% to 5.5% at the current time. The competitive advantage of bond over debt funding will be dependent upon the market conditions

at the time the deal is concluded, as well as the cost of the wrap and credit assessment of the transaction.

While bond financing is on the face of it cheaper than bank debt, it is both more time consuming and costly to arrange. It produces a lump sum which is inefficient as money requires to be placed on deposit until required to fund construction. It is also less flexible because of the nature of the bond holders and as a consequence if there are difficulties during the project it can be difficult to get agreement to project changes.

#### **Project Finance (Senior Debt)**

Senior debt funding provided by one or more banks is a well developed product which has been used to finance a wide variety of infrastructure projects. Typically it will be priced at a margin above fixed cost of funds which involves the funder entering into hedging arrangements to protect their funding cost risk. Senior debt funding will in most market conditions tend to be more expensive than bond funding as it is based on LIBOR or a similar rate, with base cost of funds currently around 5.1%-5.5%. Margins will be dependent upon a credit assessment of the borrower and the underlying project. Current market conditions would suggest margins over the underlying cost of funds ranging from 110 bps to 150 bps. The margins achieved will depend on the market conditions and the risk profile of the particular project at the time of agreeing the loan. The margins will vary during the life of the project as the risk profile changes. Funders perceive the construction phase as being the most risky and consequently this attracts a higher margin. Once into the operations phase margins can drop by 10 to 20 bps.

The project finance market has changed over recent years with the lengthening of maturities in order to meet competition from the bond market and this can be beneficial in terms of debt servicing costs.

A further important factor to be considered is that bank funding offers far greater flexibility than bond funding. It is easier to draw down bank funding in phases around a construction programme and to structure a variable repayment schedule. This would serve to minimise the financing costs and optimise the utilisation of the available cash flows. However this requires a good budgetary process and effective treasury management.

#### **Leasing**

Leasing offers a further funding solution which provides a tax efficient structure but this is subject to the SPC not being able to use capital allowances itself but it is suitable for items of plant and equipment. In the case of the trams project this could cover the vehicles control signalling and passenger information equipment, overhead lines and gantries and the tram track itself.

#### **European Investment Bank (EIB)**

The EIB, because it is funded by European Governments, provides funding for projects at a rate lower than that of commercial banks. However, dependant on market conditions the base cost of funds may not always offer significant differential. Margins do, however, tend to be significantly lower than commercial funding. EIB only fund up to a maximum of 50% of the

project cost but would make this funding available to all bidders as part of the infrastructure and equipment tendering process.

The EIB have been approached and have indicated their interest in considering this project. They are currently involved in a number of other tram projects in the UK and are well aware of the funding issues involved in these projects. The benefits of EIB funding have not been factored into the model.

#### **7.6 Conclusions**

tie has examined a number of ways to fund the construction of Line One and this process is ongoing. Property proceeds, advertising and other marketing revenues are being actively explored and mechanisms established to optimise these funds.

The way in which the public sector funding is input to the project, whether by way of up-front grant or support for a private sector funding solution, needs to remain under consideration until submission of the OBC. A commercial funding solution would utilise a mix of equity and commercial debt funding through a PFI/PPP contract. A bond solution may be more effective but this will largely be dependent on rates pertaining at the time of financial close and will be a decision for the Infraco. Leasing is an option which will remain under consideration as a means by which to capture the maximum tax benefit possible.

A PFI solution has the potential to offer significant risk transfer and performance benefits and will be tested in the OBC to determine whether it offers VFM.

## 8 Cost & Revenue Development

### 8.1 Capital and Operating Costs

#### 8.1.1 Source of Costs

The capital and operating costs for the line have been prepared by Mott MacDonald sub-consultant, Brian Hannaby & Associates and are based on the preferred route alignment agreed with tie and the Council in September 2003. These costs include the infrastructure, vehicles and the start up costs associated with the project. The costs are based on the outturn costs for other systems in the UK and have been subjected to a benchmarking exercise by the technical advisors and tie.

The original costs provided were the "base costs", i.e. the technical advisors estimate of the actual cost of the work based on the analysis to date. A contingency is added as there is the potential for elements arising that may result in cost overruns. The overall contingency in the final figures was 10.8% when applied to the total capital base cost amounting to £23.7 million. The base costs, together with the identified contingency, represent the Specified Capital Cost. The technical advisors have applied the contingency at different rates across the cost captions depending on the perceived potential for capital cost overrun.

The capital cost estimate breakdown for Line One is as follows:

#### 8.1.2 Capital Costs

Description	Line One (£)*
Civil Works	37,318,000
Electrical	31,475,000
Stops	7,889,000
Depot	13,050,000
Track	42,258,000
Land and Property	23,330,000
Vehicles	21,700,000
Utilities Diversions	31,800,000
Project Costs	10,500,000
<b>Base Cost</b>	<b>219,320,000</b>
Specific Contingencies	23,730,000
<b>Specified Capital Cost</b>	<b>243,050,000</b>
Incremental Optimism Bias	31,100,000
<b>Grand total</b>	<b>274,150,000</b>

\*All prices at Q2 2003.

### 8.1.3 Operating Costs

The operating costs are those associated with the day-to-day running of the tram system including staff wages, electricity and insurance. These costs have been provided by Mott MacDonald sub-consultant Steer Davies Gleave based on run times and frequencies of the service. In addition a profit margin has been added to the operating costs based on an analysis of operators returns from published information on other transport schemes. The costs assumed have now been refined following input from Transdev under the DPOF process.

The operating costs are forecast to be £6.287m per annum in Q2 2003 prices.

### 8.1.4 Lifecycle Maintenance

Lifecycle costs have been estimated from the capital cost data. As noted above the capital costs have been derived from a comprehensive database compiled from analysis of costs for the infrastructure works of completed and proposed LRT schemes throughout the UK. The estimated lifecycle costs relate to replacements and renewals necessary over a 30-year operational period and exclude running costs and routine maintenance costs.

The total spend, in Q2 2003 prices undiscounted, is £44.625m.

### 8.1.5 Farebox Revenue

Farebox income projections have been provided by the Line One technical advisors Mott MacDonald, based on the detailed exercise undertaken by their sub-consultants Steer Davies Gleave. The forecasting models provide demand and fare data for 2011 and 2026. To produce a 30 year profile, it is necessary to apply the average annual growth between 2011 and 2026 (the modelled forecast years). The existing revenues are assumed to remain constant from 2026 to the end of the contract. For the period between 2009 and 2011, a backwards extrapolation is applied, subject to appropriate ramp up of demand and revenue.

## 8.2 Methodology used by Technical Advisors to project Farebox Revenue

This section describes the work undertaken by tie and the specialist consultants to develop the revenue projections for the tram project

### 8.2.1 Analytical Framework

In December 2000 consultants were commissioned by tie to develop an integrated land-use/transport interaction (LUTI) model to forecast the changes in farebox revenue and journey times by public transport and road. The basic functionality and geographic coverage of the model is now described below (for full details reference should be made to the model development reports).

The model comprises a hierarchical structure. At the top level, there is a strategic land use-transport interaction model, consisting of the TRAM (Traffic Restraint Analysis Model) and the DELTA land use model. This operates at an 88 zone level covering the Edinburgh, Lothian and South Fife area and models at a spatially aggregate, but temporally and functionally detailed level. This covers the full range of travel responses to transport and land use changes, including trip frequency, destination, mode and time of day. The land use model operates interactively with the transport model, forecasts the levels of land use and associated population and employment levels. This is based on the baseline scenario 2001 and forward looking policy inputs (the level of allowable development permissions by zone and year).

The LUTI model is sufficiently detailed to forecast global responses to transport interventions but does not contain sufficient detail to identify individual road, junctions or public transport services. Detailed assignment models (DAM) were developed covering the same geographic area as the TRAM model. These were based on cordoned CSTM3A networks, but have additional detail in the LRT corridors. The DAM models (for highway and public transport) sit below the TRAM/DELTA models, with a disaggregation module being used to pass the forecasts down to the DAM models.

The modelling process used in the development of Line One employs the full functionality of the LUTI model with the TRAM/DELTA models being used to forecast high level responses to the introduction of the tram. The DAM models are then used to forecast detailed patronage estimates for the tram and the associated impacts on the bus network and the highway networks.

The LUTI model was developed in 2001 and calibrated and validated to current data. The DAM models for public transport and highways were cordoned from the CSTM3 model which was calibrated and validated to 2000 by the SE Term Model Consultants MVA. CSTM3A was subsequently audited by the SE Term Model Auditor SIAS.

The original model development was subsequently enhanced in December 2002 by the development of a Local Economic Impact (LEI) model to forecast the wider economic impacts of transport changes.

The model, which has been classified as complex, consists of the following sub-models:

- road assignment model;
- public transport passenger assignment model;
- mode choice model;
- trip generation and trip distribution assumptions based on trip end data; and
- transport and land use interactions model.

The format of the demand model is policy sensitive. Changes to the transport network (i.e. the supply) change the cost of travel and this can lead to changes in the pattern of travel demand. Conversely, changes in travel demand can lead to changes in the costs of travel on a given transport network, particularly where congestion or crowding occurs.

The model can explicitly simulate within the system the key traveller responses to different policies as follows:

- change in trip frequency;
- change in trip destination;
- change in mode of travel (car, walk/cycle and public transport);
- change in time of travel (24-hour weekday); and
- change in route of travel.

The LUTI model consists of a suite of inter-linked sub-models as follows:

**DELTA** – a land-use model involving various sub-models that predict changes in demographics, car ownership, employment and economic conditions, and combines these with



the travel costs impacts of new transport infrastructure to predict changes in future land-use and the corresponding changes in the demand for week-day travel (bespoke software);

**TRAM (Traffic Restraint Analysis Mode)** – an 88 zone strategic transport model was used to predict changes in travel behaviour resulting from the changes in transport supply and /or demand for travel (e.g. mode-choice, time-of-travel, destination choice) and to output resultant travel cost changes (bespoke software); and

**Park and Ride (ADJPNR)** – model to provide detailed modelling of formal Park and Ride services (by bus, rail and/or LRT) (bespoke software).

**Highway DAM** – detailed assignment model to predict route choice and provide corresponding predictions of traffic flows and link/junction delays resulting from these on the road network. A City centre parking model simulates the impact of parking changes. The model is used to forecast journey time changes and highway speeds, which are then passed to the PT modelling of buses;

**PT DAM** – detailed public transport assignment model to predict sub-mode and route choice for public transport impacts at a service-to-service level. The CSIM zones are too large for the tram scheme, so larger zones in the proximity of the tramline have been disaggregated. The model forecasts overall changes in journey times and revenue.

The model forecasts public transport patronage and revenue for the AM peak hour, inter peak hour and the PM peak hour, for 2011 and 2026. The economic benefits were assessed using TUBA (Transport User Benefit Appraisal), which is a multi-modal, variable trip matrix (VTM) economic appraisal package.

The Modelling Appraisal and Working Group (MAWG) was set up and chaired by tie to review all transport modelling issues and ensure consistent good working practice. Membership consisted of members of the appointed technical advisors for Lines One, Two and Three as well as the consultants appointed to assess the Network Effects due to the combined impacts of both Lines One and Two. The model developers MVA and DSC were also members of the group. A series of technical notes recording the limitations of model in terms of modes and interactions (assignment, mode split, etc) along with other factors taken into account during the course of the model were discussed at the MAWG.

As a further comfort factor tie has discussed the model outputs on patronage and revenue with Transdev who have extensive tram experience in both the UK and globally. They have confirmed that the forecasts appear achievable and are keen to work with tie to enhance the patronage support for the system.

Transdev bring with them detailed hands-on experience of operating and maintaining large tram systems. Their experience in service delivery will enable tie to drive efficiencies in several key areas. The main benefit will come from Transdev input on capital costs, lifecycle maintenance, revenue protection and enhancement and protection and integration.

### **8.3 Value Engineering and Cost Optimisation**

#### **8.3.1 Introduction**

Having established potential route alignments in an earlier exercise, Mott MacDonald undertook Work Package 1 (WPI) of their brief which was to review and sift these potential options to those that were "best" performers. Four options within the northern loop were identified. To produce an audit trail within WPI these four options were appraised using a simplified version of STAG 2.

Following this exercise two sub options still remained and these were put forward as part of the Public Consultation exercise, namely the Princes Street/ George Street and Roseburn Rail Corridor/Telford Road options.

Within the defined areas the route alignments were selected on the basis of minimum disruption to services, engineering constraints and, where possible, segregated running. One of the main engineering constraints within the Roseburn Corridor is the need to widen the Coltbridge Viaduct to allow for a twin track alignment. After reviewing operational effects and cost implications to widen the structure, it is recommended that interlacing of the track (bi-directional running) is the most practical option, retaining the structure in its original form.

#### **8.3.2 Cost Optimisation Exercise**

Following Public Consultation and the selection of a preferred route for Line One, a cost optimisation workshop was held on to explore further capital cost savings that might be achieved in delivering the final scheme. Representatives from Gle and Line One and Two technical advisors discussed assumptions that had been developed during the design process and challenged the basis of agreed specifications. These included common assumptions on vehicle parameters, stop equipment, track construction and quality of street finishes.

Several suggestions were also made with respect to the reduction of route lengths, number of stops, park and ride sites, depot location and sharing and single line (bi-directional) running. The potential for capital expenditure savings from these ideas will be assessed during the DPOF process and the Network Effects analysis and will be taken into account in the OBC when a funding application is submitted.

The remaining options for reducing capital expenditure, and the interactive effects on other costs, have been assessed. In almost every option, the reduction in capital expenditure leads to an impact on one or more other factors and the likely effect on operating expenditure, patronage, revenue, lifecycle costs, planning approval, together with public and operator perception have also been assessed.

Although the principal objective of the cost optimisation exercise concerns the minimisation of capital expenditure, other suggestions to improve operating expenditure and revenue were discussed.

#### **8.3.3 Conclusions of Cost Optimisation Exercise**

The cost optimisation exercise challenged many of the current design assumptions, particularly with respect to equipment provided at tram stops. It is estimated that, at best, £11m may be saved on capital expenditure for Line One if all the suggested changes are implemented. However, this represents a relatively small proportion of the overall capital cost of Line One

(less than 5%) and is considered to have a major impact on the Council aspirations for the system.

It is considered that these initial savings will have a detrimental impact on the quality of service. For example the potential cost savings from deletion of stop equipment is perceived as having an overwhelming influence on patronage and revenue through the loss of the quality elements of the service. This influence is seen as being medium to high negative, despite the additional operating expenditure savings that may be gained.

Many of the suggestions may also impact on the ability to gain planning approval and these options may have to be ruled out on these grounds alone.

The Specified Capital Costs already reflect compromise on a range of potential options. It is felt that public perception of the tram system and the views of the future operator will also be adversely affected by many of the suggestions arising from the subsequent optimisation exercise. Although the impact of the changes are difficult to quantify, a poor image of the tram system is certainly one which the and their advisors would not wish to promote. Therefore at this stage none of the cost cutting options have been factored into the analysis as they are deemed unfavorable when considering the overall objectives of the project.

## 9 Financial Model Assumptions

### 9.1 Summary of Assumptions in Financial Model

The financial models have been developed by Grant Thornton in conjunction with representatives of tie and the Council transport team in order to demonstrate the potential funding strategies for Line One and Two together with their financial impacts. The models bring together the cost and revenue analysis from the technical advisors.

One of the main objectives when designing and building the model was to keep it as flexible as possible, and allow the separation of the operating contract and the infrastructure and equipment supply contract in line with tie's decision to proceed with the DPOF process. For this reason the model has been designed on two levels:

1. An **Infrastructure model** has been developed to reflect those elements of the contract, predominately infrastructure, vehicles lifecycle and maintenance costs, which may be wrapped up into the Infraco contract and delivered using a Design, Build, Finance and Maintain procurement structure.

The model utilises three options to fund this contract:

- The first option is a standard PFI/PPP funding plan of 90% senior debt, and 10% risk capital. The risk capital is injected into the project as approximately 9% subordinated debt, and 1% ordinary share capital. This model assumes that the costs of the project are funded by project loans which are repaid during the 30 year contract period. The total costs associated with the contract are reflected in an annual Unitary Charge, for the availability and maintenance of the system which would be met by the public sector over the contract period.
- A second option has been modelled to reflect a Partial PFI funding structure, whereby a specific elements are treated as upfront costs and excluded from the PFI, thereby reducing the annual Unitary Charge payment required by the SPC.
- The third principal option has been to develop a public sector model which uses up-front capital grant to finance the construction of the project obviating the need for any private sector funding.

In both the Full PFI model and the Partial PFI model, loans will represent no more than 90% of the commercial funding requirement over the period of the contract, and repayments have been sculpted to optimise the cash flows within the models, whilst minimising the funding costs passed onto the public sector. The balance of commercial funding is from private sector equity.

2. An **operational model** has been developed to sit on top of the Infraco model and consolidate all elements of the tram project together. This incorporates the Unitary Charge payment calculated in the Infraco model above, with the operating cash flows (costs and revenues) of the project as identified by the technical consultants. The operating elements are separate from the Infraco to reflect tie's decision to follow the DPOF procurement route. This consolidation model does not assume that external funding is available to support the operating contract, rather it utilises the net surplus/deficit of the operating contract to offset the Unitary Charge calculated above to give the net public sector funding requirement over the life of the project.

## 9.2 Model Inflows and Outflows

The consolidated model is essentially a cash flow representation of the inflows and outflows associated with running Line One.

### 9.2.1 Inflows

The main cash inflows to the model can be summarised as follows:

- tram revenue streams (farebox income);
- commercial borrowings in the Full PFI and Partial PFI models (repayable through the Unitary Charge); and
- Public sector funding in the form of Unitary Charge and/or capital milestone elements.

### 9.2.2 Outflows

The main cash outflows of the model can be summarised as follows:

- capital costs of procuring the tram line and equipment;
- lifecycle maintenance costs;
- operational costs representing the day to day running costs of the tram; and
- debt servicing and repayment;

### 9.2.3 Public sector funding

The SE has indicated their willingness to provide funding support to assist in the delivery of the Edinburgh tram system. Dialogue is underway on the structure, either up front capital costs or over time to support the on-going costs of the tram, including debt servicing through payment of the Unitary Charge. This analysis will also require to examine the risk transfer benefits of each option.

### 9.2.4 Assumptions within the model

The following are the key assumptions that have been made within the financial model. These assumptions have been discussed with tie and the appropriate expert advisors.

### 9.2.5 Inflation

**Capital costs:** indexation on capital expenditure is assumed to be RPI + 1.25%. This is above the assumed RPI figure of 2.5% to reflect the current market conditions within Edinburgh, and also the wider impact of the buoyant construction industry.

**Farebox Revenue:** Farebox indexation is assumed to be 2.5%. At the current stage of development there is no fares policy agreed with a potential operator; this will emerge from the

DPOF process and discussion with the Council. It is therefore deemed appropriate that the fare revenue will have an inflationary factor of RPI, in the absence of definitive guidance.

**Lifecycle Costs:** Indexation on lifecycle expenditure is assumed to be 2.5%. This is the same as the RPI figure.

### **9.2.6 Private Sector Funding Assumptions**

Within the Full PFI and Partial PFI models there are a number of assumptions made regarding the funding arrangements. These are made on the basis of the market conditions at present and have been benchmarked against similar projects.

### **9.2.7 Interest**

The interest rate on commercial funding is assumed to be at current market rates. This reflects a conservative estimate of medium/long term rates going forward and includes a risk premium associated with the nature of the project. The interest rate on cash deposits is assumed to be at current market rates.

### **9.2.8 Subordinated Debt**

This is a form of tax efficient risk capital and would be provided by the private sector sponsors of the project and/or third party interests. The interest and capital payments would be paid, if there is cash available once the senior debt repayment obligations have been met. The rate is based on current market parameters. The capital repayments are limited to the lower of the proportion of senior loan repaid in the prior 12 months or the cash available.

### **9.2.9 Equity**

The equity would be provided by the sponsors of the project and/or third party investors. The equity injection represents 1% of the total funding requirement. This is pure equity, however the return on the equity has been combined with that of the sub-debt to achieve a blended rate for the risk capital portion at current market levels. The return on the equity is in the form of dividends, which will not be paid until the Infraco has positive reserves.

### **9.2.10 Timing Assumptions**

Actual construction is scheduled to commence in July 2006, although it is assumed there would be initial expenditure in the period prior to that date relating to, utility diversions, design fees and land purchases.

## **9.3 Taxation treatment in financial models**

A simplistic assumption on corporate taxation is that taxation should be regarded as neutral at this stage of the development of the project. This is based on the position that any taxation payments emerging from the project will be recouped by Central Government and are therefore neutral to the public purse. Because of the separation between HM Treasury and the SE, this neutral cash flow assumption is imperfect, but as explained below, there are good grounds for an assumption that taxation will in fact be negligible if the project is structured properly. No attempt is planned to achieve any financial advantage beyond neutrality by elaborate planning or questionable corporate constructions. The exception to the neutrality assumption is payroll taxes, which are assumed to be a net cost to the project, notwithstanding that they are received fully by Central Government.

### 9.3.1 Overall tax structure

The Council is not a taxable entity – accordingly any net income it receives from tram operations and related activity will not suffer corporation tax. Similarly any deductible expenditure will generate no tax benefit.

A corporate subsidiary owned by the Council will prima facie be taxable, although potentially subject to the benefit of group relief if properly structured. The tax group would not include the Council as an entity.

Accordingly, the net income generated by the tram will not be taxable if owned by the Council.

### 9.3.2 Grant funded model

This model involves public sector procurement with no PFI structure. The SE grant of £375m is available for drawdown during construction. A large proportion of the capital cost should be qualifying expenditure for Capital Allowances purposes.

Since the operating surplus and other income will sit with the Council, it is not taxable. The lifecycle costs will need to be met by the Council since they are over and above the available grant, and there will be no tax benefit from these. If the construction is also carried out by the Council, the net cost will not generate any tax benefit. The grant would not be taxable income. This model is therefore tax neutral.

### 9.3.3 Partial PFI

If the capital cost (mainly focussed on utility work and land acquisition) is partly met up front by the grant, so long as the grant for this expenditure is received by the Council, the grant income and the capital cost will be tax neutral. If the work is done by a subsidiary, the grant will need to be defined and structured appropriately to avoid being taxed as income, since to do so would result in a double tax-charge, both to the Council and to the PFI SPC.

An SPC is set up in normal PFI form. This receives a stream of availability payments from the SE / the Council which are taxable income to the SPC. The system constructed by the SPV is amortised over 30 years. The SPC will require sufficient income to pay debt interest, repay capital cost and also provide a return to the equity. The financial model reflects a pre-tax return as cash outflow and accordingly the tax charge on the equity return is accommodated.

Accordingly, this model can also fairly be regarded as tax neutral.

### 9.3.4 Leasing arrangement

A better balance of risk and reward could involve a leasing arrangement, which has to date been examined only at a preliminary level. A leasing arrangement established with a lease finance company ("LeaseCo") could involve the LeaseCo constructing, funding and owning the system, leased to the Council (or another operating entity). LeaseCo would get the benefit of the full extent of front-end Capital Allowances. The lease payments will be taxable in the hands of LeaseCo and will require to be sufficient to repay capital cost, fund debt service and provide a profit margin to the leasing company.

The lease payments would effectively spread the capital cost over 30 years in similar cash flow form to the PFI model and the payments would require to be guaranteed by the SE or the Council. They would however be subject to system availability. Both system maintenance and

lifecycle costs can be rolled into the lease providing further risk transfer and cash flow profile stability. The margin return required by the leasing house, which would have equity characteristics, will depend on the extent of risk transfer and will be subject to negotiation and competitive testing.

This model has the potential to achieve strong risk transfer and provide a cash flow benefit to the project. This will require both detailed modelling and in-depth market testing to establish the net benefits involved. In summary however, there could only be net advantage and the assumption of tax neutrality remains valid, arguably conservative.

The tax benefit arising may be substantial but has not been reflected in the financial models at this stage of the analysis.

#### **9.3.5 VAT**

In all of the above, it is reasonable to assume that VAT neutrality can be achieved, even if the suppliers of capital equipment such as tram vehicles are foreign entities.

These assumptions have been validated by tie's financial advisors, Grant Thornton, for the purposes of this Preliminary Financial Case.



## 10 Financial Model Output

### 10.1 Introduction

This section draws together the information contained in the previous sections of this Preliminary Financial Case. The section utilises the information provided by the Line One technical advisors on revenues, capital expenditure, operating costs and lifecycle costs in addition to operating cost analysis performed by Transdev. These are based on the core assumptions agreed between tis and the Line One technical advisors as summarised in section 9.

The models have been developed to reflect the conclusions of the Procurement Group and the proposed separation of the operating and infrastructure elements of the contract.

It is assumed that certain costs will be incurred in the period prior to the start of construction. The operations are modelled to begin in December 2009 with a 30-year operational phase.

There have been no significant changes to the project numbers since the preparation of the December 2003 version of the Preliminary Financial Case with the exception of the following:

- reduction in the overall Optimism Bias percentage from 31% to 25% as a result of further mitigation of risk;
- marginal amendment to operating costs to reflect the input of Transdev; and
- amended split of up-front and deferred capital costs in the hybrid model.

### 10.2 Funding Model

The model has been run to demonstrate the implications of three funding options:

- Full PFI: Reflects a Design, Build, Finance and Maintain contract for the infrastructure and equipment supply with 100% commercial funding repaid by the public sector through a regular Unitary Charge and the separate procurement of the Operating contract under the DPOF process;
- Partial PFI: Reflects a similar route to that outlined above, however an element of the funding requirement is met by public sector grant on the basis of milestones which reduces the commercial borrowing requirement. The balance of the funding is repaid, as above, by way of a regular Unitary Charge which is also required to cover the infraco lifecycle maintenance costs. The operating contract is procured separately following the DPOF route as above; and
- Up-Front Grant Funding: Assumes the public sector fund the capital costs with grant support. In this scenario no commercial funding is utilised.

For each of the models the following key elements of the project cash flows are:

- Unitary Charge - Relates to the annual/regular payments paid to fund the Infraco where applicable;
- Lifecycle Costs - planned maintenance and refurbishment costs, to be met by the Infraco;
- Revenue - the annual income from the project in the form of fares;
- Operating Costs - the day to day running costs of the tram system;
- Public Sector Grant Funding - relates to capital or lifecycle expenditure that is funded by public sector grant. Some of this may be enabling works; and
- Total - represents the net cashflows from the model on a real (April 2003) basis

### Application of Optimism Bias to Detailed Financial Model

The detailed financial models described in this section have utilised the full extent of the identified level of Optimism Bias for this project. This has been done to demonstrate a "worst case" scenario. As noted earlier tie's risk procedures, together with the DPOF approach, have been developed to mitigate the impact of this.

The section below sets out a summary of the key results from the financial models:

#### Full PFI

This model assumes that the infrastructure is fully funded with commercial finance with the exception of certain enabling works which are delivered through Public Sector Grant Funding. The Infraco is paid through a regular Unitary Charge over the length of the contract, which meets both its funding obligations and annual costs.

1. the NPV of the cashflows of the model including payment of a Unitary Charge, system operating surplus and public sector grant funding for enabling works is £360 million; and
2. the Unitary Charge in cash terms in the first full year of operation, ending 31 March 2011 would be £38.5 million.

#### Partial PFI

This option assumes that the capital funding requirement is met by Public Sector Grant Funding with the balance from commercial funding. The Infraco is paid through the milestones and the Unitary Charge.

1. the NPV of the cashflows of the model including payment of a Unitary Charge, system operating surplus and public sector grant funding for enabling work is £304 million;
2. the Unitary Charge would be reduced in this model as the utilisation of public sector funding through milestone payments to the Infraco reduces the commercial funding requirement. The Unitary Charge in cash terms in the first full year of operation, ending 31 March 2011 would be £22.1 million; and
3. Public Sector grant funding of £120 million funds the milestone payments made Up-Front to the Infraco for construction and installation of the system together with land acquisition and initial design costs.

**Up-Front Grant Funding**

This option assumes that Public Sector Grant Funding is available to pay for the infrastructure as it is installed, therefore commercial funding is not required, and hence there is no Unitary Charge. The lifecycle is therefore not included within a Unitary Charge but funded as and when it is performed, either through an operating surplus, or additional Public Sector Grant Funding if necessary. It should be noted that these figures do not include any allowance for differential risk allocation for the risks retained by the public sector under this option. This will follow detailed analysis of the infrastructure procurement contract.

1. the NPV of the cashflows of the model including funding of construction and lifecycle costs, system operating surplus and public sector grant funding is £236million;
2. no Unitary Charge is payable in this model as all funding is by way of Public Sector Grant

**10.3 NPV Analysis**

In order to progress a discussion with the SE on the optimal funding strategy, the results of the model must be examined and consideration given to potential risk transfer benefits. The table below illustrates the total Public Sector Funding requirement after taking into consideration all costs and income for each of the three outlined options. The NPV calculations have all been taken back to a base date of April 2003. This analysis gives a comparison of the relative cost of the three schemes by discounting the cashflows. This represents a cost in present day values for comparative purposes but is not the actual cost of the scheme. No account has been taken, at this stage, of any analysis of the impact of different risk allocations across the options. The public procurement route implies that significant risks could be retained by tie/the Council and this will have an impact on the NPV analysis. This analysis will be undertaken as part of the development of the Infraco contract. At that point a detailed risk matrix for Line One with allocation and pricing of individual risks will be completed and factored into the models to facilitate a VFM assessment. Such an assessment is likely to produce a different NPV result to that shown below.

	<b>NPV</b> <b>£'000</b>
Full PFI	360,319
Hybrid	304,295
Up-Front Grant Funding	236,536

The Full PFI route has the highest NPV of the three options. This is because it has to fund the cost of borrowing private funds and potentially also the tax burden of the Infraco. The main advantage of this option from a funding perspective for the SE is that the payments are made over a period of time (30 years in this case). More fundamentally, there may be significant risk transfer and performance benefits from such a solution.

The Partial PFI option is similar to the Full PFI option except that part of the capital expenditure is met by Public Sector Grant Funding. This is attractive in that it lowers the NPV, but does mean that the SE will have to find significant funds to finance an element of the initial capital expenditure

The above analysis indicates that the Up-Front Grant funding option also carries the lowest NPV of the three options but it should be noted that this is before any analysis of the potential costs of risks that may be retained under this option. This however assumes that the SE is able to provide the funds required for the capital expenditure over the proposed three year construction programme.

#### **10.4 Sensitivity Analysis**

Sensitivities have been run within the financial modelling exercise, designed to simulate a number of the key financial risks regarding inflation and interest rates. These sensitivities are not designed as a comprehensive review of risk as it relates to each individual project, but rather to test the overall robustness of the Line One financial structure. As there is still some time before financial close is reached on any Infraco contract, the sensitivities indicate how the model could differ due to changes in market conditions.

A change in the interest rate will only affect Infraco through its cost of funding. The risk of a change in interest rate will be with tie/the Council until the Infraco contract is let. At that point the Infraco should fix its interest rate for the duration of the loan term effectively hedging against any exposure to future rate changes.

The effect of a 1% increase in interest rates results in an increase in overall NPV of 8% in the Full PFI model and 5% in the Hybrid model. In the Up-Front Grant funded model there will be no effect on the NPV due to interest rates as there is no commercial funding.

The effect of inflation is more complex and affects all three models differently. A 1% change in the rate of RPI changes the Full PFI NPV by circa 13%, the Hybrid by circa 6% and the Up-Front Grant funded model by circa 2%.

#### **10.5 Sources and Applications of Funding and Affordability**

The financial models developed to support this Preliminary Financial Case contain revenue and cost inputs based on tie's technical advisors analysis of the project. The models also contain assumptions regarding commercial funding parameters based on current market conditions.

In order to identify the funding requirements of Line One in the context of the proposed Edinburgh Tram Network the SE support has been allocated by tie to this Line based on a proportion of its capital costs compared to Line Two. The table below utilises the NPV from the Up-Front Grant funded model and sets these against the potential funding sources. The table has been set out on the basis of the capital costs identified by the technical advisors including their identified contingency but excluding additional Optimism Bias.

**Tram Project Funding Model**

Note: Figures are illustrative pending final information  
All figures stated at 2003 prices

	Project Cash Flows		Funding Cash Flows
Capital cost of construction	219,320,000	Allocated Executive Grant	210,000,000
Add: Contingency advised by consultants	23,730,000	Other Funding	33,050,000
<b>Total expenditure</b>	<b><u>243,050,000</u></b>	<b>Total funding</b>	<b><u>243,050,000</u></b>

It should be explained that the attribution of the shared running section costs and the allocation of the grant award is intended to reflect the fact that two Tram Bills are before Parliament. Taken on a standalone basis, the Specified Capital Cost of Line One in its entirety of £243million in 2003 prices would be compared to the full grant of £375million, assuming the SE were prepared to advance the grant award for a single line (in this case Line One), rather than applied to the proposed network of Lines One and Two. In defining the terms of the infrastructure tender, it will be necessary to establish the overall system configuration and the total funding available. This will be incorporated into the OBC for the infrastructure contract anticipated in mid 2005.

tie believes that the estimates overall represent a reasonable view at present of the sources and applications of funding for the Line in 2003 prices. The sources of additional funds described in Section 7 will be deployed to finance the requirement identified above in addition to the operating surplus from this Line. In assessing affordability, two key assumptions have been made:

- that there will be no indexation or further SE funding than the £375m grant which was conditionally proposed by the SE in March 2003; and
- that the system must have a reasonable expectation of making an operating cash flow surplus over its life, avoiding the need for future subsidy from public sector sources.

At this stage of the project's development, certain variables are subject to refinement and change. On the operational and expenditure side these include:

- capital cost estimates – which will be developed further through detailed design work, advice from Transdev and then market-tested through the formal procurement process; and
- patronage and revenue projections – which will evolve to optimise the system performance with input from Transdev and most critically from the establishment of service integration plans.

On the funding side the issues under evaluation include cash flow from property development

gains, developer contributions and additional commercial income that can be driven from the trams' operations.

tie has appraised these key issues and assessed the funding which has reasonable visibility and can be delivered for the scheme. This has been done for both of the individual lines and for a network of Lines One and Two. In the context of this document, which is prepared in support of Line One, it is tie's conclusion that:

- a. there is a reasonable basis for taking forward the procurement of Line One on a standalone basis, on the basis of the funding which is reasonably visible;
- b. when a network of Lines One and Two is assessed, it becomes more difficult to be fully confident about the adequacy of available funding and accordingly there is a need for further detailed evaluation of the system scope, including the basis for extending Line Two beyond the Airport in the initial Phase 1 system construction; in these circumstances, a clearer view of the economic development assumptions in the Newbridge area would be valuable and the work required to develop a robust business case for the Newbridge shuttle should continue; and
- c. the procurement of the system should be continued according to the programme timetable which will deliver an operating system in 2009. The procurement should be executed on a phased basis which ensures the construction always remains within funding which can be regarded as reasonably assured.

It is likely to prove financially attractive to lease the tram vehicles and probably elements of the infrastructure, which will defer the cash flow. This is a complex matter, including taxation advantages for both the project and its financial partners and has not been assessed in detail at this point. The current financial appraisals do not involve leasing options and in this regard tie have modelled the conservative case for the vehicle procurement.

The estimates supporting the assessment of affordability reflect the "grant-funded" case whereby the majority of public sector funding is provided during construction. This does not specifically take account of the requirement to finance the excess capital cost above the grant support in a scenario where a network of Lines One and Two is to be constructed. There are a number of variables to take account of in such a calculation -- the extent and debt service cost of funding for land acquisition and utility diversion; the value of leasing arrangements; the timing of cash inflows from operations; and more fundamentally whether a PFI model would be deployed -- accordingly, this feature can only meaningfully be assessed when the precise funding route is better developed. This matter is under evaluation and will be concluded upon in the OBC.

The document does not conclude on the preferred funding structure, but recommends that this be the subject of further detailed analysis with the SE, taking account of the recently published HM Treasury guidance on deployment of PFI in major capital projects.

It will also be necessary for the SE and the Council to agree on the relative balance of financial risk and underwriting. In summary, the assumptions in the financial models are:

- the SE will be committing to provide either a sum up to £375m in capital funding or a stream of availability payments, which will be passed through the Council to the infrastructure design partners;
- further dialogue will be required on funding the early stage capital expenditure above that supported by the grant drawdown if a network is to be constructed; and
- the Council will require to under-write the contractual payments to the operator. This is assumed to be financed out of operational tram revenues, net of operating costs but augmented by other third party sources of income related to the tram's operations such as property gains and advertising income. In addition, the Council will require to meet lifecycle replenishment capital costs out of operational revenues.

Further discussion on these arrangements will take place between the Council and the SE in the development of the OBC for the infrastructure.

Edinburgh Tram Line One - 2004 Preliminary Financial Case - Update  
September 2004