Edinburgh Tram Network

Final Business Case Version 2

7th December 2007

Trams for Edinburgh
..connecting our Capital

Contents

1. Executive summary

Introduction and principal recommendation

1.1 In December 2006, the City of Edinburgh Council (CEC) approved the Draft Final Business Case (DFBC) for the project to construct the Edinburgh Tram Network (ETN). The DFBC presented the strong case in favour of trams. It concluded that a) the proposed scheme is economically and financially viable; b) Phase 1a, the primary tram line from Edinburgh Airport to Newhaven, was affordable within current sources of funding; and c) that Phase 1b has significant benefits for the economic development in Edinburgh. It also demonstrated the operational sustainability of the future integrated tram and bus network.

1.2 Since approval of the DFBC, considerable progress has been made on all important aspects of the project. This Final Business Case (version 2) (FBCv2) takes full account of the progress made to date and is a key part of the documentation which supports the commitment to the principal contracts for construction of the system and supply of the tram vehicles.

1.3 Two main aspects of the Business Case have progressed close to a conclusion since the DFBC was approved:

a. The procurement of the principal contracts has reached a stage where all material terms are agreed, including the capital, operational and maintenance costs; and
b. The principal terms of the funding available to support the delivery of the ETN have been agreed by CEC and the Scottish Government.

This FBCv2 explains in detail the important consequences arising from the finalisation of these two critical areas.

1.4 After an intensive and lengthy competitive procurement process, the capital and maintenance costs of the scheme have now been finalised at a level slightly below the DFBC estimate. Based on firm rates and prices received from the bidders for system construction, vehicle supply and maintenance, the capital cost for Phase 1a, the tram line from Edinburgh Airport to Newhaven, is forecast at £498m. The capital cost to deliver Phase 1b (the tram line from Roseburn to Granton) is now forecast at £87m. The contractual arrangements permit CEC to commit to Phase 1b on fixed cost terms at any time until March 2009. However, concurrent construction of Phase 1b with Phase 1a would offer significant benefits of scale.

1.5 The Scottish Government and CEC have confirmed their commitment to funding contributions of up to £500m and £45m respectively. These commitments will be structured in such a way that the final aggregate funding for Phase 1a reflects equivalent pro-rata contributions, with a cap of £500m on the Government contribution.

1.6 The primary economic viability test is known as the Benefit Cost Ratio (BCR). Further analysis has concluded that the BCR for Phase 1a is 1.77 which indicates a return of £1.77 in economic benefit for every £1 of cost. This ratio reflects the decision not to proceed with the project known as the Edinburgh Airport Rail Link (EARL). It does not yet take into account the option of a future interchange with heavy rail at Gogar, which is an option under consideration by the Scottish Government and may have a beneficial impact on the tram BCR. The BCR for Phase 1 including both Phases 1a and 1b is 2.31, which reflects the strong economic case for Phase 1b.

1.7 The principal recommendation of this FBCv2 is that Phase 1a should proceed, with funding of up to £545m committed to its delivery. The FBCv2 sets out the full supporting analysis which leads to this recommendation. The FBCv2 also provides the analysis which supports the implementation of Phase 1b, but acknowledges that additional sources of funding are needed before it may proceed. This matter is under review and it is recommended that a decision on Phase 1b should be taken during 2008.

1.8 The phased approach was anticipated in the DFBC and now forms the basis on which the project will proceed. Most of the material that was produced at considerable effort and cost for the DFBC remains valid and intact. However, there has been some editing to update figures and to clearly define the initial Phase 1a approach.

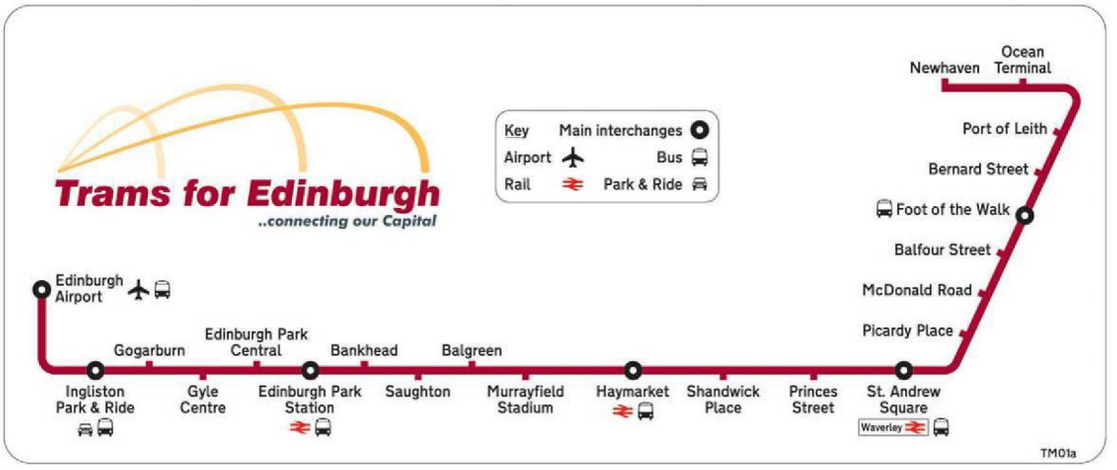
1.9 It is a fact that many tram schemes implemented in the UK and in Ireland in recent years have subsequently been extended once their successful operation has been demonstrated. Accordingly, a section has been included in this document describing the wider network options which may bear further examination in the future.

1.10 The Government has recently announced its intention to develop a new rail station at Gogar and to create an interchange with the tram project. The tram project costs in the FBCv2 do not reflect the effect of this proposed project, which will be subject to appropriate assessment in due course and which will require to be funded under separate consideration. As is normal in transport project assessment, the influence of a new project on existing transport infrastructure, benefits and costs will require to be taken into account in the assessment of the new project. The proposal that a new interchange be created is likely to have a net beneficial effect on future tram revenues, and possibly BCR. However, no detailed work has been done to date in view of the relatively recent announcement of the Gogar project.

Phase 1a

1.11 The route for Phase 1a is as depicted in Figure 1.1 below.

Figure 1.0. Tram route for Phase 1a.



Facts for Phase 1a

Trams	**Route**	**Service**
27 trams	18km	5 min intervals between trams
250 passengers	22 stops	Integrated bus and tram ticketing
100% low floor	Single depot at Gogar	Inspectors on all trams

Background

1.12 Substantial road traffic growth across the Edinburgh area, combined with forecast increases in population and employment, will lead to significant growth in road congestion and demand for transport solutions. CEC has identified an integrated tram and bus network as the preferred way to provide the backbone for a comprehensive, higher quality public transport system to support the local economy and to help to create sustainable development. The ETN ("the tram") has been central to transport policy and planning and the wider economic development aspirations of the city for more than seven years. The scheme has had in-

principle funding support from the Scottish Government (now represented by Transport Scotland (TS)) since 2003.

1.13 Early 2006 saw the tram scheme reaching an important milestone as it received Parliamentary approval. Both the Edinburgh Tram (Line One) Act and Edinburgh Tram (Line Two) Act came into force following Royal Assent in May and April 2006, respectively.

1.14 Concurrent with the parliamentary process, a careful review of cost estimates was carried out which concluded that, although Line 1 only or Line 2 only had a high degree of deliverability within the constraint of available funding, a complete network of Lines 1 and 2 was unlikely to be affordable in one phase of construction and that a phased approach to procurement and delivery would be implemented.

1.15 The phasing assessment produced a proposal for Phase 1 comprising two sub-phases namely 1a – Newhaven to Edinburgh Airport; and 1b – Roseburn to Granton Square. The core of the network from Newhaven to Edinburgh Airport, via Haymarket and Princes Street, will give a good balance of costs and benefits, is forecast to be financially viable and can be effectively integrated with Lothian Buses (LB) services.

1.16 The proposed phasing also carries the support of Transport Edinburgh Limited (TEL), which is charged by CEC with the delivery and management of an integrated tram and LB network and of Transdev, the future operator of the tram.

1.17 The three core tests examined to assess the continued viability of the scheme are:

- **Economic viability** – The quantified economic benefits and costs of Phase 1a of the tram, as well as the wider benefits relating to urban regeneration; environment; safety; transport and land use policy integration; and accessibility and social inclusion;
- **Financial viability** – The way in which Phase 1a of tram will be integrated with buses under the umbrella of TEL in a manner which preserves and enhances the public transport service in the city and does so in a profitable manner. This is embodied in the TEL Business Plan; and
- **Affordability** – The prospective deliverability of Phase 1a of the tram within the constraints of available funding.

A summary of these core tests is set out below.

Economic viability

1.18 The economic benefits and costs of Phase 1a of the tram have been assessed in accordance with Scottish Transport Appraisal Guidance (STAG) by Steer Davis Gleave. This built upon the previous work submitted to Parliament in 2004 but was updated, where appropriate, to reflect more recent and extensive transport modelling, again led by Steer Davis Gleave. The following are the highlights from the assessment:

Economic regeneration

1.19 Phase 1a of tram is integral to the regeneration of the Newhaven and Leith area. Substantial new residential, commercial, retail and other development is projected progressively between now and 2020, reflecting the growth in Edinburgh's economy and population. Without Phase 1a of the tram it is unlikely this large scale redevelopment would go ahead on the desired scale and timetable.

1.20 Significant new development is also envisaged in West Edinburgh with some 250,000 m^2 of new office space (mostly at Edinburgh Park) and over 200,000 m^2 of other commercial space, again predicted to be progressively developed between now and 2020. Phase 1a of the tram will facilitate and encourage this new development and, crucially, provide improved public transport between the new housing in Leith and the new job opportunities in the west of the city.

1.21 In employment terms, it is anticipated that at least 590 full-time permanent jobs in the city will be generated or brought forward by the development impact of Phase 1a of the tram. These jobs do not displace jobs elsewhere in Scotland. It should also be noted that a substantial proportion of the capital investment will be spent in Scotland, encompassing utility works, land purchase, civil engineering works and professional services.

1.22 The positive relationship between high quality transport capability, specifically light rail, and enhanced economic development is a well-known phenomenon. There is also now little debate about the reverse scenario, the retarding impact on development of poor transport connections. The Edinburgh tram scheme is based on the need for improved transport connections to vital development areas, efficient capacity provision on key corridors and is a critical driver of future economic growth in Edinburgh and Scotland as a whole.

Environment

1.23 Phase 1a of the tram will make a positive contribution towards the objectives of reducing emissions and improving air quality in the city centre and in the transport corridor to the west of the city and the airport. Vehicles within the city account for up to 88% of emissions of nitrogen oxides and trams will provide a large number of journeys through the city centre, improving mobility and accessibility without adding to current levels of pollution. Trams are also a relatively quiet mode of road transport providing a higher quality environment for those living, working and travelling in the area. The tram's contribution to mode shift from private car to public transport (see below) will further progress the objectives set in the Air Quality (Scotland) Amendment Regulations 2002 and to national objectives to reduce emissions of greenhouse gases.

1.24 The construction and operation of Phase 1a of the tram will address potential impacts on the World Heritage Status of Edinburgh by applying the design and mitigation standards set out in the Tram Design Manual, approved by CEC planners. Details of mitigation measures to retain, protect and enhance or replace existing plantings and wildlife habitats on Phase 1a, including badger setts, are prescribed in the Environmental Management Plan and specific elements were approved during the Parliamentary process.

1.25 To the fullest extent reasonably deliverable, disruption during construction will be minimised. Clear and open communications will ensure that the effects of construction are anticipated and the construction planning will ensure that work is restricted to the shortest time period consistent with safe working practice. Schemes to provide financial assistance to local businesses affected by construction have been implemented.

Safety reliability and capacity

1.26 Personal security will improve, reflecting tram design elements (CCTV and help points at all stops and vehicles) and designed access arrangements aimed at enhancing security. The planned use of inspectors on all vehicles will also assist this objective, as experience in other cites has clearly shown.

1.27 Trams will improve the overall reliability of public transport as they generally benefit from greater segregation from general traffic and priority at junctions. They also present an opportunity to significantly reduce the variability of dwell time at stops compared to a bus-only public transport service. In the absence of trams, a significantly increased number of bus vehicles would be required on the main Phase 1a corridor on Princes Street and Leith Walk to cope with forecast increased demand. Despite continuing implementation of a wide range of bus priority measures, buses remain vulnerable to the effects of increasing congestion across the city.

Accessibility and social inclusion

1.28 In areas around Leith Walk and Saughton and Balgreen in the west socio economic status is considerably lower than surrounding areas and employment, income levels and car ownership tend to be comparatively low. Opportunities for people living in these areas will be improved by direct connection via tram to the city centre and other employment areas, including the new development in Leith and the west of the city at Edinburgh Park and the airport.

1.29 Trams and tram stops will be fully accessible by people with mobility impairments, those travelling with small children and the elderly. These travellers will benefit from the design specification, ride-quality and reliable accessibility of trams. Where the distance between tram stops presents a challenge to accessibility, the service integration patterns with buses have been designed to maximise the continuing and improving accessibility of LB.

Transport and land use integration

1.30 The tram will be particularly vital in responding to the expected growth in travel demand arising from the new development in the north of Edinburgh at Leith. Phase 1a of the tram will help ensure this new development can be delivered without exacerbating city wide congestion by ensuring that land use and transport policies are integrated. Any displacement of new development to greenfield and greenbelt sites would have planning implications and could result in a settlement pattern that would be more difficult to serve by public transport.

1.31 Carefully considered bus-tram service integration plans and common ticketing arrangements will enhance the opportunity to make journeys on the public transport network. Effective interchange facilities will be provided at Ocean Terminal, the Foot of Leith Walk, St Andrew Bus Station, and the Gyle Shopping Centre. The tram route will integrate with Ingliston Park and Ride, already operating successfully and planned for expansion, and with other park and ride sites under active consideration. Phase 1a of the tram also provides an opportunity to significantly improve integration with other transport modes, particularly at Haymarket and Edinburgh Park railway stations and Edinburgh Airport. These interlinking services, along with the proposed frequency of the service, means tram will afford easier access to employment, retail and leisure locations.

Patronage and transport mode shift

1.32 Extensive work has been undertaken to build new demand forecasting models to predict use of the tram and the impact upon the use of other forms of transport (bus, rail and car). The modelling deployed to support the Edinburgh tram scheme is recognised by the professionals involved as among the most sophisticated ever prepared in support of a large-scale transport scheme.

1.33 Annual demand for Phase 1a is predicted to be 11m tram passengers in 2011 and to rise to 25.5m by 2031. This growth is predicated on a forecast of substantial growth in the total travel market, as well as the additional predicted commercial and housing development as a result of the scheme. Between 2005 and 2031, demand for journeys by public transport is forecast to increase by 61% (1.8% p.a.). In the context of economic growth in Edinburgh and actual experience of patronage growth by LB, this is a conservative estimate with actual growth in bus patronage in 2006 of around 5% p.a. The tram provides the capacity to meet a large proportion of this increased demand which could otherwise be met only by cars or considerably more buses on increasingly congested roads.

1.34 Modal shift from car is a key objective of the Local and Regional Transport Strategies (LTS and RTS) and is fundamental to achieving the environmental, sustainability, health and traffic aspirations of the tram. Phase 1 (Phase 1a and Phase 1b) of the tram project are forecast to generate 3m additional public transport trips in 2011, increasing to over 6m additional trips in 2031. These are mostly in areas directly served by the tram where the change from car to

public transport will be up to 10%. It is estimated Phase 1a will produce approximately 2.5m of these trips by 2011, rising to 4.2m by 2031.

1.35 In 2011, about 17% of tram patronage will be new to public transport, rising to 20% in 2031. The balance of the increase will predominantly be those who would otherwise travel by bus and other modes of public transport. Congestion is characterised by the disproportionate effect that marginal increases in car use have on the total system. Therefore, it is very important to maintain downward pressure on additional road use and the proportion of tram patronage new to the public transport market is therefore significant. It is also in keeping with results achieved on successful tram schemes elsewhere such as Croydon Tramlink, Nottingham, and Dublin.

Benefits and costs to Government

1.36 The benefits and costs of Phase 1a of tram calculated in accordance with STAG requirements are summarised in the Table 1.1. The FBCv2 has been prepared on the basis that will not proceed as per the advice received from the Scottish Government. The resulting BCR for Phase 1a of 1.77 represents an excellent return and reflects significant increased decongestion benefits to other road users (including cars). In the with EARL evaluation a proportion of these benefits were not accrued to the tram project due to the pre-existence of EARL already achieving some decongestion within the model.

Table 1.1. Value of the ETN benefits and costs for Phase 1a and resultant BCR (£m Present Value, 2002 prices).

£m Present Value, 2002 prices	Phase 1a	
	Without EARL	With EARL
Value of scheme benefits	592	373
Value of scheme costs	335	340
Net benefits	**257**	**34**
Benefit Cost Ratio to Government	**1.77**	**1.10**

Financial viability (the TEL Business Plan)

Background to TEL

1.37 TEL was established by CEC to build on the success of the current LB services through the delivery and management of an integrated tram and bus business. CEC requires TEL to achieve profitable operations, to meet its investment obligations and to continue payment of dividends broadly at the level currently received by CEC from LB.

1.38 Transdev are one of the world's largest tram operators and were awarded the development and operating contract in 2004. Using their wealth of experience, it will be their role to establish the tram operating system, reporting directly to TEL.

1.39 However TEL, like LB, will also target the delivery of a 'social dividend' by maintaining realistic and affordable fares and a more comprehensive level of service provision than would normally be the case for a private sector transport operator. TEL's objectives are also aligned to the delivery of the wider economic benefits of the tram. The measure of success for TEL will be the overall performance in commercial, social, customer and financial terms of the integrated bus and tram network. The summary presented here focuses on the drivers of the forecast financial results of TEL.

1.40 Section 9 provides a detailed analysis of the financial viability as it is presented in TEL's full Business Plan, a copy of which is included at Appendix I.

Financial forecast highlights

1.41 Table 1.2 provides a summary of the financial highlights from the forecast of TEL's profitability operating with bus and tram.

Table 1.2. TEL profitability operating with bus and Phase 1a tram.

Tram in service	Pre-tram						
Tram service pattern (see below for explanation)	n/a	n/a	6/12	6/12	8/16	8/16	8/16
Year	2006	2010	2011	2012	2016	2021	2031
Patronage (m Pax)							
Bus	108	117	113	115	125	133	150
Tram	-	-	11	13	19	21	25
Total TEL Patronage	108	117	124	128	144	154	175
Revenues and costs (£m)							
TEL Revenues	88	109	119	128	167	216	356
TEL operating costs			120	126	156	194	312
Pre-tax operating profit / (loss)			(1)	2	11	22	44
Tram lifecycle costs			-	-	1	2	2
Notional taxation			-	1	3	6	12
Dividend payment			-	-	3	3	5
Net TEL cash surplus / (deficit)			(1)	1	4	10	25

NB All £ figures inflated

1.42 The forecast represented in Table 1.2 has been developed using the patronage and revenue forecasts produced for the DFBC for both tram and bus using the transport model described above and validated by TEL, **tie** and Transdev. The forecast reflects that TEL is prospectively both a cash positive and profitable business. As explained above, the model is based on economic growth assumptions, which, in light of the actual experience of patronage growth to date, are considered conservative.

1.43 The patronage and revenue forecast for tram in 2011 to 2014 have been conservatively reduced to take account of a ramp-up period, as new services have, on occasion, taken time to be fully adopted by users. The forecast reflects that TEL's operational cash flow profile will be positive once the tram and bus patronage has stabilised after the first year of the ramp-up period in 2012.

1.44 For the DFBC, sensitivity testing was undertaken to assess the impact of EARL on TEL's patronage and revenue forecasts. These had confirmed the premises that EARL and tram would serve different patronage markets and that, although tram without EARL would gain some small market share, overall TEL revenues would be net neutral as the absence of EARL results in a marginally smaller overall public transport market within Edinburgh. It should be noted that the alternative option under consideration of linking heavy rail at Gogar with the tram line serving the airport will further improve the tram viability.

1.45 It is assumed that the policy of maintaining the current level of LB dividend to CEC will be applied prudently and that the annual dividend might be reduced or foregone for short periods in response to lower profits or short term demands on TEL's cash-flows. In such circumstances, the dividends for future periods would be adjusted upwards to ensure the shareholders receive the target dividend on a cumulative basis.

1.46 The projected operating costs for TEL include provisions for:

- The purchase of new buses to renew and / or expand the existing bus fleet; and
- The required expenditure on the tram infrastructure and vehicles necessary to ensure effective performance of the tram assets during their useful lives, including half-life refurbishment of the trams after 15 years (note: The TEL Business Plan does not specifically provide for the major replacement expenditure which will be required after 30 years).

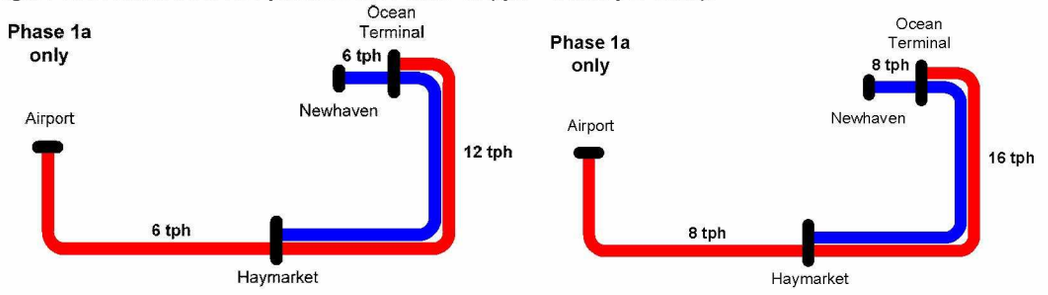
1.47 Updated information received from the bidders confirms the costs included in the DFBC for this are conservative.

1.48 Taxation is provided at the currently prevailing rate on forecast net profits, applied consistently with that of the DFBC. TEL, **tie** and CEC have begun to engage in the examination of tax mitigation opportunities in the same way as other commercial entities. As a result, the notional taxation applied in the table may be considered to be conservative.

Integrated service patterns

1.49 Using the geographical analysis of where forecast demand is likely to originate / terminate, TEL has developed a service integration plan reflecting planned tram services and bus services after the introduction of tram. The service patterns for tram must provide sufficient and reliable capacity to meet the demand and ensure overcrowding does not dissuade passengers from using public transport. The planned service patterns for opening of Phase 1a of the tram are depicted below (Figure 1.2).

Figure 1.2. Planned service patterns for Phase 1a (tph = trams per hour).



1.50 The forecast of demand indicates that, after the initial five years of growth, the '6 / 12' trams per hour service depicted above will require to be increased to provide sufficient capacity to serve demand on the Newhaven to Haymarket section. The TEL Business Plan assumes that from 2016, the service will be increased to an '8 / 16' trams per hour pattern. A further increase in services is likely to be required after the year 2027 to provide sufficient capacity to serve demand on the Haymarket to Edinburgh Park section of the tram network.

1.51 Where the tram runs parallel or close to an existing bus route amendments to bus service patterns are envisaged to prevent unnecessary overlap of services. The principle of any amendments will be that bus service reductions are only applied where the tram offers an acceptable alternative mode of travel. This approach will allow TEL to match the most effective mode of transport to levels of demand while the travelling public will continue to benefit from high quality public transport provision.

1.52 TEL's service integration plan aims to offer as near seamless a journey through the network as possible. The inconvenience of interchange is minimised by eliminating it where possible. The service integration plan seeks to achieve optimal alignment of service frequencies at interchanges, thus making interchanging as simple as possible and minimising the risk of loss of patronage. Key bus and tram interchange locations addressed by the service integration plan are Ocean Terminal, the Foot of Leith Walk, St Andrew Bus Station, and the Gyle Shopping Centre.

3rd party responses

1.53 Good relations with 3rd party operators are considered essential, not least due to the opportunities which enhanced integration with those operators may offer and the benefits of being part of the wider provision of public transport within Scotland. Dialogue is underway to develop appropriate service plans with these operators, including common and through-ticketing arrangements.

Fares and ticketing strategy

1.54 The TEL fare structure will be a single, fully integrated, flat fare for bus and tram, regardless of the distance travelled. The only exceptions will be, as now, night services and journeys to and from the airport. It is a fundamental assumption that TEL's tram operations will participate in the national concessionary ticketing scheme in a manner equivalent to that of bus operations, in order to ensure parity across modes and sustain effective integration. Under the terms of the scheme, operators receive payment of 73.6% of the price of an adult single for each journey by concessionary travel holders and this currently applies to c20% of LB patronage. This level of recompense is assumed to continue.

1.55 The assumption is that the average fares yield for TEL will be increased at the rate of the Retail Price Index (RPI) +1% growth per annum. This is in line with historical increases in fares by LB, meets political and stakeholder expectations and supports TEL's aim to provide transport services at an affordable price.

1.56 Tram tickets are to be purchased off-board with ticket machines provided at all tram stops and a number of bus stops. The only tickets to be sold on-tram are to be adult and child single tickets, which will be priced at a premium above the price available from off-tram ticket vending machines. TEL will continue to develop LB's current strategy to encourage wider use of pre-paid and / or multi-journey types of tickets by offering discounts to the standard fare.

Revenue protection

1.57 Fare evasion and fraud on the existing LB bus network has been limited. Trams, with multi-door boarding, require active processes in place to limit the opportunity for fare evasion and fraud in general, as well as the particular need to enforce the premium airport fare. TEL's revenue protection regime for trams is a combination of placing inspectors on each tram and providing ticket machines at all tram stops, with a significant price incentive to buy a ticket off-tram. The presence of inspectors has also been shown to promote a sense of security for passengers and be an effective deterrent to anti-social behaviour.

Other income opportunities

1.58 TEL, with its combined bus / tram network, offers attractive opportunities to generate additional revenues from advertising, small-scale commercial development and marketing and tourism driven revenues. The TEL Business Plan includes a prudent assessment of the income which might be earned from these additional sources, based primarily upon the existing experience of LB.

Operating costs

1.59 TEL's bus operating cost projections are based on the current experience of LB for buses. Tram operating costs were validated by Transdev, and subjected to a thorough review and benchmarking process. They are based upon the planned service patterns and required number of tram vehicles. Effective control over all aspects of operating costs is essential for TEL to achieve its profit objectives. However, the public's perception of the quality of services translates directly to patronage and revenue generation. Therefore, TEL must balance opportunities for cost savings against the impact this may have on the quality of services provided.

1.60 Maintenance services are being procured separately. A significant proportion of the maintenance fees accruing will be based on key performance indicators (kpi's) including punctuality, availability and presentational standards.

1.61 TEL's success in realising the benefits expected from the integrated bus and tram business will be measured using a number of developed kpi's. These have been incorporated into the relevant contracts and operating agreements with service providers to TEL including the operator of the trams, Transdev, and the maintenance providers for the tram system.

New development and economic growth risk to patronage and revenue forecasts

1.62 Phase 1a of the tram will encourage and facilitate the new development planned in North and West Edinburgh and stimulate economic growth in the city. However, the forecast future TEL patronage and revenues, both for bus and tram, is in turn highly sensitive to the level and timing of new development and the underlying level of economic growth. Sensitivity tests indicate that with new development delayed by five years in other areas, overall TEL revenue would be reduced by 3% in 2011 (12% in 2031).

1.63 In the event of slower than expected development or a general economic downturn, TEL would plan and implement services to match the reduced demand. On the Phase 1a corridor, where there is already a high level of demand, the opportunities to implement revised integrated service patterns for buses and tram, with commensurate savings in operating costs, would significantly mitigate the risk of failure to meet annual operating profit targets. In 2011, approximately 30% of forecast demand between Leith and Haymarket and 50% of demand between Haymarket and the airport will be directly dependent on new development.

Affordability

1.64 The summaries above demonstrate that Phase 1a on its own can deliver significant economic benefits in return for the proposed investment. Here we consider the affordability of Phase 1a of the tram in the context of visible funding and the risks being borne by the principle funders, with a particular emphasis on the risks retained by CEC. Section 10 contains the detailed analysis.

Cost estimates

1.65 Building on the detailed cost estimates prepared in November 2006, and incorporating the firm rates and prices received from bidders in 2007, the updated project cost estimates reflect the agreed scope for Phase 1a and a programme for delivery of Phase 1a by the first quarter 2011. If the option for Phase 1b was exercised within the window of opportunity to March 2009, it could commence revenue service in 2012.

	Concurrent construction	Sequential construction
Phase 1a	**£498m**	**£498m**
Phase 1b	**£ 82m**	**£ 87m**
Phase 1 in total	**£580m**	**£585m**

1.66 There is a high level of confidence in these estimates. Approximately 99.9% of the costs included are based on the rates and prices for firm bids received for the main contracts (infrastructure, tram vehicle supply, utility diversions and design), the remainder of the costs are based on known rates and prices for personnel and, in the case of land, from the Valuation Office Agency (District Valuer's) assessments. The overall level of confidence is reinforced by benchmarking against other tram schemes and the provisions for risk included in the estimate, as explained below.

1.67 It should be noted that a sum of approximately £3m has been incurred in relation of the design development for Phase 1b, and is included in the capital cost estimates for Phase 1b throughout this Business Case.

1.68 The updated estimates comprise base costs and an allowance for risk and uncertainty. A rigorous Quantitative Risk Analysis (QRA) has been applied to identify project risks to derive a risk allowance to deliver a very high level of confidence (statistically at a 90% confidence level, meaning that there is a 90% chance that costs will come in below the risk-adjusted level). The level of risk allowance so calculated and included in the updated estimate represents 15% of the underlying base cost estimates for future Phase 1a costs at Contract Award. This prudent allowance for cost uncertainty reflects the evolution of design and the increasing level of certainty and confidence in the costs of Phase 1a as procurement has progressed through 2006 / 2007 and fixed priced bids for the infrastructure and tram vehicle supply contracts have been received.

1.69 **tie** and CEC will continue to analyse, quantify and mitigate risks during the period through to final negotiation and award of the tram vehicles (Tramco) and infrastructure (Infraco) contracts and during construction with the objective of reducing or eliminating the impact of individual quantified risks and thereby the element of the allowance for risk which crystallises into actual costs.

1.70 The principal elements of the base cost estimates are:

- **Utility diversions** – The Multi Utility Diversion Framework Agreement (MUDFA) was awarded in October 2006 and rates, prices and allowances in the contract have been reflected in the updated estimate;
- **Tram vehicles** – Tenders were received for Tramco in October 2006 and the updated estimate reflects those of the anticipated Preferred Bidder;
- **Infrastructure** – Tenders were issued for Infraco in October 2006 and the updated estimate reflects those of the recommended Preferred Bidder. The cost estimates have been benchmarked against other comparable tram schemes;
- **Land compensation costs** – Estimates have been provided by the District Valuer (DV) and are subject to regular review. Reviews performed in spring 2007 confirmed the adequacy of the estimates; and
- **Internal costs** – Comprises mainly the firm price SDS design costs, as contracted, plus the costs of project management team and overhead, legal costs related to procurement and support of approval processes and the support of the operator. ,All of these costs have been estimated using a detailed resourcing plan to which staff costs and rates agreed with service providers have been applied.

1.71 The Infraco and Tramco contract cost and the MUDFA contract rates are fixed at outturn price levels. The base estimate costs for remaining items, principally internal costs, are based on fully inflated cost estimates supplied by service providers and on industry standards for salary cost inflation.

1.72 In summary, the cost estimate reflects substantial external validation from the procurement process for the major contracts and contains a sensible level of risk contingency.

Measuring affordability

1.73 On 27th June the Scottish Government confirmed support for up to £500m funding for the Edinburgh Tram scheme**.** In January 2006, CEC made an in-principle commitment to make a contribution of £45m towards the capital cost of Phase 1, to be deployed initially on Phase 1a. Therefore, the benchmark total funding package is currently £545m. The updated cost estimates above reflect that Phase 1a, at a cost of £498m, is affordable within this level of funding, with 14% headroom over and above the 15% risk allowance provided for in the cost estimate.

Application of available funding

1.74 Payment for capital costs will be made by **tie**, in accordance with principles of the contractual payment mechanisms for each contract. A detailed table showing the profile of planned expenditure is included in Section 10. Funding from the Scottish Government and CEC is for capital expenditure only. All operating and lifecycle costs in relation to the tram will be borne by TEL. This means that CEC, in its capacity as sole shareholder of TEL, is explicitly bearing the risks in relation to revenues, operating costs and the long-term maintenance of the tram insofar as these risks are not wholly, or partly, passed contractually to the private sector.

1.75 CEC must balance its desire to support the project with its fiduciary responsibility and limited resources. Therefore, CEC's contribution, comprises only such amounts as could reasonably be expected to be funded from future tram-related development income and receipts, rather than from general funds or from Council Tax. The anticipated sources of such receipts include land contributions by CEC, anticipated development gains accruing to the Council on Council-owned sites, Section 75 planning agreements already negotiated and anticipated future agreements, third party developments around the tram route and anticipated capital receipts from tram related Council owned sites.

1.76 Transport Scotland and CEC have agreed to work together to regularly review and revise (as necessary) the contribution schedule, as required by the Grant process.

Procurement strategy and risk allocation

1.77 The Procurement Strategy followed by **tie** responds to feedback from the National Audit Office (NAO) in 2004 on the effectiveness of light rail schemes. The objectives of the Procurement Strategy are summarised as follows:

- Transfer the design, construction and maintenance performance risks to the private sector;
- Minimise the risk premium (and / or exclusions of liability) that bidders for a design, construct and maintain contract normally include. Usually at tender stage bidders would not have a design with key consents proven to meet the contract performance obligations and, hence, they would usually add risk premiums for this;
- Mitigation of utilities diversion risk (i.e. potential impact of delays to utilities diversion programme on Infraco works); and
- Gain the early involvement of the operator to mitigate the risk relating to the future operation of the tram.

1.78 To date, **tie** has entered into four key contracts:

- **Development Partnering and Operating Franchise Agreement (DPOFA)**
  Awarded to Transdev in 2004;
- **System Design Services (SDS)**
  Awarded to Parsons Brinkerhoff in September 2005;
- **Joint Revenue Committee (JRC)**
  Awarded to Steer Davis Gleave in September 2005; and
- **Multi Utilities Diversion Framework Agreement (MUDFA)**
  Awarded to Alfred McAlpine in October 2006.

1.79 This leaves the two main contracts to be placed, namely:

- **Infrastructure provider and maintenance (Infraco) –** The tender process is close to conclusion with the contract to be awarded in January 2008 on conclusion of final negotiations and completion of design due diligence. BBS, a consortium comprising Bilfinger Berger and Siemens Group, has now been recommended by **tie** as the preferred bidder for this contract.
- **Vehicle Supply and maintenance (Tramco) –** The tender process is close to conclusion with the contract to be awarded in January 2008 on conclusion of final negotiations and completion of design due diligence. Spanish firm CAF has now been recommended by **tie** as the preferred bidder for this contract.

1.80 The Infraco will act as a "holding contract", with the intention that the design and vehicle provision (including maintenance contract) will be novated to the Infraco at the point of award. The entire strategy has been developed to help facilitate the speedy implementation and completion of the construction phase of the project and to remove uncertainty and, therefore, cost from bidders' proposals i.e. to deliver value for money.

1.81 In summary, the key attributes of the strategy are:

- The separation of system delivery and operations – To focus organisations on their strengths and to minimise mark-ups and risk premiums;
- Early introduction of the operator – To ensure effectiveness of design, construction and commissioning ready for operation;
- Early commencement of design by the SDS contractor – To reduce scope and pricing risk in Infraco and Tramco bids and to reduce the overall project programme;
- Separate procurement of the tram vehicles – To enable the selection of the optimum combination of tram vehicle and infrastructure suppliers;
- Re-aggregation of the supply chain at the point of award – By novation of the SDS and Tramco contracts to Infraco, thereby creating single point responsibility for design, construction, commissioning and subsequent maintenance of the tram system, with consequential transfer of performance risk to the private sector;
- Maintenance of the tram vehicles and infrastructure for up to 15 years post commencement of operations by Tramco and Infraco – To incentivise selection of components with 'whole-life' costs in mind and to incentivise Infraco to mitigate the risk of latent defects arising during the operational phase;
- Separate procurement of utilities works under MUDFA – To enable completion of the utilities diversions before commencement of infrastructure works, thus reducing risk during the construction phase and avoiding the risk premiums that would otherwise be included if this work was included with the Infraco package;
- Validation of the SDS designs by a Technical Support Services (TSS) consultant – To provide comfort that the designs produced will deliver the required performance;
- Incentivise delivery in accordance with programme – By adopting a milestone payment mechanism in the SDS, Tramco and Infraco contracts, with a significant element of the price withheld pending completion of system reliability tests; and
- Bonds and Warranties in the SDS, Tramco and Infraco contracts – To provide recourse in the event of failure.

1.82 These arrangements provide early involvement of the tram system operator, risk transfer to the private sector at an affordable level, a shorter overall programme and a single point of responsibility for the delivery of the operating tram system and subsequent maintenance.

1.83 Section 7 provides a detailed analysis of the Procurement Strategy and Section 11 describes the approach to risk management in all aspects of the project.

Risks retained by the public sector

1.84 The Procurement Strategy, when fully implemented, will be effective in transferring a very significant number of risks to the private sector. However, as explained above, the strategy is also predicated on delivering value for money, and certain risks are retained in the public sector where they can be effectively managed. **tie** maintains a comprehensive register of all identified risks in relation to the project and has an active management and mitigation plan for each risk. Where these risks can be quantified they have be assessed and included in the risk allowance in the capital cost estimates.

1.85 As the project moves towards physical construction, the following are the most significant risks which could impact on the delivery of the project on time and within the capital cost estimates (including risk allowances):

- **Utility diversions – tie** will manage the interface between utility diversions and the follow-on works by Infraco. A significant delay in the hand over of worksites to the Infraco

could result in significant financial penalties to the extent these are not met by the MUDFA contractor's liability limits. For this reason, a prompt start to these works was made in 2007, including advance works at the Gogar depot site. This allowed some of the delay, caused by the review of the project following the May election, to be absorbed. The current programme is fully aligned with the preferred Infraco bidder's programme of works and progress to date has been excellent with no major issues encountered so far;

- **Changes to scope or specification –** A great deal of care has been taken in defining the scope and specification of the tram project throughout the Parliamentary process and during design development, with input from TEL and Transdev and extensive consultation with CEC and TS. However, significant unforeseen changes to scope and specification could have a very significant impact on the deliverability of the project. Similarly, any changes introduced by stakeholders that are over and above the approved scope will increase the project estimate. Effective management of the consideration of changes through the Governance processes implemented for the project will be vital to mitigate this risk; and
- **Obtaining consents and approvals –** Responsibility for the preparation and application for most necessary consents and approvals has been passed to the SDS provider and this risk will pass to the Infraco at the point of novation. However, **tie** and the other stakeholders must continue to ensure there are clear strategies and effective processes to deliver all consents and approvals including planning approvals and Traffic Regulation Orders (TROs).

Implementation

1.86 **tie** has developed a number of key strategies and management plans to ensure the successful implementation of the construction phase of the project. They cover land acquisition, obtaining the required approvals and consents, compliance with statutory requirements and side agreements with 3rd parties, as well as traffic management plans and a people strategy. These are based on the policies developed through either public consultation or testing and consideration during the parliamentary process. They set out **tie**'s approach to mitigate the likely impacts of both the construction and operation of the tram.

1.87 Extensive work has been undertaken to establish the impact of tram on the wider traffic flows in Edinburgh and the finalisation of traffic modelling will include any necessary changes to the traffic arrangements that are indicated to be beneficial to the public.

1.88 In conjunction with development of the TEL Business Plan, the tram operating and maintenance contracts have been developed with a coordinated performance regime, safety management organisations and implementation plans. The contracts are aligned to achieve the integrated mobilisation, testing and commissioning of the tram and delivery of service.

1.89 A staged approach has been developed to allow passenger services to commence at a lower level of intensity, building with patronage growth and experience of revised road traffic flows through the city. Review and optimisation of traffic signal phasing will be performed in conjunction with CEC both before and after service commencement, to achieve effective traffic management.

Programme

1.90 The table below (Table 1.3) summarises, in chronological order, the key milestones achieved since the approval of the DFBC in December 2006 and the next stages of the project up to commencement of revenue service of Phase 1a. The detailed programme from which these dates have been extracted is described in Section 12 and has been prepared on the basis that contracts for Infraco and Tramco will be awarded in January 2008, with construction commencing in February 2008. The immediate start of construction is predicated on some limited mobilisation in late 2007.

Table 1.3. Milestone programme – Key dates

Milestones	Date
Approval of DFBC by CEC.	21 Dec 06*
Approval by Government of continuing funding including utility diversions based on the DFBC.	16 Mar 07*
TRO process commences.	28 May 07*
Tramco – Complete initial evaluation / negotiation.	07 Mar 07*
MUDFA – Completion of pre-construction period of MUDFA contract.	30 Mar 07*
MUDFA – Commencement of utility diversions.	09 July 07*
Infraco – Return of stage 2 bids.	08 May 07*
Tramco – Recommendation of Preferred Bidder.	19 Sep 07*
Infraco – Completion of evaluation / negotiation of bid.	09 Oct 07*
Infraco – Recommendation of Preferred Bidder.	15 Oct 07*
Tramco / Infraco – Final facilitation of novation negotiation complete.	16 Nov 07*
Tramco / Infraco – Final negotiation and appointment.	12 Dec 07
Infraco – Negotiation of Phase 1b complete.	12 Dec 07
Approval of FBC by CEC approval and funding for Infraco / Tramco and all related works to completion of project.	20 Dec 07
Tramco / Infraco – Award following CEC / TS approval and cooling off period.	28 Jan 08
Construction commences Phase 1a.	01 Feb 08
TRO process complete.	17 Nov 09
Commencement of test running Phase 1a.	27 Aug 10
Operations commence Phase 1a.	Q1 2011

*completed

The Business Case for Phase 1b

1.91 Phase 1 b (Roseburn to Granton Square) has a strong economic Business Case, but in the context of the £500m capped funding from the Scottish Government, the project funding position and risk appetite at this time, a Phase 1a only approach is recommended. It will be possible to progress with Phase 1b, with a limited financial penalty for this staggered approach, as long as commitment is made by 31 March 2009, following which, there could be substantial additional cost.

Economic viability

1.92 The strong incremental economic benefit of augmenting the network with the Roseburn to Granton tram line is a striking factor. There is a close relationship between this assessment and the scope and timing of new development at Granton, which carries both risk and opportunity. The economic benefits, alignment to planning objectives and financial implications that are specific to Phase 1b are summarised below.

1.93 The tram is integral to the regeneration of the brownfield area in the north of Edinburgh at Granton Waterfront. Some 7,800 new residential units and nearly 244,000 m^2 of new office, retail and other commercial development is projected to be built in Granton, progressively between now and 2020, reflecting the growth in Edinburgh's economy and population. The absence of Phase 1b of the tram is likely to have a substantial adverse effect on the scale and timetable for this redevelopment.

1.94 The forecasts reflect that by 2015 more than 4,500 residential units and 64,500 m^2 of employment related development in Granton will be not be built in the absence of Phase 1b of the tram. Beyond 2015, the predicted level of new development in Granton in the absence of tram recovers, but ultimately it is predicted that 3,800 residential units and 43,800 m^2 of new commercial development may not be built without Phase 1b of the tram.

1.95 In employment terms, it is anticipated that more than 930 full-time permanent jobs in the city will be generated, of which circa 340 can be attributed to Phase 1b. These jobs do not displace jobs elsewhere in Scotland.

1.96 On Phase 1b, Granton and Pilton to the north are areas where socio-economic status is considerably less affluent than surrounding areas and where employment, income levels and car ownership tend to be comparatively low. Opportunities for people living in these areas will be improved by direct connection via tram to the city centre and other development areas.

Benefits and costs to Government of a composite Phase 1a and 1b

1.97 The benefits and costs of Phase 1 of tram calculated in accordance with STAG requirements are summarised in the table below. The appraisal assumes that EARL, as discussed previously, will not proceed. Table 1.4 assumes that construction of Phase 1b would be commissioned prior to the end of March 2009, if not there will be a substantial penalty cost.

Table 1.4. Value of the ETN Benefits and costs for Phase 1, Phase 1a and incremental Phase 1b (£m Present Value, 2002 prices).

£m Present Value, 2002 prices	Phase 1	Phase1 a	Incremental Phase 1b
Value of scheme benefits	980	592	388
Value of scheme costs	424	335	89
Net benefits	**556**	**257**	
Benefit Cost Ratio to Government	**2.31**	**1.77**	

Note: Phase 1b is only operationally viable as part of the wider network of Phase 1. Therefore, no separate assessment of the NPV and benefits per £1 cost is performed.

Financial highlights – Phase 1b included

1.98 Table 1.5 provides a summary of the financial highlights from the forecast of TEL's profitability operating with bus and tram. This is based on a Phase 1a and Phase 1b approach and remains valid until March 2009, providing 1b is commissioned by that date.

Table 1.5. TEL profitability operating with bus and Phase 1a and Phase 1a and 1b tram.

Tram in service	Pre-tram		Ph1a Only	Phase 1a plus 1b			
Tram service pattern (see below for explanation)	n/a	n/a	6/12	6/12	8/16	8/16	8/16
Year	2006	2010	2011	2012	2016	2021	2031
Patronage (m Pax)							
Bus	108	117	113	112	121	128	143
Tram	-	-	11	16	24	28	34
Total TEL Patronage	108	117	124	128	145	156	177
Revenues and costs (£m)							
TEL Revenues	88	109	119	128	168	216	357
TEL operating costs			120	127	157	195	312
Pre-tax operating profit / (loss)			(1)	1	11	21	45
Tram lifecycle costs			-	-	1	2	2
Notional taxation			-	-	3	6	13
Dividend payment			-	-	3	3	5
Net TEL cash surplus / (deficit)			(1)	1	4	10	25

NB All £ figures inflated